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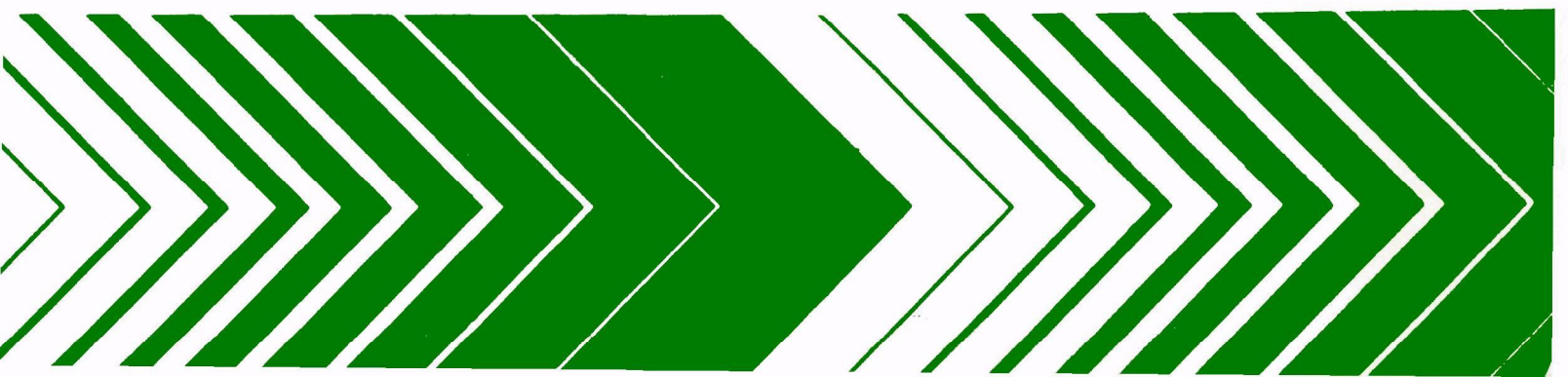
Livestock and the Environment

A Bibliography with Abstracts, Volume VI



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August 1979

LIVESTOCK AND THE ENVIRONMENT

A Bibliography with Abstracts

Volume VI

by

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FOREWORD

The Environmental Protection Agency was established to coordinate administration of the major Federal programs designed to protect the quality of our environment.

An important part of the Agency's effort involves the search for information about environmental problems, management techniques and new technologies through which optimum use of the nation's land and water resources can be assured and the threat pollution poses to the welfare of the American people can be minimized.

EPA's Office of Research and Development conducts this search through a nationwide network of research facilities.

As one of these facilities, the Robert S. Kerr Environmental Research Laboratory is responsible for the management of programs to (a) investigate the nature, transport, fate and management of pollutants in groundwater; (b) develop and demonstrate methods for treating wastewaters with soil and other natural systems; (c) develop and demonstrate pollution control technologies for irrigation return flows, (d) develop and demonstrate pollution control technologies for animal production wastes; (e) develop and demonstrate technologies to prevent, control or abate pollution from the petroleum refining and petrochemical industries, and (f) develop and demonstrate technologies to manage pollution resulting from combinations of industrial wastewaters or industrial/municipal wastewaters.

This report is a contribution to the Agency's overall effort in fulfilling its mission to improve and protect the nation's environment for the benefit of the American public.

William C. Galegar

William C. Galegar, Director
Robert S. Kerr Environmental
Research Laboratory

ABSTRACT

Management and research information on animal wastes has expanded in recent years. This material has appeared in such diverse sources as journal articles, conference papers, university publications, government publications, magazine articles, books or book chapters, and theses. This bibliography was compiled in order to speed the flow of information on findings in one segment of the livestock industry to other segments that could benefit from this technology.

Included in this publication are the following indexes: (1) author, (2) animal information categories and (3) keyword index. These indexes are followed by a section of abstracts of each reference entry found in the bibliography. Single copies of most articles can be obtained in hard copy or microfiche form at cost from the Animal Waste Technical Information Center, East Central Oklahoma State University, Ada, Oklahoma 74820.

This report was submitted in fulfillment of Grant Number R-805151-02 by the School of Environmental Science, East Central Oklahoma State University, Ada, Oklahoma, under the sponsorship of the U.S. Environmental Protection Agency. This report covers the period March 1, 1978, to February 28, 1979, and work was completed as of February 28, 1979.

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The project staff extends its gratitude to the authors and publishers for use of their publications in these bibliographic entries. Work contributed by Laurin Patton, Assistant Professor in the School of Environmental Science at East Central Oklahoma State University, is deeply appreciated. Special thanks is also extended to EPA Project Officer R. Douglas Kreis for his assistance in the preparation of this bibliography.

SECTION 1

INTRODUCTION

Evolving regulations and aims pertaining to pollution abatement and control have necessitated a timely and well-dispersed flow of pertinent information concerning animal waste management so that capital investments in the animal production industry can be made on the basis of the most recent research and operational findings. In many activities, industrial and manufacturing organizations or associations provide the linkage channels through which such information may flow. The wide range in operation sizes and makeup, the geographic factors, and the dictates of the local or regional markets make widespread dissemination of animal waste management information difficult even through the established communication networks such as breed associations, farm organizations, and the popular agricultural press. Common properties and characteristics of animal wastes enable technological transfers to occur in the production operations from one species to another. Publicizing practices of findings in one segment of the livestock production industry can spread new ideas and techniques to other segments of the industry.

The objective of this project is to facilitate the dissemination and technological transfer of information on the management and disposal of animal wastes throughout the livestock industry. Identification and location of pertinent information generated in the production operations of poultry, swine, cattle, fish, and other animals of economic interest raised in open or confined systems is accomplished through searches of technical journals, books, theses, reports from private, state and federal agencies, papers given at meetings of professional societies or symposiums, and articles appearing in the trade or production-oriented "farm" magazines.

The search topics of specific interest include: (1) The environmental impact of animal production activities on water, groundwater, air, soil systems, health, and aesthetics. (2) Feedlot, confinement pen, rangeland, and pasture land management, including animal waste management; the use of chemical fertilizers, manures, green manures, and sewage sludge in conjunction with animal production areas or animal production-related areas; and pollution effects of crop residues, soil losses and sediments production from animal production areas to animal production-related areas. (3) Legal, economic, and social constraints. (4) Research and development. The project staff will maintain a file copy of all articles which appear in the bibliography. Upon request to the project staff, users will be supplied a copy of individual articles at cost provided that copyright permission has been obtained.

An updated bibliography of animal waste management information is prepared annually. It contains entries and abstracts for all new items maintained in the collection at the Animal Waste Technical Information Center.

It is anticipated that users of this bibliography will secure pertinent publications from local libraries or through interlibrary loan. However, single copies of most publications (those for which copying approval has been obtained from copyright owners) may also be obtained upon request in hard copy or microfiche form at a cost-only fee from the following address:

Mrs. Linda Merryman, Project Librarian
Animal Waste Technical Information Center
School of Environmental Science
East Central Oklahoma State University
Ada, Oklahoma 74820

SECTION 2

USER'S GUIDE

The entries in this bibliography have been assigned a specific cross reference code. The code number consists of nine digits (example: 300-74-4453) arranged in the sequences of a three-digit class code, a two-digit number representing the year of publication or presentation, and a four-digit accession number identifying each article brought into the animal waste information collection. The first grouping identifies the class code of the document according to the following format:

Code	Class
100	Technical journal paper
200	Conference proceeding paper
300	University or government publication
400	Magazine article
500	Book or chapter from a book
600	Unpublished paper
700	Thesis

This publication consists of five sections: Author Index, Animal Information Category Index, Keyword Index (Addendum to Volume V), Keyword Index (Volume VI), and Abstracts. An explanation of each section follows.

AUTHOR INDEX

This index lists all the authors cited in the bibliography in alphabetical order. To the right of each author entry is the cross reference code of the article or articles with which he is identified. An example of the format is as follows.

ALDRICH S	400 78 4912
ALICH J A JR	100 78 5001
ALLEN K	400 78 4848
AMIR I	200 77 4774
ANCA	600 75 5150
ANDERSEN J R	300 74 4700

ANIMAL INFORMATION CATEGORY INDEX

To provide a quick entry into the abstract holdings of the collection, an animal information code was developed. This code utilizes an alphabetical entry to signify a broad interest area and a numerical digit to designate a more specific topic under the broad interest area. Each abstract in the collection is classified according to this code and could be listed under the most relevant categories. This provides the user with an easy entry into the abstract holdings pertaining to his information needs. An outline of the categories of information may be found on the next page.

CATEGORIES OF ANIMAL INFORMATION

Interest Area	Topic Area
A. Environmental Effects	1. General 2. Surface Runoff from Animal Production 3. Surface Runoff from Agricultural Watersheds 4. Surface Water Pollution 5. Groundwater Pollution 6. Odor 7. Air 8. Soil Systems 9. Biocides 10. Vectors 11. Animal Health 12. Public Health 13. Aesthetics
B. Management of Animal Production and Related Operations	1. General 2. Liquid Systems 3. Solid Systems 4. Storage 5. Pasture Land and Cropland Management
C. Characteristics of Animal Wastes	1. Physical 2. Chemical 3. Biological
D. Treatment Processes	1. Physical 2. Chemical 3. Biological
E. Utilization and Disposal	1. General 2. Land Disposal or Reuse 3. Recycling 4. By-Product Recovery
F. General	1. Economics 2. Legalities 3. Policy Needs 4. Overviews

The entries in the Animal Information Category Index appear by accession number under the code number as found in the following example.

C1
4670
4676
4687

KEYWORD INDEX (ADDENDUM TO VOLUME V)

This index supplements Volume V of Livestock and the Environment: A Bibliography with Abstracts which was published in June, 1978. The index consists of an alphabetical listing of significant words in an article or in the title of an article. To the right of the keyword are the first 85 characters contained in the title or the title and a listing of keywords, if the title is short. To the left of the keyword is the nine digit cross reference code of the article ascribed to by the keyword. The cross reference code allows the user to look up the abstract for additional information about the title. An example of this index format is:

400 77 7179	COSTS	FLY CONTROL THAT COSTS ALMOST
400 77 4333	COSTS	USE OF AGRICULTURE WASTES IN
700 74 4345	COSTS	AN EVALUATION OF A FULL-SCALE
200 77 4279	COST-SHARING	SERVICES PROVIDED BY THE SOIL
400 71 4413	COST-SHARING	PREVENTING POLLUTION WHILE
200 71 4457	COST-SHARING	AGRICULTURE'S ROLE IN ENVIRONMENT
300 75 4029	CROPLANDS	CONTROL OF WATER POLLUTION FROM

KEYWORD INDEX (VOLUME VI)

This is the keyword index for the abstracts found in this volume. Its arrangement is exactly as that described above.

ABSTRACTS

This section contains the abstracts of the information entries contained in the bibliography. Each entry includes the title of the informational material, the author or authors, the bibliographic citation, keywords, and the abstract. The abstracts are arranged sequentially by an assigned accession number which specifically identifies the article in the collection. To the right of the accession number are the animal information category code numbers assigned to the abstract entry.

SECTION 3

AUTHOR INDEX

This index lists all the authors cited in the bibliography in alphabetical order. To the right of each author entry is the cross reference code of the article or articles with which he is identified. Please refer to "Section 2: User's Guide" for examples.

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AASEN A K 200 71 4687
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SECTION 5

KEYWORD INDEX (ADDENDUM TO VOLUME V)

This index supplements Livestock and the Environment: A Bibliography with Abstracts, EPA-600/2-78-137, V. 5, Environmental Protection Agency, Ada, Oklahoma, 1978, 146 p. The index consists of an alphabetical listing of significant words in an article or in the title of an article. To the right of the keyword are the first 85 characters contained in the title or the title and a listing of keywords, if the title is short. To the left of the keyword is the nine digit cross reference code of the article ascribed to the keyword. The cross reference code allows the user to look up the abstract for additional information about the title. Please refer to "Section 2: User's Guide" for examples.

400	77	4581	ABSORBENTS — VARIED RESULTS FROM HOG PIT DEODORIZERS KEYWORDS: ODOR-CONTROL CHEMICAL-TREATMENT MASKI
400	77	4343	ACCUDOSE-R — AUTOMATIC FLY CONTROL KEYWORDS: FLY-CONTROL POULTRY-FARM ACCUDOSE-R AEROSOLS PYRETHRINS
100	77	4483	ACIDIFICATION — PHOSPHORUS FERTILIZER AS A BY-PRODUCT OF ENERGY PRODUCTION FROM AGRICULTURAL WASTES KE
100	75	4490	ACIDITY — EXPERIMENTS MADE ON STACKYARD FIELD, WOBURN, 1876-1974. II, EFFECTS OF TREATMENTS ON SOI
100	75	4645	ACID-MINE-DRAINAGE — WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS: WATER-POLLUTION NONPOINT-SOURCES PUBLIC
100	72	4012	ACTIVATED-SLUDGE — WATER MANAGEMENT PROBLEMS INVOLVED IN THE TREATMENT AND UTILIZATION OF LIQUID MANURE KE
700	72	4561	ACTIVATED-SLUDGE — USE OF AN ACTIVATED SLUDGE PROCESS IN TREATING CHICKEN MANURE COMBINED WITH DOMESTIC SE
100	76	4656	ACTIVATED-SLUDGE — THREE-STEP TREATMENT FOR PIGGERY WASTES KEYWORDS: SWINE-WASTES AEROBIC-TREATMENT ANAERO
100	73	4621	ADENOSINETRIPHOSPH — A METHOD FOR THE QUANTITATIVE EXTRACTION OF ADENOSINETRIPHOSPHATE (ATP) FROM COW SLURRY
300	76	4003	AERATION — DESIGN CRITERIA FOR SWINE WASTE TREATMENT SYSTEMS KEYWORDS: DESIGN LAGOONS SWINE-WASTES
100	76	4038	AERATION — NITROGEN TRANSFORMATIONS IN AERATED SWINE MANURE SLURRIES KEYWORDS: SLURRIES SWINE-WAST
300	76	4068	AERATION — DEMONSTRATION OF AERATION SYSTEMS FOR POULTRY WASTES KEYWORDS: POULTRY-WASTES BIOLOGICA
400	77	4123	AERATION — COMPOSTING MAKES MANURE HANDLING EASY KEYWORDS: COMPOSTING CATTLE-WASTES WINDROWS AERAT
100	73	4125	AERATION — EFFECTS OF BEEF HOUSING SYSTEMS ON GASEOUS CONTAMINANTS REMOVED BY VENTILATION KEYWORDS
200	76	4185	AERATION — REFEEDING OF AERATED POULTRY WASTES TO LAYING HENS KEYWORDS: AERATION REFEEDING POULTRY
100	72	4214	AERATION — AERATION UNDER CAGED LAYING HENS KEYWORDS: AERATION POULTRY-WASTES SLURRIES WASTE-COMPO
100	75	4264	AERATION — SURVIVAL OF SALMONELLA TYPHIMURIUM IN DAIRY COW WASTE KEYWORDS: DAIRY-WASTES SALMONELLA
700	72	4271	AERATION — SHORT TERM MINIMUM AERATION OF SWINE MANURE KEYWORDS: SWINE-WASTES WASTE-TREATMENT AERA
200	73	4323	AERATION — CONTROL OF GASES AND ODORS FROM LIVESTOCK UNITS KEYWORDS: AIR-POLLUTION GASES ODOR LEGA
700	74	4345	AERATION — AN EVALUATION OF A FULL-SCALE IN-HOUSE OXIDATION DITCH FOR POULTRY WASTE KEYWORDS: POU
100	73	4396	AERATION — WINTER OPERATION OF AERATED LIQUID ANIMAL WASTE STORAGE SYSTEMS KEYWORDS: WASTE-STORAGE
400	77	4499	AERATION — LAGOONS & GATORS KEYWORDS: LAGOONS ALLIGATORS WASTE-TREATMENT AERATION
700	76	4545	AERATION — EVALUATION OF A FLUSHING-GUTTER MANURE-REMOVAL SYSTEM TO IMPROVE ATMOSPHERIC QUALITY IN
200	76	4433	AERATION-RATE — WILLE COMPOST TANK--A DESIGN STUDY FOR A CONTINUOUS FLOW COMPOST TANK USED IN RECLAIMIN
100	72	4008	AEROBIC — SOME POSSIBILITIES AND ASPECTS OF THE CHEMICAL AND BIOLOGICAL TREATMENT OF LIQUID MANUR
100	74	4015	AEROBIC — LAGOONS AND OXIDATION PONDS KEYWORDS: LAGOONS LIVESTOCK-WASTES DAIRY-WASTES KRAFT-PULPI
100	77	4018	AEROBIC — EFFECT OF DIETARY SALT LEVEL AND LIQUID HANDLING SYSTEMS ON SWINE WASTE COMPOSITION KEY
300	76	4109	AEROBIC — EVALUATING A LOW-ENERGY, HIGH-VALUE PUMP FOR ODOR REDUCTION FROM LIVESTOCK WASTE LAGOON
100	76	4308	AEROBIC — SYNTHESIS AND STABILITY OF DIMETHYLNITROSAMINE IN CATTLE MANURE KEYWORDS: NITROSAMINES
200	74	4347	AEROBIC — LIVESTOCK ODOR CONTROL RESEARCH AT THE UNIVERSITY OF ILLINOIS KEYWORDS: ODOR-CONTROL SW
700	73	4414	AEROBIC — BACTERIOLOGICAL STUDIES OF CONFINEMENT ANIMAL WASTE AND SURVIVAL STUDIES OF INDICATOR B
300	75	4493	AEROBIC — SWINE MANURE FOR FERTILIZER--RESEARCH REVIEW KEYWORDS: SWINE-WASTES LIQUID-WASTES AEROB
400	73	4549	AEROBIC — EFFLUENT STORAGE AND DISPOSAL FROM INTENSIVE PIG UNITS KEYWORDS: SWINE-WASTES WASTE-STO
400	77	4133	AEROBIC-TREATMENT — AWARDS MADE FOR WASTE MANAGEMENT STUDIES KEYWORDS: AWARDS WASTE-MANAGEMENT RUNOFF-CONTR
200	75	4225	AEROBIC-TREATMENT — RECYCLING SWINE WASTE KEYWORDS: SWINE-WASTES OXIDATION-DITCH AEROBIC-TREATMENT ANAEROBI
400	72	4383	AEROBIC-TREATMENT — WHAT ARE YOU DOING ABOUT YOUR 1.57 BILLION TON ANIMAL WASTE PROBLEM? KEYWORDS: WASTE-MAN
200	73	4397	AEROBIC-TREATMENT — TREATMENT SYSTEMS FOR ANIMAL, AGRICULTURAL AND MUNICIPAL WASTES KEYWORDS: BIOLOGICAL-TR
100	71	4405	AEROBIC-TREATMENT — A CLEAN NEW GAS KEYWORDS: SEWAGE URBAN-WASTES AGRICULTURAL-WASTES RECYCLING ANAEROBIC-D
700	76	4458	AEROBIC-TREATMENT — THE SYMBIOTIC GROWTH OF ALGAE AND BACTERIA ON SWINE WASTE KEYWORDS: AEROBIC-TREATMENT B
100	75	4514	AEROBIC-TREATMENT — RETENTION BY SHEEP OF COPPER FROM AEROBIC DIGESTS OF PIG FAECAL SLURRY KEYWORDS: SWINE-
700	72	4561	AEROBIC-TREATMENT — USE OF AN ACTIVATED SLUDGE PROCESS IN TREATING CHICKEN MANURE COMBINED WITH DOMESTIC SE
300	76	4595	AEROBIC-TREATMENT — CONTROLLED ADDITION OF ANIMAL WASTE TO AEROBIC BIOLOGICAL TREATMENT PLANTS A COMPARISON
100	77	4599	AEROBIC-TREATMENT — DENITRIFICATION OF AEROBICALLY STABILISED PIG WASTE KEYWORDS: SWINE-WASTES LIQUID-WASTE
100	75	4608	AEROBIC-TREATMENT — THE USE OF RESPIROMETRIC METHODS FOR ASSESSING THE BIODEGRADABILITY OF DIFFERENT COMPON
100	76	4656	AEROBIC-TREATMENT — THREE-STEP TREATMENT FOR PIGGERY WASTES KEYWORDS: SWINE-WASTES AEROBIC-TREATMENT ANAERO
300	77	4659	AEROBIC-TREATMENT — AEROBIC TREATMENT IN RELATION TO LAND APPLICATION OF SLURRY KEYWORDS: AEROBIC-TREATMENT
400	77	4343	AEROSOLS — AUTOMATIC FLY CONTROL KEYWORDS: FLY-CONTROL POULTRY-FARM ACCUDOSE-R AEROSOLS PYRETHRINS
200	74	4535	AEROSOLS — SURVIVAL OF PATHOGENS IN FEEDLOT WASTE KEYWORDS: PATHOGENIC-BACTERIA CATTLE-WASTES FEED
200	72	4640	AEROSOLS — LEPTOSPIRES IN ANIMAL WASTE TREATMENT--ANIMAL HEALTH PROBLEM KEYWORDS: ANIMAL-WASTES LE
200	76	4360	AESTHETICS — LAND USE OF ANIMAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WASTES NITROGEN WASTE-COMPO
400	77	4486	AESTHETICS — MORE ON SHEEP FLOORING KEYWORDS: CONFINEMENT-PENS SHEEP MANAGEMENT FLOORING ANIMAL-HEAL
400	71	4557	AESTHETICS — WHAT TO DO WITH ANIMAL WASTES RECYCLING KEYWORDS: WASTE-DISPOSAL WATER-POLLUTION ODOR A
400	77	4066	AGITATION — DON'T BE CAUGHT DEAD PUMPING MANURE KEYWORDS: LIQUID-WASTES WASTE-STORAGE GASES AGITATI
400	77	4171	AGITATION — MANURE PITS CONTAIN GASES THAT CAN KILL KEYWORDS: MANURE-PITS GASES TOXICITY HYDROGEN-S
400	77	4317	AGITATION — WASTE CONTROL CUT HIS FERTILIZER BILL IN HALF KEYWORDS: DAIRY-WASTES WASTE-TREATMENT CO
400	77	4328	AGITATION — DAIRY WASTE--FIELD APPLICATION STILL BEST KEYWORDS: DAIRY-WASTES STORAGE-SYSTEMS LIQUID
400	72	4336	AGITATION — BUILDING A BIO-GAS PLANT KEYWORDS: BIO-GAS-PLANTS DESIGN LIQUID-WASTES AGITATION HEATIN
200	76	4433	AGITATION — WILLE COMPOST TANK--A DESIGN STUDY FOR A CONTINUOUS FLOW COMPOST TANK USED IN RECLAIMIN
400	76	4548	AGITATION — EFFLUENT DISPOSAL, A PILOT STUDY AT CRESSY RESEARCH STATION KEYWORDS: SWINE-WASTES EFFL
200	76	4617	AGITATION — STUDIES ON A MIXING DISTRIBUTION SYSTEM FOR SWINE MANURE LAGOONS KEYWORDS: SWINE-WASTES
100	77	4633	AGITATION — CHANGES IN THE SHORT-CHAIN CARBOXYLIC ACID CONTENT AND CHEMICAL OXYGEN DEMAND OF STORED
100	75	4451	AGRICULTURAL-CHEMI — THE NEEDS FOR WATER QUALITY MODELS ON AGRICULTURAL WATERSHEDS KEYWORDS: WATER-POLLUTION
200	76	4129	AGRICULTURAL-POLLU — NONPOINT SOURCES: STATE-OF-THE-ART OVERVIEW KEYWORDS: WATER-POLLUTION AGRICULTURAL-RUNO
100	76	4024	AGRICULTURAL-RUNOF — THE EFFECTS OF MANURE APPLICATIONS ON RUNOFF, EROSION AND NITRATE LOSSES KEYWORDS: LAND
300	75	4029	AGRICULTURAL-RUNOF — CONTROL OF WATER POLLUTION FROM CROPLAND VOLUME I--A MANUAL FOR GUIDELINE DEVELOPMENT
300	76	4030	AGRICULTURAL-RUNOF — CONTROL OF WATER POLLUTION FROM CROPLAND VOLUME II--AN OVERVIEW KEYWORDS AGRICULTURAL
400	75	4043	AGRICULTURAL-RUNOF — ANIMAL WASTES MANAGEMENT KEYWORDS: LIVESTOCK-WASTES WASTE-MANAGEMENT WATER-POLLUTION LE
200	76	4073	AGRICULTURAL-RUNOF — IMPACT OF HATCHERY WASTEWATER IRRIGATION UPON CONTIGUOUS STREAM QUALITY KEYWORDS: HATCH
500	77	4080	AGRICULTURAL-RUNOF — ECONOMIC AND REGULATORY ASPECTS OF LAND APPLICATION OF WASTES TO AGRICULTURAL LANDS PRO
200	76	4094	AGRICULTURAL-RUNOF — NATURE AND IMPACT OF STREAM INPUTS ON A WATERSHED BASIS KEYWORDS: AGRICULTURAL-RUNOFF W
400	76	4096	AGRICULTURAL-RUNOF — EPA WILL USE KSU MODEL AS WASTE CONTROL SYSTEMS TOOL KEYWORDS: WATER-QUALITY-INDEX COMP
300	76	4099	AGRICULTURAL-RUNOF — DESIGN PARAMETERS FOR THE LAND APPLICATION OF DAIRY MANURE KEYWORDS: DAIRY-WASTES LAND
100	76	4104	AGRICULTURAL-RUNOF — WATER QUALITY IMPLICATIONS OF CATTLE GRAZING ON A SEMIARID WATERSHED IN S. E. UTAH KEY
100	76	4105	AGRICULTURAL-RUNOF — FATE OF ANIMAL VIRUSES IN EFFLUENT FROM LIQUID FARM WASTES KEYWORDS: LAND-APPLICATION
400	72	4114	AGRICULTURAL-RUNOF — FEEDLOT POLLUTION CONTROL IS NOT AN EXPENSIVE ITEM LINDER: KEYWORDS POLLUTION-CONTROL
200	76	4129	AGRICULTURAL-RUNOF — NONPOINT SOURCES: STATE-OF-THE-ART OVERVIEW KEYWORDS: WATER-POLLUTION AGRICULTURAL-RUNO
200	76	4144	AGRICULTURAL-RUNOF — OVERLAND FLOW PRETREATMENT OF POULTRY MANURE KEYWORDS: OVERLAND-FLOW-PRETREATMENT POULT
200	76	4182	AGRICULTURAL-RUNOF — RESOURCE ADEQUACY IN LIMITING NONPOINT POLLUTION KEYWORDS: NONPOINT-POLLUTION WATER-POL
500	75	4196	AGRICULTURAL-RUNOF — NITROGEN AND PHOSPHORUS FOOD PRODUCTION, WASTE AND THE ENVIRONMENT KEYWORDS: WATER-POL
500	75	4197	AGRICULTURAL-RUNOF — TRANSPORT IN STREAMS KEYWORDS: WATER-POLLUTION POLLUTANT-SOURCES NITROGEN PHOSPHORUS AG
500	75	4198	AGRICULTURAL-RUNOF — FLOWS OF NITROGEN AND PHOSPHORUS ON LAND KEYWORDS: NITROGEN PHOSPHORUS GROUNDWATER-POLL
500	75	4199	AGRICULTURAL-RUNOF — ECONOMIC ANALYSIS OF REDUCING PHOSPHORUS LOSSES FROM AGRICULTURAL PRODUCTION KEYWORDS
300	76	4203	AGRICULTURAL-RUNOF — WASTEWATER AND RUNOFF CONTROL SYSTEMS FOR DRYLOT DAIRIES KEYWORDS: DAIRY-INDUSTRY AGRIC
300	73	4209	AGRICULTURAL-RUNOF — SWINE PRODUCTION INDUSTRY WASTE CHARACTERIZATION AND MANAGEMENT KEYWORDS: SWINE-WASTES
300	75	4242	AGRICULTURAL-RUNOF — FEASIBILITY OF CHLORINATING FEEDLOT RUNOFF TO MEET BACTERIAL WATER QUALITY STANDARDS KE
100	76	4267	AGRICULTURAL-RUNOF — POLLUTION POTENTIAL OF MANURE SPREAD ON FROZEN GROUND KEYWORDS: WATER-POLLUTION LAND-AP
700	70	4268	AGRICULTURAL-RUNOF — CATTLE MANURE: I. EFFECT ON CROPS AND SOILS II. RETENTION PROPERTIES FOR CU, MN, AND ZN
200	77	4281	AGRICULTURAL-RUNOF — PROPERTIES AND CHARACTERISTICS OF LIVESTOCK WASTES KEYWORDS: LIVESTOCK-WASTES WASTE-COM
200	76	4358	AGRICULTURAL-RUNOF — CONSIDERATION OF SOILS FOR ACCEPTING WASTES KEYWORDS: LAND-APPLICATION SOIL-PROPERTIES
200	76	4360	AGRICULTURAL-RUNOF — LAND USE OF ANIMAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WASTES NITROGEN WASTE-COMPO
300	73	4392	AGRICULTURAL-RUNOF — NITRATES IN THE UPPER SANTA ANA RIVER BASIN IN RELATION TO GROUNDWATER POLLUTION KEYWOR
100	75	4395	AGRICULTURAL-RUNOF — A MODEL FOR RUNOFF OF PESTICIDES FROM SMALL UPLAND WATERSHEDS KEYWORDS: MODEL-STUDIES A
100	76	4425	AGRICULTURAL-RUNOF — GROUND-WATER QUALITY VARIATION IN PHELPS COUNTY, MISSOURI KEYWORDS: GROUNDWATER-QUALITY
300	77	4426	AGRICULTURAL-RUNOF — PROJECTS IN PROGRESS SOME FEEDLOT INS AND OUTS KEYWORDS: WATER-POLLUTION FEEDLOTS AGRIC
300	76	4427	AGRICULTURAL-RUNOF — AGRICULTURAL RUNOFF--A BIBLIOGRAPHY VOLUME 2.KEYWORDS AGRICULTURAL-RUNOFF BIBLIOGRAPHI
300	75	4444	AGRICULTURAL-RUNOF — LIVESTOCK WASTE FACILITIES HANDBOOK KEYWORDS: LIVESTOCK-WASTES WASTE-STORAGE WASTE-TREA
300	77	4463	AGRICULTURAL-RUNOF — WATER QUALITY AND THE FARM POND KEYWORDS: FARM-PONDS WATER-QUALITY AGRICULTURAL-RUNOFF
300	75	4474	AGRICULTURAL-RUNOF — ENVIRONMENTAL AND ECONOMIC IMPACT OF NUTRIENT MANAGEMENT ON THE NEW YORK DAIRY FARM KEY
100	76	4496	AGRICULTURAL-RUNOF — NONPOINT SOURCE POLLUTION FROM AGRICULTURAL RUNOFF KEYWORDS: WATER-POLLUTION NONPOINT-S
400	77	4525	AGRICULTURAL-RUNOF — MANURE MAKES CENTS KEYWORDS: LAND-APPLICATION ANHYDROUS-AMMONIA FEEDLOT-WASTES CROP-RES

300	76 4532	AGRICULTURAL-RUNOF	DAIRY CATTLE WASTE MANAGEMENT: ITS EFFECT ON FORAGE PRODUCTION AND RUNOFF WATER QUALITY
600	4540	AGRICULTURAL-RUNOF	MANURE VS. ANAEROBIC RESIDUE KEYWORDS: ANIMAL-WASTES ANAEROBIC-RESIDUES WASTE-COMPOSITI
700	76 4541	AGRICULTURAL-RUNOF	NITROGEN REMOVAL AND TRANSFORMATIONS IN THE OVERLAND FLOW TREATMENT OF POULTRY WASTES K
100	77 4573	AGRICULTURAL-RUNOF	RUNOFF FROM A LOW-COST MANURE STORAGE FACILITY KEYWORDS: AGRICULTURAL-RUNOFF WASTE-STOR
100	76 4591	AGRICULTURAL-RUNOF	IRRIGATED AGRICULTURE--NONPOINT AND POINT SOURCE WATER POLLUTION KEYWORDS: FEEDLOT-RUNO
100	76 4601	AGRICULTURAL-RUNOF	FACTORS AFFECTING NUTRIENT LOADS IN SOME IOWA STREAMS KEYWORDS: WATERSHEDS WATER-POLLUT
200	75 4620	AGRICULTURAL-RUNOF	FEEDLOT RUNOFF CONTROL SYSTEMS FOR COLD CLIMATES KEYWORDS: FEEDLOT-RUNOFF AGRICULTURAL-
200	76 4177	AGRICULTURAL-WASTE	METHANE PRODUCTION THROUGH BIOCONVERSION OF AGRICULTURAL RESIDUES KEYWORDS: AGRICULTURA
500	75 4196	AGRICULTURAL-WASTE	NITROGEN AND PHOSPHORUS FOOD PRODUCTION, WASTE AND THE ENVIRONMENT KEYWORDS: WATER-POL
200	75 4385	AGRICULTURAL-WASTE	WASTES--USE OR DISCARD KEYWORDS: AGRICULTURAL-WASTES LAND-APPLICATION NITRIENT-LOSSES N
200	73 4397	AGRICULTURAL-WASTE	TREATMENT SYSTEMS FOR ANIMAL, AGRICULTURAL AND MUNICIPAL WASTES KEYWORDS: BIOLOGICAL-TR
100	71 4405	AGRICULTURAL-WASTE	A CLEAN NEW GAS KEYWORDS: SEWAGE URBAN-WASTES AGRICULTURAL-WASTES RECYCLING ANAEROBIC-D
300	74 4453	AGRICULTURAL-WASTE	STATE OF THE ART-METHANE GAS GENERATION FROM AGRICULTURAL WASTES KEYWORDS: AGRICULTURAL
300	77 4454	AGRICULTURAL-WASTE	A COMPLETE DISPOSAL-RECYCLE SCHEME FOR AGRICULTURAL SOLID WASTES KEYWORDS: SOLID-WASTES
100	75 4662	AGRICULTURAL-WASTE	THE WASTE PRODUCTS OF AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES LIVESTOCK-WASTES STRAW
100	76 4496	AGRICULTURAL-WATER	NONPOINT SOURCE POLLUTION FROM AGRICULTURAL RUNOFF KEYWORDS: WATER-POLLUTION NONPOINT-S
200	71 4298	AGRICULTURE	TOWARD THE DESIGN AND MANAGEMENT OF ENVIRONMENTAL SYSTEMS KEYWORDS: DESIGN MANAGEMENT E
100	75 4451	AGRICULTURE	THE NEEDS FOR WATER QUALITY MODELS ON AGRICULTURAL WATERSHEDS KEYWORDS: WATER-POLLUTION
100	76 4452	AGRICULTURE	PHOSPHORUS LOSS BY STREAM TRANSPORT FROM A RURAL WATERSHED--QUANTITIES, PROCESSES, AND
200	71 4457	AGRICULTURE	AGRICULTURE'S ROLE IN ENVIRONMENTAL QUALITY KEYWORDS: AGRICULTURE FEEDLOTS WATER-POLLUT
300	77 4509	AGRICULTURE	ENERGY USE IN AGRICULTURE: NOW AND FOR THE FUTURE KEYWORDS: AGRICULTURE ENERGY-CONSUMPT
400	77 4529	AGRICULTURE	UTILIZING WASTE FOR FERTILIZER BASE KEYWORDS: AGRICULTURE ENERGY-CONSUMPTION FERTILIZER
100	75 4645	AGRICULTURE	WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS: WATER-POLLUTION NONPOINT-SOURCES PUBLIC
200	76 4616	AIR-FILTRATION	EFFECTS OF POULTRY DUST ON PERFORMANCE OF A THERMOSIPHON HEAT RECOVERY SYSTEM KEYWORDS
500	77 4093	AIR-POLLUTION	WASTE MANAGEMENT PROBLEMS AND THEIR IMPACT ON THE ENVIRONMENT. ANIMAL WASTE MANAGEMENT K
100	75 4102	AIR-POLLUTION	*DIURNAL AND ANNUAL FLUCTUATIONS OF AERIAL BACTERIAL AND DUST LEVELS IN ENCLOSED SWINE H*
100	73 4125	AIR-POLLUTION	EFFECTS OF BEEF HOUSING SYSTEMS ON GASEOUS CONTAMINANTS REMOVED BY VENTILATION KEYWORDS
100	75 4162	AIR-POLLUTION	RELATIVE AND QUALITATIVE ASPECTS OF AERIAL BACTERIA AND DUST IN SWINE HOUSES KEYWORDS
400	76 4166	AIR-POLLUTION	RECYCLING OF LITTER FOR TURKEY BROODING SAFE KEYWORDS: POULTRY-LITTER TURKEYS RECYCLING
300	76 4176	AIR-POLLUTION	PRODUCTION AND TRANSPORT OF GASEOUS NH3 AND H2S ASSOCIATED WITH LIVESTOCK PRODUCTION K
200	73 4323	AIR-POLLUTION	CONTROL OF GASES AND ODORS FROM LIVESTOCK UNITS KEYWORDS: AIR-POLLUTION GASES ODOR LEGA
100	76 4387	AIR-POLLUTION	EXPOSURE OF LAMBS TO ATMOSPHERIC AMMONIA KEYWORDS: SHEEP ANIMAL-HEALTH AIR-POLLUTION AM
100	71 4405	AIR-POLLUTION	A CLEAN NEW GAS KEYWORDS: SEWAGE URBAN-WASTES AGRICULTURAL-WASTES RECYCLING ANAEROBIC-D
400	77 4438	AIR-POLLUTION	HOG HOUSE DUST CONTROL HELPS YOU BREATHE EASIER KEYWORDS: SWINE CONFINEMENT-BUILDINGS A
400	77 4445	AIR-POLLUTION	GUIDE TO EFFECTIVE MANURE PIT VENTILATION KEYWORDS: ODOR GASES AIR-POLLUTION SWINE-WAST
200	71 4457	AIR-POLLUTION	AGRICULTURE'S ROLE IN ENVIRONMENTAL QUALITY KEYWORDS: AGRICULTURE FEEDLOTS WATER-POLLUT
100	73 4478	AIR-POLLUTION	THE HANDLING TREATMENT, AND DISPOSAL OF FARM WASTES-- APPLICATION OF FARM SLURRIES TO A
400	71 4557	AIR-POLLUTION	WHAT TO DO WITH ANIMAL WASTES..RECYCLING KEYWORDS: WASTE-DISPOSAL WATER-POLLUTION ODOR A
500	75 4198	AIR-QUALITY	FLOWS OF NITROGEN AND PHOSPHORUS ON LAND KEYWORDS: NITROGEN PHOSPHORUS GROUNDWATER-POLL
700	76 4545	AIR-QUALITY	EVALUATION OF A FLUSHING-GUTTER MANURE-REMOVAL SYSTEM TO IMPROVE ATMOSPHERIC QUALITY IN
100	77 4229	AIR-TRANSPORT	DESIGN CRITERIA FOR AIR CARGO SYSTEMS FOR SHEEP KEYWORDS: SHEEP AIR-TRANSPORT DESIGN CA
100	77 4291	*ALCOHOLS*	*COLLECTION AND ANALYSIS OF ORGANIC GASES FROM NATURAL ECOSYSTEMS: APPLICATION TO POULTR*
400	77 4296	ALCOHOL	FARMERS AS FUEL SUPPLIERS KEYWORDS: ENERGY RECYCLING BIOMASS-CROPS CROP-RESIDUES GRAIN-
400	77 4119	ALGAE	HARNESSING ENERGY SOURCES FOR THE FEEDLOT KEYWORDS: ENERGY FEEDLOTS RECYCLING METHANE S
400	76 4241	ALGAE	THE WEDDING OF CLUCK AND MOO KEYWORDS: POULTRY-WASTES CATTLE-WASTES CONFINEMENT RECYCLI
100	74 4344	ALGAE	ANIMAL WASTES AS SUBSTRATES FOR PROTEIN PRODUCTION KEYWORDS: ANIMAL-WASTES SUBSTRATES P
400	77 4382	ALGAE	RESEARCHERS STUDY ALGAE PRODUCTION FROM HOG WASTE KEYWORDS: RECYCLING WASTEWATER-RENOVA
400	77 4441	ALGAE	MANURE AND ALGAE PRODUCE ANIMAL FEED KEYWORDS: SWINE-WASTES LIVESTOCK-WASTES RECYCLING
200	71 4457	ALGAE	AGRICULTURE'S ROLE IN ENVIRONMENTAL QUALITY KEYWORDS: AGRICULTURE FEEDLOTS WATER-POLLUT
400	77 4504	ALGAE	MANURE IS NOW A COMMODITY KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING BIOGAS METHANE CAR
400	77 4522	ALGAE	ON STRAW AND GOLD, MANURE AND ALGAE--FEEDING WASTE--IT'S BEING DONE IN A VARIETY OF WAY
400	77 4530	ALGAE	BACTERIA POWER GENERATOR, PRODUCE FERTILIZER IN IOWA KEYWORDS: POULTRY-WASTES RECYCLING
400	77 4582	ALGAE	GLEANINGS FROM REPORTS AT THE RECENT MEETING OF THE AMERICAN SOCIETY OF ANIMAL SCIENCE
100	75 4637	ALGAE	ALGAL GROWTH IN DILUTED PIG WASTE KEYWORDS: SWINE-WASTES BY-PRODUCT-RECOVERY ALGAE METH
100	74 4647	ALGAE	GROWTH OF ALGAE ON PIG MANURE KEYWORDS: SWINE-WASTES LAGOONS ALGAE WASTE-DISPOSAL WASTE
100	74 4015	ALGAE-REMOVAL	LAGOONS AND OXIDATION PONDS KEYWORDS: LAGOONS LIVESTOCK-WASTES DAIRY-WASTES KRAFT-PULPI
100	76 4600	ALGAL-GROWTH	EUTROPHICATION POTENTIAL OF DAIRY CATTLE WASTE RUNOFF KEYWORDS: CATTLE-WASTES DAIRY-WAS
300	75 4593	ALKALINITY	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 1. KEYWORDS: WASTE-TREATMENT
300	76 4594	ALKALINITY-CONDUCT	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 2. KEYWORDS: SWINE-WASTES WAS
100	76 4534	ALLANTOIN	URINARY ALLANTOIN EXCRETION AND DIGESTIBLE DRY-MATTER INTAKE IN CATTLE AND BUFFALO KEYW
400	77 4499	ALLIGATORS	LAGOONS & GATORS KEYWORDS: LAGOONS ALLIGATORS WASTE-TREATMENT AERATION
100	77 4417	ALTOSID	AN EVALUATION OF FIELD STUDIES ON CONTROLLING THE HOUSE FLY, MUSCA DOMESTICA KEYWORDS
100	77 4348	AMINO-ACIDS	AVAILABLE AMINO ACID CONTENT AND MICROBIOLOGICAL CONDITION OF CRIED POULTRY MANURE KEY
100	77 4470	AMINO-ACIDS	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
100	72 4475	AMINO-ACIDS	EFFECTS ON CHICK GROWTH OF ADDING VARIOUS NON-PROTEIN NITROGEN SOURCES OR DRIED AUTOCLA
700	72 4635	AMINO-ACIDS	BIOCHEMICAL AND NUTRITIONAL STUDIES ON FERMENTED- AMMONIATED ANIMAL FEED SUPPLEMENTS KE
200	76 4054	AMMONIA	AMMONIA VOLATILIZATION OF WINTER SPREAD MANURE KEYWORDS: AMMONIA VOLATILIZATION LAND-AP
400	77 4066	AMMONIA	DON'T BE CAUGHT DEAD PUMPING MANURE KEYWORDS: LIQUID-WASTES WASTE-STORAGE GASES AGITATI
100	73 4125	AMMONIA	EFFECTS OF BEEF HOUSING SYSTEMS ON GASEOUS CONTAMINANTS REMOVED BY VENTILATION KEYWORDS
100	73 4131	AMMONIA	THE ROLES OF AMMONIA, WATER ACTIVITY, AND PH IN THE SALMONELLACIDAL EFFECT OF LONG-USED
300	74 4152	AMMONIA	ODORS FROM CONFINED LIVESTOCK PRODUCTION KEYWORDS: ODOR-CONTROL LIVESTOCK LEGAL-ASPECTS
400	77 4171	AMMONIA	MANURE PITS CONTAIN GASES THAT CAN KILL KEYWORDS: MANURE-PITS GASES TOXICITY HYDROGEN-S
300	76 4176	AMMONIA	PRODUCTION AND TRANSPORT OF GASEOUS NH3 AND H2S ASSOCIATED WITH LIVESTOCK PRODUCTION K
200	76 4178	AMMONIA	ANAEROBIC DIGESTION STABILITY AND FOOD-PROCESSING WASTE TREATMENT KEYWORDS: ANAEROBIC-D
200	71 4190	AMMONIA	NITROGEN INPUTS TO GROUNDWATER FROM LIVESTOCK WASTES KEYWORDS: GROUNDWATER-POLLUTION LI
100	75 4205	AMMONIA	WASTE CHARACTERIZATION STUDIES FOR RACEWAY PRODUCTION OF CATFISH KEYWORDS: FISH-WASTES
100	76 4232	AMMONIA	HEN EXCRETA COMPOSITION AND RUMEN PARAMETERS KEYWURDS: SHEEP REFEEDING POULTRY-WASTES-D
100	75 4287	AMMONIA	SYNTHESIS GAS FROM BOVINE WASTES KEYWORDS: RECYCLING CATTLE-WASTES GASES FLUIDIZED-BED-
200	75 4327	AMMONIA	PRODUCTION OF AMMONIA SYNTHESIS GAS FROM MANURE IN A CYCLONIC BURNER KEYWORDS: RECYCLIN
700	74 4345	AMMONIA	AN EVALUATION OF A FULL-SCALE IN-HOUSE OXIDATION DITCH FOR POULTRY WASTE KEYWORDS: POU
200	77 4373	AMMONIA	AMMONIA SYNTHESIS GAS AND PETROCHEMICALS FROM CATTLE FEEDLOT MANURE KEYWORDS: CATTLE-WA
100	77 4381	AMMONIA	SALT REMOVAL EFFICIENCIES ON LAND DISPOSAL OF SWINE WASTE KEYWORDS: LAND-DISPOSAL SWINE
100	76 4387	AMMONIA	EXPOSURE OF LAMBS TO ATMOSPHERIC AMMONIA KEYWORDS: SHEEP ANIMAL-HEALTH AIR-POLLUTION AM
200	75 4401	AMMONIA	CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH DENSITY CATFISH CULTURES K
400	77 4438	AMMONIA	HOG HOUSE DUST CONTROL HELPS YOU BREATHE EASIER KEYWORDS: SWINE CONFINEMENT-BUILDINGS A
400	77 4445	AMMONIA	GUIDE TO EFFECTIVE MANURE PIT VENTILATION KEYWORDS: ODOR GASES AIR-POLLUTION SWINE-WAST
700	76 4541	AMMONIA	NITROGEN REMOVAL AND TRANSFORMATIONS IN THE OVERLAND FLOW TREATMENT OF POULTRY WASTES K
700	76 4543	AMMONIA	GROUNDWATER LEVELS AS AFFECTED BY SWINE WASTE LAGOONS IN HIGH WATER TABLE SOILS KEYWORD
700	73 4331	*AMMONIA-SYNTHESIS-*	*AMMONIA SYNTHESIS GAS FROM MANURE KEYWORDS: OXIDATION FLUIDIZED-BED-REACTOR RECYCLING O*
300	76 4435	AMMONIA-SYNTHESIS-	OPPORTUNITIES FOR MORE EFFECTIVE USE OF ANIMAL WASTES KEYWORDS: WASTE-DISPOSAL LAND-DIS
200	73 4256	AMMONIA-TOXICITY	SOIL PRODUCTIVITY IN RELATION TO HIGH LOADING RATES WITH MANURE KEYWORDS: MANURE LAND-A
300	75 4570	AMMONIA-TOXICITY	GUIDELINES FOR MANURE USE AND DISPOSAL IN THE WESTERN REGION, USA KEYWORDS: LAND-APPLIC
700	72 4635	AMMONIFICATION	BIOCHEMICAL AND NUTRITIONAL STUDIES ON FERMENTED- AMMONIATED ANIMAL FEED SUPPLEMENTS KE
100	76 4456	AMMONIUM	NITROGEN MOVEMENT NEAR SURFACE MANURE STORAGES KEYWORDS: WASTE-STORAGE MANURE-PIT WASTE
100	75 4206	AMMONIUM-PERSULFAI	CHEMICAL CONTROL OF HYDROGEN SULFIDE FROM ANAEROBIC SWINE MANURE 1. OXIDIZING AGENTS KEY
400	73 4507	AMMONIUM-PERSULPHA	KEEP YOUR SLURRY SMELLING SWEET KEYWORDS: DAIRY-WASTES WASTE-TREATMENT WASTE-STORAGE OD
100	76 4163	AMMONIUM-SULFATE	TRANSFORMATIONS OF NITROGEN ADDED AS AMMONIUM AND MANURE TO SOIL WITH A HIGH AMMONIUM-F
200	77 4063	AMPROLIUM	RESIDUE TRANSFER AND ACCUMULATION KEYWORDS: REFEEDING PERFORMANCE COPPER IRON CALCIUM AMPROLIUM PATHOGENIC
400	77 4314	AMPROLIUM	MORE ON MANURE KEYWORDS: REFEEDING PERFORMANCE COPPER IRON CALCIUM AMPROLIUM PATHOGENIC
200	75 4641	ANABOLIC-AGENTS	RECYCLING AND DEGRADATION OF ANABOLIC AGENTS IN ANIMAL EXCRETA KEYWORDS: REFEEDING LIVE

100	72	4008	ANAEROBIC	SOME POSSIBILITIES AND ASPECTS OF THE CHEMICAL AND BIOLOGICAL TREATMENT OF LIQUID MANUR
100	74	4015	ANAEROBIC	LAGOONS AND OXIDATION PONDS KEYWORDS: LAGOONS LIVESTOCK-WASTES DAIRY-WASTES KRAFT-PULPI
100	77	4018	ANAEROBIC	EFFECT OF DIETARY SALT LEVEL AND LIQUID HANDLING SYSTEMS ON SWINE WASTE COMPOSITION KEY
200	74	4072	ANAEROBIC	FUEL FROM FECES KEYWORDS: FUELS RECYCLING PHYSICAL-TREATMENT CHEMICAL-TREATMENT BIOLOGI
100	76	4074	ANAEROBIC	INFILTRATION CHARACTERISTICS FROM ANAEROBIC LAGOONS KEYWORDS: ANAEROBIC LAGOONS INFILTR
300	76	4109	ANAEROBIC	EVALUATING A LOW-ENERGY, HIGH-VALUE PUMP FOR ODOR REDUCTION FROM LIVESTOCK WASTE LAGOON
100	75	4206	ANAEROBIC	CHEMICAL CONTROL OF HYDROGEN SULFIDE FROM ANAEROBIC SWINE MANURE I. OXIDIZING AGENTS KEY
400	77	4231	ANAEROBIC	ON METHANE PRODUCTION KEYWORDS: METHANE RECYCLING ANAEROBIC DIGESTERS ECONOMICS
300	73	4265	ANAEROBIC	DESIGN OF ANIMAL WASTE DISPOSAL SYSTEMS KEYWORDS: ENGINEERING-STANDARDS LEGAL-ASPECTS D
100	76	4308	ANAEROBIC	SYNTHESIS AND STABILITY OF DIMETHYLNITROSAMINE IN CATTLE MANURE KEYWORDS: NITROSAMINES
400	77	4317	ANAEROBIC	WASTE CONTROL CUT HIS FERTILIZER BILL IN HALF KEYWORDS: DAIRY-WASTES WASTE-TREATMENT CO
200	74	4347	ANAEROBIC	LIVESTOCK ODOR CONTROL RESEARCH AT THE UNIVERSITY OF ILLINOIS KEYWORDS: ODOR-CONTROL SW
100	77	4362	ANAEROBIC	EFFECT OF ARSANILIC ACID LEVEL IN SWINE DIETS AND WASTE LOADING RATE ON MODEL ANAEROBIC
400	77	4382	ANAEROBIC	RESEARCHERS STUDY ALGAE PRODUCTION FROM HOG WASTE KEYWORDS, RECYCLING WASTEWATER-RENOVA
200	70	4384	ANAEROBIC	STATE OF THE ART: ANAEROBIC LAGOONS KEYWORDS: LAGOONS WASTE-TREATMENT ANAEROBIC DESIGN
100	76	4398	ANAEROBIC	ANNUAL DYNAMICS OF CHANGES IN CHARACTERISTIC PROPERTIES OF CATTLE LIQUID MANURE FROM L
700	73	4414	ANAEROBIC	BACTERIOLOGICAL STUDIES OF CONFINEMENT ANIMAL WASTE AND SURVIVAL STUDIES OF INDICATOR B
100	77	4465	ANAEROBIC	CHEMICAL CONTROL OF HYDROGEN SULFIDE FROM ANAEROBIC SWINE MANURE, II. IRON COMPOUNDS KEYW
300	73	4472	ANAEROBIC	BIO-GAS PLANT--DESIGNS WITH SPECIFICATIONS KEYWORDS: BIOGAS-PLANTS ANAEROBIC DIGESTERS
300	75	4493	ANAEROBIC	SWINE MANURE FOR FERTILIZER--RESEARCH REVIEW KEYWORDS: SWINE-WASTES LIQUID-WASTES AEROB
300	77	4510	ANAEROBIC	POLLUTANT MOVEMENT TO SHALLOW GROUND WATER TABLES FROM SWINE WASTE LAGOONS KEYWORDS: SW
700	76	4543	ANAEROBIC	GROUNDWATER LEVELS AS AFFECTED BY SWINE WASTE LAGOONS IN HIGH WATER TABLE SOILS KEYWORD
400	73	4549	ANAEROBIC	EFFLUENT STORAGE AND DISPOSAL FROM INTENSIVE PIG UNITS KEYWORDS: SWINE-WASTES WASTE-STO
400	71	4566	ANAEROBIC	GOBAR GAS:METHANE EXPERIMENTS IN INDIA KEYWORDS: METHANE GOBAR-GAS RECYCLING CATTLE-WAS
400	70	4567	ANAEROBIC	HOW TO GENERATE POWER FROM GARBAGE KEYWORDS: METHANE ANAEROBIC DIGESTERS LIVESTOCK-WAST
300	77	4597	ANAEROBIC	ENERGY RECOVERY ON THE FARM BY ANAEROBIC DIGESTION OF ANIMAL MANURES KEYWORDS: ANAEROBI
200	75	4605	ANAEROBIC	AN ECONOMIC COMPARISON OF FIVE WASTE MANAGEMENT SYSTEMS FOR SWINE FINISHING OPERATIONS
400	77	4611	ANAEROBIC	METHANE GAS MADE FROM CONFINEMENT UNIT WASTE KEYWORDS: SWINE-WASTES SLURRIES WASTE-TREA
500	73	4623	ANAEROBIC	A HOMESITE POWER UNIT--METHANE GENERATOR KEYWORDS: ANAEROBIC DIGESTER SLURRIES WASTE-TR
100	77	4628	ANAEROBIC	SPREADING SLURRY ON LAND KEYWORDS: SLURRIES LIVESTOCK-WASTES LAND-APPLICATION DRAINAGE
100	77	4632	ANAEROBIC	SIMPLE PHENOLS AND INDOLES IN ANAEROBICALLY STORED PIGGERY WASTES KEYWORDS: SWINE-WASTE
100		4658	ANAEROBIC	PRACTICAL ASPECTS OF ANAEROBIC DIGESTION KEYWORDS: FARM-WASTES DOMESTIC-WASTES FACTORY-
300	74	4175	ANAEROBIC-DIGESTER	METHANE GENERATION FROM LIVESTOCK WASTE KEYWORDS: ANAEROBIC-DIGESTERS METHANE DESIGN
100	77	4140	ANAEROBIC-DIGESTIO	THERMOPHILIC METHANE PRODUCTION FROM CATTLE WASTE KEYWORDS: ANAEROBIC-DIGESTION CATTLE-
400	77	4158	ANAEROBIC-DIGESTIO	MANURE TO METHANE IS IT FEASIBLE KEYWORDS: ANIMAL-WASTES RECYCLING METHANE ANAEROBIC-DI
200	76	4177	ANAEROBIC-DIGESTIO	METHANE PRODUCTION THROUGH BIOCONVERSION OF AGRICULTURAL RESIDUES KEYWORDS: AGRICULTURA
200	76	4178	ANAEROBIC-DIGESTIO	ANAEROBIC DIGESTION STABILITY AND FOOD-PROCESSING WASTE TREATMENT KEYWORDS: ANAEROBIC-D
200	74	4221	ANAEROBIC-DIGESTIO	METHANE RECOVERY FROM POULTRY WASTE KEYWORDS: POULTRY-WASTES SEWAGE-SLUDGE RECYCLING ME
100	76	4222	ANAEROBIC-DIGESTIO	UTILIZATION OF BIOGAS FOR FARM PRODUCTION ENERGY KEYWORDS: RECYCLING BIOGAS CATTLE-WAST
700	70	4269	ANAEROBIC-DIGESTIO	DYNAMIC RESPONSE OF AN ANAEROBIC DIGESTER WITH DAIRY COW SUBSTRATE KEYWORDS: DAIRY-WAST
200	76	4367	ANAEROBIC-DIGESTIO	METHANE FERMENTATION OF ANIMAL WASTES KEYWORDS: WASTE-TREATMENT METHANE REFEEDING CATTL
100	77	4368	ANAEROBIC-DIGESTIO	ANAEROBIC DEGRADATION OF DAIRY MANURE UNDER MESOPHILIC AND THERMOPHILIC TEMPERATURES K
100	71	4405	ANAEROBIC-DIGESTIO	A CLEAN NEW GAS KEYWORDS: SEWAGE URBAN-WASTES AGRICULTURAL-WASTES RECYCLING ANAEROBIC-D
300	74	4453	ANAEROBIC-DIGESTIO	STATE OF THE ART-METHANE GAS GENERATION FROM AGRICULTURAL WASTES KEYWORDS: AGRICULTURAL
300	77	4454	ANAEROBIC-DIGESTIO	A COMPLETE DISPOSAL-RECYCLE SCHEME FOR AGRICULTURAL SOLID WASTES KEYWORDS: SOLID-WASTES
100	77	4487	ANAEROBIC-DIGESTIO	BIOLOGICAL ENERGY RECOVERY USING DAIRY COW WASTE KEYWORDS: ANAEROBIC-DIGESTION DAIRY-WA
500	74	4596	ANAEROBIC-DIGESTIO	BIO-GAS PLANT GENERATING METHANE FROM ORGANIC WASTES KEYWORDS: METHANE BIOGAS-PLANTS AN
300	77	4597	ANAEROBIC-DIGESTIO	ENERGY RECOVERY ON THE FARM BY ANAEROBIC DIGESTION OF ANIMAL MANURES KEYWORDS: ANAEROBI
400	77	4610	ANAEROBIC-DIGESTIO	THERMONETICS--THE GUYMON PROJECT KEYWORDS: RECYCLING CATTLE-WASTES METHANE FERTILIZERS
100	76	4654	ANAEROBIC-DIGESTIO	ANAEROBIC DIGESTION OF AGRICULTURAL WASTES KEYWORDS: ANAEROBIC-DIGESTION SWINE-WASTES C
300	77	4655	ANAEROBIC-DIGESTIO	NOTES ON ANAEROBIC DIGESTION AND ANAEROBIC DIGESTERS BASED ON EXPERIMENTAL PLANT IN ABE
100	76	4386	ANAEROBIC-PITS	DIETARY ARSENIC EFFECTS ON STORED SWINE WASTE KEYWORDS: FEED-ADDITIVES ARSANILIC-ACID S
200	76	4260	ANAEROBIC-REACTORS	BIOLOGICAL POTENTIAL OF THERMOPHILIC METHANOGENESIS FROM CATTLE WASTES KEYWORDS: RECYCL
600		4540	ANAEROBIC-RESIDUES	MANURE VS. ANAEROBIC RESIDUE KEYWORDS: ANIMAL-WASTES ANAEROBIC-RESIDUES WASTE-COMPOSITI
400	77	4133	ANAEROBIC-TREATMEN	AWARDS MADE FOR WASTE MANAGEMENT STUDIES KEYWORDS: AWARDS WASTE-MANAGEMENT RUNOFF-CONTR
200	75	4225	ANAEROBIC-TREATMEN	RECYCLING SWINE WASTE KEYWORDS: SWINE-WASTES OXIDATION-DITCH AEROBIC-TREATMENT ANAEROBI
400	72	4383	ANAEROBIC-TREATMEN	WHAT ARE YOU DOING ABOUT YOUR 1.57 BILLION TON ANIMAL WASTE PROBLEM KEYWORDS: WASTE-MAN
200	73	4397	ANAEROBIC-TREATMEN	TREATMENT SYSTEMS FOR ANIMAL, AGRICULTURAL AND MUNICIPAL WASTES KEYWORDS: BIOLOGICAL-TR
700	72	4561	ANAEROBIC-TREATMEN	USE OF AN ACTIVATED SLUDGE PROCESS IN TREATING CHICKEN MANURE COMBINED WITH DOMESTIC SE
100	76	4656	ANAEROBIC-TREATMEN	THREE-STEP TREATMENT FOR PIGGERY WASTES KEYWORDS: SWINE-WASTES AEROBIC-TREATMENT ANAERO
200	75	4641	ANDROGENS	RECYCLING AND DEGRADATION OF ANABOLIC AGENTS IN ANIMAL EXCRETA KEYWORDS: REFEEDING LIVE
200	74	4243	ANHYDROUS-AMMONIA	FEEDLOT MANURE AS AN ENERGY SOURCE KEYWORDS: FEEDLOT-WASTES ENERGY ECONOMICS RECYCLING
300	74	4297	ANHYDROUS-AMMONIA	ENERGY FROM FEEDLOT MANURE KEYWORDS: FUELS RECYCLING LIVESTOCK-WASTES FERTILIZERS REFEE
400	77	4525	ANHYDROUS-AMMONIA	MANURE MAKES CENTS KEYWORDS: LAND-APPLICATION ANHYDROUS-AMMONIA FEEDLOT-WASTES CROP-RES
300	76	4067	ANIMAL-DENSITY	MANURE HARVESTING PRACTICES EFFECTS ON WASTE CHARACTERISTICS AND RUNOFF KEYWORDS: FEED
100	77	4369	ANIMAL-DENSITY	DECOMPOSITION AND NITROGEN LOSS OF DAIRY WASTES DEPOSITED ON SIMULATED ANIMAL CONFINEME
400	77	4027	ANIMAL-HEALTH	BIRD PERFORMANCE NOT HURT BY REFEEDING AERATED WASTES KEYWORDS: REFEEDING OXIDATION-DIT
200	74	4052	ANIMAL-HEALTH	HAZARDS ASSOCIATED WITH SPREADING ANIMAL-WASTE SLURRIES KEYWORDS: SLURRIES LAND-APPLICA
200	76	4053	ANIMAL-HEALTH	FATE OF PATHOGENS IN SOILS RECEIVING ANIMAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WA
400	77	4056	ANIMAL-HEALTH	BUILT-UP LITTER SAVES US TIME AND MONEY KEYWORDS: ECONOMICS TURKEYS MANAGEMENT DISEASE
200	77	4062	ANIMAL-HEALTH	PATHOGEN TRANSMISSION POTENTIAL FROM ANIMAL WASTE REFEEDING KEYWORDS: REFEEDING PATHOGE
200	77	4063	ANIMAL-HEALTH	RESIDUE TRANSFER AND ACCUMULATION KEYWORDS: REFEEDING FEED-ADDITIVES ANIMAL-HEALTH CATT
200	77	4064	ANIMAL-HEALTH	PROVISIONS OF STATE AND FEDERAL REGULATIONS ON REFEEDING KEYWORDS: REFEEDING LEGAL-ASPE
500	77	4082	ANIMAL-HEALTH	MONITORING SEWAGE SLUDGES, SOILS AND CROPS FOR ZINC AND CADMIUM KEYWORDS: ZINC CADMIUM
500	77	4083	ANIMAL-HEALTH	HEALTH HAZARDS OF AGRICULTURAL, INDUSTRIAL, AND MUNICIPAL WASTES APPLIED TO LAND KEYWOR
400	77	4103	ANIMAL-HEALTH	PULLETS IN GROW CAGES ABOVE HOGS IN PIT BELOW KEYWORDS: HIGH-RISE-CAGE POULTRY-WASTES M
100	74	4108	ANIMAL-HEALTH	POULTRY WASTES AS FEEDSTUFFS FOR RUMINANTS KEYWORDS: POULTRY-WASTES POULTRY-LITTER WAST
100	76	4121	ANIMAL-HEALTH	THE EFFECT OF DISPOSING HIGH RATES OF COPPER-RICH PIG SLURRY ON GRASSLAND ON THE HEALTH
100	71	4122	ANIMAL-HEALTH	INHIBITORY EFFECT OF USED LITTER ON SALMONELLA TYPHIMURIUM TRANSMISSION IN THE CHICKEN
100	72	4154	ANIMAL-HEALTH	ISOLATION OF ERYSIPELOTHRIX RHUSIOPATHIAE FROM SOIL AND MANURE OF SWINE-RAISING PREMISE
400	76	4166	ANIMAL-HEALTH	RECYCLING OF LITTER FOR TURKEY BROODING SAFE KEYWORDS: POULTRY-LITTER TURKEYS RECYCLING
300	76	4194	ANIMAL-HEALTH	RECYCLING SEWAGE SOLIDS AS FEEDSTUFFS FOR LIVESTOCK KEYWORDS: RECYCLING SEWAGE-SOLIDS R
100	76	4211	ANIMAL-HEALTH	FEEDLOT MANURE TOP DRESSING FOR IRRIGATED PASTURE; GOOD AGRICULTURAL PRACTICE OR A HEAL
100	72	4214	ANIMAL-HEALTH	AERATION UNDER CAGED LAYING HENS KEYWORDS: AERATION POULTRY-WASTES SLURRIES WASTE-COMPO
400	74	4220	ANIMAL-HEALTH	THE VALUE OF ANIMAL WASTES AS FEEDS FOR RUMINANTS KEYWORDS: REFEEDING WASTELAGE RUMINAN
100	77	4229	ANIMAL-HEALTH	DESIGN CRITERIA FOR AIR CARGO SYSTEMS FOR SHEEP KEYWORDS SHEEP AIR-TRANSPORT DESIGN CA
300	77	4262	ANIMAL-HEALTH	CAN CITY SEWAGE BE RECYCLED SAFELY ON FARM LAND KEYWORDS: RECYCLING SEWAGE LAND-APPLICA
100	76	4288	ANIMAL-HEALTH	FEEDING TH 6040 TO CATTLE RESIDUES IN TISSUES AND MILK AND BREAKDOWN IN MANURE KEYWORD
100	76	4289	ANIMAL-HEALTH	ACCUMULATION AND EXCRETION OF CERTAIN ORGANOCHLORINE INSECTICIDES IN BROILER BREEDER HE
100	77	4290	ANIMAL-HEALTH	LONG-TERM STUDIES OF RESIDUE RETENTION AND EXCRETION BY COWS FED A POLYCHLORINATED BIPH
400	77	4314	ANIMAL-HEALTH	MORE ON MANURE KEYWORDS: REFEEDING PERFORMANCE COPPER IRON CALCIUM AMPROLIUM PATHOGENIC
100	76	4325	ANIMAL-HEALTH	THE POTENTIAL TOXICITY OF COPPER-RICH ANIMAL EXCRETA TO SHEEP KEYWORDS: REFEEDING COPPE
100	72	4356	ANIMAL-HEALTH	ENCAPSULATED RABON FOR LARVAL HOUSE FLY CONTROL IN COW MANURE KEYWORDS: FLY-CONTROL FEE
100	76	4375	ANIMAL-HEALTH	THE DEVELOPMENT IN BEEF CATTLE MANURE OF PETRIELLIDIUM BOYDII SHEAR MALLOCH, A POTENTIA
100	76	4387	ANIMAL-HEALTH	EXPOSURE OF LAMBS TO ATMOSPHERIC AMMONIA KEYWORDS: SHEEP ANIMAL-HEALTH AIR-POLLUTION AM
200	72	4400	ANIMAL-HEALTH	RECYCLING ANIMAL WASTES KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CRUDE-PROTEINS PERFORM
200	76	4403	ANIMAL-HEALTH	RESEARCH AND DEVELOPMENT NEEDS RELATED TO PATHOGENS IN PRETREATMENT-LAND APPLICATION SY
500	75	4408	ANIMAL-HEALTH	FORAGE CROPS GRASS TETANY KEYWORDS: GRASS-TETANY ANIMAL-HEALTH CATTLE RUMINANTS MAGNES
400	77	4448	ANIMAL-HEALTH	CONVERT CITY SEWAGE TO FARM FERTILIZER KEYWORDS: SEWAGE-SLUDGE FERTILIZERS LAND-APPLICA
100	73	4478	ANIMAL-HEALTH	THE HANDLING TREATMENT, AND DISPOSAL OF FARM WASTES-- APPLICATION OF FARM SLURRIES TO A

400	77 4486	ANIMAL-HEALTH	MORE ON SHEEP FLOORING KEYWORDS: CONFINEMENT-PENS SHEEP MANAGEMENT FLOORING ANIMAL-HEAL
100	75 4514	ANIMAL-HEALTH	RETENTION BY SHEEP OF COPPER FROM AEROBIC DIGESTS OF PIG FAECAL SLURRY KEYWORDS: SWINE-
100	76 4523	ANIMAL-HEALTH	THE OCCURRENCE OF SALMONELLAS, MYCOBACTERIA AND PATHOGENIC STRAINS OF ESCHERICHIA COLI
300	76 4532	ANIMAL-HEALTH	DAIRY CATTLE WASTE MANAGEMENT: ITS EFFECT ON FORAGE PRODUCTION AND RUNOFF WATER QUALITY
200	74 4535	ANIMAL-HEALTH	SURVIVAL OF PATHOGENS IN FEEDLOT WASTE KEYWORDS: PATHOGENIC-BACTERIA CATTLE-WASTES FEED
200	75 4542	ANIMAL-HEALTH	ARSENICALS IN ANIMAL FEEDS AND WASTES KEYWORDS: ARSENICALS FEED-ADDITIVES ANIMAL-HEALTH
700	73 4555	ANIMAL-HEALTH	PIT VENTILATION SYSTEM FOR SWINE BUILDINGS KEYWORDS: VENTILATION CONFINEMENT-PENS DESIG
400	77 4606	ANIMAL-HEALTH	NO NEED TO CONTROL MANURE EATING BY TURKEYS KEYWORDS: TURKEYS MANURE-EATING ANIMAL-HEAL
400	77 4609	ANIMAL-HEALTH	WET CAGE LAYER MANURE FED TO FEEDLOT CATTLE KEYWORDS: POULTRY-WASTES PRESERVATIVES REFE
100	71 4622	ANIMAL-HEALTH	THE SURVIVAL OF ESCHERICHIA COLI AND SALMONELLA DUBLIN IN SLURRY ON PASTURE AND THE INF
200	72 4640	ANIMAL-HEALTH	LEPTOSPIRES IN ANIMAL WASTE TREATMENT--ANIMAL HEALTH PROBLEM KEYWORDS: ANIMAL-WASTES LE
200	75 4641	ANIMAL-HEALTH	RECYCLING AND DEGRADATION OF ANABOLIC AGENTS IN ANIMAL EXCRETA KEYWORDS: REFEEDING LIVE
100	75 4642	ANIMAL-HEALTH	INTERRELATIONSHIPS BETWEEN ANIMALS AND ENVIRONMENT IN HIGH-INTENSITY LIVESTOCK PRODUCTI
100	73 4646	ANIMAL-HEALTH	A FURTHER ASSESSMENT OF THE POTENTIAL HAZARD FOR CALVES ALLOWED TO GRAZE PASTURE CONTAM
200	76 4651	ANIMAL-HEALTH	FERTILIZER VALUE OF ANIMAL MANURES KEYWORDS: SWINE-WASTES CATTLE-WASTES WASTE-STORAGE L
100	71 4657	ANIMAL-HEALTH	THE SURVIVAL OF SALMONELLA DUBLIN IN CATTLE SLURRY KEYWORDS: SLURRIES DAIRY-WASTES BACT
100	72 4409	ANIMAL-PRODUCTION	THE NEED FOR INTENSIFICATION IN ANIMAL PRODUCTION AND THE CONSEQUENT POLLUTION PROBLEM
100	74 4035	ANIMAL-WASTES	SUCCESSION AND ABUNDANCE OF INSECTS IN PASTURE MANURE RELATIONSHIP TO FACE FLY SURVIVAL
300	75 4037	ANIMAL-WASTES	LAND AVAILABILITY, CROP PRODUCTION, AND FERTILIZER REQUIREMENTS IN THE UNITED STATES KE
200	74 4050	ANIMAL-WASTES	THE IMPLICATION OF HYDROGEOLOGIC FACTORS IN WASTE MANAGEMENT ON LAND WITH SPECIAL REFE
200	76 4053	ANIMAL-WASTES	FATE OF PATHOGENS IN SOILS RECEIVING ANIMAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WA
500	77 4079	ANIMAL-WASTES	LAND AS A WASTE MANAGEMENT ALTERNATIVE KEYWORDS: WASTE-MANAGEMENT LAND-APPLICATION ANIM
500	77 4083	ANIMAL-WASTES	HEALTH HAZARDS OF AGRICULTURAL, INDUSTRIAL, AND MUNICIPAL WASTES APPLIED TO LAND KEYWOR
500	77 4084	ANIMAL-WASTES	MICROBIAL CONCERNS WHEN WASTES ARE APPLIED TO LAND KEYWORDS: LAND-DISPOSAL SOIL-MICROBI
300	72 4107	ANIMAL-WASTES	MANURING OF PERMANENT MEADOWS 1962-70 KEYWORDS: LAND-APPLICATION GRASSLAND ANIMAL-WASTE
100	73 4136	ANIMAL-WASTES	INFLUENCE OF FARMYARD MANURE AND NITROGEN FERTILIZERS ON SOWN PASTURES, SEED YIELD AND
400	77 4158	ANIMAL-WASTES	MANURE TO METHANE IS IT FEASIBLE KEYWORDS: ANIMAL-WASTES RECYCLING METHANE ANAEROBIC-DI
400	77 4169	ANIMAL-WASTES	HOW MUCH MANURE SHOULD WE PUT ON KEYWORDS: ANIMAL-WASTES LAND-APPLICATION CROP-RESPONSE
300	74 4266	ANIMAL-WASTES	RECYCLE SOLID ANIMAL WASTES KEYWORDS: ANIMAL-WASTES LAND-APPLICATION CROP-RESPONSE NITR
400	77 4296	ANIMAL-WASTES	FARMERS AS FUEL SUPPLIERS KEYWORDS: ENERGY RECYCLING BIOMASS-CROPS CROP-RESIDUES GRAIN-
400	77 4309	ANIMAL-WASTES	FOOD WASTE, MANURE HOLD PROMISE AS FEED, VETERINARIANS TOLD KEYWORDS: REFEEDING FOOD-WA
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200	76 4359	ANIMAL-WASTES	CONSIDERATION OF SOILS FOR ACCEPTING PLANT NUTRIENTS AND POTENTIALLY TOXIC NONESSENTIAL
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100	74 4489	ANIMAL-WASTES	EXPERIMENTS MADE ON STACKYARD FIELD, WOBURN, 1876-1974. I. HISTORY OF THE FIELD, DETAILS
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300	76 4521	ANIMAL-WASTES	A LONG-TERM ROTATIONAL AND MANURIAL TRIAL IN UGANDA KEYWORDS: LAND-APPLICATION ANIMAL-W
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400	77 4529	ANIMAL-WASTES	UTILIZING WASTE FOR FERTILIZER BASE KEYWORDS: AGRICULTURE ENERGY-CONSUMPTION FERTILIZER
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100	76 4624	ANIMAL-WASTES	EFFECT OF CROP ROTATION, FARM YARD MANURE AND THE QUANTITY OF SALINE IRRIGATION WATER
100	76 4627	ANIMAL-WASTES	NITRATE POLLUTION OF GROUNDWATER FROM NITROGEN FERTILIZERS AND ANIMAL WASTES IN THE PU
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200	77 4063	ARSANILIC-ACID	RESIDUE TRANSFER AND ACCUMULATION KEYWORDS: REFEEDING FEED-ADDITIVES ANIMAL-HEALTH CATT
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100	77 4362	ARSANILIC-ACID	EFFECT OF ARSANILIC ACID LEVEL IN SWINE DIETS AND WASTE LOADING RATE ON MODEL ANAEROBIC
100	76 4386	ARSANILIC-ACID	DIETARY ARSENIC EFFECTS ON STORED SWINE WASTE KEYWORDS: FEED-ADDITIVES ARSANILIC-ACID S
200	75 4542	ARSENICALS	ARSENICALS IN ANIMAL FEEDS AND WASTES KEYWORDS: ARSENICALS FEED-ADDITIVES ANIMAL-HEALTH
100	76 4020	ARSENIC	DEHYDRATED BROILER EXCRETA VERSUS SOYBEAN MEAL AS NITROGEN SUPPLEMENTS FOR SHEEP KEYWO
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300	76 4067	ASH	MANURE HARVESTING PRACTICES EFFECTS ON WASTE CHARACTERISTICS AND RUNOFF KEYWORDS: FEED
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100	74 4598	BACTERIOLOGICAL	SOME BACTERIOLOGICAL CHANGES ASSOCIATED WITH THE APPLICATION OF COW SLURRY TO GRASSLAND
100	76 4432	BACTERIOPHAGES	STUDIES ON BACTERIOPHAGE DISTRIBUTION--VIRULENT AND TEMPERATE BACTERIOPHAGE CONTENT OF
100	77 4424	BARNYARDS	ANALYZING NITRATES IN WELL WATER KEYWORDS: NITRATES GROUNDWATER BARNYARDS FEEDLOTS METH
300	76 4028	BARRIERED-LANDSCAP	TERTIARY TREATMENT AND REUSE OF ANIMAL WASTES KEYWORDS: DAIRY-WASTES LIQUID-WASTES BIOL
400	73 4507	BARRIER-DITCHES	KEEP YOUR SLURRY SMELLING SWEET KEYWORDS: DAIRY-WASTES WASTE-TREATMENT WASTE-STORAGE OD
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200	76 4433	BEDDING	WILLE COMPOST TANK--A DESIGN STUDY FOR A CONTINUOUS FLOW COMPOST TANK USED IN RECLAIMIN
200	76 4433	BEDDING	WILLE COMPOST TANK--A DESIGN STUDY FOR A CONTINUOUS FLOW COMPOST TANK USED IN RECLAIMIN
100	75 4662	BEDDING	THE WASTE PRODUCTS OF AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES LIVESTOCK-WASTES STRAW
200	76 4625	BEETLES	SMALL DUNG BEETLES AS BIOLOGICAL CONTROL AGENTS-- LABORATORY STUDIES OF BEETLE ACTION O
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100	72 4009	BIOCHEMICAL-OXYGEN	CONTRIBUTION TO THE TREATMENT OF LIQUID MANURE IN NATURAL- BIOLOGICAL LAGOON SYSTEMS K
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100	77 4381	BIOCHEMICAL-OXYGEN	SALT REMOVAL EFFICIENCIES ON LAND DISPOSAL OF SWINE WASTE KEYWORDS: LAND-DISPOSAL SWINE
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100	76 4602	BIOCHEMICAL-OXYGEN	TREATMENT OF POULTRY MANURE WASTEWATER USING A ROTATING BIOLOGICAL CONTACTOR KEYWORDS
100	76 4656	BIOCHEMICAL-OXYGEN	THREE-STEP TREATMENT FOR PIGGERY WASTES KEYWORDS: SWINE-WASTES AEROBIC-TREATMENT ANAERO
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300	77 4659	BIODEGRADATION	AEROBIC TREATMENT IN RELATION TO LAND APPLICATION OF SLURRY KEYWORDS: AEROBIC-TREATMENT
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400	77 4504	BIOGAS	MANURE IS NOW A COMMODITY KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING BIOGAS METHANE CAR
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400	77 4428	BIOLOGICAL-TREATME	ENGINEER EXPLAINS NEW WASTE RUNOFF SYSTEM KEYWORDS: FEEDLOT-RUNOFF WATER-POLLUTION-CONT
100	74 4562	BIOLOGICAL-TREATME	CONVERSION OF ORGANIC WASTE INTO PROTEIN KEYWORDS: BIOLOGICAL-TREATMENT ORGANIC-WASTES
300	75 4586	BIOLOGICAL-TREATME	ADDITIVES FOR MANURE ODOR CONTROL KEYWORDS: ODOR-CONTROL LAND-APPLICATION BIOLOGICAL-TR
100	76 4602	BIOLOGICAL-TREATME	TREATMENT OF POULTRY MANURE WASTEWATER USING A ROTATING BIOLOGICAL CONTACTOR KEYWORDS
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100	76 4654	BIOLOGICAL-TREATME	ANAEROBIC DIGESTION OF AGRICULTURAL WASTES KEYWORDS: ANAEROBIC-DIGESTION SWINE-WASTE C
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400	72 4336	BIO-GAS-PLANTS	BUILDING A BIO-GAS PLANT KEYWORDS: BIO-GAS-PLANTS DESIGN LIQUID-WASTES AGITATION HEATIN
300	77 4509	BIO-MASS-FUELS	ENERGY USE IN AGRICULTURE: NOW AND FOR THE FUTURE KEYWORDS: AGRICULTURE ENERGY-CONSUMPT
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100 76 4398 CATTLE-WASTES ANNUAL DYNAMICS OF CHANGES IN CHARACTERISTIC PROPERTIES OF CATTLE LIQUID MANURE FROM L
100 77 4399 CATTLE-WASTES UTILIZATION OF CATTLE EXCREMENT FOR GROWTH AND MAINTENANCE OF BEEF CATTLE KEYWORDS: RE
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700 73 4414 CATTLE-WASTES BACTERIOLOGICAL STUDIES OF CONFINEMENT ANIMAL WASTE AND SURVIVAL STUDIES OF INDICATOR B
100 75 4420 CATTLE-WASTES A STUDY ON THE RELATIVE EFFICIENCY OF ORGANIC MANURES AND THE EFFECT OF SALINITY ON ITS
100 76 4432 CATTLE-WASTES STUDIES ON BACTERIOPHAGE DISTRIBUTION--VIRULENT AND TEMPERATE BACTERIOPHAGE CONTENT OF
300 75 4434 CATTLE-WASTES MICROBIOLOGY AND WATER QUALITY IN A TRIBUTARY OF CAYUGA LAKE KEYWORDS: WATER-POLLUTION
400 77 4436 CATTLE-WASTES THE HAPPY EARTHWORM KEYWORDS: RECYCLING CATTLE-WASTES RANCH-MANURE FEEDLOTS EARTHWORMS
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300 77 4454 CATTLE-WASTES A COMPLETE DISPOSAL-RECYCLE SCHEME FOR AGRICULTURAL SOLID WASTES KEYWORDS: SOLID-WASTES
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400	77 4563	CATTLE-WASTES	COWTOWN'S MANURE MEANS MEGAWATTS KEYWORDS: RECYCLING BIOGAS METHANE CATTLE-WASTES FEEDL
400	71 4566	CATTLE-WASTES	GOBAR GAS-METHANE EXPERIMENTS IN INDIA KEYWORDS: METHANE GOBAR-GAS RECYCLING CATTLE-WAS
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400	77 4582	CATTLE-WASTES	GLEANINGS FROM REPORTS AT THE RECENT MEETING OF THE AMERICAN SOCIETY OF ANIMAL SCIENCE
100	75 4584	CATTLE-WASTES	RELATIONSHIPS BETWEEN COPROPHILOUS FUNGI AND FECAL SUBSTRATES IN A COLORADO GRASSLAND K
100	75 4589	CATTLE-WASTES	PROPERTIES OF MANURE ACCUMULATIONS FROM MIDWEST BEEF CATTLE FEEDLOTS KEYWORDS: FEEDLOTS
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100	76 4600	CATTLE-WASTES	EUTROPHICATION POTENTIAL OF DAIRY CATTLE WASTE RUNOFF KEYWORDS: CATTLE-WASTES DAIRY-WAS
400	77 4610	CATTLE-WASTES	THERMONETICS--THE GUYMON PROJECT KEYWORDS: RECYCLING CATTLE-WASTES METHANE FERTILIZERS
200	76 4614	CATTLE-WASTES	A MODIFIED CENTRIFUGAL MANURE PUMP FCR HANDLING SEMI-SOLID CATTLE MANURE KEYWORDS: PUM
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100	71 4622	CATTLE-WASTES	THE SURVIVAL OF ESCHERICHIA COLI AND SALMONELLA DUBLIN IN SLURRY ON PASTURE AND THE INF
100	71 4629	CATTLE-WASTES	PERSISTENCE OF THREE SALMONELLA SPP IN BOVINE FAECES KEYWORDS: SALMONELLA CATTLE-WASTE
700	72 4635	CATTLE-WASTES	BIOCHEMICAL AND NUTRITIONAL STUDIES ON FERMENTED- AMMONIATED ANIMAL FEED SUPPLEMENTS KE
200	72 4640	CATTLE-WASTES	LEPTOSPIRES IN ANIMAL WASTE TREATMENT--ANIMAL HEALTH PROBLEM KEYWORDS: ANIMAL-WASTES LE
100	72 4649	CATTLE-WASTES	CONSERVATION OF CATTLE MANURE IN PITS KEYWORDS: CATTLE-WASTES WASTE-STORAGE NITROGEN-TR
200	75 4650	CATTLE-WASTES	ANIMAL MANURES IN GRASS PRODUCTION KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES
200	76 4651	CATTLE-WASTES	FERTILIZER VALUE OF ANIMAL MANURES KEYWORDS: SWINE-WASTES CATTLE-WASTES WASTE-STORAGE L
100	76 4654	CATTLE-WASTES	ANAEROBIC DIGESTION OF AGRICULTURAL WASTES KEYWORDS: ANAEROBIC-DIGESTION SWINE-WASTES C
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400	77 4537	CATTLE-WASTES-DRIE	DRIED CATTLE WASTE CAN STRETCH SWINE RATIONS KEYWORDS: REFEEDING SWINE PERFORMANCE CATT
100	77 4470	CATTLE-WASTE	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
100	77 4244	CELL-YIELD	FERMENTATION OF POULTRY MANURE FOR POULTRY DIETS KEYWORDS: POULTRY-WASTES FERMENTATION
200	76 4367	CENTRIFUGATION	METHANE FERMENTATION OF ANIMAL WASTES KEYWORDS: WASTE-TREATMENT METHANE REFEEDING CATTL
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100	73 4621	CENTRIFUGING	A METHOD FOR THE QUANTITATIVE EXTRACTION OF ADENOSINETRIPHOSPHATE (ATP) FROM COW SLURRY
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400	74 4511	CHAR	DESPITE SCIENCE, IT'S STILL MANURE KEYWORDS: LIVESTOCK-WASTES RECYCLING PYROLYSIS HYDRO
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100	77 4369	CHEMICAL-OXYGEN-DE	DECOMPOSITION AND NITROGEN LOSS OF DAIRY WASTES DEPOSITED ON SIMULATED ANIMAL CONFINEME
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300	75 4593	CHEMICAL-OXYGEN-	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 1. KEYWORDS: WASTE-TREATMENT
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400	77 4294	CHEMICAL-TREATMENT	FEEDLOT ODOR CONTROL RELIES ON DRY MANURE AND RAPID REMOVAL KEYWORDS: ODOR-CONTROL FEED
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400	73 4507	CHEMICAL-TREATMENT	KEEP YOUR SLURRY SMELLING SWEET KEYWORDS: DAIRY-WASTES WASTE-TREATMENT WASTE-STORAGE OD
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300	76 4312	CHISEL-PLOW	FEEDLOT MANURE COLLECTION EFFICIENCY KEYWORDS: WASTE-COLLECTION FEEDLOTS TIME-MOTION-ST
500	77 4088	CHLORIDES	OVERLAND RECYCLING OF ANIMAL WASTE KEYWORDS: WASTE-TREATMENT OVERLAND-SPRAY-IRRIGATION
700	76 4543	CHLORIDES	GROUNDWATER LEVELS AS AFFECTED BY SWINE WASTE LAGOONS IN HIGH WATER TABLE SOILS KEYWORD
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400	77 4485	CLEANING	PEN CLEANING ISN'T CHEAP KEYWORDS: FEEDLOT-WASTES CLEANING EFFICIENCY ECONOMICS MANAGEM
400	77 4495	CLEANING	PREPARE FOR WINTER KEYWORDS: FEEDLOT-MANAGEMENT MANURE-PACK DRAINAGE CLEANING SOLID-WA
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200	75 4620	CLIMATE	FEEDLOT RUNOFF CONTROL SYSTEMS FOR COLO CLIMATES KEYWORDS: FEEDLOT-RUNOFF AGRICULTURAL-
200	75 4327	CLYCLONIC-BURNER	PRODUCTION OF AMMONIA SYNTHESIS GAS FROM MANURE IN A CYCLONIC BURNER KEYWORDS: RECYCLIN
400	77 4027	COCCIDIOSIS	BIRD PERFORMANCE NOT HURT BY REFEEDING AERATED WASTES KEYWORDS: REFEEDING OXIDATION-DIT
400	77 4103	COCCIDIOSTATS	PULLETS IN GROW CAGES ABOVE HOGS IN PIT BELOW KEYWORDS: HIGH-RISE-CAGE POULTRY-WASTES M
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400	75 4550	COLLECTING-TANK	SIPHON A METHOD OF MANURE DISPOSAL KEYWORDS: DAIRY-WASTES COLLECTING-TANK DESIGN
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300	76 4315	COMPOSTED-WASTES	WASTE DISPOSAL IN FORESTS KEYWORDS: LAND-APPLICATION FOREST-LANDS CROPLANDS TREE-RESPON
400	74 4051	COMPOSTING	MANURE KEYWORDS: COMPOSTING RECYCLING FUELS ECONOMICS CATTLE-WASTES ORGANIC-WASTES
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300	72 4353	COMPOSTING	DISPOSING OF OUR WASTES--SOIL CAN FILTER, CROPS RECYCLE NUTRIENTS KEYWORDS: LIVESTOCK-W
300	72 4393	COMPOSTING	AN ANALYSIS OF BEEF CATTLE FEEDLOT DESIGNS FOR POLLUTION CONTROL KEYWORDS: FEEDLOTS DES
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400	77 4448	COMPOSTING	CONVERT CITY SEWAGE TO FARM FERTILIZER KEYWORDS: SEWAGE-SLUDGE FERTILIZERS LAND-APPLICA
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400	73 4549	COMPOSTING	EFFLUENT STORAGE AND DISPOSAL FROM INTENSIVE PIG UNITS KEYWORDS: SWINE-WASTES WASTE-STO
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400	77 4664	COMPOSTING	NEW RECYCLING TRIAL SHOWS 20 HD EXTRA PROFIT KEYWORDS: REFEEDING CATTLE-WASTES COMPOST
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300	76 4099	COMPUTER-MODELS	DESIGN PARAMETERS FOR THE LAND APPLICATION OF DAIRY MANURE KEYWORDS: DAIRY-WASTES LAND
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200	77 4663	COMPUTER-MODELS	DECISION TOOLS FOR DAIRY MANURE HANDLING SYSTEMS SELECTION KEYWORDS: COMPUTER-MODELS D
100	73 4361	CONDUCTIVITY	CHANGES IN SEEPAGE RATE FROM AN UNLINED CATTLE WASTE DIGESTION POND KEYWORDS: CATTLE-WA
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200	77 4060	CONFINEMENT-BUILD	HARVESTING AND PROCESSING MANURE FROM CONFINEMENT OPERATIONS FOR REFEEDING KEYWORDS: CO
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400	77 4031	CONFINEMENT-PENS	FEEDERS RECYCLING PLAN SAVES FIVE BUSHELS OF CORN FOR EACH STEER FED KEYWORDS: RECYCLI
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300 76 4318	DAIRY-WASTES	METHANE PRODUCTION FROM CATTLE WASTES KEYWORDS: RECYCLING FEEDLOTS CATTLE-WASTES DAIRY-
400 77 4321	DAIRY-WASTES	WASTE HANDLING-WHICH MANURE MOVING SYSTEM FOR YOU KEYWORDS: DAIRY-WASTES WASTE-MANAGEME
400 74 4322	DAIRY-WASTES	THERE'S MONEY IN MANURE IF HANDLED RIGHT KEYWORDS: DAIRY-WASTES WASTE-MANAGEMENT FERTIL
200 71 4324	DAIRY-WASTES	DESIGN PROCEDURES FOR ANIMAL WASTE TREATMENT LAGOONS KEYWORDS: DAIRY-WASTES DESIGN LAGO
400 77 4328	DAIRY-WASTES	DAIRY WASTE--FIELD APPLICATION STILL BEST KEYWORDS: DAIRY-WASTES STORAGE-SYSTEMS LIQUID
200 77 4337	DAIRY-WASTES	FEED INTAKE AND MANURE SOLIDS FROM LACTATING HOLSTEIN COWS KEYWORDS: FEED-INTAKE DAIRY
400 73 4352	DAIRY-WASTES	UNDERGROUND SILOS FOR LIQUID MANURE KEYWORDS: DAIRY-WASTES WASTE-STORAGE SILOS LAND-APP
100 77 4368	DAIRY-WASTES	ANAEROBIC DEGRADATION OF DAIRY MANURE UNDER MESOPHILIC AND THERMOPHILIC TEMPERATURES K
100 77 4369	DAIRY-WASTES	DECOMPOSITION AND NITROGEN LOSS OF DAIRY WASTES DEPOSITED ON SIMULATED ANIMAL CONFINEME
300 76 4394	DAIRY-WASTES	A FOUR-YEAR FIELD TRIAL WITH ANIMAL MANURES. I. NITROGEN BALANCES AND YIELDS. II. MINERAL
400 77 4404	DAIRY-WASTES	CALIFORNIA DAIRYMEN ARE GAINING EXPERIENCE WITH MANURE SEPARATORS KEYWORDS: WASTE-MANAG
300 77 4430	DAIRY-WASTES	LABORATORY SIZE COMPOSTING UNIT FOR AGRICULTURAL WASTE MATERIALS KEYWORDS: COMPOSTING E
700 76 4455	DAIRY-WASTES	EFFECTS OF METHODS AND RATES OF DAIRY MANURE APPLICATION ON SOIL WATER NITRATE LEVELS K
100 77 4487	DAIRY-WASTES	BIOLOGICAL ENERGY RECOVERY USING DAIRY COW WASTE KEYWORDS: ANAEROBIC-DIGESTION DAIRY-WA
400 73 4507	DAIRY-WASTES	KEEP YOUR SLURRY SMELLING SWEET KEYWORDS: DAIRY-WASTES WASTE-TREATMENT WASTE-STORAGE OD
400 75 4531	DAIRY-WASTES	STORAGE-STORE MANURE AS IF IT WERE VALUABLE-BECAUSE IT IS KEYWORDS: FERTILIZERS CATTLE-
300 76 4532	DAIRY-WASTES	DAIRY CATTLE WASTE MANAGEMENT-ITS EFFECT ON FORAGE PRODUCTION AND RUNOFF WATER QUALITY
400 74 4547	DAIRY-WASTES	AN ANSWER TO MANURE DISPOSAL PROBLEMS KEYWORDS: SPRAY-IRRIGATION LAND-APPLICATION EQUIP
400 75 4550	DAIRY-WASTES	SIPHON A METHOD OF MANURE DISPOSAL KEYWORDS: DAIRY-WASTES COLLECTING-TANK DESIGN
400 71 4556	DAIRY-WASTES	AUTOMATIC SYSTEM SCRAPES MANURE-AND WORK-AWAY KEYWORDS: DAIRY-WASTES CONFINEMENT HOUSIN
100 76 4600	DAIRY-WASTES	EUTROPHICATION POTENTIAL OF DAIRY CATTLE WASTE RUNOFF KEYWORDS: CATTLE-WASTES DAIRY-WAS
100 75 4607	DAIRY-WASTES	FLY PROTEIN PRODUCTION FROM MECHANICALLY MIXED ANIMAL WASTES KEYWORDS: RECYCLING POULTR
200 76 4618	DAIRY-WASTES	INFLUENCES OF LAND SPREADING LIVESTOCK WASTES ON GROUNDWATER QUALITY KEYWORDS: GROUNDWA
100 76 4638	DAIRY-WASTES	EARTHWORM POPULATION OF A PASTURE SPRAY-IRRIGATED WITH DAIRY SHED EFFLUENT KEYWORDS: DA
400 77 4644	DAIRY-WASTES	PONDER THIS SWITCH-BACK, FIELD SINK SYSTEM KEYWORDS: DAIRY-WASTES RUNOFF SWITCH-BACK-WA
100 71 4657	DAIRY-WASTES	THE SURVIVAL OF SALMONELLA DUBLIN IN CATTLE SLURRY KEYWORDS: SLURRIES DAIRY-WASTES BACT
300 72 4353	DAIRY-WASTEWATER	DISPOSING OF OUR WASTES--SOIL CAN FILTER, CROPS RECYCLE NUTRIENTS KEYWORDS: LIVESTOCK-W
300 75 4130	DEBRIS-BASINS	FEEDLOTS AND RECREATION LAKES AN EXAMPLE OF HOW THEY CAN BE GOOD NEIGHBORS KEYWORDS: F
400 76 4471	DEBRIS-BASINS	AWARD FOR NEBRASKAN KEYWORDS: FEEDLOTS WASTE-MANAGEMENT DEBRIS-BASINS HOLDING-PONDS LAN
300 77 4503	DEBRIS-BASINS	BEEF CATTLE FEEDLOT RUNOFF AND CONTROL IN EASTERN NEBRASKA KEYWORDS: FEEDLOT-RUNOFF RU
100 77 4369	DECOMPOSITION	DECOMPOSITION AND NITROGEN LOSS OF DAIRY WASTES DEPOSITED ON SIMULATED ANIMAL CONFINEME
100 75 4652	DECOMPOSITION	SUCCESSIONS OF MICROORGANISMS AND INVERTEBRATA AND THEIR CONNECTIONS WITH BIOCHEMICAL P
400 77 4071	DEEP-PITS	GETTING MORE OUT OF LIQUID MANURE KEYWORDS: LIQUID-WASTES SLOTTED-FLOORS DEEP-PITS SOIL
100 77 4350	DEEP-PITS	DRYING CAGED LAYER WASTE KEYWORDS: MODEL-STUDIES POULTRY-WASTES DEEP-PITS VENTILATION M
200 75 4605	DEEP-PITS	AN ECONOMIC COMPARISON OF FIVE WASTE MANAGEMENT SYSTEMS FOR SWINE FINISHING OPERATIONS
400 77 4117	DEEP-PIT-HOUSES	HANDLING MANURE IN THE DEEP-PIT OR HIGH RISE CAGE LAYING HOUSE KEYWORDS: DEEP-PIT-HOUSE
400 73 4528	DEEP-PIT-HOUSES	IN-HOUSE MANURE DRYING KEYWORDS: POULTRY-WASTES DEHYDRATION DEEP-PIT-HOUSES STERILIZATI
200 76 4033	DEHYDRATION	CONVECTIVE HEAT TRANSFER COEFFICIENT FOR POULTRY MANURE KEYWORDS: POULTRY-WASTES DEHYDR
400 77 4070	DEHYDRATION	POULTRY WASTE FED TO CATTLE, SHEEP KEYWORDS: REFEEDING POULTRY-WASTES-DRIED WASTE-COMPO
300 74 4106	DEHYDRATION	HANDLING AND DISPOSING OF POULTRY MANURE KEYWORDS: POULTRY-WASTES WASTE-MANAGEMENT SOLI
400 77 4117	DEHYDRATION	HANDLING MANURE IN THE DEEP-PIT OR HIGH RISE CAGE LAYING HOUSE KEYWORDS: DEEP-PIT-HOUSE
200 76 4172	DEHYDRATION	LAND DISPOSAL OF BLOOD AND PAUNCH MANURE KEYWORDS: LAND-DISPOSAL BLOOD PAUNCH-MANURE PA
400 71 4173	DEHYDRATION	A POLLUTION SOLUTION WITH BUILT-IN PROFITS KEYWORDS DEHYDRATION POULTRY-WASTES-DRIED RE
100 74 4254	DEHYDRATION	EFFECT OF DRYING TEMPERATURE AND LENGTH OF DRYING TIME ON SURVIVAL OF MICROURGANISMS IN
400 77 4293	DEHYDRATION	FEEDLOT WASTE WORKS IN GROWING RATION TEST KEYWORDS: CATTLE-WASTES DEHYDRATION ENSILING
200 72 4338	DEHYDRATION	DRIED CATTLE PAUNCH MANURE AS A FEED SUPPLEMENT FOR CHANNEL CATFISH KEYWORDS: REFEEDING
100 77 4348	DEHYDRATION	AVAILABLE AMINO ACID CONTENT AND MICROBIOLOGICAL CONDITION OF DRIED POULTRY MANURE KEY
400 77 4411	DEHYDRATION	WAYS TO SPEED UP DRYING OF MANURE IN PITS KEYWORDS: POULTRY-WASTES DEHYDRATION VENTILAT
300 77 4449	DEHYDRATION	A RAPID METHOD OF MEASURING MOISTURE IN LITTER USED FOR BROILERS BROODED AT HIGH DENSIT
700 73 4467	DEHYDRATION	EFFECT OF DRYING ON THE LOSSES OF NITROGEN AND TOTAL SOLIDS FROM POULTRY MANURE KEYWORD
400 73 4507	DEHYDRATION	KEEP YOUR SLURRY SMELLING SWEET KEYWORDS: DAIRY-WASTES WASTE-TREATMENT WASTE-STORAGE OD
400 77 4515	DEHYDRATION	SOLAR ENERGY HELPS DRY POULTRY WASTE KEYWORDS: SOLAR-DRYING POULTRY-WASTES HEATING RECY
400 77 4520	DEHYDRATION	PROFITS FROM MANURE-WORKERS LIST TREATMENTS, APPLICATION KEYWORDS: POULTRY-WASTES LAND-
400 73 4528	DEHYDRATION	IN-HOUSE MANURE DRYING KEYWORDS: POULTRY-WASTES DEHYDRATION DEEP-PIT-HOUSES STERILIZATI
400 73 4543	DEHYDRATION	EFFLUENT STORAGE AND DISPOSAL FROM INTENSIVE PIG UNITS KEYWORDS: SWINE-WASTES WASTE-STO
400 71 4557	DEHYDRATION	WHAT TO DO WITH ANIMAL WASTES RECYCLING KEYWORDS: WASTE-DISPOSAL WATER-POLLUTION ODOR A
100 75 4560	DEHYDRATION	A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND-- PART 2 KEYWORDS: WATER-POLLUT
400 70 4575	DEHYDRATION	MANURE DISPOSAL KEYWORDS: POULTRY-WASTES SOLID-WASTES SLURRIES LAND-APPLICATION DEHYDRA
200 76 4619	DEHYDRATION	ENGINEERING EVALUATION OF A POULTRY MANURE DEHYDRATING MACHINE KEYWORDS: DEHYDRATION PO
700 72 4245	DEHYDRATION-RATES	SIMULATION OF IN-HOUSE DRYING OF CHICKEN EXCRETA KEYWORDS: POULTRY-WASTES DEHYDRATION-R
300 75 4593	DEMAND	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 1 KEYWORDS: WASTE-TREATMENT
200 71 4190	DENITRIFICATION	NITROGEN INPUTS TO GROUNDWATER FROM LIVESTOCK WASTES KEYWORDS: GROUNDWATER-POLLUTION LI
500 75 4200	DENITRIFICATION	ANIMAL WASTE MANAGEMENT WITH NUTRIENT CONTROL KEYWORDS: NUTRIENT-CONTROL LAND-APPLICATI
700 76 4541	DENITRIFICATION	NITROGEN REMOVAL AND TRANSFORMATIONS IN THE OVERLAND FLOW TREATMENT OF POULTRY WASTES K
300 76 4594	DENITRIFICATION	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 2 KEYWORDS: SWINE-WASTES WAS
100 77 4599	DENITRIFICATION	DENITRIFICATION OF AEROBICALLY STABILISED PIG WASTE KEYWORDS: SWINE-WASTES LIQUID-WASTE
300 77 4449	DENSITY	A RAPID METHOD OF MEASURING MOISTURE IN LITTER USED FOR BROILERS BROODED AT HIGH DENSIT
100 76 4000	DESIGN	THE ROLE OF SYSTEMS ANALYSIS IN THE USE OF AGRICULTURAL WASTES KEYWORDS: SYSTEMS-ANALYS
300 76 4001	DESIGN	DESIGN PARAMETERS FOR ANIMAL WASTE TREATMENT SYSTEMS NITROGEN CONTROL KEYWORDS: DESIG
300 76 4003	DESIGN	DESIGN CRITERIA FOR SWINE WASTE TREATMENT SYSTEMS KEYWORDS: DESIGN LAGOONS SWINE-WASTES
300 76 4004	DESIGN	CONVERSION OF CATTLE MANURE INTO USEFUL PRODUCTS KEYWORDS: CATTLE-WASTES BYPRODUCTS PYR
100 76 4017	DESIGN	PERFORMANCE OF FEEDLOT RUNOFF CONTROL SYSTEMS IN NORTHERN CLIMATES KEYWORDS: MATHEMATIC
400 77 4076	DESIGN	IRRIGATION ONE WAY TO HANDLE LAGOON WASTES KEYWORDS: IRRIGATION-SYSTEMS LIQUID-WASTES
500 77 4087	DESIGN	ENGINEERING DESIGN CRITERIA FOR SLURRY INJECTORS KEYWORDS: DESIGN SOIL-INJECTION EQUIPM
500 77 4092	DESIGN	CONTINUOUS WATERSHED MODELING OF WASTEWATER STORAGE AND LAND APPLICATION TO IMPROVE DES
400 76 4096	DESIGN	EPA WILL USE KSU MODEL AS WASTE CONTROL SYSTEMS TOOL KEYWORDS: WATER-QUALITY-INDEX COMP
400 76 4116	DESIGN	FLUSHING GUTTERS FOR HOG BUILDINGS KEYWORDS SWINE-WASTES FLUSHING LAGOONS DESIGN
100 73 4128	DESIGN	FLOW PROPERTIES OF DAIRY WASTE SLURRIES KEYWORDS: DAIRY-WASTES SLURRIES SHEAR-RATES FLO
400 76 4141	DESIGN	HOUSING AND FLOOR DESIGN CAN INFLUENCE PIG PERFORMANCE KEYWORDS: HOUSING SLATTED-FLOORS
400 77 4160	DESIGN	KSU TRIES PLASTIC SLATS AND WALLS IN PIG NURSERY KEYWORDS: SWINE MANAGEMENT DESIGN SLAT
400 74 4174	DESIGN	OPEN COMPOUNDS FOR SHORT TERM MANURE STORAGE KEYWORDS: WASTE-STORAGE ECONOMICS DESIGN C
300 74 4175	DESIGN	METHANE GENERATION FROM LIVESTOCK WASTE KEYWORDS: ANAEROBIC-DIGESTERS METHANE DESIGN
200 76 4177	DESIGN	METHANE PRODUCTION THROUGH BIOCONVERSION OF AGRICULTURAL RESIDUES KEYWORDS: AGRICULTURA
300 72 4226	DESIGN	WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA DAIRYMEN KEYWORDS: WASTE-MANAGEMENT
300 72 4226	DESIGN	WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA DAIRYMEN KEYWORDS: WASTE-MANAGEMENT
100 77 4229	DESIGN	DESIGN CRITERIA FOR AIR CARGO SYSTEMS FOR SHEEP KEYWORDS: SHEEP AIR-TRANSPORT DESIGN CA
300 73 4265	DESIGN	DESIGN OF ANIMAL WASTE DISPOSAL SYSTEMS KEYWORDS: ENGINEERING-STANDARDS LEGAL-ASPECTS D
200 77 4272	DESIGN	DESIGN CONFERENCE ON LIVESTOCK WASTE MANAGEMENT SYSTEMS IN ILLINOIS KEYWORDS: WASTE-MA

200 77 4275	DESIGN	FARMERS AS CLIENTS KEYWORDS: DESIGN WASTE-MANAGEMENT SETTLING-BASINS LAGOONS
200 77 4280	DESIGN	SERVICES PROVIDED BY THE UNIVERSITY OF ILLINOIS FOR THE DESIGN OF LIVESTOCK WASTE MANAG
200 71 4298	DESIGN	TOWARD THE DESIGN AND MANAGEMENT OF ENVIRONMENTAL SYSTEMS KEYWORDS: DESIGN MANAGEMENT E
400 77 4302	DESIGN	DIVERSIFY--BUT STAY EFFICIENT, SAYS IOWA CATTLE FEEDER KEYWORDS: MANAGEMENT CONFINEMENT
400 72 4303	DESIGN	METHANE POWER THE PLOWBOY INTERVIEW KEYWORDS: RECYCLING METHANE ORGANIC-WASTES DIGESTE
200 71 4324	DESIGN	DESIGN PROCEDURES FOR ANIMAL WASTE TREATMENT LAGOONS KEYWORDS: DAIRY-WASTES DESIGN LAGO
700 73 4331	DESIGN	AMMONIA SYNTHESIS GAS FROM MANURE KEYWORDS: OXIDATION FLUIDIZED-BED-REACTOR RECYCLING D
400 72 4336	DESIGN	BUILDING A BIO-GAS PLANT KEYWORDS: BIO-GAS-PLANTS DESIGN LIQUID-WASTES AGITATION HEATIN
700 74 4345	DESIGN	AN EVALUATION OF A FULL-SCALE IN-HOUSE OXIDATION DITCH FOR POULTRY WASTE KEYWORDS: POU
100 77 4368	DESIGN	ANAEROBIC DEGRADATION OF DAIRY MANURE UNDER MESOPHILIC AND THERMOPHILIC TEMPERATURES K
200 77 4373	DESIGN	AMMONIA SYNTHESIS GAS AND PETROCHEMICALS FROM CATTLE FEEDLOT MANURE KEYWORDS: CATTLE-WA
200 70 4384	DESIGN	STATE OF THE ART - ANAEROBIC LAGOONS KEYWORDS: LAGOONS WASTE-TREATMENT ANAEROBIC DESIGN
300 72 4393	DESIGN	AN ANALYSIS OF BEEF CATTLE FEEDLOT DESIGNS FOR POLLUTION CONTROL KEYWORDS: FEEDLOTS DES
200 76 4433	DESIGN	WILLE COMPOST TANK--A DESIGN STUDY FOR A CONTINUOUS FLOW COMPOST TANK USED IN RECLAIMIN
300 77 4454	DESIGN	A COMPLETE DISPOSAL-RECYCLE SCHEME FOR AGRICULTURAL SOLID WASTES KEYWORDS: SOLID-WASTES
300 73 4472	DESIGN	BIO-GAS PLANT--DESIGNS WITH SPECIFICATIONS KEYWORDS: BIOGAS-PLANTS ANAEROBIC DIGESTERS
100 77 4487	DESIGN	BIOLOGICAL ENERGY RECOVERY USING DAIRY COW WASTE KEYWORDS: ANAEROBIC-DIGESTION DAIRY-WA
700 74 4502	DESIGN	THE EFFECT OF TOTAL SOLIDS CONTENT, PARTICLE SIZE, FLOW VELOCITY, AND VISCOSITY OF BEEF
400 77 4527	DESIGN	FEEDER COMPLIES WITH REGULATIONS--EPA OKAYED THESE PLANS TO STOP WASTE AND WATER RUNOFF
400 75 4550	DESIGN	SIPHON A METHOD OF MANURE DISPOSAL KEYWORDS: DAIRY-WASTES COLLECTING-TANK DESIGN
700 73 4555	DESIGN	PIT VENTILATION SYSTEM FOR SWINE BUILDINGS KEYWORDS: VENTILATION CONFINEMENT-PENS DESIG
400 71 4565	DESIGN	THE MARVELOUS CHICKEN-POWERED MOTORCAR KEYWORDS: RECYCLING ANIMAL-WASTES METHANE METHAN
400 71 4566	DESIGN	GOBAR GAS-METHANE EXPERIMENTS IN INDIA KEYWORDS: METHANE GOBAR-GAS RECYCLING CATTLE-WAS
400 70 4567	DESIGN	HOW TO GENERATE POWER FROM GARBAGE KEYWORDS: METHANE ANAEROBIC DIGESTERS LIVESTOCK-WAST
400 77 4572	DESIGN	IRRIGATING WITH WASTEWATER KEYWORDS: WASTEWATER LAND-APPLICATION EQUIPMENT-IRRIGATION
500 74 4596	DESIGN	BIO-GAS PLANT GENERATING METHANE FROM ORGANIC WASTES KEYWORDS: METHANE BIOGAS-PLANTS AN
300 77 4597	DESIGN	ENERGY RECOVERY ON THE FARM BY ANAEROBIC DIGESTION OF ANIMAL MANURES KEYWORDS: ANAEROBI
400 77 4611	DESIGN	METHANE GAS MADE FROM CONFINEMENT UNIT WASTE KEYWORDS: SWINE-WASTES SLURRIES WASTE-TREA
200 76 4613	DESIGN	AN INJECTOR-TANKER DESIGN TO APPLY LIQUID MANURE BETWEEN CORN CROP ROWS KEYWORDS: LIQUI
200 76 4615	DESIGN	ENGINEERING DESIGN OF LIQUID MANURE INJECTORS KEYWORDS: LIQUID-WASTES SOIL-INJECTORS EQ
200 76 4617	DESIGN	STUDIES ON A MIXING DISTRIBUTION SYSTEM FOR SWINE MANURE LAGOONS KEYWORDS: SWINE-WASTES
200 75 4620	DESIGN	FEEDLOT RUNOFF CONTROL SYSTEMS FOR COLD CLIMATES KEYWORDS: FEEDLOT-RUNOFF AGRICULTURAL-
500 73 4623	DESIGN	A HOMESITE POWER UNIT--METHANE GENERATOR KEYWORDS: ANAEROBIC DIGESTER SLURRIES WASTE-TR
300 77 4655	DESIGN	NOTES ON ANAEROBIC DIGESTION AND ANAEROBIC DIGESTERS BASED ON EXPERIMENTAL PLANT IN ABE
300 77 4659	DESIGN	AEROBIC TREATMENT IN RELATION TO LAND APPLICATION OF SLURRY KEYWORDS: AEROBIC-TREATMENT
300 73 4265	DETENTION-BASINS	DESIGN OF ANIMAL WASTE DISPOSAL SYSTEMS KEYWORDS: ENGINEERING-STANDARDS LEGAL-ASPECTS D
700 76 4458	DETENTION-TIMES	THE SYMBIOTIC GROWTH OF ALGAE AND BACTERIA ON SWINE WASTE KEYWORDS: AEROBIC-TREATMENT B
300 77 4655	DETENTION-TIMES	NOTES ON ANAEROBIC DIGESTION AND ANAEROBIC DIGESTERS BASED ON EXPERIMENTAL PLANT IN ABE
700 70 4269	DETENTION-TIME	DYNAMIC RESPONSE OF AN ANAEROBIC DIGESTER WITH DAIRY COW SUBSTRATE KEYWORDS: DAIRY-WAST
100 77 4368	DETENTION-TIME	ANAEROBIC DEGRADATION OF DAIRY MANURE UNDER MESOPHILIC AND THERMOPHILIC TEMPERATURES K
200 70 4384	DETENTION-TIME	STATE OF THE ART - ANAEROBIC LAGOONS KEYWORDS: LAGOONS WASTE-TREATMENT ANAEROBIC DESIGN
100 75 4135	DICHLORVOS	INSECT GROWTH REGULATORS DEVELOPMENT OF HOUSE FLIES IN FECES OF BOVINES FED TH 6040 IN
100 77 4391	DIETARY-BUFFERS	GASTROINTESTINAL TRACT PH AND STARCH IN FECES OF RUMINANTS KEYWORDS: DIETS INTESTINAL-
200 75 4641	DIETHYLSTILBESTROL	RECYCLING AND DEGRADATION OF ANABOLIC AGENTS IN ANIMAL EXCRETA KEYWORDS: REFEEDING LIVE
100 77 4018	DIETS	EFFECT OF DIETARY SALT LEVEL AND LIQUID HANDLING SYSTEMS ON SWINE WASTE COMPOSITION KEY
100 75 4022	DIETS	PERFORMANCE AND ENERGY METABOLISM OF STEERS FED A CONCENTRATE OR ROUGHAGE DIET IN CONVE
100 76 4124	DIETS	EFFECT OF DIETARY OXYTETRACYCLINE ON MICROORGANISMS IN TURKEY FECES KEYWORDS: DIETS OXY
100 77 4362	DIETS	EFFECT OF ARSANILIC ACIC LEVEL IN SWINE DIETS AND WASTE LOADING RATE ON MODEL ANAEROBIC
100 77 4391	DIETS	GASTROINTESTINAL TRACT PH AND STARCH IN FECES OF RUMINANTS KEYWORDS: DIETS INTESTINAL-
600 4407	DIETS	EFFECT OF CORN STOVER SILAGE DIETS SUPPLEMENTED WITH NITROGEN FROM POULTRY EXCRETA ON D
400 77 4473	DIETS	FEEDING POULTRY LITTER KEYWORDS: REFEEDING ENSILING POULTRY-WASTES POULTRY-LITTER CATT
100 72 4475	DIETS	EFFECTS ON CHICK GROWTH OF ADDING VARIOUS NON-PROTEIN NITROGEN SOURCES OR DRIED AUTOCLA
100 76 4534	DIETS	URINARY ALLANTOIN EXCRETION AND DIGESTIBLE DRY-MATTER INTAKE IN CATTLE AND BUFFALO KEYW
100 76 4631	DIETS	LIQUID DIETS CONTAINING POULTRY WASTES FOR RUMINANTS KEYWORDS: DIETS SHEEP LIQUID-WASTE
300 74 4106	DIGESTERS	HANDLING AND DISPOSING OF POULTRY MANURE KEYWORDS: POULTRY-WASTES WASTE-MANAGEMENT SOLI
400 77 4231	DIGESTERS	ON METHANE PRODUCTION KEYWORDS: METHANE RECYCLING ANAEROBIC DIGESTERS ECONOMICS
400 72 4303	DIGESTERS	METHANE POWER THE PLOWBOY INTERVIEW KEYWORDS: RECYCLING METHANE ORGANIC-WASTES DIGESTE
100 77 4368	DIGESTERS	ANAEROBIC DEGRADATION OF DAIRY MANURE UNDER MESOPHILIC AND THERMOPHILIC TEMPERATURES K
300 74 4453	DIGESTERS	STATE OF THE ART-METHANE GAS GENERATION FROM AGRICULTURAL WASTES KEYWORDS: AGRICULTURAL
300 77 4454	DIGESTERS	A COMPLETE DISPOSAL-RECYCLE SCHEME FOR AGRICULTURAL SOLID WASTES KEYWORDS: SOLID-WASTES
300 73 4472	DIGESTERS	BIO-GAS PLANT--DESIGNS WITH SPECIFICATIONS KEYWORDS: BIOGAS-PLANTS ANAEROBIC DIGESTERS
400 71 4566	DIGESTERS	GOBAR GAS-METHANE EXPERIMENTS IN INDIA KEYWORDS: METHANE GOBAR-GAS RECYCLING CATTLE-WAS
400 70 4567	DIGESTERS	HOW TO GENERATE POWER FROM GARBAGE KEYWORDS: METHANE ANAEROBIC DIGESTERS LIVESTOCK-WAST
300 77 4597	DIGESTERS	ENERGY RECOVERY ON THE FARM BY ANAEROBIC DIGESTION OF ANIMAL MANURES KEYWORDS: ANAEROBI
100 4658	DIGESTERS	PRACTICAL ASPECTS OF ANAEROBIC DIGESTION KEYWORDS: FARM-WASTES DOMESTIC-WASTES FACTORY-
400 71 4565	DIGESTER	THE MARVELOUS CHICKEN-POWERED MOTORCAR KEYWORDS: RECYCLING ANIMAL-WASTES METHANE METHAN
400 77 4611	DIGESTER	METHANE GAS MADE FROM CONFINEMENT UNIT WASTE KEYWORDS: SWINE-WASTES SLURRIES WASTE-TREA
500 73 4623	DIGESTER	A HOMESITE POWER UNIT--METHANE GENERATOR KEYWORDS: ANAEROBIC DIGESTER SLURRIES WASTE-TR
100 76 4020	DIGESTIBILITY	DEHYDRATED BROILER EXCRETA VERSUS SOYBEAN MEAL AS NITROGEN SUPPLEMENTS FOR SHEEP KEYWO
100 76 4101	DIGESTIBILITY	NUTRITIONAL EVALUATION OF DEHYDRATED CATTLE MANURE USING SHEEP KEYWORDS: REFEEDING CATT
100 77 4145	DIGESTIBILITY	NUTRIENT CHARACTERIZATION OF SWINE FECAL WASTE AND UTILIZATION OF THESE NUTRIENTS BY SW
100 77 4148	DIGESTIBILITY	PERFORMANCE OF BEEF CATTLE FED WASTELAGE AND DIGESTIBILITY OF WASTELAGE AND DRIED WAST
100 76 4234	DIGESTIBILITY	DRIED POULTRY WASTE AS A SUPPLEMENT FOR BEEF CATTLE KEYWORDS: POULTRY-WASTES-DRIED REFE
100 76 4236	DIGESTIBILITY	HEN EXCRETA COMPOSITION AND METABOLISM BY SHEEP KEYWORDS: POULTRY-WASTES-DRIED REFEEDIN
100 75 4329	DIGESTIBILITY	USE OF DRIED PAUNCH RESIDUE IN RUMINANT DIETS KEYWORDS: PAUNCH-MANURE REFEEDING SHEEP C
300 77 4379	DIGESTIBILITY	INFLUENCE OF RECYCLING BEEF CATTLE WASTE ON INDIGESTIBLE RESIDUE ACCUMULATION KEYWORDS
100 77 4421	DIGESTIBILITY	EFFECT OF INCLUDING ENSILED BROILER-HOUSE LITTER IN THE RATIONS OF SHEEP ON THE DIGESTI
400 73 4488	DIGESTIBILITY	RUMINANTS AND PIGS ARE THE BEST USERS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE S
100 76 4497	DIGESTIBILITY	POULTRY LITTER FOR INTENSIVE BEEF PRODUCTION KEYWORDS: POULTRY-WASTES REFEEDING DIGESTI
400 72 4336	DIGESTION	BUILDING A BIO-GAS PLANT KEYWORDS: BIO-GAS-PLANTS DESIGN LIQUID-WASTES AGITATION HEATIN
400 77 4581	DIGESTIVE-AIDS	VARIED RESULTS FROM HOG PIT DEODORIZERS KEYWORDS: ODOR-CONTROL CHEMICAL-TREATMENT MASKI
100 77 4363	DILUTIONS-TO-THRES	ODOR INTENSITIES AT CATTLE FEEDLOTS KEYWORDS: ODOR FEEDLOTS CATTLE DILUTIONS-TO-THRESHO
300 76 4097	DILUTION	DILUTION OF FEEDLOT RUNOFF KEYWORDS: LAND-APPLICATION FEEDLOT-RUNOFF DILUTION SOIL-WATE
700 72 4271	DILUTION-RATE	SHORT TERM MINIMUM AERATION OF SWINE MANURE KEYWORDS: SWINE-WASTES WASTE-TREATMENT AERA
100 77 4291	DIMETHYL-DISULFIDE	COLLECTION AND ANALYSIS OF ORGANIC GASES FROM NATURAL ECOSYSTEMS: APPLICATION TO POULTR
100 77 4291	DIMETHYL-SULFIDE	COLLECTION AND ANALYSIS OF ORGANIC GASES FROM NATURAL ECOSYSTEMS: APPLICATION TO POULTR
100 72 4154	DISEASES	ISOLATION OF ERYSIPELOTHRIX RHUSIOPATHIAE FROM SOIL AND MANURE OF SWINE-RAISING PREMISE
200 76 4053	DISEASE	FATE OF PATHOGENS IN SOILS RECEIVING ANIMAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WA
400 77 4056	DISEASE	BUILT-UP LITTER SAVES US TIME AND MONEY KEYWORDS: ECONOMICS TURKEYS MANAGEMENT DISEASE
100 71 4122	DISEASE	INHIBITORY EFFECT OF USED LITTER ON SALMONELLA TYPHIMURIUM TRANSMISSION IN THE CHICKEN
200 74 4535	DISEASE	SURVIVAL OF PATHOGENS IN FEEDLOT WASTE KEYWORDS: PATHOGENIC-BACTERIA CATTLE-WASTES FEED
100 71 4657	DISEASE	THE SURVIVAL OF SALMONELLA DUBLIN IN CATTLE SLURRY KEYWORDS: SLURRIES DAIRY-WASTES BACT
400 77 4448	DISEASE-ORGANISMS	CONVERT CITY SEWAGE TO FARM FERTILIZER KEYWORDS: SEWAGE-SLUDGE FERTILIZERS LAND-APPLICA
200 74 4667	DISEASE-ORGANISMS	SLURRY PROBLEMS IN RELATION TO POLLUTION OF SURFACE WATERS KEYWORDS: SLURRIES WASTE-MAN
100 74 4376	DISSOLVED-OXYGEN	USE OF FLUID COWSHED MANURE IN FISH PONDS KEYWORDS: ISRAEL REFEEDING FISH PONDS CATTLE-
300 75 4434	DISSOLVED-OXYGEN	MICROBIOLOGY AND WATER QUALITY IN A TRIBUTARY OF CAYUGA LAKE KEYWORDS: WATER-POLLUTION
300 75 4593	DISSOLVED-OXYGEN	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 1 KEYWORDS: WASTE-TREATMENT
300 76 4594	DISSOLVED-OXYGEN	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 2 KEYWORDS: SWINE-WASTES WAS
300 76 4595	DISSOLVED-OXYGEN	CONTROLLED ADDITION OF ANIMAL WASTE TO AEROBIC BIOLOGICAL TREATMENT PLANTS A COMPARISON
100 77 4636	DISSOLVED-OXYGEN	A COMPARISON ON PH-CONTROLLED AND DISSOLVED OXYGEN- CONTROLLED NUTRIENT ADDITION FOR TH

300 77 4659	DISSOLVED-OXYGEN	AEROBIC TREATMENT IN RELATION TO LAND APPLICATION OF SLURRY KEYWORDS: AEROBIC-TREATMENT
100 4658	DOMESTIC-WASTES	PRACTICAL ASPECTS OF ANAEROBIC DIGESTION KEYWORDS: FARM-WASTES DOMESTIC-WASTES FACTORY-
400 77 4294	DRAINAGE	FEEDLOT ODOR CONTROL RELIES ON DRY MANURE AND RAPID REMOVAL KEYWORDS: ODOR-CONTROL FEED
400 77 4495	DRAINAGE	PREPARE FOR WINTER KEYWORDS: FEEDLOT-MANAGEMENT MANURE-PACK DRAINAGE CLEANING SOLID-WA
100 77 4628	DRAINAGE	SPREADING SLURRY ON LAND KEYWORDS: SLURRIES LIVESTOCK-WASTES LAND-APPLICATION DRAINAGE
200 72 4338	DRIED-PAUNCH-MANUR	DRIED CATTLE PAUNCH MANURE AS A FEED SUPPLEMENT FOR CHANNEL CATFISH KEYWORDS: REFEEDING
100 77 4148	DRIED-WASTES	PERFORMANCE OF BEEF CATTLE FED WASTELAGE AND DIGESTIBILITY OF WASTELAGE AND DRIED WAST
700 75 4544	DRIED-WASTES	NUTRIENT CHARACTERIZATION OF SWINE FECAL WASTE AND UTILIZATION OF THESE NUTRIENTS BY SW
100 75 4564	DRINKING-WATER	HIGH LEVEL ANTIBIOTICS IN A SWINE WASTE RECYCLING SYSTEM KEYWORDS: SWINE DRINKING-WATER
400 76 4319	DRUGS	STORIES MANURE CAN TELL KEYWORDS: ANIMAL-WASTES REFEEDING LAND-APPLICATION RECYCLING FE
400 77 4103	DRUG-RESIDUES	PULLETS IN GROW CAGES ABOVE HOGS IN PIT BELOW KEYWORDS: HIGH-RISE-CAGE POULTRY-WASTES M
100 74 4108	DRUG-RESIDUES	POULTRY WASTES AS FEEDSTUFFS FOR RUMINANTS KEYWORDS: POULTRY-WASTES POULTRY-LITTER WAST
400 77 4644	DRYING	PONDER THIS SWITCH-BACK, FIELD SINK SYSTEM KEYWORDS: DAIRY-WASTES RUNOFF SWITCH-BACK-WA
100 74 4191	DRYING-TIME	LOSSES FROM CATTLE FAECES DURING CHEMICAL ANALYSIS KEYWORDS: SAMPLING-TECHNIQUES CHEMIC
100 74 4376	DRY-MATTER	USE OF FLUID COWSHED MANURE IN FISH PONDS KEYWORDS: ISRAEL REFEEDING FISH PONDS CATTLE-
100 76 4631	DRY-MATTER	LIQUID DIETS CONTAINING POULTRY WASTES FOR RUMINANTS KEYWORDS: DIETS SHEEP LIQUID-WASTE
300 77 4301	DRY-MATTER-DIGESTI	NUTRITIVE VALUE OF ENSILED BROILER LITTER KEYWORDS: REFEEDING POULTRY-LITTER ENSILING M
100 73 4396	DUCK-WASTES	WINTER OPERATION OF AERATED LIQUID ANIMAL WASTE STORAGE SYSTEMS KEYWORDS: WASTE-STORAGE
100 75 4648	DUNG-BEETLES	THE AGRONOMIC ROLE OF INTRODUCED DUNG BEETLES IN GRAZING SYSTEMS KEYWORDS: PASTURES MAN
400 77 4552	DURABILITY	FIT FLOOR TO YOUR SWINE OPERATION KEYWORDS: SWINE CONFINEMENT-PENS SLOTTED-FLOORS SLAT-
400 77 4056	DUST	BUILT-UP LITTER SAVES US TIME AND MONEY KEYWORDS: ECONOMICS TURKEYS MANAGEMENT DISEASE
100 75 4102	DUST	DIURNAL AND ANNUAL FLUCTUATIONS OF AERIAL BACTERIAL AND DUST LEVELS IN ENCLOSED SWINE H
100 75 4162	DUST	RELATIVE AND QUALITATIVE ASPECTS OF AERIAL BACTERIA AND DUST IN SWINE HOUSES KEYWORDS
200 76 4360	DUST	LAND USE OF ANIMAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WASTES NITROGEN WASTE-COMPO
300 75 4570	DUST	GUIDELINES FOR MANURE USE AND DISPOSAL IN THE WESTERN REGION, USA KEYWORDS: LAND-APPLIC
200 76 4616	DUST	EFFECTS OF POULTRY DUST ON PERFORMANCE OF A THERMOSIPHON HEAT RECOVERY SYSTEM KEYWORDS
400 77 4438	DUST-CONTROL	HOG HOUSE DUST CONTROL HELPS YOU BREATHE EASIER KEYWORDS: SWINE CONFINEMENT-BUILDINGS A
300 77 4461	DUST-CONTROL	WASTE MANAGEMENT PRACTICES OF WESTERN CATTLE FEEDLOTS KEYWORDS: WASTE-MANAGEMENT FEEDLO
400 77 4664	DUST-CONTROL	NEW RECYCLING TRIAL SHOWS 20 HD EXTRA PROFIT KEYWORDS: REFEEDING CATTLE-WASTES COMPOST
400 77 4443	EARTHEN-PIT	NEW WASTE COLLECTION AND STORAGE SYSTEM KEYWORDS: WASTE-COLLECTION WASTE-STORAGE LIQUID
100 74 4344	EARTHWORMS	ANIMAL WASTES AS SUBSTRATES FOR PROTEIN PRODUCTION KEYWORDS: ANIMAL-WASTES SUBSTRATES P
400 77 4436	EARTHWORMS	THE HAPPY EARTHWORM KEYWORDS: RECYCLING CATTLE-WASTES PAUNCH-MANURE FEEDLOTS EARTHWORMS
400 77 4522	EARTHWORMS	ON STRAW AND GOLD, MANURE AND ALGAE--FEEDING WASTE--IT'S BEING DONE IN A VARIETY OF WAY
100 77 4653	EARTHWORMS	AN EXPERIMENT ON DUNG REMOVAL BY APHODIUS LARVAE SCARABAEIDAE AND EARTHWORMS KEYWORDS
100 76 4638	EARTHWORM-POPULAT	EARTHWORM POPULATION OF A PASTURE SPRAY-IRRIGATED WITH DAIRY SHED EFFLUENT KEYWORDS: DA
400 71 4370	ECOLITE	FEEDLOT MANURE: THE ECOLOGY INSPIRED BUILDING MATERIAL KEYWORDS: RECYCLING ECOLITE BUILD
200 71 4298	ECOLOGY	TOWARD THE DESIGN AND MANAGEMENT OF ENVIRONMENTAL SYSTEMS KEYWORDS: DESIGN MANAGEMENT E
100 72 4008	ECONOMICS	SOME POSSIBILITIES AND ASPECTS OF THE CHEMICAL AND BIOLOGICAL TREATMENT OF LIQUID MANUR
400 77 4014	ECONOMICS	EXCREMENT RECONSTITUTED GRAIN FOR GROWING AND FINISHING CATTLE KEYWORDS: REFEEDING ECON
100 77 4019	ECONOMICS	ALFALFA VERSUS POULTRY EXCRETA AS NITROGEN SUPPLEMENTS FOR LAMBS KEYWORDS: REFEEDING SH
400 77 4021	ECONOMICS	ENERGY POTENTIAL FROM WASTE SMALL KEYWORDS. ENERGY FEEDLOTS LIVESTOCK-WASTES RECYCLING
300 76 4028	ECONOMICS	TERTIARY TREATMENT AND REUSE OF ANIMAL WASTES KEYWORDS: DAIRY-WASTES LIQUID-WASTES BIOL
300 75 4029	ECONOMICS	CONTROL OF WATER POLLUTION FROM CROPLAND VOLUME I--A MANUAL FOR GUIDELINE DEVELOPMENT
300 76 4030	ECONOMICS	CONTROL OF WATER POLLUTION FROM CROPLAND VOLUME II--AN OVERVIEW KEYWORDS: AGRICULTURAL
400 77 4031	ECONOMICS	FEEDERS RECYCLING PLAN SAVES FIVE BUSHELS OF CORN FOR EACH STEER FED KEYWORDS: RECYCLI
400 77 4040	ECONOMICS	BACK TO BASICS--175-BUSHEL CORN FROM LEGUMES AND WASTES KEYWORDS: LAND-APPLICATION SWIN
100 77 4042	ECONOMICS	HOG MANURE WORTH $3.50 PER TON AS FERTILIZER KEYWORDS: LIQUID-WASTES SWINE-WASTES LAND-
400 74 4051	ECONOMICS	MANURE KEYWORDS COMPOSTING RECYCLING FUELS ECONOMICS CATTLE-WASTES ORGANIC-WASTES
400 76 4055	ECONOMICS	HOGMEN SIZE UP OXIDATION SYSTEMS KEYWORDS: LIQUID-WASTES SWINE-WASTES OXIDATION RACETRA
400 77 4056	ECONOMICS	BUILT-UP LITTER SAVES US TIME AND MONEY KEYWORDS: ECONOMICS TURKEYS MANAGEMENT DISEASE
200 77 4057	ECONOMICS	SEMINAR ON FEEDLOT MANURE RECYCLING FOR NUTRIENT RECOVERY KEYWORDS. REFEEDING LIVESTOCK
200 77 4058	ECONOMICS	REFEEDING POTENTIALS FACTS AND FANTASIES KEYWORDS: REFEEDING ECONOMICS WASTE-COMPOSITI
200 77 4059	ECONOMICS	USE OF WASTE FROM OPEN FEEDLOTS FOR FATTENING, GROWING AND MAINTENANCE RATIONS KEYWORD
200 77 4060	ECONOMICS	HARVESTING AND PROCESSING MANURE FROM CONFINEMENT OPERATIONS FOR REFEEDING KEYWORDS: CO
300 76 4068	ECONOMICS	DEMONSTRATION OF AERATION SYSTEMS FOR POULTRY WASTES KEYWORDS: POULTRY-WASTES BIOLOGICA
400 77 4070	ECONOMICS	POULTRY WASTE FED TO CATTLE, SHEEP KEYWORDS: REFEEDING POULTRY-WASTES-DRIED WASTE-COMPO
200 74 4072	ECONOMICS	FUEL FROM FECES KEYWORDS: FUELS RECYCLING PHYSICAL-TREATMENT CHEMICAL-TREATMENT BIOLOGI
400 77 4076	ECONOMICS	IRRIGATION: ONE WAY TO HANDLE LAGOON WASTES KEYWORDS: IRRIGATION-SYSTEMS LIQUID-WASTES
500 76 4078	ECONOMICS	SYSTEMS ANALYSIS OF ANIMAL WASTE HANDLING ALTERNATIVES KEYWORDS: COMPUTER-MODELS WASTE-
500 77 4091	ECONOMICS	ECONOMIC POTENTIAL AND MANAGEMENT CONSIDERATIONS IN LAND APPLICATION OF BEEF FEEDLOT WA
100 75 4095	ECONOMICS	A SYSTEM OF OPTIMIZING THE USE OF ANIMAL MANURES ON A GRASSLAND FARM KEYWORDS: MATHEMAT
300 74 4106	ECONOMICS	HANDLING AND DISPOSING OF POULTRY MANURE KEYWORDS: POULTRY-WASTES WASTE-MANAGEMENT SOLI
400 74 4110	ECONOMICS	NATURAL GAS FROM THE BARNYARD, OR JUST MOVE BOSSY OVER AND HOOK IT UP KEYWORDS: RECYCL
400 77 4113	ECONOMICS	MANURE STORAGE AREAS HELP SAVE NUTRIENTS KEYWORDS. WASTE-STORAGE PUMPS NUTRIENTS ECONOM
100 46 4115	ECONOMICS	DIGESTER GAS FOR AUTOMOBILES KEYWORDS. METHANE ORGANIC-WASTES SEWAGE HORSE-WASTES RECYC
400 77 4119	ECONOMICS	HARNESSING ENERGY SOURCES FOR THE FEEDLOT KEYWORDS: ENERGY FEEDLOTS RECYCLING METHANE S
400 77 4123	ECONOMICS	COMPOSTING MAKES MANURE HANDLING EASY KEYWORDS: COMPOSTING CATTLE-WASTES WINDROWS AERAT
300 77 4134	ECONOMICS	COSTS OF DAIRY WASTE DISPOSAL ON TENNESSEE EXPERIMENT STATION FARMS KEYWORDS: DAIRY-WAS
100 76 4138	ECONOMICS	RESPONSE OF DAIRY CATTLE GIVEN A FREE CHOICE OF FREE STALL LOCATION AND THREE BEDDING
400 77 4143	ECONOMICS	MORE INTEREST EVIDENT IN POULTRY LITTER AS LESS COSTLY, MORE AVAILABLE FERTILIZER KEYWO
400 77 4153	ECONOMICS	MAKING THE MOST OF WASTE KEYWORDS: POULTRY-WASTES CATTLE-WASTES RECYCLING METHANE FERTI
400 77 4158	ECONOMICS	MANURE TO METHANE IS IT FEASIBLE KEYWORDS: ANIMAL-WASTES RECYCLING METHANE ANAEROBIC-DI
400 77 4159	ECONOMICS	INTEREST IN DPW APPEARS TO HAVE SUBSIDED KEYWORDS: POULTRY-WASTES-DRIED RECYCLING REFEE
400 74 4174	ECONOMICS	OPEN COMPOUNDS FOR SHORT TERM MANURE STORAGE KEYWORDS: WASTE-STORAGE ECONOMICS DESIGN C
200 76 4182	ECONOMICS	RESOURCE ADEQUACY IN LIMITING NONPOINT POLLUTION KEYWORDS: NONPOINT-POLLUTION WATER-POL
200 76 4186	ECONOMICS	A LOW COST SETTLING BASIN AND INFILTRATION CHANNEL FOR CONTROLLING RUNOFF FROM AN OPEN
300 73 4188	ECONOMICS	ECONOMICS OF DAIRY WASTE DISPOSAL SYSTEM FOR ALABAMA KEYWORDS: DAIRY-WASTES LIQUID-WAST
400 77 4195	ECONOMICS	MISSOURIANS VIEW IDEAS ON GUTTER, LAGOON, AND FREESTALLS KEYWORDS: DAIRY-WASTES FREE-ST
500 75 4196	ECONOMICS	NITROGEN AND PHOSPHORUS FOOD PRODUCTION, WASTE AND THE ENVIRONMENT KEYWORDS: WATER-POL
500 75 4199	ECONOMICS	ECONOMIC ANALYSIS OF REDUCING PHOSPHORUS LOSSES FROM AGRICULTURAL PRODUCTION KEYWORDS
400 77 4202	ECONOMICS	175 BUSHEL CORN YIELD WITH MANURE AND ONLY STARTER FERTILIZER KEYWORDS: LIQUID-WASTES S
300 76 4207	ECONOMICS	STATE-OF-THE-ART SWINE WASTE PRODUCTION AND PRETREATMENT PROCESSES KEYWORDS: SWINE-WAS
100 76 4222	ECONOMICS	UTILIZATION OF BIOGAS FOR FARM PRODUCTION ENERGY KEYWORDS: RECYCLING BIOGAS CATTLE-WAST
200 76 4230	ECONOMICS	THE OXIDATION DITCH A POSITIVE METHOD OF ODOR CONTROL KEYWORDS: ODOR-CONTROL WASTE-TRE
400 77 4231	ECONOMICS	ON METHANE PRODUCTION KEYWORDS: METHANE RECYCLING ANAEROBIC DIGESTERS ECONOMICS
400 77 4239	ECONOMICS	SLAT-SCRAPE RECAPTURES RATION NUTRIENTS FOR REFEEDING MANURE KEYWORDS: CATTLE-WASTES EN
200 74 4243	ECONOMICS	FEEDLOT MANURE AS AN ENERGY SOURCE KEYWORDS: FEEDLOT-WASTES ENERGY ECONOMICS RECYCLING
400 77 4253	ECONOMICS	CATTLE FEEDING GAINS REPORTED GOOD ON MISSISSIPPI COMPANY'S POULTRY WASTE KEYWORDS: POU
400 77 4257	ECONOMICS	IOWA FARMERS FEED DRIED POULTRY WASTE TO CATTLE KEYWORDS: POULTRY-WASTES-DRIED REFEEDIN
300 77 4262	ECONOMICS	CAN CITY SEWAGE BE RECYCLED SAFELY ON FARM LAND KEYWORDS: RECYCLING SEWAGE LAND-APPLICA
400 77 4263	ECONOMICS	HANDLE WASTE CHEAPLY WITH PARTIAL SLATS KEYWORDS: SWINE-WASTES FLOORS FLUSHING WASTE-MA
300 74 4297	ECONOMICS	ENERGY FROM FEEDLOT MANURE KEYWORDS: FUELS RECYCLING LIVESTOCK-WASTES FERTILIZERS REFEE
400 76 4299	ECONOMICS	ENERGY AND RESOURCE REQUIREMENTS FOR BEEF CATTLE PRODUCTION KEYWORDS CATTLE-WASTES FEE
400 77 4300	ECONOMICS	RE-CYCLING IS NO CURE-ALL KEYWORDS: REFEEDING FEEDLOT-WASTES CATTLE PERFORMANCE ECONOMI
400 77 4302	ECONOMICS	DIVERSIFY--BUT STAY EFFICIENT, SAYS IOWA CATTLE FEEDER KEYWORDS: MANAGEMENT CONFINEMENT
400 72 4303	ECONOMICS	METHANE POWER! THE PLOWBOY INTERVIEW KEYWORDS: RECYCLING METHANE ORGANIC-WASTES DIGESTE
400 70 4311	ECONOMICS	IMAGINE YOUR FEEDLOT MANURE CAN POWER YOUR MILL AND BRING CASH FROM SALE OF EXCESS POWE
300 76 4312	ECONOMICS	FEEDLOT MANURE COLLECTION EFFICIENCY KEYWORDS: WASTE-COLLECTION FEEDLOTS TIME-MOTION-ST
400 75 4313	ECONOMICS	DPW VALUE AS ANIMAL FEED SEEN REACHING 100 A TON KEYWORDS: REFEEDING POULTRY-WASTES-DR
400 77 4317	ECONOMICS	WASTE CONTROL CUT HIS FERTILIZER BILL IN HALF KEYWORDS: DAIRY-WASTES WASTE-TREATMENT CO

400	76	4319	ECONOMICS — STORIES MANURE CAN TELL KEYWORDS: ANIMAL-WASTES REFEEDING LAND-APPLICATION RECYCLING FE
400	77	4320	ECONOMICS — SEMI-CONFINEMENT AT 1/3 THE COST KEYWORDS: SEMI-CONFINEMENT CATTLE ECONOMICS WEATHER WA
400	74	4322	ECONOMICS — THERE'S MONEY IN MANURE IF HANDLED RIGHT KEYWORDS: DAIRY-WASTES WASTE-MANAGEMENT FERTIL
300	77	4334	ECONOMICS — UTILIZATION OF LIVESTOCK WASTES-ALTERNATIVE TREATMENTS AND PRODUCTS KEYWORDS: RECYCLIN
400	77	4342	ECONOMICS — C.P.S.T.A -N OR WHY POOR WASTE MANAGEMENT COSTS YOU MONEY KEYWORDS: LIVESTOCK-WASTES PO
200	74	4347	ECONOMICS — LIVESTOCK ODOR CONTROL RESEARCH AT THE UNIVERSITY OF ILLINOIS KEYWORDS: ODOR-CONTROL SW
100	77	4350	ECONOMICS — DRYING CAGED LAYER WASTE KEYWORDS: MODEL-STUDIES POULTRY-WASTES DEEP-PITS VENTILATION M
400	73	4352	ECONOMICS — UNDERGROUND SILOS FOR LIQUID MANURE KEYWORDS: DAIRY-WASTES WASTE-STORAGE SILOS LAND-APP
400	77	4382	ECONOMICS — RESEARCHERS STUDY ALGAE PRODUCTION FROM HOG WASTE KEYWORDS: RECYCLING WASTEWATER-RENOVA
400	72	4383	ECONOMICS — WHAT ARE YOU DOING ABOUT YOUR 1.57 BILLION TON ANIMAL WASTE PROBLEM KEYWORDS: WASTE-MAN
300	72	4393	ECONOMICS — AN ANALYSIS OF BEEF CATTLE FEEDLOT DESIGNS FOR POLLUTION CONTROL KEYWORDS: FEEDLOTS DES
200	76	4403	ECONOMICS — RESEARCH AND DEVELOPMENT NEEDS RELATED TO PATHOGENS IN PRETREATMENT-LAND APPLICATION SY
100	71	4405	ECONOMICS — A CLEAN NEW GAS KEYWORDS: SEWAGE URBAN-WASTES AGRICULTURAL-WASTES RECYCLING ANAEROBIC-D
100	72	4409	ECONOMICS — THE NEED FOR INTENSIFICATION IN ANIMAL PRODUCTION AND THE CONSEQUENT POLLUTION PROBLEM
400	77	4410	ECONOMICS — POULTRY WASTE--NITROGEN FOR LACTATING DAIRY COWS KEYWORDS: REFEEDING POULTRY-WASTES-DRI
400	77	4411	ECONOMICS — WAYS TO SPEED UP DRYING OF MANURE IN PITS KEYWORDS: POULTRY-WASTES DEHYDRATION VENTILAT
200	74	4415	ECONOMICS — FIVE-YEAR BEEF ANIMAL ENVIRONMENT STUDY IN MINNESOTA KEYWORDS: CONFINEMENT-PENS FEEDLOT
400	77	4428	ECONOMICS — ENGINEER EXPLAINS NEW WASTE RUNOFF SYSTEM KEYWORDS: FEEDLOT-RUNOFF WATER-POLLUTION-CONT
300	76	4435	ECONOMICS — OPPORTUNITIES FOR MORE EFFECTIVE USE OF ANIMAL WASTES KEYWORDS: WASTE-DISPOSAL LAND-DIS
400	77	4436	ECONOMICS — THE HAPPY EARTHWORM KEYWORDS: RECYCLING CATTLE-WASTES PAUNCH-MANURE FEEDLOTS EARTHWORMS
400	77	4438	ECONOMICS — HOG HOUSE DUST CONTROL HELPS YOU BREATHE EASIER KEYWORDS: SWINE CONFINEMENT-BUILDINGS A
400	77	4439	ECONOMICS — INJECTING MANURE CUTS CORN FERTILIZER COSTS KEYWORDS: LAND-APPLICATION SOIL-INJECTION C
400	77	4440	ECONOMICS — INJECTING MANURE PAYS WITH SAVED NITROGEN KEYWORDS: SWINE-WASTES CATTLE-WASTES LAND-APP
300	75	4444	ECONOMICS — LIVESTOCK WASTE FACILITIES HANDBOOK KEYWORDS: LIVESTOCK-WASTES WASTE-STORAGE WASTE-TREA
700	74	4447	ECONOMICS — DECISION MODEL FOR ANIMAL MANURE HANDLING KEYWORDS: WASTE-MANAGEMENT WASTE-TREATMENT WA
300	77	4461	ECONOMICS — WASTE MANAGEMENT PRACTICES OF WESTERN CATTLE FEEDLOTS KEYWORDS: WASTE-MANAGEMENT FEEDLO
400	77	4473	ECONOMICS — FEEDING POULTRY LITTER KEYWORDS. REFEEDING ENSILING POULTRY-WASTES POULTRY-LITTER CATT
300	75	4474	ECONOMICS — ENVIRONMENTAL AND ECONOMIC IMPACT OF NUTRIENT MANAGEMENT ON THE NEW YORK DAIRY FARM KEY
400	77	4479	ECONOMICS — HOUSING HINTS KEYWORDS FEEDLOTS HOUSING OPEN-LOTS CATTLE MANAGEMENT ECONOMICS
400	77	4485	ECONOMICS — PEN CLEANING ISN'T CHEAP KEYWORDS: FEEDLOT-WASTES CLEANING EFFICIENCY ECONOMICS MANAGEM
400	77	4498	ECONOMICS — NITROGEN LOSS IN SWINE WASTE APPLICATION STUDIED KEYWORDS: LAND-APPLICATION NITROGEN-LO
400	77	4504	ECONOMICS — MANURE IS NOW A COMMODITY KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING BIOGAS METHANE CAR
300	75	4505	ECONOMICS — AN ECONOMIC ANALYSIS OF THE INVESTMENT AND OPERATING COSTS ASSOCIATED WITH LIQUID MANU
200	74	4506	ECONOMICS — ANIMAL PRODUCTION IN SINGAPORE--PRESENT STATUS AND TRENDS KEYWORDS: PRODUCTION SWINE PO
400	73	4507	ECONOMICS — KEEP YOUR SLURRY SMELLING SWEET KEYWORDS: DAIRY-WASTES WASTE-TREATMENT WASTE-STORAGE OD
300	77	4509	ECONOMICS — ENERGY USE IN AGRICULTURE: NOW AND FOR THE FUTURE KEYWORDS: AGRICULTURE ENERGY-CONSUMPT
400	74	4511	ECONOMICS — DESPITE SCIENCE, IT'S STILL MANURE KEYWORDS: LIVESTOCK-WASTES RECYCLING PYROLYSIS HYDRO
400	77	4518	ECONOMICS — MANURE CAN BE A PROFITABLE FERTILIZER KEYWORDS: ANIMAL-WASTES SWINE-WASTES LAND-APPLICA
400	77	4519	ECONOMICS — METHANE GAS ENERGY POSSIBLE FROM MANURE KEYWORDS: RECYCLING LIVESTOCK-WASTES WASTE-TREA
400	77	4522	ECONOMICS — ON STRAW AND GOLD, MANURE AND ALGAE--FEEDING WASTE--IT'S BEING DONE IN A VARIETY OF WAY
400	77	4526	ECONOMICS — WHAT'S HOUSING REALLY WORTH KEYWORDS: CONFINEMENT-PENS HOUSING FLOORS ECONOMICS PERFORM
400	77	4529	ECONOMICS — UTILIZING WASTE FOR FERTILIZER BASE KEYWORDS AGRICULTURE ENERGY-CONSUMPTION FERTILIZER
400	77	4530	ECONOMICS — BACTERIA POWER GENERATOR, PRODUCE FERTILIZER IN ICWA KEYWORDS: POULTRY-WASTES RECYCLING
400	77	4538	ECONOMICS — FOR THIS HOG FARMER NEW PORK PRODUCTION UNIT ELIMINATES WASTE DISPOSAL KEYWORDS: SWINE-
700	76	4545	ECONOMICS — EVALUATION OF A FLUSHING-GUTTER MANURE-REMOVAL SYSTEM TO IMPROVE ATMOSPHERIC QUALITY IN
400	74	4547	ECONOMICS — AN ANSWER TO MANURE DISPOSAL PROBLEMS KEYWORDS: SPRAY-IRRIGATION LAND-APPLICATION EQUIP
400	76	4548	ECONOMICS — EFFLUENT DISPOSAL, A PILOT STUDY AT CRESSY RESEARCH STATION KEYWORDS: SWINE-WASTES EFFL
400	73	4549	ECONOMICS — EFFLUENT STORAGE AND DISPOSAL FROM INTENSIVE PIG UNITS KEYWORDS: SWINE-WASTES WASTE-STO
400	77	4552	ECONOMICS — FIT FLOOR TO YOUR SWINE OPERATION KEYWORDS; SWINE CONFINEMENT-PENS SLOTTED-FLOORS SLAT-
200	75	4558	ECONOMICS — HOW TO CLEAN UP AT THE RACES KEYWORDS: HORSE-WASTES RACE-TRACKS WASTE-MANAGEMENT WASTE-
100	74	4559	ECONOMICS — A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND-- PART 1 KEYWORDS: ANIMAL-WASTE
100	75	4560	ECONOMICS — A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND-- PART 2 KEYWORDS: WATER-POLLUT
400	77	4563	ECONOMICS — COWTOWN'S MANURE MEANS MEGAWATTS KEYWORDS: RECYCLING BIOGAS METHANE CATTLE-WASTES FEEDL
400	71	4565	ECONOMICS — THE MARVELOUS CHICKEN-POWERED MOTORCAR KEYWORDS: RECYCLING ANIMAL-WASTES METHANE METHAN
400	70	4568	ECONOMICS — NOW ELECTRICITY FROM MANURE GASES KEYWORDS: ELECTRICITY ENERGY RECYCLING SWINE-WASTES G
400	77	4571	ECONOMICS — A PLACE FOR POULTRY WASTE KEYWORDS: REFEEDING POULTRY-WASTES WASTE-STORAGE ENSILING SIL
400	76	4576	ECONOMICS — HOUSING AND EQUIPMENT--OPTIONS FOR CONFINEMENT HOUSING KEYWORDS: CONFINEMENT-PENS HOUSI
300	75	4586	ECONOMICS — ADDITIVES FOR MANURE ODOR CONTROL KEYWORDS: ODOR-CONTROL LAND-APPLICATION BIOLOGICAL-TR
500	74	4596	ECONOMICS — BIO-GAS PLANT GENERATING METHANE FROM ORGANIC WASTES KEYWORDS: METHANE BIOGAS-PLANTS AN
200	75	4605	ECONOMICS — AN ECONOMIC COMPARISON OF FIVE WASTE MANAGEMENT SYSTEMS FOR SWINE FINISHING OPERATIONS
100	75	4607	ECONOMICS — FLY PROTEIN PRODUCTION FROM MECHANICALLY MIXED ANIMAL WASTES KEYWORDS: RECYCLING POULTR
400	77	4611	ECONOMICS — METHANE GAS MADE FROM CONFINEMENT UNIT WASTE KEYWORDS. SWINE-WASTES SLURRIES WASTE-TREA
200	76	4617	ECONOMICS — STUDIES ON A MIXING DISTRIBUTION SYSTEM FOR SWINE MANURE LAGOONS KEYWORDS; SWINE-WASTES
200	76	4619	ECONOMICS — ENGINEERING EVALUATION OF A POULTRY MANURE DEHYDRATING MACHINE KEYWORDS; DEHYDRATION PO
100	76	4624	ECONOMICS — EFFECT OF CROP ROTATION, FARM YARD MANURE AND THE QUANTITY OF SALINE IRRIGATION WATER
200	76	4651	ECONOMICS — FERTILIZER VALUE OF ANIMAL MANURES KEYWORDS: SWINE-WASTES CATTLE-WASTES WASTE-STORAGE L
200	77	4663	ECONOMICS — DECISION TOOLS FOR DAIRY MANURE HANDLING SYSTEMS SELECTION KEYWORDS: COMPUTER-MODELS D
400	77	4664	ECONOMICS — NEW RECYCLING TRIAL SHOWS 20 HD EXTRA PROFIT KEYWORDS: REFEEDING CATTLE-WASTES COMPOST
400	77	4665	ECONOMICS — METHANE FROM CATTLE MANURE TO REPLACE FUEL OIL KEYWORDS: CATTLE-WASTES FERMENTATION REC
400	77	4485	EFFICIENCY — PEN CLEANING ISN'T CHEAP KEYWORDS: FEEDLOT-WASTES CLEANING EFFICIENCY ECONOMICS MANAGEM
100	74	4015	EFFLUENTS — LAGOONS AND OXIDATION PONDS KEYWORDS: LAGOONS LIVESTOCK-WASTES DAIRY-WASTES KRAFT-PULPI
200	76	4261	EFFLUENTS — OVERLAND FLOW TREATMENT OF SWINE LAGOON EFFLUENT KEYWORDS: OVERLAND-FLOW-TREATMENT SWIN
200	75	4401	EFFLUENTS — CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH DENSITY CATFISH CULTURES K
100	71	4405	EFFLUENTS — A CLEAN NEW GAS KEYWORDS: SEWAGE URBAN-WASTES AGRICULTURAL-WASTES RECYCLING ANAEROBIC-D
400	74	4511	EFFLUENT — DESPITE SCIENCE, IT'S STILL MANURE KEYWORDS; LIVESTOCK-WASTES RECYCLING PYROLYSIS HYDRO
400	76	4548	EFFLUENT — EFFLUENT DISPOSAL, A PILOT STUDY AT CRESSY RESEARCH STATION KEYWORDS: SWINE-WASTES EFFL
400	73	4549	EFFLUENT — EFFLUENT STORAGE AND DISPOSAL FROM INTENSIVE PIG UNITS KEYWORDS: SWINE-WASTES WASTE-STO
100	77	4599	EFFLUENT-QUALITY — DENITRIFICATION OF AEROBICALLY STABILISED PIG WASTE KEYWORDS: SWINE-WASTES LIQUID-WASTE
100	76	4602	EFFLUENT-QUALITY — TREATMENT OF POULTRY MANURE WASTEWATER USING A ROTATING BIOLOGICAL CONTACTOR KEYWORDS
100	76	4656	EFFLUENT-QUALITY — THREE-STEP TREATMENT FOR PIGGERY WASTES KEYWORDS: SWINE-WASTES AEROBIC-TREATMENT ANAERO
100	77	4041	EGG-QUALITY — THE LAYING PERFORMANCE OF TWO STRAINS OF HENS OFFERED DIETS CONTAINING DRIED POULTRY MA
400	77	4070	EGG-QUALITY — POULTRY WASTE FED TO CATTLE, SHEEP KEYWORDS: REFEEDING POULTRY-WASTES-DRIED WASTE-COMPO
100	76	4289	EGG-QUALITY — ACCUMULATION AND EXCRETION OF CERTAIN ORGANOCHLORINE INSECTICIDES IN BROILER BREEDER HE
200	72	4400	EGG-QUALITY — RECYCLING ANIMAL WASTES KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CRUDE-PROTEINS PERFORM
500	77	4089	ELECTRICAL-CONDUCT — SOIL AND CROP RESPONSE TO APPLIED ANIMAL WASTE KEYWORDS: LAND-APPLICATION CROP-RESPONSE
100	75	4589	ELECTRICAL-CONDUCT — PROPERTIES OF MANURE ACCUMULATIONS FROM MIDWEST BEEF CATTLE FEEDLOTS KEYWORDS: FEEDLOTS
100	76	4627	ELECTRICAL-CONDUCT — NITRATE POLLUTION OF GROUNDWATER FROM NITROGEN FERTILIZERS AND ANIMAL WASTES IN THE PU
100	76	4634	ELECTRICAL-CONDUCT — ANALYSIS OF THE ROTTING PROCESS OF SAWDUST BARNYARD MANURE KEYWORDS: ANIMAL-WASTES SAW
400	70	4568	ELECTRICITY — NOW ELECTRICITY FROM MANURE GASES KEYWORDS: ELECTRICITY ENERGY RECYCLING SWINE-WASTES G
300	77	4597	ELECTRODE-POTENTIA — ENERGY RECOVERY ON THE FARM BY ANAEROBIC DIGESTION OF ANIMAL MANURES KEYWORDS: ANAEROBI
300	76	4312	ELEVATING-SCRAPER — FEEDLOT MANURE COLLECTION EFFICIENCY KEYWORDS: WASTE-COLLECTION FEEDLOTS TIME-MOTION-ST
300	75	4492	ELEVATING-SCRAPER — COMPARISON OF FEEDLOT MANURE COLLECTION MACHINERY KEYWORDS: WASTE-COLLECTION ELEVATING-
100	76	4416	ELIMINATIVE-AREAS — A STUDY ON ELIMINATIVE AND GRAZING BEHAVIOUR--THE USE OF THE FIELD BY CAPTIVE HORSES KE
400	77	4021	ENERGY — ENERGY POTENTIAL FROM WASTE SMALL KEYWORDS; ENERGY FEEDLOTS LIVESTOCK-WASTES RECYCLING
500	76	4078	ENERGY — *SYSTEMS ANALYSIS OF ANIMAL WASTE HANDLING ALTERNATIVES KEYWORDS: COMPUTER-MODELS WASTE-*
400	77	4119	ENERGY — HARNESSING ENERGY SOURCES FOR THE FEEDLOT KEYWORDS; ENERGY FEEDLOTS RECYCLING METHANE S
200	76	4172	ENERGY — LAND DISPOSAL OF BLOOD AND PAUNCH MANURE KEYWORDS; LAND-DISPOSAL BLOOD PAUNCH-MANURE PA
200	74	4243	ENERGY — FEEDLOT MANURE AS AN ENERGY SOURCE KEYWORDS: FEEDLOT-WASTES ENERGY ECONOMICS RECYCLING
400	77	4296	ENERGY — FARMERS AS FUEL SUPPLIERS KEYWORDS; ENERGY RECYCLING BIOMASS-CROPS CROP-RESIDUES GRAIN-
300	77	4334	ENERGY — UTILIZATION OF LIVESTOCK WASTES-ALTERNATIVE TREATMENTS AND PRODUCTS KEYWORDS: RECYCLIN

400 77 4530	ENERGY		BACTERIA POWER GENERATOR, PRODUCE FERTILIZER IN IOWA KEYWORDS: POULTRY-WASTES RECYCLING
200 75 4558	ENERGY		HOW TO CLEAN UP AT THE RACES KEYWORDS: HORSE-WASTES RACE-TRACKS WASTE-MANAGEMENT WASTE-
400 70 4568	ENERGY		NOW ELECTRICITY FROM MANURE GASES KEYWORDS: ELECTRICITY ENERGY RECYCLING SWINE-WASTES G
300 76 4312	ENERGY-CONSUMPTION		FEEDLOT MANURE COLLECTION EFFICIENCY KEYWORDS: WASTE-COLLECTION FEEDLOTS TIME-MOTION-ST
300 77 4509	ENERGY-CONSUMPTION		ENERGY USE IN AGRICULTURE: NOW AND FOR THE FUTURE KEYWORDS: AGRICULTURE ENERGY-CONSUMPT
400 77 4529	ENERGY-CONSUMPTION		UTILIZING WASTE FOR FERTILIZER BASE KEYWORDS: AGRICULTURE ENERGY-CONSUMPTION FERTILIZER
300 77 4509	ENERGY-SOURCES		ENERGY USE IN AGRICULTURE: NOW AND FOR THE FUTURE KEYWORDS: AGRICULTURE ENERGY-CONSUMPT
300 73 4265	ENGINEERING-STANDA		DESIGN OF ANIMAL WASTE DISPOSAL SYSTEMS KEYWORDS: ENGINEERING-STANDARDS LEGAL-ASPECTS D
100 77 4048	ENSILING		MICROBIAL POPULATION CHANGES AND FERMENTATION CHARACTERISTICS OF ENSILED BOVINE MANURE-
200 77 4060	ENSILING		HARVESTING AND PROCESSING MANURE FROM CONFINEMENT OPERATIONS FOR REFEEDING KEYWORDS: CO
200 77 4062	ENSILING		PATHOGEN TRANSMISSION POTENTIAL FROM ANIMAL WASTE REFEEDING KEYWORDS: REFEEDING PATHOGE
100 77 4146	ENSILING		COMPOSITION OF CORN PLANT ENSILED WITH EXCRETA OR NITROGEN SUPPLEMENTS AND ITS EFFECT
100 76 4201	ENSILING		INCLUSION OF LIVESTOCK FECES INTO CORN SILAGE KEYWORDS: LIVESTOCK-WASTES POULTRY-WASTES
100 77 4208	ENSILING		FERMENTATION, NITROGEN UTILIZATION, DIGESTIBILITY AND PALATABILITY OF BROILER LITTER EN
400 77 4239	ENSILING		SLAT-SCRAPE RECAPTURES RATION NUTRIENTS FOR REFEEDING MANURE KEYWORDS: CATTLE-WASTES EN
400 77 4258	ENSILING		RECYCLING SOLVES WASTE MANAGEMENT PROBLEMS KEYWORDS: REFEEDING ENSILING CATTLE-WASTES P
400 77 4293	ENSILING		FEEDLOT WASTE WORKS IN GROWING RATION TEST KEYWORDS: CATTLE-WASTES DEHYDRATION ENSILING
300 77 4301	ENSILING		NUTRITIVE VALUE OF ENSILED BROILER LITTER KEYWORDS: REFEEDING POULTRY-LITTER ENSILING M
200 77 4335	ENSILING		UTILIZATION OF SUNFLOWER SILAGE, SUNFLOWER HULLS WITH POULTRY LITTER AND SUNFLOWER HULL
300 76 4355	ENSILING		EVALUATION OF ENSILING SWINE FECAL WASTE WITH GROUND ORCHARDGRASS HAY, PRELIMINARY REPO
100 74 4374	ENSILING		NUTRITIONAL VALUE OF CATTLE WASTE FOR CATTLE KEYWORDS: REFEEDING CATTLE-WASTES WASTELAG
400 77 4380	ENSILING		WINTERING BROOD COWS MAKE BEST USE OF POULTRY LITTER: RESEARCHER KEYWORDS: REFEEDING PO
100 76 4389	ENSILING		NUTRITIVE VALUE OF ENSILED CATTLE WASTE KEYWORDS ENSILING CATTLE-WASTES REFEEDING CATT
600 4407	ENSILING		EFFECT OF CORN STOVER SILAGE DIETS SUPPLEMENTED WITH NITROGEN FROM POULTRY EXCRETA ON D
100 77 4418	ENSILING		LAMB PERFORMANCE ON CAGE HEN MANURE ENSILED WITH CORRUGATED CARDBOARD KEYWORDS: REFEEDI
100 77 4421	ENSILING		EFFECT OF INCLUDING ENSILED BROILER-HOUSE LITTER IN THE RATIONS OF SHEEP ON THE DIGESTI
200 77 4422	ENSILING		MICROFLORA OF ENSILED MANURE-BLENDED FEED, CORN AND SORGHUM SILAGES KEYWORDS: ENSILING
200 71 4457	ENSILING		AGRICULTURE'S ROLE IN ENVIRONMENTAL QUALITY KEYWORDS: AGRICULTURE FEEDLOTS WATER-POLLUT
400 77 4473	ENSILING		FEEDING POULTRY LITTER KEYWORDS. REFEEDING ENSILING POULTRY-WASTES POULTRY-LITTER CATT
400 77 4522	ENSILING		ON STRAW AND GOLD, MANURE AND ALGAE--FEEDING WASTE--IT'S BEING DONE IN A VARIETY OF WAY
400 77 4571	ENSILING		A PLACE FOR POULTRY WASTE KEYWORDS: REFEEDING POULTRY-WASTES WASTE-STORAGE ENSILING SIL
100 75 4577	ENSILING		MICROFLORA OF NEWLY CUT GRASS AFTER ADDITION OF LIQUID MANURE KEYWORDS: LIQUID-WASTES A
400 77 4643	ENSILING		ENSILED POULTRY LITTER REDUCES CATTLE FEED COSTS KEYWORDS POULTRY-LITTER ENSILING REFE
200 74 4052	ENVIRONMENTAL-EFFE		HAZARDS ASSOCIATED WITH SPREADING ANIMAL-WASTE SLURRIES KEYWORDS: SLURRIES LAND-APPLICA
300 77 4262	ENVIRONMENTAL-EFFE		CAN CITY SEWAGE BE RECYCLED SAFELY ON FARM LAND KEYWORDS RECYCLING SEWAGE LAND-APPLICA
400 77 4340	ENVIRONMENTAL-EFFE		CAST REVIEWS USDA WASTE MANUAL KEYWORDS: MANUALS LAND-APPLICATION GUIDELINES ENVIRONMEN
200 76 4034	ENVIRONMENTAL-FACT		ENVIRONMENTAL FACTORS AFFECTING GROWTH PERFORMANCE OF TURKEYS KEYWORDS TURKEYS PERFORM
500 77 4079	ENVIRONMENTAL-IMPA		LAND AS A WASTE MANAGEMENT ALTERNATIVE KEYWORDS WASTE-MANAGEMENT LAND-APPLICATION ANIM
200 74 4347	ENZYMES		LIVESTOCK ODOR CONTROL RESEARCH AT THE UNIVERSITY OF ILLINOIS KEYWORDS: ODOR-CONTROL SW
400 77 4581	ENZYMES		VARIED RESULTS FROM HOG PIT DEODORIZERS KEYWORDS ODOR-CONTROL CHEMICAL-TREATMENT MASKI
200 76 4617	EQUIPMENT-AGITATIN		STUDIES ON A MIXING DISTRIBUTION SYSTEM FOR SWINE MANURE LAGOONS KEYWORDS. SWINE-WASTES
300 77 4430	EQUIPMENT-COMPOSTI		LABORATORY SIZE COMPOSTING UNIT FOR AGRICULTURAL WASTE MATERIALS KEYWORDS: COMPOSTING E
200 76 4619	EQUIPMENT-DEHYDRAT		ENGINEERING EVALUATION OF A POULTRY MANURE DEHYDRATING MACHINE KEYWORDS: DEHYDRATION PO
400 74 4547	EQUIPMENT-IRRIGATI		AN ANSWER TO MANURE DISPOSAL PROBLEMS KEYWORDS: SPRAY-IRRIGATION LAND-APPLICATION EQUIP
400 77 4572	EQUIPMENT-IRRIGATI		IRRIGATING WITH WASTEWATER KEYWORDS WASTEWATER LAND-APPLICATION EQUIPMENT-IRRIGATION
400 77 4442	EQUIPMENT-MANURE-L		MANURE LOADERS NEED CARE AND MAINTENANCE KEYWORDS EQUIPMENT-MANURE-LOADERS MAINTENANCE
400 77 4167	EQUIPMENT-MANURE-R		MINI LOADERS PROVIDE FAST MANURE REMOVAL KEYWORDS WASTE-REMOVAL EQUIPMENT-MANURE-REMOV
200 71 4583	EQUIPMENT-ODOR-MEA		ANALYTICAL AND ORGANOLEPTIC MEASUREMENT OF ODOURS FROM ANIMAL WASTES KEYWORDS. ODOR SAM
200 76 4614	EQUIPMENT-PUMPING		A MODIFIED CENTRIFUGAL MANURE PUMP FOR HANDLING SEMI-SOLID CATTLE MANURE KEYWORDS: PUM
500 77 4087	EQUIPMENT-SOIL-INJ		ENGINEERING DESIGN CRITERIA FOR SLURRY INJECTORS KEYWORDS: DESIGN SOIL-INJECTION EQUIPM
200 76 4613	EQUIPMENT-SOIL-INJ		AN INJECTOR-TANKER DESIGN TO APPLY LIQUID MANURE BETWEEN CORN CROP ROWS KEYWORDS: LIQUI
200 76 4615	EQUIPMENT-SOIL-INJ		ENGINEERING DESIGN OF LIQUID MANURE INJECTORS KEYWORDS: LIQUID-WASTES SOIL-INJECTORS EQ
200 76 4617	EQUIPMENT-SPRINKLE		STUDIES ON A MIXING DISTRIBUTION SYSTEM FOR SWINE MANURE LAGOONS KEYWORDS: SWINE-WASTES
400 77 4111	EQUIPMENT-WASTE-SP		OPERATIONAL AND MAINTENANCE TIPS TO GET MOST FROM MANURE SPREADER KEYWORDS: LIVESTOCK-W
400 77 4321	EQUIPMENT-WASTE-TR		WASTE HANDLING-WHICH MANURE MOVING SYSTEM FOR YOU KEYWORDS DAIRY-WASTES WASTE-MANAGEME
100 76 4024	EROSION		THE EFFECTS OF MANURE APPLICATIONS ON RUNOFF, EROSION AND NITRATE LOSSES KEYWORDS: LAND
300 75 4029	EROSION		CONTROL OF WATER POLLUTION FROM CROPLAND: VOLUME I--A MANUAL FOR GUIDELINE DEVELOPMENT
300 76 4030	EROSION		CONTROL OF WATER POLLUTION FROM CROPLAND: VOLUME II--AN OVERVIEW KEYWORDS AGRICULTURAL
200 76 4182	EROSION		RESOURCE ADEQUACY IN LIMITING NONPOINT POLLUTION KEYWORDS: NONPOINT-POLLUTION WATER-POL
100 76 4267	EROSION		POLLUTION POTENTIAL OF MANURE SPREAD ON FROZEN GROUND KEYWORDS WATER-POLLUTION LAND-AP
100 75 4395	EROSION		A MODEL FOR RUNOFF OF PESTICIDES FROM SMALL UPLAND WATERSHEDS KEYWORDS: MODEL-STUDIES A
100 75 4645	EROSION		WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS: WATER-POLLUTION NONPOINT-SOURCES PUBLIC
100 72 4154	ERYSIPELOTHRIX-RHU		ISOLATION OF ERYSIPELOTHRIX RHUSIOPATHIAE FROM SOIL AND MANURE OF SWINE-RAISING PREMISE
100 76 4523	ESCHERICHIA-COLI		THE OCCURRENCE OF SALMONELLAS, MYCOBACTERIA AND PATHOGENIC STRAINS OF ESCHERICHIA COLI
100 77 4291	ESTERS		COLLECTION AND ANALYSIS OF ORGANIC GASES FROM NATURAL ECOSYSTEMS: APPLICATION TO POULTR
200 75 4641	ESTROGENS		RECYCLING AND DEGRADATION OF ANABOLIC AGENTS IN ANIMAL EXCRETA KEYWORDS: REFEEDING LIVE
400 74 4511	ETHANE		DESPITE SCIENCE, IT'S STILL MANURE KEYWORDS: LIVESTOCK-WASTES RECYCLING PYRCLYSIS HYDRO
100 74 4193	ETHYLENE		THE EFFECT OF PIG SLURRY APPLIED TO A SOIL SURFACE ON THE COMPOSITION OF THE SOIL ATMOS
200 77 4373	ETHYLENE		AMMONIA SYNTHESIS GAS AND PETROCHEMICALS FROM CATTLE FEEDLOT MANURE KEYWORDS: CATTLE-WA
200 77 4062	ETHYLENE-OXIDE-FUM		PATHOGEN TRANSMISSION POTENTIAL FROM ANIMAL WASTE REFEEDING KEYWORDS: REFEEDING PATHOGE
400 77 4296	EUPHORIA-TIRUCALLI		FARMERS AS FUEL SUPPLIERS KEYWORDS. ENERGY RECYCLING BIOMASS-CROPS CROP-RESIDUES GRAIN-
100 76 4600	EUTROPHICATION		EUTROPHICATION POTENTIAL OF DAIRY CATTLE WASTE RUNOFF KEYWORDS: CATTLE-WASTES DAIRY-WAS
400 77 4149	EXPLOSIONS		HOG CONFINEMENT GASES CAUSE MEDICAL PROBLEMS KEYWORDS: SWINE CONFINEMENT-PENS GASES PUB
700 76 4466	EXPRESSION		DEWATERING A SWINE MANURE SLURRY BY EXPRESSION KEYWORDS: SWINE-WASTES SLURRIES FILTRATI
100 73 4621	EXTRACTION		A METHOD FOR THE QUANTITATIVE EXTRACTION OF ADENOSINETRIPHOSPHATE (ATP) FROM COW SLURRY
400 77 4153	EXTRUSION		MAKING THE MOST OF WASTE KEYWORDS: POULTRY-WASTES CATTLE-WASTES RECYCLING METHANE FERTI
500 77 4093	E-COLI		WASTE MANAGEMENT PROBLEMS AND THEIR IMPACT ON THE ENVIRONMENT ANIMAL WASTE MANAGEMENT K
100 4658	FACTORY-WASTES		PRACTICAL ASPECTS OF ANAEROBIC DIGESTION KEYWORDS. FARM-WASTES DOMESTIC-WASTES FACTORY-
400 77 4411	FANS		WAYS TO SPEED UP DRYING OF MANURE IN PITS KEYWORDS POULTRY-WASTES DEHYDRATION VENTILAT
100 76 4588	FARMYARD-WASTES		ON THE INFLUENCE OF MANURE AND FERTILIZERS ON THE DISTRIBUTION AND AMOUNTS OF PLANT-AVA
300 77 4463	FARM-PONDS		WATER QUALITY AND THE FARM POND KEYWORDS. FARM-PONDS WATER-QUALITY AGRICULTURAL-RUNOFF
200 70 4384	FARM-WASTES		STATE OF THE ART ANAEROBIC LAGOONS KEYWORDS: LAGOONS WASTE-TREATMENT ANAEROBIC DESIGN
100 4658	FARM-WASTES		PRACTICAL ASPECTS OF ANAEROBIC DIGESTION KEYWORDS: FARM-WASTES DOMESTIC-WASTES FACTORY-
100 71 4002	FASCIOLA-HEPATICA-		EXPERIMENTAL STUDIES INTO THE EFFECT OF CATTLE MANURE ON FASCIOLA HEPATICA EGGS KEYWORD
100 74 4023	FECAL		EVALUATION OF PORCELAIN CUP SOIL WATER SAMPLERS FOR BACTERIOLOGICAL SAMPLING KEYWORDS
700 71 4139	FECAL-COLIFORMS		VARIATION IN THE DENSITY OF POLLUTION INDICATOR BACTERIA IN THE COTTONWOOD RIVER AS REL
100 76 4211	FECAL-COLIFORMS		FEEDLOT MANURE TOP DRESSING FOR IRRIGATED PASTURE GOOD AGRICULTURAL PRACTICE OR A HEAL
300 76 4355	FECAL-COLIFORMS		EVALUATION OF ENSILING SWINE FECAL WASTE WITH GROUND ORCHARDGRASS HAY, PRELIMINARY REPO
200 75 4401	FECAL-COLIFORMS		CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH DENSITY CATFISH CULTURES K
400 77 4536	FEEDING		FARM PROGRESS SHOW MORE CATTLE AND LESS WORK WITH CONFINEMENT KEYWORDS: CONFINEMENT-PEN
400 77 4021	FEEDLOTS		ENERGY POTENTIAL FROM WASTE SMALL KEYWORDS: ENERGY FEEDLOTS LIVESTOCK-WASTES RECYCLING
400 75 4043	FEEDLOTS		ANIMAL WASTES MANAGEMENT KEYWORDS LIVESTOCK-WASTES WASTE-MANAGEMENT WATER-POLLUTION LE
100 77 4048	FEEDLOTS		MICROBIAL POPULATION CHANGES AND FERMENTATION CHARACTERISTICS OF ENSILED BOVINE MANURE-
200 77 4057	FEEDLOTS		SEMINAR ON FEEDLOT MANURE RECYCLING FOR NUTRIENT RECOVERY KEYWORDS: REFEEDING LIVESTOCK
200 77 4059	FEEDLOTS		USE OF WASTE FROM OPEN FEEDLOTS FOR FATTENING, GROWING AND MAINTENANCE RATIONS KEYWORD
500 77 4080	FEEDLOTS		ECONOMIC AND REGULATORY ASPECTS OF LAND APPLICATION OF WASTES TO AGRICULTURAL LANDS PRO
400 76 4096	FEEDLOTS		EPA WILL USE KSU MODEL AS WASTE CONTROL SYSTEMS TOOL KEYWORDS: WATER-QUALITY-INDEX COMP
400 72 4114	FEEDLOTS		FEEDLOT POLLUTION CONTROL IS NOT AN EXPENSIVE ITEM LINDER KEYWORDS POLLUTION-CONTROL
400 77 4119	FEEDLOTS		HARNESSING ENERGY SOURCES FOR THE FEEDLOT KEYWORDS: ENERGY FEEDLOTS RECYCLING METHANE S
100 75 4135	FEEDLOTS		INSECT GROWTH REGULATORS DEVELOPMENT OF HOUSE FLIES IN FECES OF BOVINES FED TH 6040 IN

400 76 4141 FEEDLOTS HOUSING AND FLOOR DESIGN CAN INFLUENCE PIG PERFORMANCE KEYWORDS: HOUSING SLATTED-FLOORS
400 77 4165 FEEDLOTS RECYCLING IS SUCCESSFUL AT MERTEN'S KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING REFEEDIN
100 76 4213 FEEDLOTS SOLUBLE CATIONS BENEATH A FEEDLOT AND AN ADJACENT CROPPED FIELD KEYWORDS: FEEDLOTS CATI
300 74 4217 FEEDLOTS SOIL POLLUTION FROM FEEDLOTS IN GEORGIA KEYWORDS: GROUNDWATER-POLLUTION SOIL-CONTAMINAT
100 76 4222 FEEDLOTS UTILIZATION OF BIOGAS FOR FARM PRODUCTION ENERGY KEYWORDS: RECYCLING BIOGAS CATTLE-WAST
300 75 4242 FEEDLOTS FEASIBILITY OF CHLORINATING FEEDLOT RUNOFF TO MEET BACTERIAL WATER QUALITY STANDARDS KE
400 77 4270 FEEDLOTS COMBAT CATTLE FLIES WITH THESE WEAPONS KEYWORDS: FLY-CONTROL PASTURES FEEDLOTS FEED-ADD
200 77 4276 FEEDLOTS FEDERAL LIVESTOCK WASTE REGULATIONS KEYWORDS: LEGAL-ASPECTS FEEDLOTS PERMITS WATER-POLL
200 77 4278 *FEEDLOTS* *CASE STUDIES OF WATER POLLUTION CAUSED BY FEEDLOT OPERATIONS AND FUTURE DEMAND FOR PRIV*
100 75 4286 FEEDLOTS RESIDUE DETERMINATION OF THOMPSON-HAYWARD 6040 IN BOVINE MANURE BY HIGH PERFORMANCE LIQ
400 77 4294 FEEDLOTS FEEDLOT ODOR CONTROL RELIES ON DRY MANURE AND RAPID REMOVAL KEYWORDS: ODOR-CONTROL FEED
400 77 4295 FEEDLOTS STATE ODOR REGULATIONS KEYWORDS: FEEDLOTS NUISANCE-LAWSUITS ODOR LEGAL-ASPECTS ODOR-INT
100 76 4308 FEEDLOTS SYNTHESIS AND STABILITY OF DIMETHYLNITROSAMINE IN CATTLE MANURE KEYWORDS: NITROSAMINES
300 73 4310 FEEDLOTS LIVESTOCK WASTE MANAGEMENT-STATE OF THE ART KEYWORDS: WASTE-MANAGEMENT FEEDLOTS LIVESTO
300 76 4312 FEEDLOTS FEEDLOT MANURE COLLECTION EFFICIENCY KEYWORDS: WASTE-COLLECTION FEEDLOTS TIME-MOTION-ST
300 76 4318 FEEDLOTS METHANE PRODUCTION FROM CATTLE WASTES KEYWORDS: RECYCLING FEEDLOTS CATTLE-WASTES DAIRY-
400 76 4319 FEEDLOTS STORIES MANURE CAN TELL KEYWORDS: ANIMAL-WASTES REFEEDING LAND-APPLICATION RECYCLING FE
400 74 4330 FEEDLOTS WASTE DISPOSAL IN BEEF FEEDLOTS KEYWORDS: FEEDLOTS MANAGEMENT FEEDLOT-RUNOFF WATER-POLL
100 77 4363 FEEDLOTS ODOR INTENSITIES AT CATTLE FEEDLOTS KEYWORDS: ODOR FEEDLOTS CATTLE DILUTIONS-TO-THRESHO
400 77 4371 FEEDLOTS SANITATION IS FIRST STEP IN EFFECTIVE FEEDLOT FLY CONTROL KEYWORDS: FLY-CONTROL FEEDLOT
200 77 4373 FEEDLOTS AMMONIA SYNTHESIS GAS AND PETROCHEMICALS FROM CATTLE FEEDLOT MANURE KEYWORDS: CATTLE-WA
100 76 4375 FEEDLOTS THE DEVELOPMENT IN BEEF CATTLE MANURE OF PETRIELLIDIUM BOYDII SHEAR MALLOCH, A POTENTIA
300 72 4393 FEEDLOTS AN ANALYSIS OF BEEF CATTLE FEEDLOT DESIGNS FOR POLLUTION CONTROL KEYWORDS: FEEDLOTS DES
100 72 4409 FEEDLOTS THE NEED FOR INTENSIFICATION IN ANIMAL PRODUCTION AND THE CONSEQUENT POLLUTION PROBLEM
400 71 4413 *FEEDLOTS* *PREVENTING POLLUTION WHILE EXPANDING THE LIVESTOCK INDUSTRY IN SOUTH DAKOTA KEYWORDS: F*
200 74 4415 FEEDLOTS FIVE-YEAR BEEF ANIMAL ENVIRONMENT STUDY IN MINNESOTA KEYWORDS: CONFINEMENT-PENS FEEDLOT
100 77 4424 FEEDLOTS ANALYZING NITRATES IN WELL WATER KEYWORDS NITRATES GROUNDWATER BARNYARDS FEEDLOTS METH
300 77 4426 FEEDLOTS PROJECTS IN PROGRESS SOME FEEDLOT INS AND OUTS KEYWORDS WATER-POLLUTION FEEDLOTS AGRIC
300 76 4435 FEEDLOTS OPPORTUNITIES FOR MORE EFFECTIVE USE OF ANIMAL WASTES KEYWORDS: WASTE-DISPOSAL LAND-DIS
400 77 4436 FEEDLOTS THE HAPPY EARTHWORM KEYWORDS. RECYCLING CATTLE-WASTES PAUNCH-MANURE FEEDLOTS EARTHWORMS
300 75 4444 FEEDLOTS LIVESTOCK WASTE FACILITIES HANDBOOK KEYWORDS. LIVESTOCK-WASTES WASTE-STORAGE WASTE-TREA
200 71 4457 FEEDLOTS AGRICULTURE'S ROLE IN ENVIRONMENTAL QUALITY KEYWORDS: AGRICULTURE FEEDLOTS WATER-POLLUT
300 77 4461 FEEDLOTS WASTE MANAGEMENT PRACTICES OF WESTERN CATTLE FEEDLOTS KEYWORDS: WASTE-MANAGEMENT FEEDLO
300 77 4462 FEEDLOTS THE SELECTION AND MANAGEMENT OF FEEDLOT SITES AND LAND DISPOSAL OF ANIMAL WASTE IN BOIS
300 77 4463 FEEDLOTS WATER QUALITY AND THE FARM POND KEYWORDS: FARM-PONDS WATER-QUALITY AGRICULTURAL-RUNOFF
100 77 4464 FEEDLOTS CHARACTERIZATION OF AN AGENT IN AQUEOUS EXTRACTS OF BEEF CATTLE MANURE THAT INHIBITS TH
400 76 4471 FEEDLOTS AWARD FOR NEBRASKAN KEYWORDS: FEEDLOTS WASTE-MANAGEMENT DEBRIS-BASINS HOLDING-PONDS LAN
400 77 4476 FEEDLOTS FEEDLOT ODOR INTENSITY KEYWORDS: ODOR FEEDLOTS CATTLE SCENTOMETER-READINGS ODOR-CONTROL
400 76 4477 FEEDLOTS FEEDLOT PAYS PENALTY KEYWORDS: WATER-POLLUTION LEGAL-ASPECTS FEEDLOTS IOWA-LAW POLLUTIO
400 77 4479 FEEDLOTS HOUSING HINTS KEYWORDS: FEEDLOTS HOUSING OPEN-LOTS CATTLE MANAGEMENT ECONOMICS
400 76 4480 *FEEDLOTS* *KEEP IT DRY KEYWORDS FEEDLOTS ODOR-CONTROL STOCKING-RATES FEEDLOT-RUNOFF HOLDING-PONDS*
400 77 4484 FEEDLOTS ODOR COMPLAINTS KEYWORDS: ODOR FEEDLOTS LEGAL-ASPECTS TEXAS-LAW NUISANCE-LAWSUITS
400 77 4504 FEEDLOTS MANURE IS NOW A COMMODITY KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING BIOGAS METHANE CAR
200 74 4535 FEEDLOTS SURVIVAL OF PATHOGENS IN FEEDLOT WASTE KEYWORDS: PATHOGENIC-BACTERIA CATTLE-WASTES FEED
400 77 4554 FEEDLOTS LEGAL POINTERS TO HELP KEEP YOUR LIVESTOCK SMELLING LIKE ROSES KEYWORDS: FEEDLOTS ODOR
400 77 4563 FEEDLOTS COWTOWN S MANURE MEANS MEGAWATTS KEYWORDS RECYCLING BIOGAS METHANE CATTLE-WASTES FEEDL
100 75 4589 FEEDLOTS PROPERTIES OF MANURE ACCUMULATIONS FROM MIDWEST BEEF CATTLE FEEDLOTS KEYWORDS: FEEDLOTS
100 76 4591 FEEDLOTS IRRIGATED AGRICULTURE: NONPOINT AND POINT SOURCE WATER POLLUTION KEYWORDS: FEEDLOT-RUNO
300 76 4612 FEEDLOTS PART III-STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION IN THE NATIONAL POLLUTANT D
100 75 4642 FEEDLOTS INTERRELATIONSHIPS BETWEEN ANIMALS AND ENVIRONMENT IN HIGH-INTENSITY LIVESTOCK PRODUCTI
400 77 4495 FEEDLOT-MANAGEMENT PREPARE FOR WINTER KEYWORDS: FEEDLOT-MANAGEMENT MANURE-PACK DRAINAGE CLEANING SOLID-WA
100 76 4017 FEEDLOT-RUNOFF PERFORMANCE OF FEEDLOT RUNOFF CONTROL SYSTEMS IN NORTHERN CLIMATES KEYWORDS: MATHEMATIC
400 72 4025 FEEDLOT-RUNOFF ENGINEER SOUNDS WARNING ON USE OF LAGOON WASTE ON FIELD CROPS KEYWORDS: LAND-APPLICATIO
100 76 4047 FEEDLOT-RUNOFF FEEDLOT WASTE RUNOFF AND MORTALITY OF WINDBREAK TREES KEYWORDS FEEDLOT-RUNOFF TREE-MOR
300 76 4067 FEEDLOT-RUNOFF MANURE HARVESTING PRACTICES EFFECTS ON WASTE CHARACTERISTICS AND RUNOFF KEYWORDS: FEED
700 70 4069 FEEDLOT-RUNOFF THE EFFECT OF FEEDLOT RUNOFF ON COMMUNITY STRUCTURE IN THE COTTONWOOD RIVER, KANSAS KE
500 77 4092 *FEEDLOT-RUNOFF* *CONTINUOUS WATERSHED MODELING OF WASTEWATER STORAGE AND LAND APPLICATION TO IMPROVE DES*
300 76 4097 FEEDLOT-RUNOFF DILUTION OF FEEDLOT RUNOFF KEYWORDS LAND-APPLICATION FEEDLOT-RUNOFF DILUTION SOIL-WATE
300 75 4130 FEEDLOT-RUNOFF FEEDLOTS AND RECREATION LAKES AN EXAMPLE OF HOW THEY CAN BE GOOD NEIGHBORS KEYWORDS F
700 71 4139 FEEDLOT-RUNOFF VARIATION IN THE DENSITY OF POLLUTION INDICATOR BACTERIA IN THE COTTONWOOD RIVER AS REL
400 72 4150 FEEDLOT-RUNOFF POLLUTION RESEARCHERS FINDING MANY ANSWERS, EXPERT REPORTS KEYWORDS. LIVESTOCK-WASTES
400 72 4157 FEEDLOT-RUNOFF KANSAN APPLIES FEEDLOT RUN-OFF TO CORN FIELDS KEYWORDS FEEDLOT-RUNOFF LAND-APPLICATION
200 76 4186 FEEDLOT-RUNOFF A LOW COST SETTLING BASIN AND INFILTRATION CHANNEL FOR CONTROLLING RUNOFF FROM AN OPEN
500 75 4199 FEEDLOT-RUNOFF ECONOMIC ANALYSIS OF REDUCING PHOSPHORUS LOSSES FROM AGRICULTURAL PRODUCTION KEYWORDS
400 77 4294 FEEDLOT-RUNOFF FEEDLOT ODOR CONTROL RELIES ON DRY MANURE AND RAPID REMOVAL KEYWORDS: ODOR-CONTROL FEED
300 73 4310 FEEDLOT-RUNOFF LIVESTOCK WASTE MANAGEMENT-STATE OF THE ART KEYWORDS: WASTE-MANAGEMENT FEEDLOTS LIVESTO
400 74 4330 FEEDLOT-RUNOFF WASTE DISPOSAL IN BEEF FEEDLOTS KEYWORDS: FEEDLOTS MANAGEMENT FEEDLOT-RUNOFF WATER-POLL
300 74 4412 FEEDLOT-RUNOFF SALT LEVELS IN STEER FINISHING RATIONS KEYWORDS: CATTLE FEEDS SALT-LEVELS PERFORMANCE C
400 71 4413 FEEDLOT-RUNOFF PREVENTING POLLUTION WHILE EXPANDING THE LIVESTOCK INDUSTRY IN SOUTH DAKOTA KEYWORDS: F
400 77 4428 FEEDLOT-RUNOFF ENGINEER EXPLAINS NEW WASTE RUNOFF SYSTEM KEYWORDS: FEEDLOT-RUNOFF WATER-POLLUTION-CONT
300 75 4434 FEEDLOT-RUNOFF MICROBIOLOGY AND WATER QUALITY IN A TRIBUTARY OF CAYUGA LAKE KEYWORDS: WATER-POLLUTION
100 76 4456 FEEDLOT-RUNOFF NITROGEN MOVEMENT NEAR SURFACE MANURE STORAGES KEYWORDS: WASTE-STORAGE MANURE-PIT WASTE
400 76 4480 *FEEDLOT-RUNOFF* *KEEP IT DRY KEYWORDS. FEEDLOTS ODOR-CONTROL STOCKING-RATES FEEDLOT-RUNOFF HOLDING-PONDS*
300 77 4503 FEEDLOT-RUNOFF BEEF CATTLE FEEDLOT RUNOFF AND CONTROL IN EASTERN NEBRASKA KEYWORDS: FEEDLOT-RUNOFF RU
400 77 4527 FEEDLOT-RUNOFF FEEDER COMPLIES WITH REGULATIONS--EPA OKAYED THESE PLANS TO STOP WASTE AND WATER RUNOFF
700 76 4546 FEEDLOT-RUNOFF INFLUENCE OF SURFACES ON POLLUTION FROM FEEDLOTS KEYWORDS: FEEDLOT-SURFACES FEEDLOT-RUN
100 75 4585 FEEDLOT-RUNOFF MONITORING AGRICULTURAL POLLUTION USING NATURAL FLUORESCENCE KEYWORDS: FEEDLOT-WASTES P
100 75 4590 FEEDLOT-RUNOFF ANALYSIS OF RUNOFF FROM SOUTHERN GREAT PLAINS FEEDLOTS KEYWORDS: FEEDLOT-RUNOFF SALTS I
100 76 4591 FEEDLOT-RUNOFF IRRIGATED AGRICULTURE; NONPOINT AND POINT SOURCE WATER POLLUTION KEYWORDS: FEEDLOT-RUNO
100 76 4600 FEEDLOT-RUNOFF EUTROPHICATION POTENTIAL OF DAIRY CATTLE WASTE RUNOFF KEYWORDS: CATTLE-WASTES DAIRY-WAS
100 76 4601 FEEDLOT-RUNOFF FACTORS AFFECTING NUTRIENT LOADS IN SOME IOWA STREAMS KEYWORDS, WATERSHEDS WATER-POLLUT
200 75 4620 FEEDLOT-RUNOFF FEEDLOT RUNOFF CONTROL SYSTEMS FOR COLD CLIMATES KEYWORDS: FEEDLOT-RUNOFF AGRICULTURAL-
400 77 4664 FEEDLOT-RUNOFF NEW RECYCLING TRIAL SHOWS 20 HD EXTRA PROFIT KEYWORDS: REFEEDING CATTLE-WASTES COMPOST
300 76 4067 FEEDLOT-SURFACES MANURE HARVESTING PRACTICES EFFECTS ON WASTE CHARACTERISTICS AND RUNOFF KEYWORDS. FEED
400 76 4141 FEEDLOT-SURFACES HOUSING AND FLOOR DESIGN CAN INFLUENCE PIG PERFORMANCE KEYWORDS HOUSING SLATTED-FLOORS
700 76 4546 FEEDLOT-SURFACES INFLUENCE OF SURFACES ON POLLUTION FROM FEEDLOTS KEYWORDS FEEDLOT-SURFACES FEEDLOT-RUN
100 75 4137 FEEDLOT-WASTES CHANGES IN MICROBIAL POPULATION DURING FERMENTATION OF FEEDLOT WASTE WITH CORN KEYWORDS
200 74 4243 FEEDLOT-WASTES FEEDLOT MANURE AS AN ENERGY SOURCE KEYWORDS FEEDLOT-WASTES ENERGY ECONOMICS RECYCLING
200 73 4250 FEEDLOT-WASTES SOME FACTORS TO CONSIDER IN USING ANIMAL MANURES FOR FERTILIZER KEYWORDS POULTRY-WASTE
400 77 4300 FEEDLOT-WASTES RE-CYCLING IS NO CURE-ALL KEYWORDS REFEEDING FEEDLOT-WASTES CATTLE PERFORMANCE ECONOMI
400 70 4311 FEEDLOT-WASTES IMAGINE YOUR FEEDLOT MANURE CAN POWER YOUR MILL AND BRING CASH FROM SALE OF EXCESS POWE
700 73 4390 FEEDLOT-WASTES EFFECTS OF HEAVY FEEDLOT MANURE APPLICATION RATES ON THE BASIC INFILTRATION RATE OF SOI
300 76 4394 FEEDLOT-WASTES A FOUR-YEAR FIELD TRIAL WITH ANIMAL MANURES. I NITROGEN BALANCES AND YIELDS. II. MINERAL
400 77 4485 FEEDLOT-WASTES PEN CLEANING ISN'T CHEAP KEYWORDS: FEEDLOT-WASTES CLEANING EFFICIENCY ECONOMICS MANAGEM
300 72 4501 FEEDLOT-WASTES SODIUM LEVELS IN BEEF CATTLE FINISHING RATIONS AS RELATED TO PERFORMANCE AND CONCENTRAT
400 77 4525 FEEDLOT-WASTES MANURE MAKES CENTS KEYWORDS: LAND-APPLICATION ANHYDROUS-AMMONIA FEEDLOT-WASTES CROP-RES
200 72 4574 FEEDLOT-WASTES EFFECTS OF FEEDLOT WASTES ON THE WATER RELATIONS OF PULLMAN CLAY LOAM KEYWORDS: FEEDLOT
100 75 4585 FEEDLOT-WASTES MONITORING AGRICULTURAL POLLUTION USING NATURAL FLUORESCENCE KEYWORDS: FEEDLOT-WASTES P
400 77 4587 FEEDLOT-WASTES COMPOSTING CONVERTS WASTE INTO VALUABLE RESOURCES KEYWORDS COMPOSTING FEEDLOT-WASTES P
200 72 4603 FEEDLOT-WASTES ROLE OF RECYCLED LARGE ANIMAL WASTE FOR ANIMAL PROTEIN PRODUCTION KEYWORDS: LIQUID-WAST

400 77 4158 FEEDS MANURE TO METHANE IS IT FEASIBLE KEYWORDS: ANIMAL-WASTES RECYCLING METHANE ANAEROBIC-DI
100 72 4247 FEEDS TOXIGENIC FUNGI FROM POULTRY FEED AND LITTER KEYWORDS: POULTRY-LITTER FUNGI FEEDS TOXIN
400 76 4299 FEEDS ENERGY AND RESOURCE REQUIREMENTS FOR BEEF CATTLE PRODUCTION KEYWORDS: CATTLE-WASTES FEE
400 77 4333 FEEDS USE OF AGRICULTURE WASTES IN AQUACULTURE KEYWORDS: AQUACULTURE FISH FEEDS ORGANIC-WASTE
300 74 4412 FEEDS SALT LEVELS IN STEER FINISHING RATIONS KEYWORDS: CATTLE FEEDS SALT-LEVELS PERFORMANCE C
400 77 4441 FEEDS MANURE AND ALGAE PRODUCE ANIMAL FEED KEYWORDS: SWINE-WASTES LIVESTOCK-WASTES RECYCLING
100 75 4662 FEEDS THE WASTE PRODUCTS OF AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES LIVESTOCK-WASTES STRAW
100 76 4044 FEED-ADDITIVES ARSENIC CONTENT OF CORN GRAIN ON A COASTAL PLAIN SOIL AMENDED WIH POULTRY MANURE KEYWOR
200 77 4063 FEED-ADDITIVES RESIDUE TRANSFER AND ACCUMULATION KEYWORDS: REFEEDING FEED-ADDITIVES ANIMAL-HEALTH CATT
200 77 4064 FEED-ADDITIVES PROVISIONS OF STATE AND FEDERAL REGULATIONS ON REFEEDING KEYWORDS: REFEEDING LEGAL-ASPE
100 76 4124 FEED-ADDITIVES EFFECT OF DIETARY OXYTETRACYCLINE ON MICROORGANISMS IN TURKEY FECES KEYWORDS: DIETS OXY
100 77 4147 FEED-ADDITIVES EFFECT OF ARSANILIC ACID IN SWINE DIETS ON FRESH WASTE PRODUCTION, COMPOSITION AND ANAE
400 72 4181 FEED-ADDITIVES USDA RESEARCHER USES MANURE TO MAKE FEED AND WALLBOARD KEYWORDS: RECYCLING WALLBOARD RE
400 77 4204 FEED-ADDITIVES FEED-THROUGH LARVICIDE KILLS MAGGOTS IN MANURE KEYWORDS: FEED-ADDITIVES FLY-CONTROL LAR
400 77 4270 FEED-ADDITIVES COMBAT CATTLE FLIES WITH THESE WEAPONS KEYWORDS. FLY-CONTROL PASTURES FEEDLOTS FEED-ADD
100 76 4288 FEED-ADDITIVES FEEDING TH 6040 TO CATTLE RESIDUES IN TISSUES AND MILK AND BREAKDOWN IN MANURE KEYWORD
100 76 4289 FEED-ADDITIVES ACCUMULATION AND EXCRETION OF CERTAIN ORGANOCHLORINE INSECTICIDES IN BROILER BREEDER HE
100 77 4290 FEED-ADDITIVES LONG-TERM STUDIES OF RESIDUE RETENTION AND EXCRETION BY COWS FED A POLYCHLORINATED BIPH
100 73 4304 FEED-ADDITIVES TOXICITY OF SD 8447 AND DICHLORVOS TO LARVAE OF THE HORN FLY HAEMATOBIA IRRITANS, DIPT
400 77 4307 FEED-ADDITIVES AAFCO TASKFORCE WORKS ON ANIMAL WASTE REGULATIONS KEYWORDS: REFEEDING LEGAL-ASPECTS ANT
400 76 4319 FEED-ADDITIVES STORIES MANURE CAN TELL KEYWORDS: ANIMAL-WASTES REFEEDING LAND-APPLICATION RECYCLING FE
100 76 4351 FEED-ADDITIVES INHIBITION OF LARVAL HORN FLY DEVELOPMENT IN THE MANURE OF BOVINES FED DIMILIN R MINER
100 72 4356 FEED-ADDITIVES ENCAPSULATED RABON FOR LARVAL HOUSE FLY CONTROL IN COW MANURE KEYWORDS: FLY-CONTROL FEE
100 77 4362 FEED-ADDITIVES EFFECT OF ARSANILIC ACID LEVEL IN SWINE DIETS AND WASTE LOADING RATE ON MODEL ANAEROBIC
100 77 4363 FEED-ADDITIVES ODOR INTENSITIES AT CATTLE FEEDLOTS KEYWORDS: ODOR FEEDLOTS CATTLE DILUTIONS-TO-THRESHO
100 76 4377 FEED-ADDITIVES EFFECT ON SOIL AND PLANT MINERAL LEVELS FOLLOWING APPLICATION OF MANURES OF DIFFERENT C
100 76 4386 FEED-ADDITIVES DIETARY ARSENIC EFFECTS ON STORED SWINE WASTE KEYWORDS: FEED-ADDITIVES ARSANILIC-ACID S
200 75 4542 FEED-ADDITIVES ARSENICALS IN ANIMAL FEEDS AND WASTES KEYWORDS: ARSENICALS FEED-ADDITIVES ANIMAL-HEALTH
200 72 4603 FEED-ADDITIVES ROLE OF RECYCLED LARGE ANIMAL WASTE FOR ANIMAL PROTEIN PRODUCTION KEYWORDS LIQUID-WAST
200 77 4354 FEED-CONSUMPTION FEED FED, MILK PRODUCED, AND EXPECTED EXCRETA SOLIDS OF DAIRY COWS KEYWORDS: DAIRY-CATT
200 74 4535 FEED-CONTAMINATION SURVIVAL OF PATHOGENS IN FEEDLOT WASTE KEYWORDS: PATHOGENIC-BACTERIA CATTLE-WASTES FEED
200 77 4337 FEED-INTAKE FEED INTAKE AND MANURE SOLIDS FROM LACTATING HOLSTEIN COWS KEYWORDS: FEED-INTAKE DAIRY
100 76 4234 FEED-SUPPLEMENTS DRIED POULTRY WASTE AS A SUPPLEMENT FOR BEEF CATTLE KEYWORDS POULTRY-WASTES-DRIED REFE
400 70 4311 FEED-SUPPLEMENTS IMAGINE YOUR FEEDLOT MANURE CAN POWER YOUR MILL AND BRING CASH FROM SALE OF EXCESS POWE
300 77 4454 FEED-SUPPLEMENTS A COMPLETE DISPOSAL-RECYCLE SCHEME FOR AGRICULTURAL SOLID WASTES KEYWORDS. SOLID-WASTES
100 72 4475 FEED-SUPPLEMENTS EFFECTS ON CHICK GROWTH OF ADDING VARIOUS NON-PROTEIN NITROGEN SOURCES OR DRIED AUTOCLA
400 77 4504 FEED-SUPPLEMENTS MANURE IS NOW A COMMODITY KEYWORDS FEEDLOTS CATTLE-WASTES RECYCLING BIOGAS METHANE CAR
200 74 4072 FERMENTATION FUEL FROM FECES KEYWORDS FUELS RECYCLING PHYSICAL-TREATMENT CHEMICAL-TREATMENT BIOLOGI
100 75 4137 FERMENTATION CHANGES IN MICROBIAL POPULATION DURING FERMENTATION OF FEEDLOT WASTE WITH CORN KEYWORDS
100 77 4244 FERMENTATION FERMENTATION OF POULTRY MANURE FOR POULTRY DIETS KEYWORDS POULTRY-WASTES FERMENTATION
400 77 4296 FERMENTATION FARMERS AS FUEL SUPPLIERS KEYWORDS ENERGY RECYCLING BIOMASS-CROPS CROP-RESIDUES GRAIN-
400 77 4314 FERMENTATION MORE ON MANURE KEYWORDS REFEEDING PERFORMANCE COPPER IRON CALCIUM AMPROLIUM PATHOGENIC
300 76 4318 FERMENTATION METHANE PRODUCTION FROM CATTLE WASTES KEYWORDS: RECYCLING FEEDLOTS CATTLE-WASTES DAIRY-
200 76 4367 FERMENTATION METHANE FERMENTATION OF ANIMAL WASTES KEYWORDS: WASTE-TREATMENT METHANE REFEEDING CATTL
400 77 4378 FERMENTATION 140 DEGREES IS CRITICAL--METHANE FROM CATTLE WASTE FERMENTATION STARTS RAPIDLY, CONTINU
400 74 4511 FERMENTATION DESPITE SCIENCE, IT'S STILL MANURE KEYWORDS. LIVESTOCK-WASTES RECYCLING PYROLYSIS HYDRO
300 76 4595 FERMENTATION CONTROLLED ADDITION OF ANIMAL WASTE TO AEROBIC BIOLOGICAL TREATMENT PLANTS A COMPARISON
100 76 4634 FERMENTATION ANALYSIS OF THE ROTTING PROCESS OF SAWDUST BARNYARD MANURE KEYWORDS: ANIMAL-WASTES SAW
700 72 4635 FERMENTATION BIOCHEMICAL AND NUTRITIONAL STUDIES ON FERMENTED- AMMONIATED ANIMAL FEED SUPPLEMENTS KE
300 77 4655 FERMENTATION NOTES ON ANAEROBIC DIGESTION AND ANAEROBIC DIGESTERS BASED ON EXPERIMENTAL PLANT IN ABE
400 77 4665 FERMENTATION METHANE FROM CATTLE MANURE TO REPLACE FUEL OIL KEYWORDS CATTLE-WASTES FERMENTATION REC
100 74 4562 FERMENTERS CONVERSION OF ORGANIC WASTE INTO PROTEIN KEYWORDS BIOLOGICAL-TREATMENT ORGANIC-WASTES
400 77 4071 FERTIGATION GETTING MORE OUT OF LIQUID MANURE KEYWORDS LIQUID-WASTES SLOTTED-FLOORS DEEP-PITS SOIL
100 72 4006 FERTILIZERS PROCESSING SOLID MANURE FROM LIVESTOCK-FARMING TO ORGANIC FERTILIZER FOR VEGETABLE GARD
300 75 4029 FERTILIZERS CONTROL OF WATER POLLUTION FROM CROPLAND: VOLUME I--A MANUAL FOR GUIDELINE DEVELOPMENT
400 77 4040 FERTILIZERS BACK TO BASICS--175-BUSHEL CORN FROM LEGUMES AND WASTES KEYWORDS LAND-APPLICATION SWIN
100 77 4042 FERTILIZERS HOG MANURE WORTH $3.50 PER TON AS FERTILIZER KEYWORDS LIQUID-WASTES SWINE-WASTES LAND-
200 74 4072 FERTILIZERS FUEL FROM FECES KEYWORDS FUELS RECYCLING PHYSICAL-TREATMENT CHEMICAL-TREATMENT BIOLOGI
300 75 4077 FERTILIZERS STATUS OF SEDIMENT FROM CATFISH PRODUCTION PONDS AS A FERTILIZER AND SOIL CONDITIONER K
100 75 4095 FERTILIZERS A SYSTEM OF OPTIMIZING THE USE OF ANIMAL MANURES ON A GRASSLAND FARM KEYWORDS. MATHEMAT
400 74 4110 FERTILIZERS NATURAL GAS FROM THE BARNYARD, OR JUST MOVE BOSSY OVER AND HOOK IT UP KEYWORDS: RECYCL
100 46 4115 FERTILIZERS DIGESTER GAS FOR AUTOMOBILES KEYWORDS METHANE ORGANIC-WASTES SEWAGE HORSE-WASTES RECYC
100 73 4136 FERTILIZERS INFLUENCE OF FARMYARD MANURE AND NITROGEN FERTILIZERS ON SOWN PASTURES, SEED YIELD AND
300 4142 FERTILIZERS SPREAD THE MUCK AROUND THE FARM KEYWORDS: LIVESTOCK-WASTES LAND-APPLICATION NUTRIENTS F
400 77 4143 FERTILIZERS MORE INTEREST EVIDENT IN POULTRY LITTER AS LESS COSTLY, MORE AVAILABLE FERTILIZER KEYWO
400 77 4153 FERTILIZERS MAKING THE MOST OF WASTE KEYWORDS POULTRY-WASTES CATTLE-WASTES RECYCLING METHANE FERTI
400 77 4158 FERTILIZERS MANURE TO METHANE IS IT FEASIBLE KEYWORDS ANIMAL-WASTES RECYCLING METHANE ANAEROBIC-DI
400 77 4159 FERTILIZERS INTEREST IN DPW APPEARS TO HAVE SUBSIDED KEYWORDS: POULTRY-WASTES-DRIED RECYCLING REFEE
100 73 4168 FERTILIZERS ORGANIC MANAGEMENT REDUCES LEACHING OF NITRATE KEYWORDS LAND-APPLICATION LEACHING NITR
400 71 4173 FERTILIZERS A POLLUTION SOLUTION WITH BUILT-IN PROFITS KEYWORDS DEHYDRATION POULTRY-WASTES-DRIED RE
400 77 4202 FERTILIZERS 175 BUSHEL CORN YIELD WITH MANURE AND ONLY STARTER FERTILIZER KEYWORDS: LIQUID-WASTES S
100 76 4237 FERTILIZERS VALUE OF LIQUID CATTLE WASTE TO ESTABLISHED GRASSES KEYWORDS LIQUID-WASTES CATTLE-WAST
200 74 4243 FERTILIZERS FEEDLOT MANURE AS AN ENERGY SOURCE KEYWORDS. FEEDLOT-WASTES ENERGY ECONOMICS RECYCLING
100 76 4246 FERTILIZERS EFFECT OF SIMAZINE AND ATRAZINE ON THE FERMENTATION OF FERTILIZER AND MANURE NITROGEN K
400 77 4292 FERTILIZERS ENRICHED POULTRY MANURE AS A BALANCED FERTILIZER KEYWORDS: POULTRY-WASTES FERTILIZERS R
300 74 4297 FERTILIZERS ENERGY FROM FEEDLOT MANURE KEYWORDS FUELS RECYCLING LIVESTOCK-WASTES FERTILIZERS REFEE
100 76 4306 FERTILIZERS AN EVALUATION OF FARMYARD SLURRY ENRICHED WITH EITHER POULTRY MANURE OR INORGANIC N-P-K
400 70 4311 FERTILIZERS IMAGINE YOUR FEEDLOT MANURE CAN POWER YOUR MILL AND BRING CASH FROM SALE OF EXCESS POWE
400 75 4313 FERTILIZERS DPW VALUE AS ANIMAL FEED SEEN REACHING 100 A TON KEYWORDS: REFEEDING POULTRY-WASTES-DR
400 76 4316 FERTILIZERS WHAT'S MANURE WORTH AS A FERTILIZER KEYWORDS: LIVESTOCK-WASTES WASTE-PRODUCTION-RATE FE
300 76 4318 FERTILIZERS METHANE PRODUCTION FROM CATTLE WASTES KEYWORDS: RECYCLING FEEDLOTS CATTLE-WASTES DAIRY-
400 74 4322 FERTILIZERS THERE'S MONEY IN MANURE IF HANDLED RIGHT KEYWORDS DAIRY-WASTES WASTE-MANAGEMENT FERTIL
300 77 4334 FERTILIZERS UTILIZATION OF LIVESTOCK WASTES-ALTERNATIVE TREATMENTS AND PRODUCTS KEYWORDS: RECYCLIN
300 77 4341 FERTILIZERS LONG TERM MANURE STORAGE KEYWORDS WASTE-STORAGE FERTILIZERS LAND-APPLICATION TIME LABO
400 77 4342 FERTILIZERS C+P+S, T+A=N OR WHY POOR WASTE MANAGEMENT COSTS YOU MONEY KEYWORDS: LIVESTOCK-WASTES PO
100 77 4372 FERTILIZERS A NEW CONCEPT OF LITTER MANAGEMENT FOR BROILER PRODUCTION KEYWORDS. POULTRY POULTRY-LIT
400 77 4378 FERTILIZERS 140 DEGREES IS CRITICAL--METHANE FROM CATTLE WASTE FERMENTATION STARTS RAPIDLY, CONTINU
300 73 4392 FERTILIZERS NITRATES IN THE UPPER SANTA ANA RIVER BASIN IN RELATION TO GROUNDWATER POLLUTION KEYWOR
100 76 4398 FERTILIZERS ANNUAL DYNAMICS OF CHANGES IN CHARACTERISTIC PROPERTIES OF CATTLE LIQUID MANURE FROM L
500 75 4408 FERTILIZERS FORAGE CROPS GRASS TETANY KEYWORDS: GRASS-TETANY ANIMAL-HEALTH CATTLE RUMINANTS MAGNES
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300 77 4423 FERTILIZERS NO FERTILIZER, SOIL TEST FERTILIZATION, AND HEAVY FERTILIZATION OF CORN--WHAT HAPPENS W
100 76 4425 FERTILIZERS GROUND-WATER QUALITY VARIATION IN PHELPS COUNTY, MISSOURI KEYWORDS GROUNDWATER-QUALITY
400 77 4436 FERTILIZERS THE HAPPY EARTHWORM KEYWORDS: RECYCLING CATTLE-WASTES PAUNCH-MANURE FEEDLOTS EARTHWORMS
400 77 4439 FERTILIZERS INJECTING MANURE CUTS CORN FERTILIZER COSTS KEYWORDS LAND-APPLICATION SOIL-INJECTION C
400 77 4448 FERTILIZERS CONVERT CITY SEWAGE TO FARM FERTILIZER KEYWORDS SEWAGE-SLUDGE FERTILIZERS LAND-APPLICA
100 76 4452 FERTILIZERS PHOSPHORUS LOSS BY STREAM TRANSPORT FROM A RURAL WATERSHED--QUANTITIES, PROCESSES, AND
300 77 4454 FERTILIZERS A COMPLETE DISPOSAL-RECYCLE SCHEME FOR AGRICULTURAL SOLID WASTES KEYWORDS: SOLID-WASTES
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100	75 4287	FLUIDIZED-BED-REAC	SYNTHESIS GAS FROM BOVINE WASTES KEYWORDS RECYCLING CATTLE-WASTES GASES FLUIDIZED-BED-
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400	70	4567	GAS-STORAGE HOW TO GENERATE POWER FROM GARBAGE KEYWORDS: METHANE ANAEROBIC DIGESTERS LIVESTOCK-WAST
500	73	4623	GAS-STORAGE A HOMESITE POWER UNIT--METHANE GENERATOR KEYWORDS: ANAEROBIC DIGESTER SLURRIES WASTE-TR
500	77	4081	GERMAN-LAW THE ADMISSIBLE RATE OF WASTE RESIDUE APPLICATION ON LAND WITH REGARD TO HIGH EFFICIE
100	77	4632	GLUCURONIDES SIMPLE PHENOLS AND INDOLES IN ANAEROBICALLY STORED PIGGERY WASTES KEYWORDS: SWINE-WASTE
100	77	4470	GLUTAMIC-ACID COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
100	76	4192	GOAT-WASTES STAPHYLOCOCCI FROM THE FECES OF DIFFERENT ANIMAL SPECIES BIOTYPES OF STAPHYLOCOCCUS AUR
400	71	4566	GOBAR-GAS GOBAR GAS-METHANE EXPERIMENTS IN INDIA KEYWORDS METHANE GOBAR-GAS RECYCLING CATTLE-WAS
400	77	4014	GRAINS EXCREMENT RECONSTITUTED GRAIN FOR GROWING AND FINISHING CATTLE KEYWORDS REFEEDING ECON
400	76	4299	GRAINS ENERGY AND RESOURCE REQUIREMENTS FOR BEEF CATTLE PRODUCTION KEYWORDS: CATTLE-WASTES FEE
400	77	4296	GRAIN-PROCESSING FARMERS AS FUEL SUPPLIERS KEYWORDS. ENERGY RECYCLING BIOMASS-CROPS CROP-RESIDUES GRAIN-
200	77	4283	GRASSED-WATERWAY A FARMERS VIEWPOINT, PART I. - BEEF WASTE MANAGEMENT KEYWORDS: WASTE-MANAGEMENT CATTLE G
300	74	4366	GRASSLANDS JOINT LAND SPREADING TRIAL KEYWORDS: SLURRIES SOILS LAND-APPLICATION GRASSLANDS RAINFAL
300	75	4493	GRASSLANDS SWINE MANURE FOR FERTILIZER--RESEARCH REVIEW KEYWORDS: SWINE-WASTES LIQUID-WASTES AEROB
100	76	4512	GRASSLANDS THE SPATIAL DISTRIBUTION OF EXCRETA UNDER INTENSIVE CATTLE GRAZING KEYWORDS: CATTLE-WAS
100	75	4577	GRASSLANDS MICROFLORA OF NEWLY CUT GRASS AFTER ADDITION OF LIQUID MANURE KEYWORDS: LIQUID-WASTES A
300	72	4107	GRASSLAND MANURING OF PERMANENT MEADOWS 1962-70 KEYWORDS: LAND-APPLICATION GRASSLAND ANIMAL-WASTE
300	76	4532	GRASSLAND DAIRY CATTLE WASTE MANAGEMENT:ITS EFFECT ON FORAGE PRODUCTION AND RUNOFF WATER QUALITY
100	75	4584	GRASSLAND RELATIONSHIPS BETWEEN COPROPHILOUS FUNGI AND FECAL SUBSTRATES IN A COLORADO GRASSLAND K
100	74	4598	GRASSLAND SOME BACTERIOLOGICAL CHANGES ASSOCIATED WITH THE APPLICATION OF COW SLURRY TO GRASSLAND
200	75	4650	GRASSLAND ANIMAL MANURES IN GRASS PRODUCTION KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES
200	76	4651	GRASSLAND FERTILIZER VALUE OF ANIMAL MANURES KEYWORDS: SWINE-WASTES CATTLE-WASTES WASTE-STORAGE L
100	75	4095	GRASS-PRODUCTION A SYSTEM OF OPTIMIZING THE USE OF ANIMAL MANURES ON A GRASSLAND FARM KEYWORDS: MATHEMAT
500	75	4408	GRASS-TETANY FORAGE CROPS GRASS TETANY KEYWORDS: GRASS-TETANY ANIMAL-HEALTH CATTLE RUMINANTS MAGNES
300	76	4532	GRASS-TETANY DAIRY CATTLE WASTE MANAGEMENT:ITS EFFECT ON FORAGE PRODUCTION AND RUNOFF WATER QUALITY
200	74	4052	GRAZING HAZARDS ASSOCIATED WITH SPREADING ANIMAL-WASTE SLURRIES KEYWORDS: SLURRIES LAND-APPLICA
100	76	4512	GRAZING THE SPATIAL DISTRIBUTION OF EXCRETA UNDER INTENSIVE CATTLE GRAZING KEYWORDS: CATTLE-WAS
100	71	4622	GRAZING THE SURVIVAL OF ESCHERICHIA COLI AND SALMONELLA DUBLIN IN SLURRY ON PASTURE AND THE INF
100	73	4646	GRAZING A FURTHER ASSESSMENT OF THE POTENTIAL HAZARD FOR CALVES ALLOWED TO GRAZE PASTURE CONTAM
100	75	4648	GRAZING THE AGRONOMIC ROLE OF INTRODUCED DUNG BEETLES IN GRAZING SYSTEMS KEYWORDS: PASTURES MAN
200	76	4651	GRAZING FERTILIZER VALUE OF ANIMAL MANURES KEYWORDS: SWINE-WASTES CATTLE-WASTES WASTE-STORAGE L

100 76 4416	GRAZING-AREAS	A STUDY ON ELIMINATIVE AND GRAZING BEHAVIOUR--THE USE OF THE FIELD BY CAPTIVE HORSES KE
200 77 4065	GRAZON	PRESERVATION AND REFEEDING POULTRY WASTE TO CATTLE KEYWORDS: REFEEDING POULTRY-LITTER C
300 77 4509	GREENHOUSE-AGRICUL	ENERGY USE IN AGRICULTURE: NOW AND FOR THE FUTURE KEYWORDS: AGRICULTURE ENERGY-CONSUMPT
300 76 4521	GREEN-MANURES	A LONG-TERM ROTATIONAL AND MANURIAL TRIAL IN UGANDA KEYWORDS: LAND-APPLICATION ANIMAL-W
400 77 4123	GRINDING	COMPOSTING MAKES MANURE HANDLING EASY KEYWORDS: COMPOSTING CATTLE-WASTES WINDROWS AERAT
100 77 4424	GROUNDWATER	ANALYZING NITRATES IN WELL WATER KEYWORDS: NITRATES GROUNDWATER BARNYARDS FEEDLOTS METH
300 77 4510	GROUNDWATER-MONITO	POLLUTANT MOVEMENT TO SHALLOW GROUND WATER TABLES FROM SWINE WASTE LAGOONS KEYWORDS: SW
300 76 4001	GROUNDWATER-POLLUT	DESIGN PARAMETERS FOR ANIMAL WASTE TREATMENT SYSTEMS - NITROGEN CONTROL KEYWORDS: DESIG
100 72 4007	GROUNDWATER-POLLUT	WATER MANAGEMENT ASPECTS OF THE AGRICULTURAL UTILIZATION OF LIQUID MANURE AND PRELIMINA
300 76 4016	GROUNDWATER-POLLUT	DAIRY MANURE CAN BE USED SAFELY KEYWORDS: DAIRY-WASTES WASTE-MANAGEMENT WASTE-STORAGE W
100 76 4049	GROUNDWATER-POLLUT	ACCUMULATION OF NUTRIENTS IN SOIL BENEATH HOG MANURE LAGOONS KEYWORDS: LAGOONS SWINE-WA
200 74 4050	GROUNDWATER-POLLUT	THE IMPLICATION OF HYDROGEOLOGIC FACTORS IN WASTE MANAGEMENT ON LAND WITH SPECIAL REFE
100 76 4074	GROUNDWATER-POLLUT	INFILTRATION CHARACTERISTICS FROM ANAEROBIC LAGOONS KEYWORDS: ANAEROBIC LAGOONS INFILTR
500 77 4079	GROUNDWATER-POLLUT	LAND AS A WASTE MANAGEMENT ALTERNATIVE KEYWORDS: WASTE-MANAGEMENT LAND-APPLICATION ANIM
500 77 4083	GROUNDWATER-POLLUT	HEALTH HAZARDS OF AGRICULTURAL, INDUSTRIAL, AND MUNICIPAL WASTES APPLIED TO LAND KEYWOR
500 77 4084	GROUNDWATER-POLLUT	MICROBIAL CONCERNS WHEN WASTES ARE APPLIED TO LAND KEYWORDS: LAND-DISPOSAL SOIL-MICROBI
500 77 4086	GROUNDWATER-POLLUT	CONTINUOUS SUBSURFACE INJECTION OF LIQUID ORGANIC WASTES KEYWORDS: LAND-APPLICATION LIQ
100 76 4105	GROUNDWATER-POLLUT	FATE OF ANIMAL VIRUSES IN EFFLUENT FROM LIQUID FARM WASTES KEYWORDS: LAND-APPLICATION
700 72 4189	GROUNDWATER-POLLUT	NITRATE LEACHING FROM ANIMAL WASTE APPLICATIONS KEYWORDS: GROUNDWATER-POLLUTION LEACHIN
200 71 4190	GROUNDWATER-POLLUT	NITROGEN INPUTS TO GROUNDWATER FROM LIVESTOCK WASTES KEYWORDS: GROUNDWATER-POLLUTION LI
500 75 4198	GROUNDWATER-POLLUT	FLOWS OF NITROGEN AND PHOSPHORUS ON LAND KEYWORDS: NITROGEN PHOSPHORUS GROUNDWATER-POLL
100 76 4213	GROUNDWATER-POLLUT	SOLUBLE CATIONS BENEATH A FEEDLOT AND AN ADJACENT CROPPED FIELD KEYWORDS: FEEDLOTS CATI
300 74 4217	GROUNDWATER-POLLUT	SOIL POLLUTION FROM FEEDLOTS IN GEORGIA KEYWORDS: GROUNDWATER-POLLUTION SOIL-CONTAMINAT
300 77 4262	GROUNDWATER-POLLUT	CAN CITY SEWAGE BE RECYCLED SAFELY ON FARM LAND KEYWORDS: RECYCLING SEWAGE LAND-APPLICA
300 73 4310	GROUNDWATER-POLLUT	LIVESTOCK WASTE MANAGEMENT-STATE OF THE ART KEYWORDS: WASTE-MANAGEMENT FEEDLOTS LIVESTO
400 74 4330	GROUNDWATER-POLLUT	WASTE DISPOSAL IN BEEF FEEDLOTS KEYWORDS: FEEDLOTS MANAGEMENT FEEDLOT-RUNOFF WATER-POLL
100 73 4361	GROUNDWATER-POLLUT	CHANGES IN SEEPAGE RATE FROM AN UNLINED CATTLE WASTE DIGESTION POND KEYWORDS: CATTLE-WA
300 73 4392	GROUNDWATER-POLLUT	NITRATES IN THE UPPER SANTA ANA RIVER BASIN IN RELATION TO GROUNDWATER POLLUTION KEYWOR
400 77 4448	GROUNDWATER-POLLUT	CONVERT CITY SEWAGE TO FARM FERTILIZER KEYWORDS: SEWAGE-SLUDGE FERTILIZERS LAND-APPLICA
700 76 4455	GROUNDWATER-POLLUT	EFFECTS OF METHODS AND RATES OF DAIRY MANURE APPLICATION ON SOIL WATER NITRATE LEVELS K
100 76 4456	GROUNDWATER-POLLUT	NITROGEN MOVEMENT NEAR SURFACE MANURE STORAGES KEYWORDS: WASTE-STORAGE MANURE-PIT WASTE
300 77 4462	GROUNDWATER-POLLUT	THE SELECTION AND MANAGEMENT OF FEEDLOT SITES AND LAND DISPOSAL OF ANIMAL WASTE IN 80IS
100 77 4468	GROUNDWATER-POLLUT	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
300 75 4474	GROUNDWATER-POLLUT	ENVIRONMENTAL AND ECONOMIC IMPACT OF NUTRIENT MANAGEMENT ON THE NEW YORK DAIRY FARM KEY
300 77 4482	GROUNDWATER-POLLUT	NUTRIENT, BACTERIAL, AND VIRUS CONTROL AS RELATED TO GROUND-WATER CONTAMINATION KEYWORD
700 76 4543	GROUNDWATER-POLLUT	GROUNDWATER LEVELS AS AFFECTED BY SWINE WASTE LAGOONS IN HIGH WATER TABLE SOILS KEYWORD
100 75 4626	GROUNDWATER-POLLUT	A SUMMARY OF THE BIOGEOCHEMISTRY OF NITROGEN COMPOUNDS IN GROUNC WATER KEYWORDS: GROUND
100 76 4627	GROUNDWATER-POLLUT	NITRATE POLLUTION OF GROUNDWATER FROM NITROGEN FERTILIZERS AND ANIMAL WASTES IN THE PU
300 72 4339	GROUNDWATER-QUALIT	WASTEWATER RESEARCH EXPANDS KEYWORDS: MUNICIPAL-WASTES SEWAGE LAND-APPLICATION FORAGES
200 76 4358	GROUNDWATER-QUALIT	CONSIDERATION OF SOILS FOR ACCEPTING WASTES KEYWORDS: LAND-APPLICATION SOIL-PROPERTIES
100 76 4425	GROUNDWATER-QUALIT	GROUND-WATER QUALITY VARIATION IN PHELPS COUNTY, MISSOURI KEYWORDS: GROUNDWATER-QUALITY
100 75 4450	GROUNDWATER-QUALIT	NITRATE-NITROGEN REMOVAL FROM SOIL PROFILES BY ALFALFA KEYWORDS: NITRATES SOIL-PROFILES
300 77 4510	GROUNDWATER-QUALIT	POLLUTANT MOVEMENT TO SHALLOW GROUND WATER TABLES FROM SWINE WASTE LAGOONS KEYWORDS: SW
200 76 4610	GROUNDWATER-QUALIT	INFLUENCES OF LAND SPREADING LIVESTOCK WASTES ON GROUNDWATER QUALITY KEYWORDS: GROUNDWA
400 77 4340	GUIDELINES	CAST REVIEWS USDA WASTE MANUAL KEYWORDS: MANUALS LAND-APPLICATION GUIDELINES ENVIRONMEN
300 75 4570	GUIDELINES	GUIDELINES FOR MANURE USE AND DISPOSAL IN THE WESTERN REGION, USA KEYWORDS: LAND-APPLIC
100 77 4468	GULLE	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
100 77 4469	GULLE	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
100 77 4470	GULLE	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
100 76 4630	GYPSUM	EFFECT OF GYPSUM, FARMYARD MANURE AND ZINC ON THE YIELD OF BERSEEM, RICE AND MAIZE GRO
100 74 4661	GYPSUM	DEVELOPMENT OF A SYNTHETIC COMPOST FOR MUSHROOM GROWING BASED ON WHEAT STRAW AND CHICKE
200 72 4640	HAMSTERS	LEPTOSPIRES IN ANIMAL WASTE TREATMENT--ANIMAL HEALTH PROBLEM KEYWORDS: ANIMAL-WASTES LE
200 76 4073	HATCHERY-WASTES	IMPACT OF HATCHERY WASTEWATER IRRIGATION UPON CONTIGUOUS STREAM QUALITY KEYWORDS: HATCH
100 77 4365	HEAD-LOSSES	HEAD LOSS OF BEEF MANURE SLURRY FLOW IN POLYVINYLCHLORIDE PIPE KEYWORDS: CATTLE-WASTES
700 74 4502	HEAD-LOSS	THE EFFECT OF TOTAL SOLIDS CONTENT, PARTICLE SIZE, FLOW VELOCITY, AND VISCOSITY OF BEEF
300 76 4315	HEALTH-HAZARDS	WASTE DISPOSAL IN FORESTS KEYWORDS: LAND-APPLICATION FOREST-LANDS CROPLANDS TREE-RESPON
400 72 4336	HEATING	BUILDING A BIO-GAS PLANT KEYWORDS: BIO-GAS-PLANTS DESIGN LIQUID-WASTES AGITATION HEATIN
100 77 4350	HEATING	DRYING CAGED LAYER WASTE KEYWORDS: MODEL-STUDIES POULTRY-WASTES DEEP-PITS VENTILATION M
400 77 4515	HEATING	SOLAR ENERGY HELPS DRY POULTRY WASTE KEYWORDS: SOLAR-DRYING POULTRY-WASTES HEATING RECY
200 76 4616	HEAT-RECOVERY	EFFECTS OF POULTRY DUST ON PERFORMANCE OF A THERMOSIPHON HEAT RECOVERY SYSTEM KEYWORDS
200 76 4033	HEAT-TRANSFER	CONVECTIVE HEAT TRANSFER COEFFICIENT FOR POULTRY MANURE KEYWORDS: POULTRY-WASTES DEHYDR
100 76 4046	HEAVY-METALS	EFFECT OF POULTRY MANURE ADDITIONS ON THE EXTRACTABILITY OF AN ADDED METAL KEYWORDS: PO
100 76 4047	HEAVY-METALS	FEEDLOT WASTE RUNOFF AND MORTALITY OF WINDBREAK TREES KEYWORDS: FEEDLOT-RUNOFF TREE-MOR
200 77 4063	HEAVY-METALS	RESIDUE TRANSFER AND ACCUMULATION KEYWORDS: REFEEDING FEED-ADDITIVES ANIMAL-HEALTH CATT
500 77 4079	HEAVY-METALS	LAND AS A WASTE MANAGEMENT ALTERNATIVE KEYWORDS. WASTE-MANAGEMENT LAND-APPLICATION ANIM
500 77 4086	HEAVY-METALS	CONTINUOUS SUBSURFACE INJECTION OF LIQUID ORGANIC WASTES KEYWORDS: LAND-APPLICATION LIQ
100 77 4145	HEAVY-METALS	NUTRIENT CHARACTERIZATION OF SWINE FECAL WASTE AND UTILIZATION OF THESE NUTRIENTS BY SW
300 76 4194	HEAVY-METALS	RECYCLING SEWAGE SOLIDS AS FEEDSTUFFS FOR LIVESTOCK KEYWORDS: RECYCLING SEWAGE-SOLIDS R
300 73 4209	HEAVY-METALS	SWINE PRODUCTION INDUSTRY WASTE CHARACTERIZATION AND MANAGEMENT KEYWORDS: SWINE-WASTES
100 77 4210	HEAVY-METALS	INFLUENCE OF FEEDING DEHYDRATED POULTRY WASTE ON COMPOSITION AND ORGANOLEPTIC QUALITY O
300 77 4262	HEAVY-METALS	CAN CITY SEWAGE BE RECYCLED SAFELY ON FARM LAND KEYWORDS: RECYCLING SEWAGE LAND-APPLICA
700 70 4268	HEAVY-METALS	CATTLE MANURE. I. EFFECT ON CROPS AND SOILS. II. RETENTION PROPERTIES FOR CU, MN, AND ZN
400 77 4307	HEAVY-METALS	AAFCO TASKFORCE WORKS ON ANIMAL WASTE REGULATIONS KEYWORDS: REFEEDING LEGAL-ASPECTS ANT
200 76 4358	HEAVY-METALS	CONSIDERATION OF SOILS FOR ACCEPTING WASTES KEYWORDS: LAND-APPLICATION SOIL-PROPERTIES
200 75 4385	HEAVY-METALS	WASTES--USE OR DISCARD KEYWORDS: AGRICULTURAL-WASTES LAND-APPLICATION NITRIENT-LOSSES N
300 75 4429	HEAVY-METALS	MANURE--LONG-TERM STUDY KEYWORDS: ANIMAL-WASTES LAND-APPLICATION CROP-RESPONSE NUTRIENT
400 77 4448	HEAVY-METALS	CONVERT CITY SEWAGE TO FARM FERTILIZER KEYWORDS: SEWAGE-SLUDGE FERTILIZERS LAND-APPLICA
100 75 4451	HEAVY-METALS	THE NEEDS FOR WATER QUALITY MODELS ON AGRICULTURAL WATERSHEDS KEYWORDS: WATER-POLLUTION
700 76 4543	HEAVY-METALS	GROUNDWATER LEVELS AS AFFECTED BY SWINE WASTE LAGOONS IN HIGH WATER TABLE SOILS KEYWORD
100 75 4645	HEAVY-METALS	WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS: WATER-POLLUTION NONPOINT-SOURCES PUBLIC
100 76 4246	HERBICIDES	EFFECT OF SIMAZINE AND ATRAZINE ON THE FERMENTATION OF FERTILIZER AND MANURE NITROGEN K
300 77 4509	HERBICIDES	ENERGY USE IN AGRICULTURE: NOW AND FOR THE FUTURE KEYWORDS: AGRICULTURE ENERGY-CONSUMPT
300 75 4474	HERD-DENSITIES	ENVIRONMENTAL AND ECONOMIC IMPACT OF NUTRIENT MANAGEMENT ON THE NEW YORK DAIRY FARM KEY
400 77 4103	HIGH-RISE-CAGE	PULLETS IN GROW CAGES ABOVE HOGS IN PIT BELOW KEYWORDS: HIGH-RISE-CAGE POULTRY-WASTES M
300 74 4106	HIGH-RISE-POULTRY-	HANDLING AND DISPOSING OF POULTRY MANURE KEYWORDS. POULTRY-WASTES WASTE-MANAGEMENT SOLI
100 77 4470	HISTIDINE	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
300 74 4152	HOGS	ODORS FROM CONFINED LIVESTOCK PRODUCTION KEYWORDS: ODOR-CONTROL LIVESTOCK LEGAL-ASPECTS
100 76 4017	HOLDING-PONDS	PERFORMANCE OF FEEDLOT RUNOFF CONTROL SYSTEMS IN NORTHERN CLIMATES KEYWORDS: MATHEMATIC
300 76 4097	HOLDING-PONDS	DILUTION OF FEEDLOT RUNOFF KEYWORDS: LAND-APPLICATION FEEDLOT-RUNOFF DILUTION SOIL-WATE
400 72 4114	HOLDING-PONDS	FEEDLOT POLLUTION CONTROL IS NOT AN EXPENSIVE ITEM: LINDER KEYWORDS: POLLUTION-CONTROL
300 75 4130	HOLDING-PONDS	FEEDLOTS AND RECREATION LAKES AN EXAMPLE OF HOW THEY CAN BE GOOD NEIGHBORS KEYWORDS: F
400 72 4240	HOLDING-PONDS	MANURE SYSTEMS PLANNING DATA KEYWORDS: WASTE-STORAGE LAGOONS HOLDING-PONDS SETTLING-BAS
300 73 4265	HOLDING-PONDS	DESIGN OF ANIMAL WASTE DISPOSAL SYSTEMS KEYWORDS: ENGINEERING-STANDARDS LEGAL-ASPECTS D
400 76 4471	HOLDING-PONDS	AWARD FOR NEBRASKAN KEYWORDS: FEEDLOTS WASTE-MANAGEMENT DEBRIS-BASINS HOLDING-PONDS LAN
400 76 4480	HOLDING-PONDS	KEEP IT DRY KEYWORDS: FEEDLOTS ODOR-CONTROL STOCKING-RATES FEEDLOT-RUNOFF HOLDING-PONDS
300 77 4503	HOLDING-PONDS	BEEF CATTLE FEEDLOT RUNOFF AND CONTROL IN EASTERN NEBRASKA KEYWORDS: FEEDLOT-RUNOFF RU
400 77 4527	HOLDING-PONDS	FEEDER COMPLIES WITH REGULATIONS--EPA OKAYED THESE PLANS TO STOP WASTE AND WATER RUNOFF
100 75 4590	HOLDING-PONDS	ANALYSIS OF RUNOFF FROM SOUTHERN GREAT PLAINS FEEDLOTS KEYWORDS: FEEDLOT-RUNOFF SALTS I
200 77 4283	HOLDING-POND	A FARMERS VIEWPOINT, PART I - BEEF WASTE MANAGEMENT KEYWORDS: WASTE-MANAGEMENT CATTLE G
300 73 4265	HOLDING-TANKS	DESIGN OF ANIMAL WASTE DISPOSAL SYSTEMS KEYWORDS: ENGINEERING-STANDARDS LEGAL-ASPECTS D

100	73 4621	HOMOGENIZATION	A METHOD FOR THE QUANTITATIVE EXTRACTION OF ADENOSINETRIPHOSPHATE ATP, FROM COW SLURRY
200	77 4063	HORMONES	RESIDUE TRANSFER AND ACCUMULATION KEYWORDS: REFEEDING FEED-ADDITIVES ANIMAL-HEALTH CATT
200	75 4641	HORMONES	RECYCLING AND DEGRADATION OF ANABOLIC AGENTS IN ANIMAL EXCRETA KEYWORDS: REFEEDING LIVE
100	76 4416	HORSES	A STUDY ON ELIMINATIVE AND GRAZING BEHAVIOUR--THE USE OF THE FIELD BY CAPTIVE HORSES KE
100	46 4115	HORSE-WASTES	DIGESTER GAS FOR AUTOMOBILES KEYWORDS: METHANE ORGANIC-WASTES SEWAGE HORSE-WASTES RECYC
200	75 4558	HORSE-WASTES	HOW TO CLEAN UP AT THE RACES KEYWORDS: HORSE-WASTES RACE-TRACKS WASTE-MANAGEMENT WASTE-
400	77 4522	HOUSEFLIES	ON STRAW AND GOLD, MANURE AND ALGAE--FEEDING WASTE--IT S BEING DONE IN A VARIETY OF WAY
100	75 4022	HOUSING	PERFORMANCE AND ENERGY METABOLISM OF STEERS FED A CONCENTRATE OR ROUGHAGE DIET IN CONVE
100	75 4102	HOUSING	DIURNAL AND ANNUAL FLUCTUATIONS OF AERIAL BACTERIAL AND DUST LEVELS IN ENCLOSED SWINE H
100	73 4125	HOUSING	EFFECTS OF BEEF HOUSING SYSTEMS ON GASEOUS CONTAMINANTS REMOVED BY VENTILATION KEYWORDS
100	73 4126	HOUSING	EFFECTS OF BEEF HOUSING SYSTEMS ON MOISTURE REMOVED BY VENTILATION KEYWORDS HOUSING CA
400	76 4141	HOUSING	HOUSING AND FLOOR DESIGN CAN INFLUENCE PIG PERFORMANCE KEYWORDS: HOUSING SLATTED-FLOORS
100	75 4162	HOUSING	RELATIVE AND QUALITATIVE ASPECTS OF AERIAL BACTERIA AND DUST IN SWINE HOUSES KEYWORDS:
300	72 4228	HOUSING	WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA SWINE PRODUCERS KEYWORDS: WASTE-DISP
700	73 4414	HOUSING	BACTERIOLOGICAL STUDIES OF CONFINEMENT ANIMAL WASTE AND SURVIVAL STUDIES OF INDICATOR B
400	77 4443	HOUSING	NEW WASTE COLLECTION AND STORAGE SYSTEM KEYWORDS WASTE-COLLECTION WASTE-STORAGE LIQUID
400	77 4445	HOUSING	GUIDE TO EFFECTIVE MANURE PIT VENTILATION KEYWORDS: ODOR GASES AIR-POLLUTION SWINE-WAST
400	77 4479	HOUSING	HOUSING HINTS KEYWORDS: FEEDLOTS HOUSING OPEN-LOTS CATTLE MANAGEMENT ECONOMICS
400	77 4526	HOUSING	WHAT'S HOUSING REALLY WORTH KEYWORDS: CONFINEMENT-PENS HOUSING FLOORS ECONOMICS PERFORM
700	76 4545	HOUSING	EVALUATION OF A FLUSHING-GUTTER MANURE-REMOVAL SYSTEM TO IMPROVE ATMOSPHERIC QUALITY IN
700	73 4555	HOUSING	PIT VENTILATION SYSTEM FOR SWINE BUILDINGS KEYWORDS: VENTILATION CONFINEMENT-PENS DESIG
400	71 4556	HOUSING	AUTOMATIC SYSTEM SCRAPES MANURE-AND WORK-AWAY KEYWORDS DAIRY-WASTES CONFINEMENT HOUSIN
400	76 4576	HOUSING	HOUSING AND EQUIPMENT--OPTIONS FOR CONFINEMENT HOUSING KEYWORDS: CONFINEMENT-PENS HOUSI
200	76 4359	HUMAN-WASTES	CONSIDERATION OF SOILS FOR ACCEPTING PLANT NUTRIENTS AND POTENTIALLY TOXIC NONESSENTIAL
100	76 4432	HUMAN-WASTES	STUDIES ON BACTERIOPHAGE DISTRIBUTION--VIRULENT AND TEMPERATE BACTERIOPHAGE CONTENT OF
100	76 4634	HUMIFICATION	ANALYSIS OF THE ROTTING PROCESS OF SAWDUST BARNYARD MANURE KEYWORDS: ANIMAL-WASTES SAW
200	74 4347	HYDRATED-LIME	LIVESTOCK ODOR CONTROL RESEARCH AT THE UNIVERSITY OF ILLINOIS KEYWORDS: ODOR-CONTROL SW
100	76 4074	HYDRAULIC-GRADIENT	INFILTRATION CHARACTERISTICS FROM ANAEROBIC LAGOONS KEYWORDS: ANAEROBIC LAGOONS INFILTR
700	74 4502	HYDRAULIC-PIPE-TRA	THE EFFECT OF TOTAL SOLIDS CONTENT, PARTICLE SIZE, FLOW VELOCITY, AND VISCOSITY OF BEEF
200	74 4072	HYDROGASIFICATION	FUEL FROM FECES KEYWORDS: FUELS RECYCLING PHYSICAL-TREATMENT CHEMICAL-TREATMENT BIOLOGI
400	74 4511	HYDROGASIFICATION	DESPITE SCIENCE, IT S STILL MANURE KEYWORDS: LIVESTOCK-WASTES RECYCLING PYROLYSIS HYDRO
100	74 4193	HYDROGEN	THE EFFECT OF PIG SLURRY APPLIED TO A SOIL SURFACE ON THE COMPOSITION OF THE SOIL ATMOS
200	75 4327	HYDROGEN	PRODUCTION OF AMMONIA SYNTHESIS GAS FROM MANURE IN A CYCLONIC BURNER KEYWORDS: RECYCLIN
700	73 4331	HYDROGEN	AMMONIA SYNTHESIS GAS FROM MANURE KEYWORDS OXIDATION FLUIDIZED-BED-REACTOR RECYCLING D
400	74 4511	HYDROGEN	DESPITE SCIENCE, IT'S STILL MANURE KEYWORDS: LIVESTOCK-WASTES RECYCLING PYROLYSIS HYDRO
400	77 4066	HYDROGEN-SULFIDE	DON'T BE CAUGHT DEAD PUMPING MANURE KEYWORDS LIQUID-WASTES WASTE-STORAGE GASES AGITATI
300	74 4152	HYDROGEN-SULFIDE	ODORS FROM CONFINED LIVESTOCK PRODUCTION KEYWORDS ODOR-CONTROL LIVESTOCK LEGAL-ASPECTS
400	77 4171	HYDROGEN-SULFIDE	MANURE PITS CONTAIN GASES THAT CAN KILL KEYWORDS: MANURE-PITS GASES TOXICITY HYDROGEN-S
300	76 4176	HYDROGEN-SULFIDE	PRODUCTION AND TRANSPORT OF GASEOUS NH3 AND H2S ASSOCIATED WITH LIVESTOCK PRODUCTION K
100	75 4206	HYDROGEN-SULFIDE	CHEMICAL CONTROL OF HYDROGEN SULFIDE FROM ANAEROBIC SWINE MANURE I. OXIDIZING AGENTS KEY
400	77 4445	HYDROGEN-SULFIDE	GUIDE TO EFFECTIVE MANURE PIT VENTILATION KEYWORDS ODOR GASES AIR-POLLUTION SWINE-WAST
100	77 4465	HYDROGEN-SULFIDE	CHEMICAL CONTROL OF HYDROGEN SULFIDE FROM ANAEROBIC SWINE MANURE. II. IRON COMPOUNDS KEYW
200	74 4050	HYDROGEOLOGY	THE IMPLICATION OF HYDROGEOLOGIC FACTORS IN WASTE MANAGEMENT ON LAND WITH SPECIAL REFE
100	77 4632	HYDROLYSIS	SIMPLE PHENOLS AND INDOLES IN ANAEROBICALLY STORED PIGGERY WASTES KEYWORDS: SWINE-WASTE
300	77 4334	HYDROPONICS	UTILIZATION OF LIVESTOCK WASTES-ALTERNATIVE TREATMENTS AND PRODUCTS KEYWORDS RECYCLIN
100	76 4351	IGR-DIMLIN-R	INHIBITION OF LARVAL HORN FLY DEVELOPMENT IN THE MANURE OF BOVINES FED DIMILIN R MINER
300	76 4251	ILLINOIS-LAW	DESIGN CRITERIA FOR FIELD APPLICATION OF LIVESTOCK WASTE KEYWORDS LIVESTOCK-WASTES LAN
200	77 4272	ILLINOIS-LAW	DESIGN CONFERENCE ON LIVESTOCK WASTE MANAGEMENT SYSTEMS IN ILLINOIS KEYWORDS: WASTE-MA
200	77 4276	ILLINOIS-LAW	FEDERAL LIVESTOCK WASTE REGULATIONS KEYWORDS. LEGAL-ASPECTS FEEDLOTS PERMITS WATER-POLL
200	77 4277	ILLINOIS-LAW	STATUS OF ILLINOIS LIVESTOCK WASTE REGULATIONS KEYWORDS ILLINOIS-LAW LEGAL-ASPECTS PER
200	77 4278	ILLINOIS-LAW	CASE STUDIES OF WATER POLLUTION CAUSED BY FEEDLOT OPERATIONS AND FUTURE DEMAND FOR PRIV
300	72 4393	INCINERATION	AN ANALYSIS OF BEEF CATTLE FEEDLOT DESIGNS FOR POLLUTION CONTROL KEYWORDS FEEDLOTS DES
400	73 4549	INCINERATION	EFFLUENT STORAGE AND DISPOSAL FROM INTENSIVE PIG UNITS KEYWORDS: SWINE-WASTES WASTE-STO
100	75 4264	INCUBATION	SURVIVAL OF SALMONELLA TYPHIMURIUM IN DAIRY COW WASTE KEYWORDS: DAIRY-WASTES SALMONELLA
100	77 4632	INDOLES	SIMPLE PHENOLS AND INDOLES IN ANAEROBICALLY STORED PIGGERY WASTES KEYWORDS: SWINE-WASTE
500	77 4079	INDUSTRIAL-WASTES	LAND AS A WASTE MANAGEMENT ALTERNATIVE KEYWORDS: WASTE-MANAGEMENT LAND-APPLICATION ANIM
500	77 4081	INDUSTRIAL-WASTES	THE ADMISSIBLE RATE OF WASTE RESIDUE APPLICATION ON LAND WITH REGARD TO HIGH EFFICIE
500	77 4083	INDUSTRIAL-WASTES	HEALTH HAZARDS OF AGRICULTURAL, INDUSTRIAL, AND MUNICIPAL WASTES APPLIED TO LAND KEYWOR
200	70 4384	INDUSTRIAL-WASTES	STATE OF THE ART - ANAEROBIC LAGOONS KEYWORDS LAGOONS WASTE-TREATMENT ANAEROBIC DESIGN
100	75 4451	INDUSTRIAL-WASTES	THE NEEDS FOR WATER QUALITY MODELS ON AGRICULTURAL WATERSHEDS KEYWORDS WATER-POLLUTION
200	71 4298	INDUSTRY	TOWARD THE DESIGN AND MANAGEMENT OF ENVIRONMENTAL SYSTEMS KEYWORDS: DESIGN MANAGEMENT E
200	76 4358	INFILTRATION	CONSIDERATION OF SOILS FOR ACCEPTING WASTES KEYWORDS: LAND-APPLICATION SOIL-PROPERTIES
200	76 4186	INFILTRATION-CHANN	A LOW COST SETTLING BASIN AND INFILTRATION CHANNEL FOR CONTROLLING RUNOFF FROM AN OPEN
100	76 4074	INFILTRATION-RATES	INFILTRATION CHARACTERISTICS FROM ANAEROBIC LAGOONS KEYWORDS: ANAEROBIC LAGOONS INFILTR
500	77 4089	INFILTRATION-RATES	SOIL AND CROP RESPONSE TO APPLIED ANIMAL WASTE KEYWORDS: LAND-APPLICATION CROP-RESPONSE
700	73 4390	INFILTRATION-RATES	EFFECTS OF HEAVY FEEDLOT MANURE APPLICATION RATES ON THE BASIC INFILTRATION RATE OF SOI
200	72 4574	INFILTRATION-RATES	EFFECTS OF FEEDLOT WASTES ON THE WATER RELATIONS OF PULLMAN CLAY LOAM KEYWORDS: FEEDLOT
100	75 4514	INGESTION	RETENTION BY SHEEP OF COPPER FROM AEROBIC DIGESTS OF PIG FAECAL SLURRY KEYWORDS. SWINE-
400	77 4486	INJURIES	MORE ON SHEEP FLOORING KEYWORDS CONFINEMENT-PENS SHEEP MANAGEMENT FLOORING ANIMAL-HEAL
400	77 4204	INSECTICIDES	FEED-THROUGH LARVICIDE KILLS MAGGOTS IN MANURE KEYWORDS: FEED-ADDITIVES FLY-CONTROL LAR
400	77 4270	INSECTICIDES	COMBAT CATTLE FLIES WITH THESE WEAPONS KEYWORDS FLY-CONTROL PASTURES FEEDLOTS FEED-ADD
100	75 4286	INSECTICIDES	RESIDUE DETERMINATION OF THOMPSON-HAYWARD 6040 IN BOVINE MANURE BY HIGH PERFORMANCE LIQ
100	76 4288	INSECTICIDES	FEEDING TH 6040 TO CATTLE RESIDUES IN TISSUES AND MILK AND BREAKDOWN IN MANURE KEYWORD
100	76 4289	INSECTICIDES	ACCUMULATION AND EXCRETION OF CERTAIN ORGANOCHLORINE INSECTICIDES IN BROILER BREEDER HE
100	73 4304	INSECTICIDES	TOXICITY OF SD 8447 AND DICHLORVOS TO LARVAE OF THE HORN FLY HAEMATOBIA IRRITANS, DIPT
100	72 4356	INSECTICIDES	ENCAPSULATED RABON FOR LARVAL HOUSE FLY CONTROL IN COW MANURE KEYWORDS: FLY-CONTROL FEE
400	77 4371	INSECTICIDES	SANITATION IS FIRST STEP IN EFFECTIVE FEEDLOT FLY CONTROL KEYWORDS FLY-CONTROL FEEDLOT
400	77 4406	INSECTICIDES	CONTROLLING FLIES WITH IN-HOUSE MANURE STORAGE KEYWORDS: FLY-CONTROL POULTRY-WASTES WAS
300	77 4509	INSECTICIDES	ENERGY USE IN AGRICULTURE- NOW AND FOR THE FUTURE KEYWORDS AGRICULTURE ENERGY-CONSUMPT
100	72 4155	INSECTS	ADDITIONAL INSECTS ASSOCIATED WITH BOVINE DROPPINGS IN KERR AND BEXAR COUNTIES, TEXAS K
100	70 4285	INSECTS	INSECTS ASSOCIATED WITH BOVINE DROPPINGS IN KERR AND BEXAR COUNTIES, TEXAS KEYWORDS: I
100	76 4346	INSECTS	TABULAR KEYS & BIOLOGICAL NOTES TO COMMON PARASITOIDS OF SYNANTHROPIC DIPTERA BREEDING
300	77 4461	INSECT-CONTROL	WASTE MANAGEMENT PRACTICES OF WESTERN CATTLE FEEDLOTS KEYWORDS: WASTE-MANAGEMENT FEEDLO
200	74 4506	INTENSIFICATION	ANIMAL PRODUCTION IN SINGAPORE--PRESENT STATUS AND TRENDS KEYWORDS: PRODUCTION SWINE PO
100	77 4391	INTESTINAL-PH	GASTROINTESTINAL TRACT PH AND STARCH IN FECES OF RUMINANTS KEYWORDS: DIETS INTESTINAL-
200	74 4347	IONIZATION	LIVESTOCK ODOR CONTROL RESEARCH AT THE UNIVERSITY OF ILLINOIS KEYWORDS: ODOR-CONTROL SW
400	77 4438	IONIZATION	HOG HOUSE DUST CONTROL HELPS YOU BREATHE EASIER KEYWORDS. SWINE CONFINEMENT-BUILDINGS A
100	75 4592	IONIZATION	ADSORPTION OF POULTRY LITTER EXTRACTS BY SOIL AND CLAY KEYWORDS POULTRY-LITTER-EXTRACT
100	76 4377	ION-MOVEMENT	EFFECT ON SOIL AND PLANT MINERAL LEVELS FOLLOWING APPLICATION OF MANURES OF DIFFERENT C
400	77 4437	IOWA-LAW	HIS HOGS DON'T STINK KEYWORDS CONFINEMENT-PENS LEGAL-ASPECTS IOWA-LAW ODOR-CONTROL SWI
400	76 4477	IOWA-LAW	FEEDLOT PAYS PENALTY KEYWORDS: WATER-POLLUTION LEGAL-ASPECTS FEEDLOTS IOWA-LAW POLLUTIO
400	77 4554	IOWA-LAW	LEGAL POINTERS TO HELP KEEP YOUR LIVESTOCK SMELLING LIKE ROSES KEYWORDS FEEDLOTS ODOR
100	76 4045	IRON	NUTRIENT CONCENTRATION OF CORN AS EFFECTED BY POULTRY MANURE KEYWORDS POULTRY-WASTES L
200	77 4063	IRON	RESIDUE TRANSFER AND ACCUMULATION KEYWORDS REFEEDING FEED-ADDITIVES ANIMAL-HEALTH CATT
100	76 4213	IRON	SOLUBLE CATIONS BENEATH A FEEDLOT AND AN ADJACENT CROPPED FIELD KEYWORDS FEEDLOTS CATI
400	77 4314	IRON	MORE ON MANURE KEYWORDS REFEEDING PERFORMANCE COPPER IRON CALCIUM AMPROLIUM PATHOGENIC
300	75 4429	IRON	MANURE--LONG-TERM STUDY KEYWORDS ANIMAL-WASTES LAND-APPLICATION CROP-RESPONSE NUTRIENT
100	77 4465	IRON-COMPOUNDS	CHEMICAL CONTROL OF HYDROGEN SULFIDE FROM ANAEROBIC SWINE MANURE II. IRON COMPOUNDS KEYW
100	77 4468	IRON-OXIDE	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
300	76 4003	IRRIGATION	DESIGN CRITERIA FOR SWINE WASTE TREATMENT SYSTEMS KEYWORDS: DESIGN LAGOONS SWINE-WASTES

100 72 4009	IRRIGATION		CONTRIBUTION TO THE TREATMENT OF LIQUID MANURE IN NATURAL' BIOLOGICAL LAGOON SYSTEMS K
100 72 4011	IRRIGATION		EXPERIENCES WITH THE COMBINED LIQUID MANURE-CLEAR WATER IRRIGATION KEYWORDS' LIQUID-WAS
100 74 4032	IRRIGATION		CHANGES IN THE RHIZOSPHERE EFFECT OF MILLET ASSOCIATED WITH SPRINKLER IRRIGATION WITH A
300 75 4039	IRRIGATION		NATURAL METHODS OF PURIFYING WASTE WATERS AND UTILIZING THEM IN AGRIUCLTURE, BIBLIOGRAP
400 77 4071	IRRIGATION		GETTING MORE OUT OF LIQUID MANURE KEYWORDS. LIQUID-WASTES SLOTTED-FLOORS DEEP-PITS SOIL
200 76 4073	IRRIGATION		IMPACT OF HATCHERY WASTEWATER IRRIGATION UPON CONTIGUOUS STREAM QUALITY KEYWORDS' HATCH
100 76 4118	IRRIGATION		NITRATE CONTENTS OF SUDANGRASS AND BARLEY FORAGES GROWN ON PLOTS TREATED WITH ANIMAL M
300 75 4130	IRRIGATION		FEEDLOTS AND RECREATION LAKES AN EXAMPLE OF HOW THEY CAN BE GOOD NEIGHBORS KEYWORDS' F
400 76 4132	IRRIGATION		HOGS TO GET FLUSH TOILETS KEYWORDS' SWINE-WASTES WASTE-MANAGEMENT FLUSHING SETTLING-TAN
300 77 4134	IRRIGATION		COSTS OF DAIRY WASTE DISPOSAL ON TENNESSEE EXPERIMENT STATION FARMS KEYWORDS' DAIRY-WAS
400 77 4153	IRRIGATION		MAKING THE MOST OF WASTE KEYWORDS PCULTRY-WASTES CATTLE-WASTES RECYCLING METHANE FERTI
400 77 4165	IRRIGATION		RECYCLING IS SUCCESSFUL AT MERTEN S KEYWORDS FEEDLOTS CATTLE-WASTES RECYCLING REFEEDIN
300 73 4188	IRRIGATION		ECONOMICS OF DAIRY WASTE DISPOSAL SYSTEM FOR ALABAMA KEYWORDS' DAIRY-WASTES LIQUID-WAST
100 76 4211	IRRIGATION		FEEDLOT MANURE TOP DRESSING FOR IRRIGATED PASTURE GOOD AGRICULTURAL PRACTICE OR A HEAL
400 77 4219	IRRIGATION		SOLID VS LIQUID WASTE PRE-POND WASTE SEPARATION ALLOWS FLUSH RECOVERY RECYCLING KEYWOR
300 74 4252	IRRIGATION		LIVESTOCK WASTE REGULATIONS' CHAPTER 5. AGRICULTURE RELATED POLLUTION KEYWORDS LIVESTO
200 77 4283	IRRIGATION		A FARMERS VIEWPOINT, PART I - BEEF WASTE MANAGEMENT KEYWORDS' WASTE-MANAGEMENT CATTLE G
300 76 4315	IRRIGATION		WASTE DISPOSAL IN FORESTS KEYWORDS LAND-APPLICATION FOREST-LANDS CROPLANDS TREE-RESPON
400 77 4388	IRRIGATION		2,057 POUNDS OF BEEF PER ACRE FROM FORAGE KEYWORDS' SWINE-WASTES LAND-APPLICATION LIQUI
700 73 4390	IRRIGATION		EFFECTS OF HEAVY FEEDLOT MANURE APPLICATION RATES ON THE BASIC INFILTRATION RATE OF SOI
300 76 4394	IRRIGATION		A FOUR-YEAR FIELD TRIAL WITH ANIMAL MANURES I NITROGEN BALANCES AND YIELDS II MINERAL
400 77 4404	IRRIGATION		CALIFORNIA DAIRYMEN ARE GAINING EXPERIENCE WITH MANURE SEPARATORS KEYWORDS' WASTE-MANAG
100 71 4405	IRRIGATION		A CLEAN NEW GAS KEYWORDS SEWAGE URBAN-WASTES AGRICULTURAL-WASTES RECYCLING ANAEROBIC-D
400 77 4527	IRRIGATION		FEEDER COMPLIES WITH REGULATIONS--EPA OKAYED THESE PLANS TO STOP WASTE AND WATER RUNOFF
400 73 4549	IRRIGATION		EFFLUENT STORAGE AND DISPOSAL FROM INTENSIVE PIG UNITS KEYWORDS' SWINE-WASTES WASTE-STO
400 77 4572	IRRIGATION		IRRIGATING WITH WASTEWATER KEYWORDS' WASTEWATER LAND-APPLICATION EQUIPMENT-IRRIGATION
100 77 4573	IRRIGATION		RUNOFF FROM A LOW-COST MANURE STORAGE FACILITY KEYWORDS AGRICULTURAL-RUNOFF WASTE-STOR
100 75 4590	IRRIGATION		ANALYSIS OF RUNOFF FROM SOUTHERN GREAT PLAINS FEEDLOTS KEYWORDS' FEEDLOT-RUNOFF SALTS I
100 76 4591	IRRIGATION		IRRIGATED AGRICULTURE--NONPOINT AND POINT SOURCE WATER POLLUTION KEYWORDS FEEDLOT-RUNO
200 75 4605	IRRIGATION		AN ECONOMIC COMPARISON OF FIVE WASTE MANAGEMENT SYSTEMS FOR SWINE FINISHING OPERATIONS
200 75 4620	IRRIGATION		FEEDLOT RUNOFF CONTROL SYSTEMS FOR COLD CLIMATES KEYWORDS' FEEDLOT-RUNOFF AGRICULTURAL-
100 76 4624	IRRIGATION		EFFECT OF CROP ROTATION, FARM YARD MANURE AND THE QUANTITY OF SALINE IRRIGATION WATER
400 77 4076	IRRIGATION-SYSTEMS		IRRIGATION ONE WAY TO HANDLE LAGOON WASTES KEYWORDS' IRRIGATION-SYSTEMS LIQUID-WASTES
100 74 4376	ISRAEL		USE OF FLUID COWSHED MANURE IN FISH PONDS KEYWORDS' ISRAEL REFEEDING FISH PONDS CATTLE-
100 75 4592	KAOLINITE		ADSORPTION OF POULTRY LITTER EXTRACTS BY SOIL AND CLAY KEYWORDS' POULTRY-LITTER-EXTRACT
100 77 4291	KETONES		COLLECTION AND ANALYSIS OF ORGANIC GASES FROM NATURAL ECOSYSTEMS- APPLICATION TO POULTR
100 74 4015	KRAFT-PULPING-WAST		LAGOONS AND OXIDATION PONDS KEYWORDS' LAGOONS LIVESTOCK-WASTES DAIRY-WASTES KRAFT-PULPI
400 77 4307	LABELING		AAFCO TASKFORCE WORKS ON ANIMAL WASTE REGULATIONS KEYWORDS' REFEEDING LEGAL-ASPECTS ANT
500 76 4078	LABOR		SYSTEMS ANALYSIS OF ANIMAL WASTE HANDLING ALTERNATIVES KEYWORDS' COMPUTER-MODELS WASTE-
200 76 4186	LABOR		A LOW COST SETTLING BASIN AND INFILTRATION CHANNEL FOR CONTROLLING RUNOFF FROM AN OPEN
300 77 4341	LABOR		LONG TERM MANURE STORAGE KEYWORDS WASTE-STORAGE FERTILIZERS LAND-APPLICATION TIME LABO
400 77 4428	LABOR		ENGINEER EXPLAINS NEW WASTE RUNOFF SYSTEM KEYWORDS' FEEDLOT-RUNOFF WATER-POLLUTION-CONT
400 77 4498	LABOR		NITROGEN LOSS IN SWINE WASTE APPLICATION STUDIED KEYWORDS LAND-APPLICATION NITROGEN-LO
700 76 4545	LABOR		EVALUATION OF A FLUSHING-GUTTER MANURE-REMOVAL SYSTEM TO IMPROVE ATMOSPHERIC QUALITY IN
700 72 4635	LACTIC-ACIDS		BIOCHEMICAL AND NUTRITIONAL STUDIES ON FERMENTED- AMMONIATED ANIMAL FEED SUPPLEMENTS KE
300 76 4355	LACTIC-ACID		EVALUATION OF ENSILING SWINE FECAL WASTE WITH GROUND ORCHARDGRASS HAY, PRELIMINARY REPO
100 75 4137	LACTOBACILLI		CHANGES IN MICROBIAL POPULATION DURING FERMENTATION OF FEEDLOT WASTE WITH CORN KEYWORDS
300 76 4003	LAGOONS		DESIGN CRITERIA FOR SWINE WASTE TREATMENT SYSTEMS KEYWORDS' DESIGN LAGOONS SWINE-WASTES
100 72 4008	LAGOONS		SOME POSSIBILITIES AND ASPECTS OF THE CHEMICAL AND BIOLOGICAL TREATMENT OF LIQUID MANUR
100 72 4009	LAGOONS		CONTRIBUTION TO THE TREATMENT OF LIQUID MANURE IN NATURAL- BIOLOGICAL LAGOON SYSTEMS K
100 74 4015	LAGOONS		LAGOONS AND OXIDATION PONDS KEYWORDS' LAGOONS LIVESTOCK-WASTES DAIRY-WASTES KRAFT-PULPI
400 72 4025	LAGOONS		ENGINEER SOUNDS WARNING ON USE OF LAGOON WASTE ON FIELD CROPS KEYWORDS' LAND-APPLICATIO
400 77 4031	LAGOONS		FEEDERS RECYCLING PLAN SAVES FIVE BUSHELS OF CORN PER EACH STEER FED KEYWORDS' RECYCLI
100 76 4049	LAGOONS		ACCUMULATION OF NUTRIENTS IN SOIL BENEATH HOG MANURE LAGOONS KEYWORDS' LAGOONS SWINE-WA
400 76 4055	LAGOONS		HOGMEN SIZE UP OXIDATION SYSTEMS KEYWORDS' LIQUID-WASTES SWINE-WASTES OXIDATION RACETRA
100 76 4074	LAGOONS		INFILTRATION CHARACTERISTICS FROM ANAEROBIC LAGOONS KEYWORDS' ANAEROBIC LAGOONS INFILTR
400 77 4076	LAGOONS		IRRIGATION ONE WAY TO HANDLE LAGOON WASTES KEYWORDS' IRRIGATION-SYSTEMS LIQUID-WASTES
500 77 4090	LAGOONS		SALT ACCUMULATION IN SOIL AS A FACTOR FOR DETERMINING APPLICATION RATES OF BEEF-FEEDLOT
300 74 4106	LAGOONS		HANDLING AND DISPOSING OF POULTRY MANURE KEYWORDS POULTRY-WASTES WASTE-MANAGEMENT SOLI
300 76 4109	LAGOONS		EVALUATING A LOW-ENERGY, HIGH-VALUE PUMP FOR ODOR REDUCTION FROM LIVESTOCK WASTE LAGOON
400 76 4116	LAGOONS		FLUSHING GUTTERS FOR HOG BUILDINGS KEYWORDS' SWINE-WASTES FLUSHING LAGOONS DESIGN
400 76 4132	LAGOONS		HOGS TO GET FLUSH TOILETS KEYWORDS. SWINE-WASTES WASTE-MANAGEMENT FLUSHING SETTLING-TAN
300 77 4134	LAGOONS		COSTS OF DAIRY WASTE DISPOSAL ON TENNESSEE EXPERIMENT STATION FARMS KEYWORDS DAIRY-WAS
100 75 4135	LAGOONS		INSECT GROWTH REGULATORS DEVELOPMENT OF HOUSE FLIES IN FECES OF BOVINES FED TH 6040 IN
400 77 4151	LAGOONS		POULTRY WASTE GOES DOWN THE DRAIN KEYWORDS. POULTRY-WASTES LAGOONS FLUSHING FLY-CONTROL
300 73 4188	LAGOONS		ECONOMICS OF DAIRY WASTE DISPOSAL SYSTEM FOR ALABAMA KEYWORDS. DAIRY-WASTES LIQUID-WAST
400 77 4195	LAGOONS		MISSOURIANS VIEW IDEAS ON GUTTER, LAGOON, AND FREESTALLS KEYWORDS' DAIRY-WASTES FREE-ST
300 76 4207	LAGOONS		STATE-OF-THE-ART SWINE WASTE PRODUCTION AND PRETREATMENT PROCESSES KEYWORDS' SWINE-WAS
400 72 4240	LAGOONS		MANURE SYSTEMS PLANNING DATA KEYWORDS. WASTE-STORAGE LAGOONS HOLDING-PONDS SETTLING-BAS
200 76 4261	LAGOONS		OVERLAND FLOW TREATMENT OF SWINE LAGOON EFFLUENT KEYWORDS' OVERLAND-FLOW-TREATMENT SWIN
300 73 4265	LAGOONS		DESIGN OF ANIMAL WASTE DISPOSAL SYSTEMS KEYWORDS. ENGINEERING-STANDARDS LEGAL-ASPECTS D
200 77 4275	LAGOONS		FARMERS AS CLIENTS KEYWORDS' DESIGN WASTE-MANAGEMENT SETTLING-BASINS LAGOONS
200 77 4282	LAGOONS		TYPES OF WASTE MANAGEMENT SYSTEMS ON ILLINOIS FARMS KEYWORDS' WASTE-STORAGE WASTE-TREAT
200 77 4284	LAGOONS		THE FARMER'S VIEWPOINT, PART II - SWINE WASTE MANAGEMENT KEYWORDS' WASTE-MANAGEMENT SWI
200 71 4324	LAGOONS		DESIGN PROCEDURES FOR ANIMAL WASTE TREATMENT LAGOONS KEYWORDS' DAIRY-WASTES DESIGN LAGO
100 77 4349	LAGOONS		LAGOON PRETREATMENT- SWINE WASTE LOADING RATE AND RESPONSE TO LOADING RATE CHANGE-LABO
200 76 4360	LAGOONS		LAND USE OF ANIMAL WASTES KEYWORDS' LAND-APPLICATION ANIMAL-WASTES NITROGEN WASTE-COMPO
100 77 4362	LAGOONS		EFFECT OF ARSANILIC ACID LEVEL IN SWINE DIETS AND WASTE LOADING RATE ON MODEL ANAEROBIC
200 70 4384	LAGOONS		STATE OF THE ART - ANAEROBIC LAGOONS KEYWORDS' LAGOONS WASTE-TREATMENT ANAEROBIC DESIGN
200 73 4397	LAGOONS		TREATMENT SYSTEMS FOR ANIMAL, AGRICULTURAL AND MUNICIPAL WASTES KEYWORDS' BIOLOGICAL-TR
700 73 4414	LAGOONS		BACTERIOLOGICAL STUDIES OF CONFINEMENT ANIMAL WASTE AND SURVIVAL STUDIES OF INDICATOR B
400 77 4437	LAGOONS		HIS HOGS DON T STINK KEYWORDS' CONFINEMENT-PENS LEGAL-ASPECTS IOWA-LAW ODOR-CONTROL SWI
400 77 4499	LAGOONS		LAGOONS & GATORS KEYWORDS' LAGOONS ALLIGATORS WASTE-TREATMENT AERATION
400 73 4507	LAGOONS		KEEP YOUR SLURRY SMELLING SWEET KEYWORDS' DAIRY-WASTES WASTE-TREATMENT WASTE-STORAGE OD
300 77 4510	LAGOONS		POLLUTANT MOVEMENT TO SHALLOW GROUND WATER TABLES FROM SWINE WASTE LAGOONS KEYWORDS' SW
400 77 4538	LAGOONS		FOR THIS HOG FARMER NEW PORK PRODUCTION UNIT ELIMINATES WASTE DISPOSAL KEYWORDS' SWINE-
700 76 4543	LAGOONS		GROUNDWATER LEVELS AS AFFECTED BY SWINE WASTE LAGOONS IN HIGH WATER TABLE SOILS KEYWORD
700 76 4545	LAGOONS		EVALUATION OF A FLUSHING-GUTTER MANURE-REMOVAL SYSTEM TO IMPROVE ATMOSPHERIC QUALITY IN
400 77 4554	LAGOONS		LEGAL POINTERS TO HELP KEEP YOUR LIVESTOCK SMELLING LIKE ROSES KEYWORDS' FEEDLOTS ODOR
400 71 4557	LAGOONS		WHAT TO DO WITH ANIMAL WASTES RECYCLING KEYWORDS' WASTE-DISPOSAL WATER-POLLUTION ODOR A
200 75 4605	LAGOONS		AN ECONOMIC COMPARISON OF FIVE WASTE MANAGEMENT SYSTEMS FOR SWINE FINISHING OPERATIONS
200 76 4617	LAGOONS		STUDIES ON A MIXING DISTRIBUTION SYSTEM FOR SWINE MANURE LAGOONS KEYWORDS' SWINE-WASTES
100 74 4647	LAGOONS		GROWTH OF ALGAE ON PIG MANURE KEYWORDS' SWINE-WASTES LAGOONS ALGAE WASTE-DISPOSAL WASTE
400 77 4382	LAGOON		RESEARCHERS STUDY ALGAE PRODUCTION FROM HOG WASTE KEYWORDS RECYCLING WASTEWATER-RENOVA
100 77 4362	LAGOON-PERFORMANCE		EFFECT OF ARSANILIC ACID LEVEL IN SWINE DIETS AND WASTE LOADING RATE ON MODEL ANAEROBIC
300 75 4130	LAKES		FEEDLOTS AND RECREATION LAKES AN EXAMPLE OF HOW THEY CAN BE GOOD NEIGHBORS KEYWORDS. F
300 77 4462	LAND-APPLICATIONS		THE SELECTION AND MANAGEMENT OF FEEDLOT SITES AND LAND DISPOSAL OF ANIMAL WASTE IN BOIS
300 76 4001	LAND-APPLICATION		DESIGN PARAMETERS FOR ANIMAL WASTE TREATMENT SYSTEMS - NITROGEN CONTROL KEYWORDS DESIG
300 76 4003	LAND-APPLICATION		DESIGN CRITERIA FOR SWINE WASTE TREATMENT SYSTEMS KEYWORDS' DESIGN LAGOONS SWINE-WASTES
100 72 4007	LAND-APPLICATION		WATER MANAGEMENT ASPECTS OF THE AGRICULTURAL UTILIZATION OF LIQUID MANURE AND PRELIMINA

100 72 4011 LAND-APPLICATION EXPERIENCES WITH THE COMBINED LIQUID MANURE-CLEAR WATER IRRIGATION KEYWORDS: LIQUID-WAS
100 72 4012 LAND-APPLICATION WATER MANAGEMENT PROBLEMS INVOLVED IN THE TREATMENT AND UTILIZATION OF LIQUID MANURE KE
300 76 4016 LAND-APPLICATION DAIRY MANURE CAN BE USED SAFELY KEYWORDS: DAIRY-WASTES WASTE-MANAGEMENT WASTE-STORAGE W
100 76 4024 LAND-APPLICATION THE EFFECTS OF MANURE APPLICATIONS ON RUNOFF, EROSION AND NITRATE LOSSES KEYWORDS: LAND
400 72 4025 LAND-APPLICATION ENGINEER SOUNDS WARNING ON USE OF LAGOON WASTE ON FIELD CROPS KEYWORDS: LAND-APPLICATIO
100 74 4032 LAND-APPLICATION CHANGES IN THE RHIZOSPHERE EFFECT OF MILLET ASSOCIATED WITH SPRINKLER IRRIGATION WITH A
300 75 4037 LAND-APPLICATION LAND AVAILABILITY, CROP PRODUCTION, AND FERTILIZER REQUIREMENTS IN THE UNITED STATES KE
400 77 4040 LAND-APPLICATION BACK TO BASICS--175-BUSHEL CORN FROM LEGUMES AND WASTES KEYWORDS: LAND-APPLICATION SWIN
100 77 4042 LAND-APPLICATION HOG MANURE WORTH $3.50 PER TON AS FERTILIZER KEYWORDS: LIQUID-WASTES SWINE-WASTES LAND-
400 75 4043 LAND-APPLICATION ANIMAL WASTES MANAGEMENT KEYWORDS: LIVESTOCK-WASTES WASTE-MANAGEMENT WATER-POLLUTION LE
100 76 4044 LAND-APPLICATION ARSENIC CONTENT OF CORN GRAIN ON A COASTAL PLAIN SOIL AMENDED WIH POULTRY MANURE KEYWOR
100 76 4045 LAND-APPLICATION NUTRIENT CONCENTRATION OF CORN AS EFFECTED BY POULTRY MANURE KEYWORDS: POULTRY-WASTES L
100 76 4046 LAND-APPLICATION EFFECT OF POULTRY MANURE ADDITIONS ON THE EXTRACTABILITY OF AN ADDED METAL KEYWORDS: PO
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400	77	4520	LITTERS	PROFITS FROM MANURE-WORKERS LIST TREATMENTS, APPLICATION KEYWORDS: POULTRY-WASTES LAND-
500	77	4080	LIVESTOCK	ECONOMIC AND REGULATORY ASPECTS OF LAND APPLICATION OF WASTES TO AGRICULTURAL LANDS PRO
300	74	4152	LIVESTOCK	ODORS FROM CONFINED LIVESTOCK PRODUCTION KEYWORDS: ODOR-CONTROL LIVESTOCK LEGAL-ASPECTS
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100	74	4015	LIVESTOCK-WASTES	LAGOONS AND OXIDATION PONDS KEYWORDS: LAGOONS LIVESTOCK-WASTES DAIRY-WASTES KRAFT-PULPI
400	77	4021	LIVESTOCK-WASTES	ENERGY POTENTIAL FROM WASTE SMALL KEYWORDS: ENERGY FEEDLOTS LIVESTOCK-WASTES RECYCLING
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300	76	4176	LIVESTOCK-WASTES	PRODUCTION AND TRANSPORT OF GASEOUS NH3 AND H2S ASSOCIATED WITH LIVESTOCK PRODUCTION K
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400	70 4567	METHANE	HOW TO GENERATE POWER FROM GARBAGE KEYWORDS: METHANE ANAEROBIC DIGESTERS LIVESTOCK-WAST
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500	74 4596	METHANE	BIO-GAS PLANT GENERATING METHANE FROM ORGANIC WASTES KEYWORDS: METHANE BIOGAS-PLANTS AN
400	77 4610	METHANE	THERMONETICS--THE GUYMON PROJECT KEYWORDS: RECYCLING CATTLE-WASTES METHANE FERTILIZERS
400	77 4611	METHANE	METHANE GAS MADE FROM CONFINEMENT UNIT WASTE KEYWORDS: SWINE-WASTES SLURRIES WASTE-TREA
500	73 4623	METHANE	A HOMESITE POWER UNIT--METHANE GENERATOR KEYWORDS: ANAEROBIC DIGESTER SLURRIES WASTE-TR
100	75 4637	METHANE	ALGAL GROWTH IN DILUTED PIG WASTE KEYWORDS: SWINE-WASTES BY-PRODUCT-RECOVERY ALGAE METH
300	77 4655	METHANE	NOTES ON ANAEROBIC DIGESTION AND ANAEROBIC DIGESTERS BASED ON EXPERIMENTAL PLANT IN ABE
100	75 4662	METHANE	THE WASTE PRODUCTS OF AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES LIVESTOCK-WASTES STRAW
400	77 4665	METHANE	METHANE FROM CATTLE MANURE TO REPLACE FUEL OIL KEYWORDS: CATTLE-WASTES FERMENTATION REC
400	74 4110	METHANE-GENERATOR	NATURAL GAS FROM THE BARNYARD, OR JUST MOVE BOSSY OVER AND HOOK IT UP KEYWORDS: RECYCL
400	71 4565	METHANE-POWERED-MO	THE MARVELOUS CHICKEN-POWERED MOTORCAR KEYWORDS: RECYCLING ANIMAL-WASTES METHANE METHAN
400	71 4569	METHANE-POWERED-MO	POWER-HAROLD BATE AND HIS MARVELOUS CHICKEN-POWERED CAR KEYWORDS: POULTRY-WASTES RECYCL
100	77 4424	METHEMOGLOBINEMIA	ANALYZING NITRATES IN WELL WATER KEYWORDS NITRATES GROUNDWATER BARNYARDS FEEDLOTS METH
400	77 4204	METHOPRENE	FEED-THROUGH LARVICIDE KILLS MAGGOTS IN MANURE KEYWORDS: FEED-ADDITIVES FLY-CONTROL LAR
200	77 4062	METHYLBROMIDE-FUMI	PATHOGEN TRANSMISSION POTENTIAL FROM ANIMAL WASTE REFEEDING KEYWORDS: REFEEDING PATHOGE
700	76 4541	MICROBIAL-ASSIMILA	NITROGEN REMOVAL AND TRANSFORMATIONS IN THE OVERLAND FLOW TREATMENT OF POULTRY WASTES K
100	75 4645	MICROBIAL-POLLUTIO	WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS: WATER-POLLUTION NONPOINT-SOURCES PUBLIC
100	75 4577	MICROFLORA	MICROFLORA OF NEWLY CUT GRASS AFTER ADDITION OF LIQUID MANURE KEYWORDS: LIQUID-WASTES A
100	77 4579	MICROFLORA	THE EFFECT OF THE MICROFLORA IN CATTLE SLURRY ON THE SURVIVAL OF SALMONELLA DUBLIN KEYW
100	74 4562	MICROFUNGI	CONVERSION OF ORGANIC WASTE INTO PROTEIN KEYWORDS: BIOLOGICAL-TREATMENT ORGANIC-WASTES
100	76 4398	MICROMYCETES	ANNUAL DYNAMICS OF CHANGES IN CHARACTERISTIC PROPERTIES OF CATTLE LIQUID MANURE FROM L
200	76 4359	MICRONUTRIENTS	CONSIDERATION OF SOILS FOR ACCEPTING PLANT NUTRIENTS AND POTENTIALLY TOXIC NONESSENTIAL
100	77 4048	*MICROORGANISMS*	*MICROBIAL POPULATION CHANGES AND FERMENTATION CHARACTERISTICS OF ENSILED BOVINE MANURE-*
500	77 4085	MICROORGANISMS	PATHOGEN SURVIVAL IN SOILS RECEIVING WASTE KEYWORDS: LAND-DISPOSAL MICROORGANISMS PATHO
100	77 4161	MICROORGANISMS	ISOLATION AND IDENTIFICATION OF FECAL BACTERIA FROM ADULT SWINE KEYWORDS: SWINE-WASTES
100	74 4254	MICROORGANISMS	EFFECT OF DRYING TEMPERATURE AND LENGTH OF DRYING TIME ON SURVIVAL OF MICROORGANISMS IN
100	74 4344	MICROORGANISMS	ANIMAL WASTES AS SUBSTRATES FOR PROTEIN PRODUCTION KEYWORDS: ANIMAL-WASTES SUBSTRATES P
200	76 4358	MICROORGANISMS	CONSIDERATION OF SOILS FOR ACCEPTING WASTES KEYWORDS: LAND-APPLICATION SOIL-PROPERTIES
100	76 4375	MICROORGANISMS	THE DEVELOPMENT IN BEEF CATTLE MANURE OF PETRIELLIDIUM BOYDII SHEAR MALLOCH, A POTENTIA
100	76 4398	MICROORGANISMS	ANNUAL DYNAMICS OF CHANGES IN CHARACTERISTIC PROPERTIES OF CATTLE LIQUID MANURE FROM L
200	77 4422	MICROORGANISMS	MICROFLORA OF ENSILED MANURE-BLENDED FEED, CORN AND SORGHUM SILAGES KEYWORDS: ENSILING
300	77 4659	MICROORGANISMS	AEROBIC TREATMENT IN RELATION TO LAND APPLICATION OF SLURRY KEYWORDS: AEROBIC-TREATMENT
100	72 4356	MILK-CONTENT	ENCAPSULATED RABON FOR LARVAL HOUSE FLY CONTROL IN COW MANURE KEYWORDS: FLY-CONTROL FEE
100	76 4098	MILK-PRODUCTION	COMPLETE RATIONS FOR DAIRY CATTLE VII DRIED POULTRY WASTE FOR LACTATING COWS KEYWORDS
200	77 4354	MILK-PRODUCTION	FEED FED, MILK PRODUCED, AND EXPECTED EXCRETA SOLIDS OF DAIRY COWS KEYWORDS: DAIRY-CATT
100	72 4356	MILK-PRODUCTION	ENCAPSULATED RABON FOR LARVAL HOUSE FLY CONTROL IN COW MANURE KEYWORDS: FLY-CONTROL FEE
400	77 4410	MILK-PRODUCTION	POULTRY WASTE--NITROGEN FOR LACTATING DAIRY COWS KEYWORDS: REFEEDING POULTRY-WASTES-DRI
100	77 4210	MILK-QUALITY	INFLUENCE OF FEEDING DEHYDRATED POULTRY WASTE ON COMPOSITION AND ORGANOLEPTIC QUALITY O
100	76 4288	MILK-QUALITY	FEEDING TH 6040 TO CATTLE RESIDUES IN TISSUES AND MILK AND BREAKDOWN IN MANURE KEYWORD
100	77 4290	MILK-QUALITY	LONG-TERM STUDIES OF RESIDUE RETENTION AND EXCRETION BY COWS FED A POLYCHLORINATED BIPH
200	72 4400	MILK-QUALITY	RECYCLING ANIMAL WASTES KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CRUDE-PROTEINS PERFORM
100	76 4246	MINERALIZATION	EFFECT OF SIMAZINE AND ATRAZINE ON THE FERMENTATION OF FERTILIZER AND MANURE NITROGEN K
200	73 4250	MINERALIZATION	SOME FACTORS TO CONSIDER IN USING ANIMAL MANURES FOR FERTILIZER KEYWORDS: POULTRY-WASTE
300	73 4332	MINERALIZATION	USING ORGANIC WASTES AS NITROGEN FERTILIZERS KEYWORDS: ORGANIC-WASTES LAND-APPLICATION
200	73 4533	MINERALS	OBSERVATIONS CONCERNING THE USE OF CATTLE MANURES IN DRYLOT FEEDING KEYWORDS. REFEEDING
300	75 4593	MINERALS	*TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 1 KEYWORDS: WASTE-TREATMENT*
300	76 4594	MINERALS	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 2 KEYWORDS: SWINE-WASTES WAS
100	76 4351	MINERAL-BLOCKS	INHIBITION OF LARVAL HORN FLY DEVELOPMENT IN THE MANURE OF BOVINES FED DIMILIN R MINER
100	75 4645	MINING	WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS: WATER-POLLUTION NONPOINT-SOURCES PUBLIC
100	77 4364	MINK-WASTES	THE CHARACTERISTICS AND MANAGEMENT OF MINK WASTES KEYWORDS: MINK-WASTES WASTE-COMPOSITI
300	76 4176	MINT-OIL	PRODUCTION AND TRANSPORT OF GASEOUS NH3 AND H2S ASSOCIATED WITH LIVESTOCK PRODUCTION K
300	76 4109	MIXING	EVALUATING A LOW-ENERGY, HIGH-VALUE PUMP FOR ODOR REDUCTION FROM LIVESTOCK WASTE LAGOON
200	70 4384	MIXING	STATE OF THE ART - ANAEROBIC LAGOONS KEYWORDS: LAGOONS WASTE-TREATMENT ANAEROBIC DESIGN
100	75 4607	MIXING	FLY PROTEIN PRODUCTION FROM MECHANICALLY MIXED ANIMAL WASTES KEYWORDS: RECYCLING POULTR
300	77 4655	MIXING	NOTES ON ANAEROBIC DIGESTION AND ANAEROBIC DIGESTERS BASED ON EXPERIMENTAL PLANT IN ABE
100	76 4000	MODEL-STUDIES	THE ROLE OF SYSTEMS ANALYSIS IN THE USE OF AGRICULTURAL WASTES KEYWORDS: SYSTEMS-ANALYS
300	76 4003	MODEL-STUDIES	*DESIGN CRITERIA FOR SWINE WASTE TREATMENT SYSTEMS KEYWORDS: DESIGN LAGOONS SWINE-WASTES*
100	76 4017	MODEL-STUDIES	PERFORMANCE OF FEEDLOT RUNOFF CONTROL SYSTEMS IN NORTHERN CLIMATES KEYWORDS: MATHEMATIC
500	77 4092	MODEL-STUDIES	CONTINUOUS WATERSHED MODELING OF WASTEWATER STORAGE AND LAND APPLICATION TO IMPROVE DES
100	75 4095	MODEL-STUDIES	A SYSTEM OF OPTIMIZING THE USE OF ANIMAL MANURES ON A GRASSLAND FARM KEYWORDS: MATHEMAT
400	76 4096	MODEL-STUDIES	EPA WILL USE KSU MODEL AS WASTE CONTROL SYSTEMS TOOL KEYWORDS: WATER-QUALITY-INDEX COMP
200	76 4182	MODEL-STUDIES	RESOURCE ADEQUACY IN LIMITING NONPOINT POLLUTION KEYWORDS: NONPOINT-POLLUTION WATER-POL
500	75 4196	MODEL-STUDIES	NITROGEN AND PHOSPHORUS FOOD PRODUCTION, WASTE AND THE ENVIRONMENT KEYWORDS: WATER-POL
500	75 4199	MODEL-STUDIES	ECONOMIC ANALYSIS OF REDUCING PHOSPHORUS LOSSES FROM AGRICULTURAL PRODUCTION KEYWORDS
100	77 4350	MODEL-STUDIES	DRYING CAGED LAYER WASTE KEYWORDS: MODEL-STUDIES POULTRY-WASTES DEEP-PITS VENTILATION M
100	77 4362	MODEL-STUDIES	EFFECT OF ARSANILIC ACID LEVEL IN SWINE DIETS AND WASTE LOADING RATE ON MODEL ANAEROBIC
100	75 4395	MODEL-STUDIES	A MODEL FOR RUNOFF OF PESTICIDES FROM SMALL UPLAND WATERSHEDS KEYWORDS: MODEL-STUDIES A
100	73 4396	MODEL-STUDIES	WINTER OPERATION OF AERATED LIQUID ANIMAL WASTE STORAGE SYSTEMS KEYWORDS: WASTE-STORAGE
100	74 4559	MODEL-STUDIES	A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND-- PART 1 KEYWORDS: ANIMAL-WASTE
200	76 4615	MODEL-STUDIES	ENGINEERING DESIGN OF LIQUID MANURE INJECTORS KEYWORDS: LIQUID-WASTES SOIL-INJECTORS EQ
100	73 4126	MOISTURE-CONTENT	EFFECTS OF BEEF HOUSING SYSTEMS ON MOISTURE REMOVED BY VENTILATION KEYWORDS: HOUSING CA
100	73 4131	MOISTURE-CONTENT	THE ROLES OF AMMONIA, WATER ACTIVITY, AND PH IN THE SALMONELLACIDAL EFFECT OF LONG-USED
300	77 4301	MOISTURE-CONTENT	NUTRITIVE VALUE OF ENSILED BROILER LITTER KEYWORDS: REFEEDING POULTRY-LITTER ENSILING M
100	77 4348	MOISTURE-CONTENT	AVAILABLE AMINO ACID CONTENT AND MICROBIOLOGICAL CONDITION OF DRIED POULTRY MANURE KEY

100	77	4350	MOISTURE-CONTENT	DRYING CAGED LAYER WASTE KEYWORDS: MODEL-STUDIES POULTRY-WASTES DEEP-PITS VENTILATION M
100	77	4369	MOISTURE-CONTENT	DECOMPOSITION AND NITROGEN LOSS OF DAIRY WASTES DEPOSITED ON SIMULATED ANIMAL CONFINEME
100	77	4372	MOISTURE-CONTENT	A NEW CONCEPT OF LITTER MANAGEMENT FOR BROILER PRODUCTION KEYWORDS: POULTRY POULTRY-LIT
400	77	4380	MOISTURE-CONTENT	WINTERING BROOD COWS MAKE BEST USE OF POULTRY LITTER- RESEARCHER KEYWORDS: REFEEDING PO
400	77	4406	MOISTURE-CONTENT	CONTROLLING FLIES WITH IN-HOUSE MANURE STORAGE KEYWORDS: FLY-CONTROL POULTRY-WASTES WAS
400	77	4411	MOISTURE-CONTENT	WAYS TO SPEED UP DRYING OF MANURE IN PITS KEYWORDS: POULTRY-WASTES DEHYDRATION VENTILAT
300	77	4430	MOISTURE-CONTENT	LABORATORY SIZE COMPOSTING UNIT FOR AGRICULTURAL WASTE MATERIALS KEYWORDS: COMPOSTING E
300	77	4449	MOISTURE-CONTENT	A RAPID METHOD OF MEASURING MOISTURE IN LITTER USED FOR BROILERS BROODED AT HIGH DENSIT
700	73	4467	MOISTURE-CONTENT	EFFECT OF DRYING ON THE LOSSES OF NITROGEN AND TOTAL SOLIDS FROM POULTRY MANURE KEYWORD
400	77	4519	MOISTURE-CONTENT	METHANE GAS ENERGY POSSIBLE FROM MANURE KEYWORDS: RECYCLING LIVESTOCK-WASTES WASTE-TREA
400	77	4525	MOISTURE-CONTENT	MANURE MAKES CENTS KEYWORDS: LAND-APPLICATION ANHYDROUS-AMMONIA FEEDLOT-WASTES CROP-RES
400	77	4587	MOISTURE-CONTENT	COMPOSTING CONVERTS WASTE INTO VALUABLE RESOURCES KEYWORDS: COMPOSTING FEEDLOT-WASTES P
100	75	4589	MOISTURE-CONTENT	PROPERTIES OF MANURE ACCUMULATIONS FROM MIDWEST BEEF CATTLE FEEDLOTS KEYWORDS: FEEDLOTS
100	75	4607	MOISTURE-CONTENT	FLY PROTEIN PRODUCTION FROM MECHANICALLY MIXED ANIMAL WASTES KEYWORDS: RECYCLING POULTR
400	77	4056	MOLDS	BUILT-UP LITTER SAVES US TIME AND MONEY KEYWORDS ECONOMICS TURKEYS MANAGEMENT DISEASE
400	76	4166	MOLDS	RECYCLING OF LITTER FOR TURKEY BROODING SAFE KEYWORDS: POULTRY-LITTER TURKEYS RECYCLING
500	77	4081	MUNICIPAL-WASTES	THE ADMISSIBLE RATE OF WASTE RESIDUE APPLICATION ON LAND WITH REGARD TO HIGH EFFICIE
300	72	4339	MUNICIPAL-WASTES	WASTEWATER RESEARCH EXPANDS KEYWORDS: MUNICIPAL-WASTES SEWAGE LAND-APPLICATION FORAGES
300	72	4353	MUNICIPAL-WASTES	DISPOSING OF OUR WASTES--SOIL CAN FILTER, CROPS RECYCLE NUTRIENTS KEYWORDS: LIVESTOCK-W
200	70	4384	MUNICIPAL-WASTES	STATE OF THE ART - ANAEROBIC LAGOONS KEYWORDS: LAGOONS WASTE-TREATMENT ANAEROBIC DESIGN
200	73	4397	MUNICIPAL-WASTES	TREATMENT SYSTEMS FOR ANIMAL, AGRICULTURAL AND MUNICIPAL WASTES KEYWORDS: BIOLOGICAL-TR
100	75	4451	MUNICIPAL-WASTES	THE NEEDS FOR WATER QUALITY MODELS ON AGRICULTURAL WATERSHEDS KEYWORDS: WATER-POLLUTION
100	77	4417	MUSCAMONE	AN EVALUATION OF FIELD STUDIES ON CONTROLLING THE HOUSE FLY, MUSCA DOMESTICA KEYWORDS
100	74	4661	MUSHROOM-PRODUCTIO	DEVELOPMENT OF A SYNTHETIC COMPOST FOR MUSHROOM GROWING BASED ON WHEAT STRAW AND CHICKE
100	76	4523	MYCOBACTERIA	THE OCCURRENCE OF SALMONELLAS, MYCOBACTERIA AND PATHOGENIC STRAINS OF ESCHERICHIA COLI
100	76	4375	MYCOFLORA	THE DEVELOPMENT IN BEEF CATTLE MANURE OF PETRIELLIDIUM BOYDII SHEAR MALLOCH, A POTENTIA
100	75	4652	NAPHTHALENE	SUCCESSIONS OF MICROORGANISMS AND INVERTEBRATA AND THEIR CONNECTIONS WITH BIOCHEMICAL P
300	75	4474	NEW-YORK-LAW	ENVIRONMENTAL AND ECONOMIC IMPACT OF NUTRIENT MANAGEMENT ON THE NEW YORK DAIRY FARM KEY
100	72	4007	NITRATES	WATER MANAGEMENT ASPECTS OF THE AGRICULTURAL UTILIZATION OF LIQUID MANURE AND PRELIMINA
100	76	4024	NITRATES	THE EFFECTS OF MANURE APPLICATIONS ON RUNOFF, EROSION AND NITRATE LOSSES KEYWORDS: LAND
200	75	4026	NITRATES	RECYCLED EXCRETA AS A NUTRIENT SOURCE FOR SWINE KEYWORDS: OXIDATION-DITCH REFEEDING SWI
500	77	4088	NITRATES	OVERLAND RECYCLING OF ANIMAL WASTE KEYWORDS: WASTE-TREATMENT OVERLAND-SPRAY-IRRIGATION
400	72	4157	NITRATES	KANSAN APPLIES FEEDLOT RUN-OFF TO CORN FIELDS KEYWORDS: FEEDLOT-RUNOFF LAND-APPLICATION
100	73	4168	NITRATES	ORGANIC MANAGEMENT REDUCES LEACHING OF NITRATE KEYWORDS: LAND-APPLICATION LEACHING NITR
700	72	4189	NITRATES	NITRATE LEACHING FROM ANIMAL WASTE APPLICATIONS KEYWORDS: GROUNDWATER-POLLUTION LEACHIN
300	74	4217	NITRATES	SOIL POLLUTION FROM FEEDLOTS IN GEORGIA KEYWORDS. GROUNDWATER-POLLUTION SOIL-CONTAMINAT
200	75	4225	NITRATES	RECYCLING SWINE WASTE KEYWORDS' SWINE-WASTES OXIDATION-DITCH AEROBIC-TREATMENT ANAEROBI
100	73	4361	NITRATES	CHANGES IN SEEPAGE RATE FROM AN UNLINED CATTLE WASTE DIGESTION POND KEYWORDS: CATTLE-WA
100	77	4381	NITRATES	SALT REMOVAL EFFICIENCIES ON LAND DISPOSAL OF SWINE WASTE KEYWORDS: LAND-DISPOSAL SWINE
300	73	4392	NITRATES	NITRATES IN THE UPPER SANTA ANA RIVER BASIN IN RELATION TO GROUNDWATER POLLUTION KEYWOR
100	77	4424	NITRATES	ANALYZING NITRATES IN WELL WATER KEYWORDS NITRATES GROUNDWATER BARNYARDS FEEDLOTS METH
100	76	4425	NITRATES	GROUND-WATER QUALITY VARIATION IN PHELPS COUNTY, MISSOURI KEYWORDS: GROUNDWATER-QUALITY
100	75	4450	NITRATES	NITRATE-NITROGEN REMOVAL FROM SOIL PROFILES BY ALFALFA KEYWORDS' NITRATES SOIL-PROFILES
700	76	4455	NITRATES	EFFECTS OF METHODS AND RATES OF DAIRY MANURE APPLICATION ON SOIL WATER NITRATE LEVELS K
100	76	4456	NITRATES	NITROGEN MOVEMENT NEAR SURFACE MANURE STORAGES KEYWORDS' WASTE-STORAGE MANURE-PIT WASTE
200	71	4457	NITRATES	AGRICULTURE'S ROLE IN ENVIRONMENTAL QUALITY KEYWORDS: AGRICULTURE FEEDLOTS WATER-POLLUT
100	75	4626	NITRATES	A SUMMARY OF THE BIOGEOCHEMISTRY OF NITROGEN COMPOUNDS IN GROUND WATER KEYWORDS: GROUND
100	76	4627	NITRATES	NITRATE POLLUTION OF GROUNDWATER FROM NITROGEN FERTILIZERS AND ANIMAL WASTES IN THE PU
200	75	4385	NITRIENT-LOSSES	WASTES--USE OR DISCARD KEYWORDS: AGRICULTURAL-WASTES LAND-APPLICATION NITRIENT-LOSSES N
200	71	4190	NITRIFICATION	NITROGEN INPUTS TO GROUNDWATER FROM LIVESTOCK WASTES KEYWORDS: GROUNDWATER-POLLUTION LI
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300	75	4593	NITRIFICATION	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 1 KEYWORDS' WASTE-TREATMENT
300	76	4594	NITRIFICATION	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 2 KEYWORDS SWINE-WASTES WAS
100	76	4656	NITRIFICATION	THREE-STEP TREATMENT FOR PIGGERY WASTES KEYWORDS: SWINE-WASTES AEROBIC-TREATMENT ANAERO
300	74	4217	NITRITES	SOIL POLLUTION FROM FEEDLOTS IN GEORGIA KEYWORDS: GROUNDWATER-POLLUTION SOIL-CONTAMINAT
300	76	4001	NITROGEN	DESIGN PARAMETERS FOR ANIMAL WASTE TREATMENT SYSTEMS - NITROGEN CONTROL KEYWORDS: DESIG
300	76	4003	NITROGEN	DESIGN CRITERIA FOR SWINE WASTE TREATMENT SYSTEMS KEYWORDS: DESIGN LAGOONS SWINE-WASTES
100	72	4006	NITROGEN	PROCESSING SOLID MANURE FROM LIVESTOCK-FARMING TO ORGANIC FERTILIZER FOR VEGETABLE GARD
100	72	4010	NITROGEN	POSSIBLE TREATMENT METHODS FOR LIQUID MANURE FOR THE MODIFICATION OF ITS PHYSICAL, CHEM
100	72	4012	NITROGEN	WATER MANAGEMENT PROBLEMS INVOLVED IN THE TREATMENT AND UTILIZATION OF LIQUID MANURE KE
300	76	4016	NITROGEN	DAIRY MANURE CAN BE USED SAFELY KEYWORDS: DAIRY-WASTES WASTE-MANAGEMENT WASTE-STORAGE W
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100	76	4020	NITROGEN	DEHYDRATED BROILER EXCRETA VERSUS SOYBEAN MEAL AS NITROGEN SUPPLEMENTS FOR SHEEP KEYWO
300	76	4028	NITROGEN	TERTIARY TREATMENT AND REUSE OF ANIMAL WASTES KEYWORDS DAIRY-WASTES LIQUID-WASTES BIOL
100	76	4049	NITROGEN	ACCUMULATION OF NUTRIENTS IN SOIL BENEATH HOG MANURE LAGOONS KEYWORDS: LAGOONS SWINE-WA
300	76	4067	NITROGEN	MANURE HARVESTING PRACTICES EFFECTS ON WASTE CHARACTERISTICS AND RUNOFF KEYWORDS FEED
400	77	4070	NITROGEN	POULTRY WASTE FED TO CATTLE, SHEEP KEYWORDS REFEEDING POULTRY-WASTES-DRIED WASTE-COMPO
200	76	4073	NITROGEN	IMPACT OF HATCHERY WASTEWATER IRRIGATION UPON CONTIGUOUS STREAM QUALITY KEYWORDS' HATCH
100	76	4074	NITROGEN	INFILTRATION CHARACTERISTICS FROM ANAEROBIC LAGOONS KEYWORDS: ANAEROBIC LAGOONS INFILTR
300	75	4077	NITROGEN	STATUS OF SEDIMENT FROM CATFISH PRODUCTION PONDS AS A FERTILIZER AND SOIL CONDITIONER K
500	76	4078	NITROGEN	SYSTEMS ANALYSIS OF ANIMAL WASTE HANDLING ALTERNATIVES KEYWORDS. COMPUTER-MODELS WASTE-
500	77	4079	NITROGEN	LAND AS A WASTE MANAGEMENT ALTERNATIVE KEYWORDS. WASTE-MANAGEMENT LAND-APPLICATION ANIM
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300	76	4099	NITROGEN	DESIGN PARAMETERS FOR THE LAND APPLICATION OF DAIRY MANURE KEYWORDS' DAIRY-WASTES LAND
300	72	4107	NITROGEN	MANURING OF PERMANENT MEADOWS 1962-70 KEYWORDS: LAND-APPLICATION GRASSLAND ANIMAL-WASTE
100	73	4136	NITROGEN	INFLUENCE OF FARMYARD MANURE AND NITROGEN FERTILIZERS ON SOWN PASTURES, SEED YIELD AND
400	77	4159	NITROGEN	INTEREST IN DPW APPEARS TO HAVE SUBSIDED KEYWORDS' POULTRY-WASTES-DRIED RECYCLING REFEE
400	77	4169	NITROGEN	HOW MUCH MANURE SHOULD WE PUT ON KEYWORDS. ANIMAL-WASTES LAND-APPLICATION CROP-RESPONSE
200	76	4172	NITROGEN	LAND DISPOSAL OF BLOOD AND PAUNCH MANURE KEYWORDS. LAND-DISPOSAL BLOOD PAUNCH-MANURE PA
400	71	4173	NITROGEN	A POLLUTION SOLUTION WITH BUILT-IN PROFITS KEYWORDS' DEHYDRATION POULTRY-WASTES-DRIED RE
200	76	4186	NITROGEN	A LOW COST SETTLING BASIN AND INFILTRATION CHANNEL FOR CONTROLLING RUNOFF FROM AN OPEN
300	75	4187	NITROGEN	FEEDING VALUE OF EXCRETA-STOVER SILAGE AND CORN RESIDUE FOR BEEF COWS KEYWORDS: REFEEDI
500	75	4196	NITROGEN	NITROGEN AND PHOSPHORUS FOOD PRODUCTION, WASTE AND THE ENVIRONMENT KEYWORDS: WATER-POL
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500	75	4198	NITROGEN	FLOWS OF NITROGEN AND PHOSPHORUS ON LAND KEYWORDS: NITROGEN PHOSPHORUS GROUNDWATER-POLL
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400	77	4212	NITROGEN	LIQUID MANURE CAN SERVE AS SOURCE OF NUTRIENTS KEYWORDS: CATTLE-WASTES LIQUID-WASTES LA
100	76	4218	NITROGEN	SOIL NITROGEN. IX. THE EFFECTS OF LEYS AND ORGANIC MANURES ON THE AVAILABLE-N IN CLAY AND
100	76	4236	NITROGEN	HEN EXCRETA COMPOSITION AND METABOLISM BY SHEEP KEYWORDS' POULTRY-WASTES-DRIED REFEEDIN
100	76	4246	NITROGEN	EFFECT OF SIMAZINE AND ATRAZINE ON THE FERMENTATION OF FERTILIZER AND MANURE NITROGEN K.
200	73	4250	NITROGEN	SOME FACTORS TO CONSIDER IN USING ANIMAL MANURES FOR FERTILIZER KEYWORDS' POULTRY-WASTE
300	74	4266	NITROGEN	RECYCLE SOLID ANIMAL WASTES KEYWORDS: ANIMAL-WASTES LAND-APPLICATION CROP-RESPONSE NITR
700	70	4268	NITROGEN	CATTLE MANURE. I. EFFECT ON CROPS AND SOILS. II RETENTION PROPERTIES FOR CU, MN, AND ZN
200	77	4274	NITROGEN	CROPPING PRACTICES ON ILLINOIS LIVESTOCK FARMS KEYWORDS: CROP-PRODUCTION FORAGES LAND-A
400	72	4303	NITROGEN	METHANE POWER' THE PLOWBOY INTERVIEW KEYWORDS: RECYCLING METHANE ORGANIC-WASTES DIGESTE
100	76	4306	NITROGEN	AN EVALUATION OF FARMYARD SLURRY ENRICHED WITH EITHER POULTRY MANURE OR INORGANIC N-P-K
400	76	4316	NITROGEN	WHAT'S MANURE WORTH AS A FERTILIZER KEYWORDS: LIVESTOCK-WASTES WASTE-PRODUCTION-RATE FE
400	77	4328	NITROGEN	DAIRY WASTE--FIELD APPLICATION STILL BEST KEYWORDS' DAIRY-WASTES STORAGE-SYSTEMS LIQUID
300	73	4332	NITROGEN	USING ORGANIC WASTES AS NITROGEN FERTILIZERS KEYWORDS' ORGANIC-WASTES LAND-APPLICATION

200	77	4337	NITROGEN	FEED INTAKE AND MANURE SOLIDS FROM LACTATING HOLSTEIN COWS KEYWORDS: FEED-INTAKE DAIRY
700	74	4345	NITROGEN	AN EVALUATION OF A FULL-SCALE IN-HOUSE OXIDATION DITCH FOR POULTRY WASTE KEYWORDS: POU
100	77	4348	NITROGEN	AVAILABLE AMINO ACID CONTENT AND MICROBIOLOGICAL CONDITION OF DRIED POULTRY MANURE KEY
200	76	4358	NITROGEN	CONSIDERATION OF SOILS FOR ACCEPTING WASTES KEYWORDS: LAND-APPLICATION SOIL-PROPERTIES
200	76	4360	NITROGEN	LAND USE OF ANIMAL WASTES KEYWORDS. LAND-APPLICATION ANIMAL-WASTES NITROGEN WASTE-COMPO
100	77	4364	NITROGEN	THE CHARACTERISTICS AND MANAGEMENT OF MINK WASTES KEYWORDS: MINK-WASTES WASTE-COMPOSITI
100	77	4369	NITROGEN	DECOMPOSITION AND NITROGEN LOSS OF DAIRY WASTES DEPOSITED ON SIMULATED ANIMAL CONFINEME
300	77	4379	NITROGEN	INFLUENCE OF RECYCLING BEEF CATTLE WASTE ON INDIGESTIBLE RESIDUE ACCUMULATION KEYWORDS
200	75	4385	NITROGEN	WASTES--USE OR DISCARD KEYWORDS: AGRICULTURAL-WASTES LAND-APPLICATION NITRIENT-LOSSES N
200	73	4397	NITROGEN	TREATMENT SYSTEMS FOR ANIMAL, AGRICULTURAL AND MUNICIPAL WASTES KEYWORDS: BIOLOGICAL-TR
200	75	4401	NITROGEN	CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH DENSITY CATFISH CULTURES K
400	77	4410	NITROGEN	POULTRY WASTE--NITROGEN FOR LACTATING DAIRY COWS KEYWORDS: REFEEDING POULTRY-WASTES-DRI
100	75	4420	NITROGEN	A STUDY ON THE RELATIVE EFFICIENCY OF ORGANIC MANURES AND THE EFFECT OF SALINITY ON ITS
300	77	4423	NITROGEN	NO FERTILIZER, SOIL TEST FERTILIZATION, AND HEAVY FERTILIZATION OF CORN--WHAT HAPPENS W
300	75	4429	NITROGEN	MANURE--LONG-TERM STUDY KEYWORDS *ANIMAL-WASTES LAND-APPLICATION CROP-RESPONSE NUTRIENT*
400	77	4431	NITROGEN	GOOD GAINS ON POULTRY WASTE, HIGH FIBER DIET KEYWORDS: POULTRY-WASTES-DRIED REFEEDING N
200	76	4433	NITROGEN	WILLE COMPOST TANK--A DESIGN STUDY FOR A CONTINUOUS FLOW COMPOST TANK USED IN RECLAIMIN
300	75	4434	NITROGEN	MICROBIOLOGY AND WATER QUALITY IN A TRIBUTARY OF CAYUGA LAKE KEYWORDS: WATER-POLLUTION
400	77	4439	NITROGEN	INJECTING MANURE CUTS CORN FERTILIZER COSTS KEYWORDS: LAND-APPLICATION SOIL-INJECTION C
400	77	4440	NITROGEN	INJECTING MANURE PAYS WITH SAVED NITROGEN KEYWORDS: SWINE-WASTES CATTLE-WASTES LAND-APP
700	76	4458	NITROGEN	THE SYMBIOTIC GROWTH OF ALGAE AND BACTERIA ON SWINE WASTE KEYWORDS: AEROBIC-TREATMENT B
100	69	4459	NITROGEN	STUDIES ON THE USE OF ANIMAL SLURRIES TO MANURE BARLEY 1-- THE EFFECT OF AGE AND DILUT
300	75	4474	NITROGEN	ENVIRONMENTAL AND ECONOMIC IMPACT OF NUTRIENT MANAGEMENT ON THE NEW YORK DAIRY FARM KEY
100	76	4481	NITROGEN	NUTRIENT CONTENT OF SORGHUM LEAVES AND GRAIN AS INFLUENCED BY LONG-TERM CROP ROTATION
300	77	4482	NITROGEN	NUTRIENT, BACTERIAL, AND VIRUS CONTROL AS RELATED TO GROUND-WATER CONTAMINATION KEYWORD
400	*73*	*4488*	*NITROGEN*	*RUMINANTS AND PIGS ARE THE BEST USERS KEYWORDS* REFEEDING POULTRY-WASTES-DRIED CATTLE S
100	74	4489	NITROGEN	EXPERIMENTS MADE ON STACKYARD FIELD, WOBURN, 1876-1974 I HISTORY OF THE FIELD, DETAILS
100	75	4491	NITROGEN	EXPERIMENTS MADE ON STACKYARD FIELD, WOBURN, 1876-1974 III. EFFECTS OF NPK FERTILIZERS
300	75	4493	NITROGEN	SWINE MANURE FOR FERTILIZER--RESEARCH REVIEW KEYWORDS: SWINE-WASTES LIQUID-WASTES AEROB
100	76	4496	NITROGEN	NONPOINT SOURCE POLLUTION FROM AGRICULTURAL RUNOFF KEYWORDS: WATER-POLLUTION NONPOINT-S
100	73	4513	NITROGEN	EFFECTS OF NITROGEN, PHOSPHORUS, POTASSIUM, AND MANURE FACTORIALLY APPLIED TO POTATOES
400	77	4522	NITROGEN	ON STRAW AND GOLD, MANURE AND ALGAE--FEEDING WASTE--IT'S BEING DONE IN A VARIETY OF WAY
400	77	4525	NITROGEN	MANURE MAKES CENTS KEYWORDS: LAND-APPLICATION ANHYDROUS-AMMONIA FEEDLOT-WASTES CROP-RES
400	75	4531	NITROGEN	STORAGE-STORE MANURE AS IF IT WERE VALUABLE-BECAUSE IT IS KEYWORDS: FERTILIZERS CATTLE-
400	77	4553	NITROGEN	GET MORE VALUE FROM HOG MANURE KEYWORDS: SWINE-WASTES CONFINEMENT-PENS LIQUID-WASTES WA
100	74	4559	NITROGEN	A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND-- PART I KEYWORDS: ANIMAL-WASTE
100	77	4573	NITROGEN	RUNOFF FROM A LOW-COST MANURE STORAGE FACILITY KEYWORDS: AGRICULTURAL-RUNOFF WASTE-STOR
400	70	4575	NITROGEN	MANURE DISPOSAL KEYWORDS: POULTRY-WASTES SOLID-WASTES SLURRIES LAND-APPLICATION DEHYDRA
100	73	4580	NITROGEN	EVALUATION OF ORGANIC MANURES KEYWORDS: ORGANIC-WASTES LAND-APPLICATION CROP-RESPONSE P
400	77	4587	NITROGEN	COMPOSTING CONVERTS WASTE INTO VALUABLE RESOURCES KEYWORDS: COMPOSTING FEEDLOT-WASTES P
100	75	4589	NITROGEN	PROPERTIES OF MANURE ACCUMULATIONS FROM MIDWEST BEEF CATTLE FEEDLOTS KEYWORDS: FEEDLOTS
300	75	4593	NITROGEN	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 1 KEYWORDS: WASTE-TREATMENT
300	76	4594	NITROGEN	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 2 KEYWORDS. SWINE-WASTES WAS
100	76	4600	NITROGEN	EUTROPHICATION POTENTIAL OF DAIRY CATTLE WASTE RUNOFF KEYWORDS: CATTLE-WASTES DAIRY-WAS
100	76	4601	NITROGEN	FACTORS AFFECTING NUTRIENT LOADS IN SOME IOWA STREAMS KEYWORDS. WATERSHEDS WATER-POLLUT
100	77	4628	NITROGEN	SPREADING SLURRY ON LAND KEYWORDS: SLURRIES LIVESTOCK-WASTES LAND-APPLICATION DRAINAGE
100	76	4631	NITROGEN	LIQUID DIETS CONTAINING POULTRY WASTES FOR RUMINANTS KEYWORDS: DIETS SHEEP LIQUID-WASTE
100	75	4648	NITROGEN	THE AGRONOMIC ROLE OF INTRODUCED DUNG BEETLES IN GRAZING SYSTEMS KEYWORDS: PASTURES MAN
200	*75*	*4650*	*NITROGEN*	*ANIMAL MANURES IN GRASS PRODUCTION KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES*
200	76	4651	NITROGEN	FERTILIZER VALUE OF ANIMAL MANURES KEYWORDS: SWINE-WASTES CATTLE-WASTES WASTE-STORAGE L
100	76	4656	NITROGEN	THREE-STEP TREATMENT FOR PIGGERY WASTES KEYWORDS: SWINE-WASTES AEROBIC-TREATMENT ANAERO
100	74	4661	NITROGEN	DEVELOPMENT OF A SYNTHETIC COMPOST FOR MUSHROOM GROWING BASED ON WHEAT STRAW AND CHICKE
100	73	4666	NITROGEN	STUDIES ON POULTRY MANURE IN RELATION TO VEGETABLE PRODUCTION. II POTATO KEYWORDS POUL
100	77	4148	NITROGEN-BALANCE	PERFORMANCE OF BEEF CATTLE FED WASTELAGE AND DIGESTIBILITY OF WASTELAGE AND DRIED WAST
100	75	4626	NITROGEN-COMPOUNDS	A SUMMARY OF THE BIOGEOCHEMISTRY OF NITROGEN COMPOUNDS IN GROUND WATER KEYWORDS: GROUND
700	73	4467	NITROGEN-LOSSES	EFFECT OF DRYING ON THE LOSSES OF NITROGEN AND TOTAL SOLIDS FROM POULTRY MANURE KEYWORD
400	77	4498	NITROGEN-LOSSES	NITROGEN LOSS IN SWINE WASTE APPLICATION STUDIED KEYWORDS: LAND-APPLICATION NITROGEN-LO
700	76	4541	NITROGEN-LOSSES	NITROGEN REMOVAL AND TRANSFORMATIONS IN THE OVERLAND FLOW TREATMENT OF POULTRY WASTES K
200	76	4144	NITROGEN-LOSS	OVERLAND FLOW PRETREATMENT OF POULTRY MANURE KEYWORDS: OVERLAND-FLOW-PRETREATMENT POULT
100	74	4191	NITROGEN-LOSS	LOSSES FROM CATTLE FAECES DURING CHEMICAL ANALYSIS KEYWORDS: SAMPLING-TECHNIQUES CHEMIC
400	77	4520	NITROGEN-LOSS	PROFITS FROM MANURE-WORKERS LIST TREATMENTS, APPLICATION KEYWORDS: POULTRY-WASTES LAND-
100	76	4602	NITROGEN-REMOVAL	TREATMENT OF POULTRY MANURE WASTEWATER USING A ROTATING BIOLOGICAL CONTACTOR KEYWORDS
100	77	4421	NITROGEN-RETENTION	EFFECT OF INCLUDING ENSILED BROILER-HOUSE LITTER IN THE RATIONS OF SHEEP ON THE DIGESTI
700	72	4635	NITROGEN-RETENTION	BIOCHEMICAL AND NUTRITIONAL STUDIES ON FERMENTED- AMMONIATED ANIMAL FEED SUPPLEMENTS KE
100	76	4038	NITROGEN-TRANSFORM	NITROGEN TRANSFORMATIONS IN AERATED SWINE MANURE SLURRIES KEYWORDS: SLURRIES SWINE-WAST
300	76	4068	NITROGEN-TRANSFORM	DEMONSTRATION OF AERATION SYSTEMS FOR POULTRY WASTES KEYWORDS: POULTRY-WASTES BIOLOGICA
100	76	4163	NITROGEN-TRANSFORM	TRANSFORMATIONS OF NITROGEN ADDED AS AMMONIUM AND MANURE TO SOIL WITH A HIGH AMMONIUM-F
200	71	4190	NITROGEN-TRANSFORM	NITROGEN INPUTS TO GROUNDWATER FROM LIVESTOCK WASTES KEYWORDS: GROUNDWATER-POLLUTION LI
300	76	4394	NITROGEN-TRANSFORM	A FOUR-YEAR FIELD TRIAL WITH ANIMAL MANURES. I NITROGEN BALANCES AND YIELDS. II MINERAL
600		4540	NITROGEN-TRANSFORM	MANURE VS. ANAEROBIC RESIDUE KEYWORDS: ANIMAL-WASTES ANAEROBIC-RESIDUES WASTE-COMPOSITI
100	72	4649	NITROGEN-TRANSFORM	CONSERVATION OF CATTLE MANURE IN PITS KEYWORDS: CATTLE-WASTES WASTE-STORAGE NITROGEN-TR
700	72	4189	NITROGEN-	NITRATE LEACHING FROM ANIMAL WASTE APPLICATIONS KEYWORDS: GROUNDWATER-POLLUTION LEACHIN
100	76	4308	NITROSAMINES	SYNTHESIS AND STABILITY OF DIMETHYLNITROSAMINE IN CATTLE MANURE KEYWORDS: NITROSAMINES
100	74	4193	NITROUS-OXIDE	THE EFFECT OF PIG SLURRY APPLIED TO A SOIL SURFACE ON THE COMPOSITION OF THE SOIL ATMOS
300	77	4461	NOISE	WASTE MANAGEMENT PRACTICES OF WESTERN CATTLE FEEDLOTS KEYWORDS: WASTE-MANAGEMENT FEEDLO
200	76	4182	NONPOINT-POLLUTION	RESOURCE ADEQUACY IN LIMITING NONPOINT POLLUTION KEYWORDS. NONPOINT-POLLUTION WATER-POL
200	76	4073	NONPOINT-SOURCES	IMPACT OF HATCHERY WASTEWATER IRRIGATION UPON CONTIGUOUS STREAM QUALITY KEYWORDS: HATCH
500	77	4080	NONPOINT-SOURCES	ECONOMIC AND REGULATORY ASPECTS OF LAND APPLICATION OF WASTES TO AGRICULTURAL LANDS PRO
500	77	4091	NONPOINT-SOURCES	ECONOMIC POTENTIAL AND MANAGEMENT CONSIDERATIONS IN LAND APPLICATION OF BEEF FEEDLOT WA
200	76	4094	NONPOINT-SOURCES	NATURE AND IMPACT OF STREAM INPUTS ON A WATERSHED BASIS KEYWORDS: AGRICULTURAL-RUNOFF W
200	76	4129	NONPOINT-SOURCES	NONPOINT SOURCES: STATE-OF-THE-ART OVERVIEW KEYWORDS: WATER-POLLUTION AGRICULTURAL-RUNO
100	76	4496	NONPOINT-SOURCES	NONPOINT SOURCE POLLUTION FROM AGRICULTURAL RUNOFF KEYWORDS: WATER-POLLUTION NONPOINT-S
100	*76*	*4591*	*NONPOINT-SOURCES*	*IRRIGATED AGRICULTURE--NONPOINT AND POINT SOURCE WATER POLLUTION KEYWORDS: FEEDLOT-RUNO*
100	75	4645	NONPOINT-SOURCES	WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS: WATER-POLLUTION NONPOINT-SOURCES PUBLIC
100	75	4451	NON-POINT-SOURCES	THE NEEDS FOR WATER QUALITY MODELS ON AGRICULTURAL WATERSHEDS KEYWORDS: WATER-POLLUTION
100	76	4452	NON-POINT-SOURCES	PHOSPHORUS LOSS BY STREAM TRANSPORT FROM A RURAL WATERSHED--QUANTITIES, PROCESSES, AND
300	77	4463	NON-POINT-SOURCES	WATER QUALITY AND THE FARM POND KEYWORDS: FARM-PONDS WATER-QUALITY AGRICULTURAL-RUNOFF
100	76	4534	NUCLEIC-ACIDS	URINARY ALLANTOIN EXCRETION AND DIGESTIBLE DRY-MATTER INTAKE IN CATTLE AND BUFFALO KEYW
200	74	4127	NUISANCE-LAWSUITS	GOOD ANIMAL WASTE MANAGEMENT REDUCES ODORS AND COMPLAINTS KEYWORDS: ODOR-CONTROL WASTE-
400	77	4295	NUISANCE-LAWSUITS	STATE ODOR REGULATIONS KEYWORDS: FEEDLOTS NUISANCE-LAWSUITS ODOR LEGAL-ASPECTS ODOR-INT
400	77	4484	NUISANCE-LAWSUITS	ODOR COMPLAINTS KEYWORDS: ODOR FEEDLOTS LEGAL-ASPECTS TEXAS-LAW NUISANCE-LAWSUITS
300	75	4494	NUISANCE-LAWSUITS	REGULATION OF ODORS THROUGH NUISANCE LAWS KEYWORDS: ODOR LEGAL-ASPECTS NUISANCE-LAWSUIT
400	77	4554	NUISANCE-LAWSUITS	LEGAL POINTERS TO HELP KEEP YOUR LIVESTOCK SMELLING LIKE ROSES KEYWORDS: FEEDLOTS ODOR
100	*72*	*4006*	*NUTRIENTS*	*PROCESSING SOLID MANURE FROM LIVESTOCK-FARMING* TO ORGANIC FERTILIZER FOR VEGETABLE GARD
300	76	4016	NUTRIENTS	DAIRY MANURE CAN BE USED SAFELY KEYWORDS: DAIRY-WASTES WASTE-MANAGEMENT WASTE-STORAGE W
100	77	4018	NUTRIENTS	EFFECT OF DIETARY SALT LEVEL AND LIQUID HANDLING SYSTEMS ON SWINE WASTE COMPOSITION KEY
300	75	4037	NUTRIENTS	LAND AVAILABILITY, CROP PRODUCTION, AND FERTILIZER REQUIREMENTS IN THE UNITED STATES KE
500	77	4091	NUTRIENTS	ECONOMIC POTENTIAL AND MANAGEMENT CONSIDERATIONS IN LAND APPLICATION OF BEEF FEEDLOT WA
300	73	4100	NUTRIENTS	LIQUID WASTE MANAGEMENT AT A SLATTED FLOOR SWINE BARN KEYWORDS: SWINE-WASTES LIQUID-WAS
100	76	4101	NUTRIENTS	NUTRITIONAL EVALUATION OF DEHYDRATED CATTLE MANURE USING SHEEP KEYWORDS: REFEEDING CATT

400	77 4113	NUTRIENTS	MANURE STORAGE AREAS HELP SAVE NUTRIENTS KEYWORDS: WASTE-STORAGE PUMPS NUTRIENTS ECONOM
200	76 4129	NUTRIENTS	NONPOINT SOURCES: STATE-OF-THE-ART OVERVIEW KEYWORDS: WATER-POLLUTION AGRICULTURAL-RUNO
300	4142	NUTRIENTS	SPREAD THE MUCK AROUND THE FARM KEYWORDS: LIVESTOCK-WASTES LAND-APPLICATION NUTRIENTS F
300	76 4194	NUTRIENTS	RECYCLING SEWAGE SOLIDS AS FEEDSTUFFS FOR LIVESTOCK KEYWORDS: RECYCLING SEWAGE-SOLIDS R
400	77 4212	NUTRIENTS	LIQUID MANURE CAN SERVE AS SOURCE OF NUTRIENTS KEYWORDS: CATTLE-WASTES LIQUID-WASTES LA
100	76 4223	NUTRIENTS	EFFECTS OF DAIRY CATTLE MANURE SOLUBLES IN LAMB DIETS KEYWORDS: DAIRY-WASTES REFEEDING
200	75 4225	NUTRIENTS	RECYCLING SWINE WASTE KEYWORDS: SWINE-WASTES OXIDATION-DITCH AEROBIC-TREATMENT ANAEROBI
100	76 4236	NUTRIENTS	HEN EXCRETA COMPOSITION AND METABOLISM BY SHEEP KEYWORDS: POULTRY-WASTES-DRIED REFEEDIN
400	77 4239	NUTRIENTS	SLAT-SCRAPE RECAPTURES RATION NUTRIENTS FOR REFEEDING MANURE KEYWORDS: CATTLE-WASTES EN
400	72 4240	NUTRIENTS	MANURE SYSTEMS PLANNING DATA KEYWORDS: WASTE-STORAGE LAGOONS HOLDING-PONDS SETTLING-BAS
300	76 4251	NUTRIENTS	DESIGN CRITERIA FOR FIELD APPLICATION OF LIVESTOCK WASTE KEYWORDS: LIVESTOCK-WASTES LAN
400	77 4257	NUTRIENTS	IOWA FARMERS FEED DRIED POULTRY WASTE TO CATTLE KEYWORDS: POULTRY-WASTES-DRIED REFEEDIN
100	76 4267	NUTRIENTS	POLLUTION POTENTIAL OF MANURE SPREAD ON FROZEN GROUND KEYWORDS: WATER-POLLUTION LAND-AP
700	70 4268	NUTRIENTS	CATTLE MANURE. I EFFECT ON CROPS AND SOILS II. RETENTION PROPERTIES FOR CU, MN, AND ZN
400	77 4300	NUTRIENTS	RE-CYCLING IS NO CURE-ALL KEYWORDS. REFEEDING FEEDLOT-WASTES CATTLE PERFORMANCE ECONOMI
200	76 4358	NUTRIENTS	CONSIDERATION OF SOILS FOR ACCEPTING WASTES KEYWORDS: LAND-APPLICATION SOIL-PROPERTIES
300	75 4429	NUTRIENTS	MANURE--LONG-TERM STUDY KEYWORDS: ANIMAL-WASTES LAND-APPLICATION CROP-RESPONSE NUTRIENT
300	77 4482	NUTRIENTS	NUTRIENT, BACTERIAL, AND VIRUS CONTROL AS RELATED TO GROUND-WATER CONTAMINATION KEYWORD
700	75 4544	NUTRIENTS	NUTRIENT CHARACTERIZATION OF SWINE FECAL WASTE AND UTILIZATION OF THESE NUTRIENTS BY SW
100	75 4645	NUTRIENTS	WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS: WATER-POLLUTION NONPOINT-SOURCES PUBLIC
200	75 4385	NUTRIENT-AVAILABIL	WASTES--USE OR DISCARD KEYWORDS: AGRICULTURAL-WASTES LAND-APPLICATION NITRIENT-LOSSES N
500	75 4200	NUTRIENT-CONTROL	ANIMAL WASTE MANAGEMENT WITH NUTRIENT CONTROL KEYWORDS: NUTRIENT-CONTROL LAND-APPLICATI
400	77 4071	ODOR	GETTING MORE OUT OF LIQUID MANURE KEYWORDS: LIQUID-WASTES SLOTTED-FLOORS DEEP-PITS SOIL
300	74 4106	ODOR	HANDLING AND DISPOSING OF POULTRY MANURE KEYWORDS: POULTRY-WASTES WASTE-MANAGEMENT SOLI
400	72 4150	ODOR	POLLUTION RESEARCHERS FINDING MANY ANSWERS, EXPERT REPORTS KEYWORDS: LIVESTOCK-WASTES
400	77 4156	ODOR	ODORS MAY LEAD TO COURTROOM KEYWORDS ODOR LEGAL-ASPECTS LIQUID-WASTES LIVESTOCK-WASTES
300	76 4170	ODOR	AUTOMATED TREATMENT AND RECYCLE OF SWINE FEEDLOT WASTEWATERS KEYWORDS: SWINE-WASTES LIQ
300	76 4176	ODOR	PRODUCTION AND TRANSPORT OF GASEOUS NH3 AND H2S ASSOCIATED WITH LIVESTOCK PRODUCTION K
300	76 4203	ODOR	WASTEWATER AND RUNOFF CONTROL SYSTEMS FOR DRYLOT DAIRIES KEYWORDS: DAIRY-INDUSTRY AGRIC
100	72 4214	ODOR	AERATION UNDER CAGED LAYING HENS KEYWORDS. AERATION POULTRY-WASTES SLURRIES WASTE-COMPO
200	77 4284	ODOR	THE FARMER S VIEWPOINT, PART II - SWINE WASTE MANAGEMENT KEYWORDS: WASTE-MANAGEMENT SWI
100	77 4291	ODOR	COLLECTION AND ANALYSIS OF ORGANIC GASES FROM NATURAL ECOSYSTEMS: APPLICATION TO POULTR
400	77 4295	ODOR	STATE ODOR REGULATIONS KEYWORDS: FEEDLOTS NUISANCE-LAWSUITS ODOR LEGAL-ASPECTS ODOR-INT
300	73 4310	ODOR	LIVESTOCK WASTE MANAGEMENT-STATE OF THE ART KEYWORDS. WASTE-MANAGEMENT FEEDLOTS LIVESTO
200	73 4323	ODOR	CONTROL OF GASES AND ODORS FROM LIVESTOCK UNITS KEYWORDS: AIR-POLLUTION GASES ODOR LEGA
400	77 4333	ODOR	USE OF AGRICULTURE WASTES IN AQUACULTURE KEYWORDS: AQUACULTURE FISH FEEDS ORGANIC-WASTE
700	74 4345	ODOR	AN EVALUATION OF A FULL-SCALE IN-HOUSE OXIDATION DITCH FOR POULTRY WASTE KEYWORDS: POU
200	76 4360	ODOR	LAND USE OF ANIMAL WASTES KEYWORDS LAND-APPLICATION ANIMAL-WASTES NITROGEN WASTE-COMPO
100	77 4363	ODOR	ODOR INTENSITIES AT CATTLE FEEDLOTS KEYWORDS ODOR FEEDLOTS CATTLE DILUTIONS-TO-THRESHO
200	70 4384	ODOR	STATE OF THE ART - ANAEROBIC LAGOONS KEYWORDS: LAGOONS WASTE-TREATMENT ANAEROBIC DESIGN
300	72 4393	ODOR	AN ANALYSIS OF BEEF CATTLE FEEDLOT DESIGNS FOR POLLUTION CONTROL KEYWORDS: FEEDLOTS DES
300	75 4444	ODOR	LIVESTOCK WASTE FACILITIES HANDBOOK KEYWORDS LIVESTOCK-WASTES WASTE-STORAGE WASTE-TREA
400	77 4445	ODOR	GUIDE TO EFFECTIVE MANURE PIT VENTILATION KEYWORDS: ODOR GASES AIR-POLLUTION SWINE-WAST
200	71 4457	ODOR	AGRICULTURE S ROLE IN ENVIRONMENTAL QUALITY KEYWORDS: AGRICULTURE FEEDLOTS WATER-POLLUT
300	77 4461	ODOR	WASTE MANAGEMENT PRACTICES OF WESTERN CATTLE FEEDLOTS KEYWORDS: WASTE-MANAGEMENT FEEDLO
400	77 4476	ODOR	FEEDLOT ODOR INTENSITY KEYWORDS: ODOR FEEDLOTS CATTLE SCENTOMETER-READINGS ODOR-CONTROL
100	73 4478	ODOR	THE HANDLING TREATMENT, AND DISPOSAL OF FARM WASTES-- APPLICATION OF FARM SLURRIES TO A
400	77 4484	ODOR	ODOR COMPLAINTS KEYWORDS: ODOR FEEDLOTS LEGAL-ASPECTS TEXAS-LAW NUISANCE-LAWSUITS
300	75 4494	ODOR	REGULATION OF ODORS THROUGH NUISANCE LAWS KEYWORDS: ODOR LEGAL-ASPECTS NUISANCE-LAWSUIT
400	76 4548	ODOR	EFFLUENT DISPOSAL, A PILOT STUDY AT CRESSY RESEARCH STATION KEYWORDS: SWINE-WASTES EFFL
400	77 4554	ODOR	LEGAL POINTERS TO HELP KEEP YOUR LIVESTOCK SMELLING LIKE ROSES KEYWORDS: FEEDLOTS ODOR
400	71 4557	ODOR	WHAT TO DO WITH ANIMAL WASTES RECYCLING KEYWORDS: WASTE-DISPOSAL WATER-POLLUTION ODOR A
200	75 4558	ODOR	HOW TO CLEAN UP AT THE RACES KEYWORDS: HORSE-WASTES RACE-TRACKS WASTE-MANAGEMENT WASTE-
300	75 4570	ODOR	GUIDELINES FOR MANURE USE AND DISPOSAL IN THE WESTERN REGION, USA KEYWORDS: LAND-APPLIC
200	71 4583	ODOR	ANALYTICAL AND ORGANOLEPTIC MEASUREMENT OF ODOURS FROM ANIMAL WASTES KEYWORDS: ODOR SAM
300	75 4593	ODOR	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 1 KEYWORDS: WASTE-TREATMENT
100	77 4632	ODOR	SIMPLE PHENOLS AND INDOLES IN ANAEROBICALLY STORED PIGGERY WASTES KEYWORDS: SWINE-WASTE
300	77 4659	ODOR	AEROBIC TREATMENT IN RELATION TO LAND APPLICATION OF SLURRY KEYWORDS AEROBIC-TREATMENT
400	77 4665	ODOR	METHANE FROM CATTLE MANURE TO REPLACE FUEL OIL KEYWORDS: CATTLE-WASTES FERMENTATION REC
300	76 4001	ODOR-CONTROL	DESIGN PARAMETERS FOR ANIMAL WASTE TREATMENT SYSTEMS - NITROGEN CONTROL KEYWORDS: DESIG
300	76 4003	ODOR-CONTROL	DESIGN CRITERIA FOR SWINE WASTE TREATMENT SYSTEMS KEYWORDS DESIGN LAGOONS SWINE-WASTES
100	72 4009	ODOR-CONTROL	CONTRIBUTION TO THE TREATMENT OF LIQUID MANURE IN NATURAL- BIOLOGICAL LAGOON SYSTEMS K
100	72 4010	ODOR-CONTROL	POSSIBLE TREATMENT METHODS FOR LIQUID MANURE FOR THE MODIFICATION OF ITS PHYSICAL, CHEM
400	76 4055	ODOR-CONTROL	HOGMEN SIZE UP OXIDATION SYSTEMS KEYWORDS: LIQUID-WASTES SWINE-WASTES OXIDATION RACETRA
200	77 4060	ODOR-CONTROL	HARVESTING AND PROCESSING MANURE FROM CONFINEMENT OPERATIONS FOR REFEEDING KEYWORDS: CO
300	76 4068	ODOR-CONTROL	DEMONSTRATION OF AERATION SYSTEMS FOR POULTRY WASTES KEYWORDS: POULTRY-WASTES BIOLOGICA
300	76 4109	ODOR-CONTROL	EVALUATING A LOW-ENERGY, HIGH-VALUE PUMP FOR ODOR REDUCTION FROM LIVESTOCK WASTE LAGOON
400	77 4117	ODOR-CONTROL	HANDLING MANURE IN THE DEEP-PIT OR HIGH RISE CAGE LAYING HOUSE KEYWORDS: DEEP-PIT-HOUSE
200	74 4127	ODOR-CONTROL	GOOD ANIMAL WASTE MANAGEMENT REDUCES ODORS AND COMPLAINTS KEYWORDS: ODOR-CONTROL WASTE-
400	77 4151	ODOR-CONTROL	POULTRY WASTE GOES DOWN THE DRAIN KEYWORDS: POULTRY-WASTES LAGOONS FLUSHING FLY-CONTROL
300	74 4152	ODOR-CONTROL	ODORS FROM CONFINED LIVESTOCK PRODUCTION KEYWORDS: ODOR-CONTROL LIVESTOCK LEGAL-ASPECTS
400	77 4156	ODOR-CONTROL	ODORS MAY LEAD TO COURTROOM KEYWORDS: ODOR LEGAL-ASPECTS LIQUID-WASTES LIVESTOCK-WASTES
100	75 4206	ODOR-CONTROL	CHEMICAL CONTROL OF HYDROGEN SULFIDE FROM ANAEROBIC SWINE MANURE. I OXIDIZING AGENTS KEY
300	72 4226	ODOR-CONTROL	WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA DAIRYMEN KEYWORDS: WASTE-MANAGEMENT
300	72 4227	ODOR-CONTROL	WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA POULTRYMEN KEYWORDS. WASTE-TREATMENT
300	72 4228	ODOR-CONTROL	WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA SWINE PRODUCERS KEYWORDS: WASTE-DISP
200	76 4230	ODOR-CONTROL	THE OXIDATION DITCH A POSITIVE METHOD OF ODOR CONTROL KEYWORDS ODOR-CONTROL WASTE-TRE
400	77 4239	ODOR-CONTROL	SLAT-SCRAPE RECAPTURES RATION NUTRIENTS FOR REFEEDING MANURE KEYWORDS: CATTLE-WASTES EN
400	77 4294	ODOR-CONTROL	FEEDLOT ODOR CONTROL RELIES ON DRY MANURE AND RAPID REMOVAL KEYWORDS: ODOR-CONTROL FEED
200	74 4347	ODOR-CONTROL	LIVESTOCK ODOR CONTROL RESEARCH AT THE UNIVERSITY OF ILLINOIS KEYWORDS: ODOR-CONTROL SK
100	77 4363	ODOR-CONTROL	ODOR INTENSITIES AT CATTLE FEEDLOTS KEYWORDS: ODOR FEEDLOTS CATTLE DILUTIONS-TO-THRESHO
400	77 4382	ODOR-CONTROL	RESEARCHERS STUDY ALGAE PRODUCTION FROM HOG WASTE KEYWORDS RECYCLING WASTEWATER-RENOVA
100	73 4396	ODOR-CONTROL	WINTER OPERATION OF AERATED LIQUID ANIMAL WASTE STORAGE SYSTEMS KEYWORDS WASTE-STORAGE
400	77 4437	ODOR-CONTROL	HIS HOGS DON T STINK KEYWORDS: CONFINEMENT-PENS LEGAL-ASPECTS IOWA-LAW ODOR-CONTROL SWI
100	77 4465	ODOR-CONTROL	CHEMICAL CONTROL OF HYDROGEN SULFIDE FROM ANAEROBIC SWINE MANURE II IRON COMPOUNDS KEYW
700	73 4467	ODOR-CONTROL	EFFECT OF DRYING ON THE LOSSES OF NITROGEN AND TOTAL SOLIDS FROM POULTRY MANURE KEYWORD
400	77 4476	ODOR-CONTROL	FEEDLOT ODOR INTENSITY KEYWORDS ODOR FEEDLOTS CATTLE SCENTOMETER-READINGS ODOR-CONTROL
400	76 4480	ODOR-CONTROL	KEEP IT DRY KEYWORDS: FEEDLOTS ODOR-CONTROL STOCKING-RATES FEEDLOT-RUNOFF HOLDING-PONDS
400	73 4507	ODOR-CONTROL	KEEP YOUR SLURRY SMELLING SWEET KEYWORDS DAIRY-WASTES WASTE-TREATMENT WASTE-STORAGE OD
400	77 4538	ODOR-CONTROL	FOR THIS HOG FARMER NEW PORK PRODUCTION UNIT ELIMINATES WASTE DISPOSAL KEYWORDS: SWINE-
400	70 4568	ODOR-CONTROL	NOW ELECTRICITY FROM MANURE GASES KEYWORDS: ELECTRICITY ENERGY RECYCLING SWINE-WASTES G.
400	77 4581	ODOR-CONTROL	VARIED RESULTS FROM HOG PIT DEODORIZERS KEYWORDS. ODOR-CONTROL CHEMICAL-TREATMENT MASKI
300	75 4586	ODOR-CONTROL	ADDITIVES FOR MANURE ODOR CONTROL KEYWORDS: ODOR-CONTROL LAND-APPLICATION BIOLOGICAL-TR
400	77 4664	ODOR-CONTROL	NEW RECYCLING TRIAL SHOWS 20 HD EXTRA PROFIT KEYWORDS REFEEDING CATTLE-WASTES COMPOST
400	77 4295	ODOR-INTENSITY-STA	STATE ODOR REGULATIONS KEYWORDS: FEEDLOTS NUISANCE-LAWSUITS ODOR LEGAL-ASPECTS ODOR-INT
200	76 4305	OIL	CONVERSION OF BOVINE MANURE TO OIL KEYWORDS: RECYCLING CATTLE WASTES OIL CARBON-MONOXID
400	77 4479	OPEN-LOTS	HOUSING HINTS KEYWORDS: FEEDLOTS HOUSING OPEN-LOTS CATTLE MANAGEMENT ECONOMICS
400	77 4445	ORGANIC-ACIDS	GUIDE TO EFFECTIVE MANURE PIT VENTILATION KEYWORDS: ODOR GASES AIR-POLLUTION SWINE-WAST
700	72 4635	ORGANIC-ACIDS	BIOCHEMICAL AND NUTRITIONAL STUDIES ON FERMENTEC- AMMONIATED ANIMAL FEED SUPPLEMENTS KE
200	75 4401	ORGANIC-COMPOUNDS	CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH DENSITY CATFISH CULTURES K

300	75	4077	ORGANIC-CONTENT STATUS OF SEDIMENT FROM CATFISH PRODUCTION PONDS AS A FERTILIZER AND SOIL CONDITIONER K
300	74	4217	ORGANIC-MATTER SOIL POLLUTION FROM FEEDLOTS IN GEORGIA KEYWORDS: GROUNDWATER-POLLUTION SOIL-CONTAMINAT
100	77	4653	ORGANIC-MATTER AN EXPERIMENT ON DUNG REMOVAL BY APHODIUS LARVAE SCARABAEIDAE AND EARTHWORMS KEYWORDS
400	74	4051	ORGANIC-WASTES MANURE KEYWORDS: COMPOSTING RECYCLING FUELS ECONOMICS CATTLE-WASTES ORGANIC-WASTES
200	74	4072	ORGANIC-WASTES FUEL FROM FECES KEYWORDS: FUELS RECYCLING PHYSICAL-TREATMENT CHEMICAL-TREATMENT BIOLOGI
100	46	4115	ORGANIC-WASTES *DIGESTER GAS FOR AUTOMOBILES* KEYWORDS: METHANE ORGANIC-WASTES SEWAGE HORSE-WASTES RECYC
100	76	4218	ORGANIC-WASTES SOIL NITROGEN. IX. THE EFFECTS OF LEYS AND ORGANIC MANURES ON THE AVAILABLE-N IN CLAY AND
400	72	4303	ORGANIC-WASTES METHANE POWER' THE PLOWBOY INTERVIEW KEYWORDS' RECYCLING METHANE ORGANIC-WASTES DIGESTE
300	73	4332	ORGANIC-WASTES USING ORGANIC WASTES AS NITROGEN FERTILIZERS KEYWORDS: ORGANIC-WASTES LAND-APPLICATION
400	77	4333	ORGANIC-WASTES USE OF AGRICULTURE WASTES IN AQUACULTURE KEYWORDS: AQUACULTURE FISH FEEDS ORGANIC-WASTE
200	76	4358	ORGANIC-WASTES CONSIDERATION OF SOILS FOR ACCEPTING WASTES KEYWORDS: LAND-APPLICATION SOIL-PROPERTIES
100	74	4562	ORGANIC-WASTES CONVERSION OF ORGANIC WASTE INTO PROTEIN KEYWORDS BIOLOGICAL-TREATMENT ORGANIC-WASTES
400	70	4567	ORGANIC-WASTES HOW TO GENERATE POWER FROM GARBAGE KEYWORDS: METHANE ANAEROBIC DIGESTERS LIVESTOCK-WAST
100	73	4580	ORGANIC-WASTES EVALUATION OF ORGANIC MANURES KEYWORDS: ORGANIC-WASTES LAND-APPLICATION CROP-RESPONSE P
500	73	4623	ORGANIC-WASTES A HOMESITE POWER UNIT--METHANE GENERATOR KEYWORDS: ANAEROBIC DIGESTER SLURRIES WASTE-TR
100	77	4349	ORTHO-PHOSPHORUS LAGOON PRETREATMENT- SWINE WASTE LOADING RATE AND RESPONSE TO LOADING RATE CHANGE-LABO
100	76	4456	OVERFLOW NITROGEN MOVEMENT NEAR SURFACE MANURE STORAGES KEYWORDS: WASTE-STORAGE MANURE-PIT WASTE
400	77	4151	OVERFLOW-POND POULTRY WASTE GOES DOWN THE DRAIN KEYWORDS: POULTRY-WASTES LAGOONS FLUSHING FLY-CONTROL
300	73	4310	OVERLAND-FLOW LIVESTOCK WASTE MANAGEMENT-STATE OF THE ART KEYWORDS WASTE-MANAGEMENT FEEDLOTS LIVESTO
300	77	4426	OVERLAND-FLOW PROJECTS IN PROGRESS SOME FEEDLOT INS AND OUTS KEYWORDS WATER-POLLUTION FEEDLOTS AGRIC
700	76	4541	OVERLAND-FLOW NITROGEN REMOVAL AND TRANSFORMATIONS IN THE OVERLAND FLOW TREATMENT OF POULTRY WASTES K
200	76	4144	OVERLAND-FLOW-PRET OVERLAND FLOW PRETREATMENT OF POULTRY MANURE KEYWORDS: OVERLAND-FLOW-PRETREATMENT POULT
200	76	4261	OVERLAND-FLOW-TREA OVERLAND FLOW TREATMENT OF SWINE LAGOON EFFLUENT KEYWORDS' OVERLAND-FLOW-TREATMENT SWIN
500	77	4088	OVERLAND-SPRAY-IRR OVERLAND RECYCLING OF ANIMAL WASTE KEYWORDS WASTE-TREATMENT OVERLAND-SPRAY-IRRIGATION
400	76	4055	OXICATION HOGMEN SIZE UP OXIDATION SYSTEMS KEYWORDS LIQUID-WASTES SWINE-WASTES OXIDATION RACETRA
300	75	4075	OXICATION UTILIZATION AND DISPOSAL OF RESIDUE FROM THE PARTIAL OXIDATION OF CATTLE FEEDLOT MANURE
300	76	4207	OXICATION STATE-OF-THE-ART: SWINE WASTE PRODUCTION AND PRETREATMENT PROCESSES KEYWORDS: SWINE-WAS
700	73	4331	OXIDATION AMMONIA SYNTHESIS GAS FROM MANURE KEYWORDS' OXIDATION FLUIDIZED-BED-REACTOR RECYCLING D
200	77	4373	OXIDATION AMMONIA SYNTHESIS GAS AND PETROCHEMICALS FROM CATTLE FEEDLOT MANURE KEYWORDS: CATTLE-WA
300	76	4001	OXIDATION-DITCH DESIGN PARAMETERS FOR ANIMAL WASTE TREATMENT SYSTEMS - NITROGEN CONTROL KEYWORDS: DESIG
100	77	4018	OXIDATION-DITCH EFFECT OF DIETARY SALT LEVEL AND LIQUID HANDLING SYSTEMS ON SWINE WASTE COMPOSITION KEY
200	75	4026	OXIDATION-DITCH RECYCLED EXCRETA AS A NUTRIENT SOURCE FOR SWINE KEYWORDS' OXIDATION-DITCH REFEEDING SWI
400	77	4027	OXIDATION-DITCH BIRD PERFORMANCE NOT HURT BY REFEEDING AERATED WASTES KEYWORDS REFEEDING OXIDATION-DIT
300	76	4068	OXIDATION-DITCH DEMONSTRATION OF AERATION SYSTEMS FOR POULTRY WASTES KEYWORDS' POULTRY-WASTES BIOLOGICA
400	77	4164	OXIDATION-DITCH JAPANESE HOGMEN BATTLE POLLUTION KEYWORDS. SWINE-WASTES POLLUTION WASTE-MANAGEMENT OXID
200	75	4225	OXIDATION-DITCH RECYCLING SWINE WASTE KEYWORDS SWINE-WASTES OXICATION-DITCH AEROBIC-TREATMENT ANAEROBI
200	76	4230	OXIDATION-DITCH THE OXIDATION DITCH A POSITIVE METHOD OF ODOR CONTROL KEYWORDS: ODOR-CONTROL WASTE-TRE
700	74	4345	OXIDATION-DITCH AN EVALUATION OF A FULL-SCALE IN-HOUSE OXIDATION DITCH FOR POULTRY WASTE KEYWORDS: POU
200	74	4347	OXIDATION-DITCH LIVESTOCK ODOR CONTROL RESEARCH AT THE UNIVERSITY OF ILLINOIS KEYWORDS: ODOR-CONTROL SW
300	72	4393	OXIDATION-DITCH AN ANALYSIS OF BEEF CATTLE FEEDLOT DESIGNS FOR POLLUTION CONTROL KEYWORDS: FEEDLOTS DES
100	73	4396	OXIDATION-DITCH WINTER OPERATION OF AERATED LIQUID ANIMAL WASTE STORAGE SYSTEMS KEYWORDS: WASTE-STORAGE
200	74	4415	OXIDATION-DITCH FIVE-YEAR BEEF ANIMAL ENVIRONMENT STUDY IN MINNESOTA KEYWORDS CONFINEMENT-PENS FEEDLOT
400	77	4522	OXIDATION-DITCH ON STRAW AND GOLD, MANURE AND ALGAE--FEEDING WASTE--IT'S BEING DONE IN A VARIETY OF WAY
300	75	4593	OXIDATION-DITCH TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 1 KEYWORDS' WASTE-TREATMENT
300	76	4594	OXIDATION-DITCH TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 2 KEYWORDS: SWINE-WASTES WAS
200	72	4603	*OXIDATION-DITCH* *ROLE OF RECYCLED LARGE ANIMAL WASTE FOR ANIMAL PROTEIN PRODUCTION KEYWORDS: LIQUID-WAST*
200	75	4605	OXIDATION-DITCH AN ECONOMIC COMPARISON OF FIVE WASTE MANAGEMENT SYSTEMS FOR SWINE FINISHING OPERATIONS
200	72	4640	OXIDATION-DITCH LEPTOSPIRES IN ANIMAL WASTE TREATMENT--ANIMAL HEALTH PROBLEM KEYWORDS: ANIMAL-WASTES LE
400	73	4507	OXIDATION-TOWER KEEP YOUR SLURRY SMELLING SWEET KEYWORDS' DAIRY-WASTES WASTE-TREATMENT WASTE-STORAGE OD
100	76	4124	OXYTETRACYCLINE EFFECT OF DIETARY OXYTETRACYCLINE ON MICROORGANISMS IN TURKEY FECES KEYWORDS: DIETS OXY
400	76	4184	PACKINGHOUSE-WASTE FEED GRAIN SUPPLIES, USE OF WASTES AS FEED INGREDIENTS DETAILED AT CONFERENCE KEYWORDS
200	76	4172	PACKING-PLANT-WAST LAND DISPOSAL OF BLOOD AND PAUNCH MANURE KEYWORDS: LAND-DISPOSAL BLOOD PAUNCH-MANURE PA
700	72	4635	PALATABILITY BIOCHEMICAL AND NUTRITIONAL STUDIES ON FERMENTED- AMMONIATED ANIMAL FEED SUPPLEMENTS KE
400	77	4643	PALATABILITY ENSILED POULTRY LITTER REDUCES CATTLE FEED COSTS KEYWORDS: POULTRY-LITTER ENSILING REFE
100	75	4662	PAPER-PULP THE WASTE PRODUCTS OF AGRICULTURE KEYWORDS' AGRICULTURAL-WASTES LIVESTOCK-WASTES STRAW
200	77	4062	PARAFORMALDEHYDE PATHOGEN TRANSMISSION POTENTIAL FROM ANIMAL WASTE REFEEDING KEYWORDS' REFEEDING PATHOGE
100	75	4036	PARASITES REARING AND RELEASE OF THE HOUSE FLY PUPAL PARASITE SPALANGIA ENDIUS WALKER KEYWORDS: F
200	77	4062	PARASITES PATHOGEN TRANSMISSION POTENTIAL FROM ANIMAL WASTE REFEEDING KEYWORDS: REFEEDING PATHOGE
100	71	4500	PARASITES SOME EFFECTS OF THE AMBIENT ARTHROPOD COMPLEX ON THE DENSITY AND POTENTIAL PARASITIZATI
100	74	4326	PARASITOIDS HYMENOPTEROUS PARASITOIDS ASSOCIATED WITH POULTRY MANURE KEYWORDS: FLY-CONTROL PARASITO
100	76	4346	PARASITOIDS TABULAR KEYS & BIOLOGICAL NOTES TO COMMON PARASITOIDS OF SYNANTHROPIC DIPTERA BREEDING
700	74	4502	PARTICLE-SIZE THE EFFECT OF TOTAL SOLIDS CONTENT, PARTICLE SIZE, FLOW VELOCITY, AND VISCOSITY OF BEEF
100	74	4035	PASTURES SUCCESSION AND ABUNDANCE OF INSECTS IN PASTURE MANURE RELATIONSHIP TO FACE FLY SURVIVAL
200	76	4073	PASTURES IMPACT OF HATCHERY WASTEWATER IRRIGATION UPON CONTIGUOUS STREAM QUALITY KEYWORDS: HATCH
100	76	4237	PASTURES VALUE OF LIQUID CATTLE WASTE TO ESTABLISHED GRASSES KEYWORDS: LIQUID-WASTES CATTLE-WAST
300	77	4262	PASTURES CAN CITY SEWAGE BE RECYCLED SAFELY ON FARM LAND KEYWORDS: RECYCLING SEWAGE LAND-APPLICA
400	77	4270	PASTURES COMBAT CATTLE FLIES WITH THESE WEAPONS KEYWORDS: FLY-CONTROL PASTURES FEEDLOTS FEED-ADD
100	76	4425	PASTURES GROUND-WATER QUALITY VARIATION IN PHELPS COUNTY, MISSOURI KEYWORDS: GROUNDWATER-QUALITY
100	76	4512	PASTURES THE SPATIAL DISTRIBUTION OF EXCRETA UNDER INTENSIVE CATTLE GRAZING KEYWORDS: CATTLE-WAS
100	71	4622	PASTURES THE SURVIVAL OF ESCHERICHIA COLI AND SALMONELLA DUBLIN IN SLURRY ON PASTURE AND THE INF
100	75	4648	PASTURES THE AGRONOMIC ROLE OF INTRODUCED DUNG BEETLES IN GRAZING SYSTEMS KEYWORDS: PASTURES MAN
400	77	4388	PASTURE 2,057 POUNDS OF BEEF PER ACRE FROM FORAGE KEYWORDS: SWINE-WASTES LAND-APPLICATION LIQUI
500	77	4083	PASTURE-CONTAMINAT HEALTH HAZARDS OF AGRICULTURAL, INDUSTRIAL, AND MUNICIPAL WASTES APPLIED TO LAND KEYWOR
400	73	4507	PASVEER-OXIDATION- KEEP YOUR SLURRY SMELLING SWEET KEYWORDS: DAIRY-WASTES WASTE-TREATMENT WASTE-STORAGE OD
100	71	4002	PATHOGENIC-BACTERI EXPERIMENTAL STUDIES INTO THE EFFECT OF CATTLE MANURE ON FASCIOLA HEPATICA EGGS KEYWORD
200	76	4053	PATHOGENIC-BACTERI FATE OF PATHOGENS IN SOILS RECEIVING ANIMAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WA
200	77	4060	PATHOGENIC-BACTERI HARVESTING AND PROCESSING MANURE FROM CONFINEMENT OPERATIONS FOR REFEEDING KEYWORDS: CO
200	77	4062	PATHOGENIC-BACTERI PATHOGEN TRANSMISSION POTENTIAL FROM ANIMAL WASTE REFEEDING KEYWORDS: REFEEDING PATHOGE
500	77	4085	PATHOGENIC-BACTERI PATHOGEN SURVIVAL IN SOILS RECEIVING WASTE KEYWORDS: LAND-DISPOSAL MICROORGANISMS PATHO
100	72	4154	PATHOGENIC-BACTERI ISOLATION OF ERYSIPELOTHRIX RHUSIOPATHIAE FROM SOIL AND MANURE OF SWINE-RAISING PREMISE
100	76	4211	PATHOGENIC-BACTERI FEEDLOT MANURE TOP DRESSING FOR IRRIGATED PASTURE GOOD AGRICULTURAL PRACTICE OR A HEAL
100	77	4233	PATHOGENIC-BACTERI STUDIES ON THE VIABILITY OF PATHOGENIC BACTERIA DURING SHORT-TIME-COMPOSTING OF POULTRY
300	77	4262	PATHOGENIC-BACTERI CAN CITY SEWAGE BE RECYCLED SAFELY ON FARM LAND KEYWORDS: RECYCLING SEWAGE LAND-APPLICA
400	77	4314	PATHOGENIC-BACTERI MORE ON MANURE KEYWORDS: REFEEDING PERFORMANCE COPPER IRON CALCIUM AMPROLIUM PATHOGENIC
200	76	4403	PATHOGENIC-BACTERI RESEARCH AND DEVELOPMENT NEEDS RELATED TO PATHOGENS IN PRETREATMENT-LAND APPLICATION SY
100	75	4451	PATHOGENIC-BACTERI THE NEEDS FOR WATER QUALITY MODELS ON AGRICULTURAL WATERSHEDS KEYWORDS: WATER-POLLUTION
200	74	4535	PATHOGENIC-BACTERI SURVIVAL OF PATHOGENS IN FEEDLOT WASTE KEYWORDS: PATHOGENIC-BACTERIA CATTLE-WASTES FEED
200	72	4603	PATHOGENIC-BACTERI ROLE OF RECYCLED LARGE ANIMAL WASTE FOR ANIMAL PROTEIN PRODUCTION KEYWORDS' LIQUID-WAST
100	71	4622	PATHOGENIC-BACTERI THE SURVIVAL OF ESCHERICHIA COLI AND SALMONELLA DUBLIN IN SLURRY ON PASTURE AND THE INF
400	77	4643	PATHOGENIC-BACTERI ENSILED POULTRY LITTER REDUCES CATTLE FEED COSTS KEYWORDS: POULTRY-LITTER ENSILING REFE
300	77	4659	PATHOGENIC-BACTERI AEROBIC TREATMENT IN RELATION TO LAND APPLICATION OF SLURRY KEYWORDS: AEROBIC-TREATMENT
100	72	4010	PATHOGENIC- POSSIBLE TREATMENT METHODS FOR LIQUID MANURE FOR THE MODIFICATION OF ITS PHYSICAL, CHEM
100	74	4108	PATHOGENS POULTRY WASTES AS FEEDSTUFFS FOR RUMINANTS KEYWORDS' POULTRY-WASTES POULTRY-LITTER WAST
400	77	4333	PATHOGENS USE OF AGRICULTURE WASTES IN AQUACULTURE KEYWORDS: AQUACULTURE FISH FEEDS ORGANIC-WASTE
100	76	4523	PATHOGENS THE OCCURRENCE OF SALMONELLAS, MYCOBACTERIA AND PATHOGENIC STRAINS OF ESCHERICHIA COLI
200	76	4172	PAUNCH-MANURE LAND DISPOSAL OF BLOOD AND PAUNCH MANURE KEYWORDS: LAND-DISPOSAL BLOOD PAUNCH-MANURE PA
100	75	4329	PAUNCH-MANURE USE OF DRIED PAUNCH RESIDUE IN RUMINANT DIETS KEYWORDS' PAUNCH-MANURE REFEEDING SHEEP C
400	77	4436	PAUNCH-MANURE THE HAPPY EARTHWORM KEYWORDS: RECYCLING CATTLE-WASTES PAUNCH-MANURE FEEDLOTS EARTHWORMS
400	77	4587	PAUNCH-MANURE COMPOSTING CONVERTS WASTE INTO VALUABLE *RESOURCES KEYWORDS' COMPOSTING FEEDLOT-WASTES P*
300	75	4029	PERCOLATION CONTROL OF WATER POLLUTION FROM CROPLAND. VOLUME I--A MANUAL FOR GUIDELINE DEVELOPMENT

600	74	4013	PERFORMANCE	CHARACTERISTICS OF SORGHUM GRAIN RECONSTITUTED WITH EXCREMENT FROM FEEDLOT CATTLE KEYWO
400	77	4014	PERFORMANCE	EXCREMENT RECONSTITUTED GRAIN FOR GROWING AND FINISHING CATTLE KEYWORDS: REFEEDING ECON
100	77	4018	PERFORMANCE	EFFECT OF DIETARY SALT LEVEL AND LIQUID HANDLING SYSTEMS ON SWINE WASTE COMPOSITION KEY
100	77	4019	PERFORMANCE	ALFALFA VERSUS POULTRY EXCRETA AS NITROGEN SUPPLEMENTS FOR LAMBS KEYWORDS: REFEEDING SH
100	76	4020	PERFORMANCE	DEHYDRATED BROILER EXCRETA VERSUS SOYBEAN MEAL AS NITROGEN SUPPLEMENTS FOR SHEEP KEYWO
100	75	4022	PERFORMANCE	PERFORMANCE AND ENERGY METABOLISM OF STEERS FED A CONCENTRATE OR ROUGHAGE DIET IN CONVE
200	75	4026	PERFORMANCE	RECYCLED EXCRETA AS A NUTRIENT SOURCE FOR SWINE KEYWORDS: OXIDATION-DITCH REFEEDING SWI
400	77	4027	PERFORMANCE	BIRD PERFORMANCE NOT HURT BY REFEEDING AERATED WASTES KEYWORDS: REFEEDING OXIDATION-DIT
200	76	4034	PERFORMANCE	ENVIRONMENTAL FACTORS AFFECTING GROWTH PERFORMANCE OF TURKEYS KEYWORDS: TURKEYS PERFORM
100	77	4041	PERFORMANCE	THE LAYING PERFORMANCE OF TWO STRAINS OF HENS OFFERED DIETS CONTAINING DRIED POULTRY MA
200	77	4057	PERFORMANCE	SEMINAR ON FEEDLOT MANURE RECYCLING FOR NUTRIENT RECOVERY KEYWORDS: REFEEDING LIVESTOCK
200	77	4059	PERFORMANCE	USE OF WASTE FROM OPEN FEEDLOTS FOR FATTENING, GROWING AND MAINTENANCE RATIONS KEYWORD
200	77	4061	PERFORMANCE	FORMULATING AND MILLING FEEDS CONTAINING MANURE FROM OPEN FEEDLOTS KEYWORDS: REFEEDING
400	77	4070	PERFORMANCE	POULTRY WASTE FED TO CATTLE, SHEEP KEYWORDS: REFEEDING POULTRY-WASTES-DRIED WASTE-COMPO
100	76	4098	PERFORMANCE	COMPLETE RATIONS FOR DAIRY CATTLE. VII. DRIED POULTRY WASTE FOR LACTATING COWS KEYWORDS
100	76	4101	PERFORMANCE	NUTRITIONAL EVALUATION OF DEHYDRATED CATTLE MANURE USING SHEEP KEYWORDS: REFEEDING CATT
400	76	4141	PERFORMANCE	HOUSING AND FLOOR DESIGN CAN INFLUENCE PIG PERFORMANCE KEYWORDS: HOUSING SLATTED-FLOORS
100	77	4145	PERFORMANCE	NUTRIENT CHARACTERIZATION OF SWINE FECAL WASTE AND UTILIZATION OF THESE NUTRIENTS BY SW
100	77	4146	PERFORMANCE	COMPOSITION OF CORN PLANT ENSILED WITH EXCRETA OR NITROGEN SUPPLEMENTS AND ITS EFFECT
100	77	4148	PERFORMANCE	PERFORMANCE OF BEEF CATTLE FED WASTELAGE AND DIGESTIBILITY OF WASTELAGE AND DRIED WAST
200	76	4185	PERFORMANCE	REFEEDING OF AERATED POULTRY WASTES TO LAYING HENS KEYWORDS: AERATION REFEEDING POULTRY
300	75	4187	PERFORMANCE	FEEDING VALUE OF EXCRETA-STOVER SILAGE AND CORN RESIDUE FOR BEEF COWS KEYWORDS: REFEEDI
300	76	4194	PERFORMANCE	RECYCLING SEWAGE SOLIDS AS FEEDSTUFFS FOR LIVESTOCK KEYWORDS: RECYCLING SEWAGE-SOLIDS R
100	77	4208	PERFORMANCE	FERMENTATION, NITROGEN UTILIZATION, DIGESTIBILITY AND PALATABILITY OF BROILER LITTER EN
400	77	4215	PERFORMANCE	PELLETED POULTRY LITTER ECONOMICAL CATTLE FEED KEYWORDS: POULTRY-LITTER REFEEDING CATT
100	76	4223	PERFORMANCE	EFFECTS OF DAIRY CATTLE MANURE SOLUBLES IN LAMB DIETS KEYWORDS: DAIRY-WASTES REFEEDING
100	76	4235	PERFORMANCE	RECYCLING OF SWINE MANURE BY SELECTED FISHES KEYWORDS: REFEEDING SWINE-WASTES FISH PERF
100	76	4237	PERFORMANCE	VALUE OF LIQUID CATTLE WASTE TO ESTABLISHED GRASSES KEYWORDS: LIQUID-WASTES CATTLE-WAST
400	77	4239	PERFORMANCE	SLAT-SCRAPE RECAPTURES RATION NUTRIENTS FOR REFEEDING MANURE KEYWORDS: CATTLE-WASTES EN
100	72	4249	PERFORMANCE	THE GROWTH OF BROILER CHICKENS FED LOW-PROTEIN DIETS CONTAINING TRIAMMONIUM CITRATE, DI
400	77	4255	PERFORMANCE	BROILER WASTES GOOD PROTEIN SOURCE KEYWORDS: REFEEDING POULTRY-WASTES CATTLE PERFORMAN
400	77	4257	PERFORMANCE	IOWA FARMERS FEED DRIED POULTRY WASTE TO CATTLE KEYWORDS: POULTRY-WASTES-DRIED REFEEDIN
400	77	4258	PERFORMANCE	RECYCLING SOLVES WASTE MANAGEMENT PROBLEMS KEYWORDS: REFEEDING ENSILING CATTLE-WASTES P
100	76	4288	PERFORMANCE	FEEDING TH 6040 TO CATTLE RESIDUES IN TISSUES AND MILK AND BREAKDOWN IN MANURE KEYWORD
100	77	4290	PERFORMANCE	LONG-TERM STUDIES OF RESIDUE RETENTION AND EXCRETION BY COWS FED A POLYCHLORINATED BIPH
400	77	4293	PERFORMANCE	FEEDLOT WASTE WORKS IN GROWING RATION TEST KEYWORDS: CATTLE-WASTES DEHYDRATION ENSILING
400	77	4300	PERFORMANCE	RE-CYCLING IS NO CURE-ALL KEYWORDS: REFEEDING FEEDLOT-WASTES CATTLE PERFORMANCE ECONOMI
400	77	4314	PERFORMANCE	MORE ON MANURE KEYWORDS: REFEEDING PERFORMANCE COPPER IRON CALCIUM AMPROLIUM PATHOGENIC
100	75	4329	PERFORMANCE	USE OF DRIED PAUNCH RESIDUE IN RUMINANT DIETS KEYWORDS: PAUNCH-MANURE REFEEDING SHEEP C
400	77	4333	PERFORMANCE	USE OF AGRICULTURE WASTES IN AQUACULTURE KEYWORDS: AQUACULTURE FISH FEEDS ORGANIC-WASTE
200	77	4335	PERFORMANCE	UTILIZATION OF SUNFLOWER SILAGE, SUNFLOWER HULLS WITH POULTRY LITTER AND SUNFLOWER HULL
300	76	4357	PERFORMANCE	EXPERIMENTS IN RECYCLING SWINE MANURE IN FISHPONDS KEYWORDS: SWINE-WASTES FISH-FEEDING
200	76	4367	PERFORMANCE	METHANE FERMENTATION OF ANIMAL WASTES KEYWORDS: WASTE-TREATMENT METHANE REFEEDING CATTL
400	77	4371	PERFORMANCE	SANITATION IS FIRST STEP IN EFFECTIVE FEEDLOT FLY CONTROL KEYWORDS: FLY-CONTROL FEEDLOT
100	77	4372	PERFORMANCE	A NEW CONCEPT OF LITTER MANAGEMENT FOR BROILER PRODUCTION KEYWORDS: POULTRY POULTRY-LIT
100	74	4374	PERFORMANCE	NUTRITIONAL VALUE OF CATTLE WASTE FOR CATTLE KEYWORDS: REFEEDING CATTLE-WASTES WASTELAG
100	74	4376	PERFORMANCE	USE OF FLUID COWSHED MANURE IN FISH PONDS KEYWORDS: ISRAEL REFEEDING FISH PONDS CATTLE-
300	77	4379	PERFORMANCE	INFLUENCE OF RECYCLING BEEF CATTLE WASTE ON INDIGESTIBLE RESIDUE ACCUMULATION KEYWORDS
400	77	4380	PERFORMANCE	WINTERING BROOD COWS MAKE BEST USE OF POULTRY LITTER- RESEARCHER KEYWORDS: REFEEDING PO
100	76	4387	PERFORMANCE	EXPOSURE OF LAMBS TO ATMOSPHERIC AMMONIA KEYWORDS: SHEEP ANIMAL-HEALTH AIR-POLLUTION AM
100	76	4389	PERFORMANCE	NUTRITIVE VALUE OF ENSILED CATTLE WASTE KEYWORDS: ENSILING CATTLE-WASTES REFEEDING CATT
100	77	4399	PERFORMANCE	UTILIZATION OF CATTLE EXCREMENT FOR GROWTH AND MAINTENANCE OF BEEF CATTLE KEYWORDS: RE
200	72	4400	PERFORMANCE	RECYCLING ANIMAL WASTES KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CRUDE-PROTEINS PERFORM
600		4407	PERFORMANCE	EFFECT OF CORN STOVER SILAGE DIETS SUPPLEMENTED WITH NITROGEN FROM POULTRY EXCRETA ON D
400	77	4410	PERFORMANCE	POULTRY WASTE--NITROGEN FOR LACTATING DAIRY COWS KEYWORDS: REFEEDING POULTRY-WASTES-DRI
300	74	4412	PERFORMANCE	SALT LEVELS IN STEER FINISHING RATIONS KEYWORDS. CATTLE FEEDS SALT-LEVELS PERFORMANCE C
200	74	4415	PERFORMANCE	FIVE-YEAR BEEF ANIMAL ENVIRONMENT STUDY IN MINNESOTA KEYWORDS: CONFINEMENT-PENS FEEDLOT
100	77	4418	PERFORMANCE	LAMB PERFORMANCE ON CAGE HEN MANURE ENSILED WITH CORRUGATED CARDBOARD KEYWORDS: REFEEDI
100	77	4419	PERFORMANCE	EFFECTS OF FERMENTED AND NON-FERMENTED POULTRY MANURE SILAGE ON BROILER CHICK GROWTH KE
400	77	4431	PERFORMANCE	GOOD GAINS ON POULTRY WASTE, HIGH FIBER DIET KEYWORDS: POULTRY-WASTES-DRIED REFEEDING N
300	77	4449	PERFORMANCE	A RAPID METHOD OF MEASURING MOISTURE IN LITTER USED FOR BROILERS BROODED AT HIGH DENSIT
100	72	4475	PERFORMANCE	EFFECTS ON CHICK GROWTH OF ADDING VARIOUS NON-PROTEIN NITROGEN SOURCES OR DRIED AUTOCLA
400	73	4488	PERFORMANCE	RUMINANTS AND PIGS ARE THE BEST USERS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE S
100	76	4497	PERFORMANCE	POULTRY LITTER FOR INTENSIVE BEEF PRODUCTION KEYWORDS: POULTRY-WASTES REFEEDING DIGESTI
300	72	4501	PERFORMANCE	SODIUM LEVELS IN BEEF CATTLE FINISHING RATIONS AS RELATED TO PERFORMANCE AND CONCENTRAT
100	72	4508	PERFORMANCE	THE EFFECTS OF CONTINUOUS RECYCLING DRIED POULTRY WASTE IN LAYING HEN DIETS ON TRACE M
400	77	4516	PERFORMANCE	MILO-MANURE SLURRY BEATS RECONSTITUTING KEYWORDS: REFEEDING CATTLE-WASTES CATTLE PERFOR
400	77	4526	PERFORMANCE	WHAT'S HOUSING REALLY WORTH KEYWORDS CONFINEMENT-PENS HOUSING FLOORS ECONOMICS PERFORM
200	73	4533	PERFORMANCE	OBSERVATIONS CONCERNING THE USE OF CATTLE MANURES IN DRYLOT FEEDING KEYWORDS: REFEEDING
400	77	4537	PERFORMANCE	DRIED CATTLE WASTE CAN STRETCH SWINE RATIONS KEYWORDS: REFEEDING SWINE PERFORMANCE CATT
700	75	4544	PERFORMANCE	NUTRIENT CHARACTERIZATION OF SWINE FECAL WASTE AND UTILIZATION OF THESE NUTRIENTS BY SW
100	75	4564	PERFORMANCE	HIGH LEVEL ANTIBIOTICS IN A SWINE WASTE RECYCLING SYSTEM KEYWORDS: SWINE DRINKING-WATER
400	77	4571	PERFORMANCE	A PLACE FOR POULTRY WASTE KEYWORDS. REFEEDING POULTRY-WASTES WASTE-STORAGE ENSILING SIL
400	76	4576	PERFORMANCE	HOUSING AND EQUIPMENT--OPTIONS FOR CONFINEMENT HOUSING KEYWORDS: CONFINEMENT-PENS HOUSI
200	72	4603	PERFORMANCE	ROLE OF RECYCLED LARGE ANIMAL WASTE FOR ANIMAL PROTEIN PRODUCTION KEYWORDS: LIQUID-WAST
400	77	4609	PERFORMANCE	WET CAGE LAYER MANURE FED TO FEEDLOT CATTLE KEYWORDS: POULTRY-WASTES PRESERVATIVES REFE
100	76	4631	PERFORMANCE	LIQUID DIETS CONTAINING POULTRY WASTES FOR RUMINANTS KEYWORDS: DIETS SHEEP LIQUID-WASTE
700	72	4635	PERFORMANCE	BIOCHEMICAL AND NUTRITIONAL STUDIES ON FERMENTED- AMMONIATED ANIMAL FEED SUPPLEMENTS KE
100	77	4636	PERFORMANCE	A COMPARISON ON PH-CONTROLLED AND DISSOLVED OXYGEN- CONTROLLED NUTRIENT ADDITION FOR TH
100	76	4639	PERFORMANCE	USING DEHYDRATED POULTRY WASTE IN POULTRY RATIONS--A REVIEW KEYWORDS: POULTRY-WASTES-DR
400	77	4664	PERFORMANCE	NEW RECYCLING TRIAL SHOWS 20 HD EXTRA PROFIT KEYWORDS: REFEEDING CATTLE-WASTES COMPOST
500	77	4080	PERMITS	ECONOMIC AND REGULATORY ASPECTS OF LAND APPLICATION OF WASTES TO AGRICULTURAL LANDS PRO
200	77	4276	PERMITS	FEDERAL LIVESTOCK WASTE REGULATIONS KEYWORDS: LEGAL-ASPECTS FEEDLOTS PERMITS WATER-POLL
200	77	4277	PERMITS	STATUS OF ILLINOIS LIVESTOCK WASTE REGULATIONS KEYWORDS: ILLINOIS-LAW LEGAL-ASPECTS PER
200	77	4278	PERMITS	CASE STUDIES OF WATER POLLUTION CAUSED BY FEEDLOT OPERATIONS AND FUTURE DEMAND FOR PRIV
300	75	4029	PESTICIDES	CONTROL OF WATER POLLUTION FROM CROPLAND: VOLUME I--A MANUAL FOR GUIDELINE DEVELOPMENT
300	76	4030	PESTICIDES	CONTROL OF WATER POLLUTION FROM CROPLAND. VOLUME II--AN OVERVIEW KEYWORDS: AGRICULTURAL
200	77	4063	PESTICIDES	RESIDUE TRANSFER AND ACCUMULATION KEYWORDS: REFEEDING FEED-ADDITIVES ANIMAL-HEALTH CATT
200	76	4129	PESTICIDES	NONPOINT SOURCES: STATE-OF-THE-ART OVERVIEW KEYWORDS: WATER-POLLUTION AGRICULTURAL-RUNO
300	77	4262	PESTICIDES	CAN CITY SEWAGE BE RECYCLED SAFELY ON FARM LAND KEYWORDS RECYCLING SEWAGE LAND-APPLICA
100	75	4395	PESTICIDES	A MODEL FOR RUNOFF OF PESTICIDES FROM SMALL UPLAND WATERSHEDS KEYWORDS: MODEL-STUDIES A
100	75	4645	PESTICIDES	WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS: WATER-POLLUTION NONPOINT-SOURCES PUBLIC
100	76	4375	PETRIELLIDIUM-BOYD	THE DEVELOPMENT IN BEEF CATTLE MANURE OF PETRIELLIDIUM BOYDII SHEAR MALLOCH, A POTENTIA
200	77	4373	PETROCHEMICALS	AMMONIA SYNTHESIS GAS AND PETROCHEMICALS FROM CATTLE FEEDLOT MANURE KEYWORDS: CATTLE-WA
100	77	4632	PHENOLS	SIMPLE PHENOLS AND INDOLES IN ANAEROBICALLY STORED PIGGERY WASTES KEYWORDS: SWINE-WASTE
100	72	4007	PHOSPHATES	WATER MANAGEMENT ASPECTS OF THE AGRICULTURAL UTILIZATION OF LIQUID MANURE AND PRELIMINA
100	75	4205	PHOSPHATES	WASTE CHARACTERIZATION STUDIES FOR RACEWAY PRODUCTION OF CATFISH KEYWORDS: FISH-WASTES
400	77	4212	PHOSPHATES	LIQUID MANURE CAN SERVE AS SOURCE OF NUTRIENTS KEYWORDS: CATTLE-WASTES LIQUID-WASTES LA
100	76	4456	PHOSPHATES	NITROGEN MOVEMENT NEAR SURFACE MANURE STORAGES KEYWORDS: WASTE-STORAGE MANURE-PIT WASTE
100	69	4460	PHOSPHATES	STUDIES ON THE USE OF ANIMAL SLURRIES TO MANURE BARLEY 2-- THE EFFECT OF AUTUMN, WINTE

100	77 4470	PHOSPHATES	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
300	72 4107	PHOSPHATE	MANURING OF PERMANENT MEADOWS 1962-70 KEYWORDS: LAND-APPLICATION GRASSLAND ANIMAL-WASTE
400	77 4169	PHOSPHATE	HOW MUCH MANURE SHOULD WE PUT ON KEYWORDS: ANIMAL-WASTES LAND-APPLICATION CROP-RESPONSE
400	77 4328	PHOSPHATE	DAIRY WASTE--FIELD APPLICATION STILL BEST KEYWORDS: DAIRY-WASTES STORAGE-SYSTEMS LIQUID
300	75 4434	PHOSPHATE	MICROBIOLOGY AND WATER QUALITY IN A TRIBUTARY OF CAYUGA LAKE KEYWORDS: WATER-POLLUTION
100	77 4468	PHOSPHATE	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
400	77 4553	PHOSPHATE	GET MORE VALUE FROM HOG MANURE KEYWORDS: *SWINE-WASTES CONFINEMENT-PENS LIQUID-WASTES* WA
400	71 4173	PHOSPHORIC-ACID	A POLLUTION SOLUTION WITH BUILT-IN PROFITS KEYWORDS: DEHYDRATION POULTRY-WASTES-DRIED RE
100	72 4006	PHOSPHORUS	PROCESSING SOLID MANURE FROM LIVESTOCK-FARMING TO ORGANIC FERTILIZER FOR VEGETABLE GARD
100	72 4010	PHOSPHORUS	POSSIBLE TREATMENT METHODS FOR LIQUID MANURE FOR THE MODIFICATION OF ITS PHYSICAL, CHEM
100	72 4012	PHOSPHORUS	WATER MANAGEMENT PROBLEMS INVOLVED IN THE TREATMENT AND UTILIZATION OF LIQUID MANURE KE
100	77 4018	PHOSPHORUS	EFFECT OF DIETARY SALT LEVEL AND LIQUID HANDLING SYSTEMS ON SWINE WASTE COMPOSITION KEY
300	76 4028	PHOSPHORUS	TERTIARY TREATMENT AND REUSE OF ANIMAL WASTES KEYWORDS: DAIRY-WASTES LIQUID-WASTES BIOL
100	76 4049	PHOSPHORUS	ACCUMULATION OF NUTRIENTS IN SOIL BENEATH HOG MANURE LAGOONS KEYWORDS: LAGOONS SWINE-WA
200	74 4052	PHOSPHORUS	HAZARDS ASSOCIATED WITH SPREADING ANIMAL-WASTE SLURRIES KEYWORDS: SLURRIES LAND-APPLICA
300	76 4067	PHOSPHORUS	MANURE HARVESTING PRACTICES EFFECTS ON WASTE CHARACTERISTICS AND RUNOFF KEYWORDS: FEED
400	77 4070	PHOSPHORUS	POULTRY WASTE FED TO CATTLE, SHEEP KEYWORDS: REFEEDING POULTRY-WASTES-DRIED WASTE-COMPO
300	75 4077	PHOSPHORUS	STATUS OF SEDIMENT FROM CATFISH PRODUCTION PONDS AS A FERTILIZER AND SOIL CONDITIONER K
500	77 4079	PHOSPHORUS	LAND AS A WASTE MANAGEMENT ALTERNATIVE KEYWORDS: WASTE-MANAGEMENT LAND-APPLICATION ANIM
300	76 4099	PHOSPHORUS	DESIGN PARAMETERS FOR THE LAND APPLICATION OF DAIRY MANURE KEYWORDS: DAIRY-WASTES LAND
100	77 4145	PHOSPHORUS	NUTRIENT CHARACTERIZATION OF SWINE FECAL WASTE AND UTILIZATION OF THESE NUTRIENTS BY SW
200	76 4185	PHOSPHORUS	REFEEDING OF AERATED POULTRY WASTES TO LAYING HENS KEYWORDS: AERATION REFEEDING POULTRY
200	76 4186	PHOSPHORUS	A LOW COST SETTLING BASIN AND INFILTRATION CHANNEL FOR CONTROLLING RUNOFF FROM AN OPEN
500	75 4196	PHOSPHORUS	NITROGEN AND PHOSPHORUS FOOD PRODUCTION, WASTE AND THE ENVIRONMENT KEYWORDS: WATER-POL
500	75 4197	PHOSPHORUS	TRANSPORT IN STREAMS KEYWORDS: WATER-POLLUTION POLLUTANT-SOURCES NITROGEN PHOSPHORUS AG
500	75 4198	PHOSPHORUS	FLOWS OF NITROGEN AND PHOSPHORUS ON LAND KEYWORDS NITROGEN PHOSPHORUS GROUNDWATER-POLL
300	74 4217	PHOSPHORUS	SOIL POLLUTION FROM FEEDLOTS IN GEORGIA KEYWORDS: GROUNDWATER-POLLUTION SOIL-CONTAMINAT
200	73 4250	PHOSPHORUS	SOME FACTORS TO CONSIDER IN USING ANIMAL MANURES FOR FERTILIZER KEYWORDS: POULTRY-WASTE
300	74 4266	PHOSPHORUS	RECYCLE SOLID ANIMAL WASTES KEYWORDS: ANIMAL-WASTES LAND-APPLICATION CROP-RESPONSE NITR
700	70 4268	PHOSPHORUS	CATTLE MANURE. I EFFECT ON CROPS AND SOILS. II RETENTION PROPERTIES FOR CU, MN, AND ZN
200	77 4274	PHOSPHORUS	CROPPING PRACTICES ON ILLINOIS LIVESTOCK FARMS KEYWORDS: CROP-PRODUCTION FORAGES LAND-A
100	76 4306	PHOSPHORUS	AN EVALUATION OF FARMYARD SLURRY ENRICHED WITH EITHER POULTRY MANURE OR INORGANIC N-P-K
400	76 4316	PHOSPHORUS	WHAT'S MANURE WORTH AS A FERTILIZER KEYWORDS: LIVESTOCK-WASTES WASTE-PRODUCTION-RATE FE
100	76 4377	PHOSPHORUS	EFFECT ON SOIL AND PLANT MINERAL LEVELS FOLLOWING APPLICATION OF MANURES OF DIFFERENT C
200	75 4401	PHOSPHORUS	CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH DENSITY CATFISH CULTURES K
300	77 4423	PHOSPHORUS	NO FERTILIZER, SOIL TEST FERTILIZATION, AND HEAVY FERTILIZATION OF CORN--WHAT HAPPENS W
300	75 4429	PHOSPHORUS	MANURE--LONG-TERM STUDY KEYWORDS: ANIMAL-WASTES LAND-APPLICATION CROP-RESPONSE NUTRIENT
400	77 4439	PHOSPHORUS	INJECTING MANURE CUTS CORN FERTILIZER COSTS KEYWORDS: LAND-APPLICATION SOIL-INJECTION C
100	76 4452	PHOSPHORUS	PHOSPHORUS LOSS BY STREAM TRANSPORT FROM A RURAL WATERSHED--QUANTITIES, PROCESSES, AND
100	76 4481	PHOSPHORUS	NUTRIENT CONTENT OF SORGHUM LEAVES AND GRAIN AS INFLUENCED BY LONG-TERM CROP ROTATION
300	77 4482	PHOSPHORUS	NUTRIENT, BACTERIAL, AND VIRUS CONTROL AS RELATED TO GROUND-WATER CONTAMINATION KEYWORD
100	77 4483	PHOSPHORUS	PHOSPHORUS FERTILIZER AS A BY-PRODUCT OF ENERGY PRODUCTION FROM AGRICULTURAL WASTES KE
100	74 4489	PHOSPHORUS	EXPERIMENTS MADE ON STACKYARD FIELD, WOBURN, 1876-1974. I HISTORY OF THE FIELD, DETAILS
100	75 4490	PHOSPHORUS	EXPERIMENTS MADE ON STACKYARD FIELD, WOBURN, 1876-1974 II EFFECTS OF TREATMENTS ON SOI
100	75 4491	PHOSPHORUS	EXPERIMENTS MADE ON STACKYARD FIELD, WOBURN, 1876-1974. III. EFFECTS OF NPK FERTILIZERS
100	76 4496	PHOSPHORUS	NONPOINT SOURCE POLLUTION FROM AGRICULTURAL RUNOFF KEYWORDS: WATER-POLLUTION NONPOINT-S
100	73 4513	PHOSPHORUS	EFFECTS OF NITROGEN, PHOSPHORUS, POTASSIUM, AND MANURE FACTORIALLY APPLIED TO POTATOES
400	77 4522	PHOSPHORUS	ON STRAW AND GOLD, MANURE AND ALGAE--FEEDING WASTE--IT'S BEING DONE IN A VARIETY OF WAY
400	77 4525	PHOSPHORUS	MANURE MAKES CENTS KEYWORDS: LAND-APPLICATION ANHYDROUS-AMMONIA FEEDLOT-WASTES CROP-RES
400	75 4531	PHOSPHORUS	STORAGE-STORE MANURE AS IF IT WERE VALUABLE-BECAUSE IT IS KEYWORDS: FERTILIZERS CATTLE-
200	76 4551	PHOSPHORUS	LAND DISPOSAL OF ANIMAL MANURE IN THE RED RIVER VALLEY KEYWORDS: CANADA-LAW LIVESTOCK-W
100	77 4573	PHOSPHORUS	RUNOFF FROM A LOW-COST MANURE STORAGE FACILITY KEYWORDS: AGRICULTURAL-RUNOFF WASTE-STOR
400	70 4575	PHOSPHORUS	MANURE DISPOSAL KEYWORDS: POULTRY-WASTES SOLID-WASTES SLURRIES LAND-APPLICATION DEHYDRA
100	73 4580	PHOSPHORUS	EVALUATION OF ORGANIC MANURES KEYWORDS; ORGANIC-WASTES LAND-APPLICATION CROP-RESPONSE P
400	77 4587	PHOSPHORUS	COMPOSTING CONVERTS WASTE INTO VALUABLE RESOURCES KEYWORDS: COMPOSTING FEEDLOT-WASTES P
100	75 4589	PHOSPHORUS	PROPERTIES OF MANURE ACCUMULATIONS FROM MIDWEST BEEF CATTLE FEEDLOTS KEYWORDS: FEEDLOTS
300	75 4593	PHOSPHORUS	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 1 KEYWORDS: WASTE-TREATMENT
300	76 4594	PHOSPHORUS	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 2 KEYWORDS: SWINE-WASTES WAS
100	77 4599	PHOSPHORUS	DENITRIFICATION OF AEROBICALLY STABILISED PIG WASTE KEYWORDS: SWINE-WASTES LIQUID-WASTE
100	76 4600	PHOSPHORUS	EUTROPHICATION POTENTIAL OF DAIRY CATTLE WASTE RUNOFF KEYWORDS: CATTLE-WASTES DAIRY-WAS
100	76 4601	PHOSPHORUS	FACTORS AFFECTING NUTRIENT LOADS IN SOME IOWA STREAMS KEYWORDS: WATERSHEDS WATER-POLLUT
100	75 4604	PHOSPHORUS	EFFECT OF LONG TERM MANURING ON THE SOIL PHOSPHATE POTENTIAL IN CALCAREOUS SOIL AND ITS
100	77 4628	PHOSPHORUS	SPREADING SLURRY ON LAND KEYWORDS: SLURRIES LIVESTOCK-WASTES LAND-APPLICATION DRAINAGE
100	76 4639	PHOSPHORUS	USING DEHYDRATED POULTRY WASTE IN POULTRY RATIONS--A REVIEW KEYWORDS: POULTRY-WASTES-DR
200	75 4650	PHOSPHORUS	ANIMAL MANURES IN GRASS PRODUCTION KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES
200	76 4651	PHOSPHORUS	FERTILIZER VALUE OF ANIMAL MANURES KEYWORDS: SWINE-WASTES CATTLE-WASTES WASTE-STORAGE L
100	76 4656	PHOSPHORUS	THREE-STEP TREATMENT FOR PIGGERY WASTES KEYWORDS: SWINE-WASTES AEROBIC-TREATMENT ANAERO
300	76 4109	PHYSICAL-PROPERTIE	EVALUATING A LOW-ENERGY, HIGH-VALUE PUMP FOR ODOR REDUCTION FROM LIVESTOCK WASTE LAGOON
100	72 4008	PHYSICAL-TREATMENT	SOME POSSIBILITIES AND ASPECTS OF THE CHEMICAL AND BIOLOGICAL TREATMENT OF LIQUID MANUR
100	72 4010	PHYSICAL-TREATMENT	POSSIBLE TREATMENT METHODS FOR LIQUID MANURE FOR THE MODIFICATION OF ITS PHYSICAL, CHEM
200	75 4026	PHYSICAL-TREATMENT	RECYCLED EXCRETA AS A NUTRIENT SOURCE FOR SWINE KEYWORDS OXIDATION-DITCH REFEEDING SWI
200	74 4072	PHYSICAL-TREATMENT	FUEL FROM FECES KEYWORDS FUELS RECYCLING PHYSICAL-TREATMENT CHEMICAL-TREATMENT BIOLOGI
500	75 4200	PHYSICAL-TREATMENT	ANIMAL WASTE MANAGEMENT WITH NUTRIENT CONTROL KEYWORDS: NUTRIENT-CONTROL LAND-APPLICATI
100	74 4562	PHYSICAL-TREATMENT	CONVERSION OF ORGANIC WASTE INTO PROTEIN KEYWORDS: BIOLOGICAL-TREATMENT ORGANIC-WASTES
100	73 4131	PH	THE ROLES OF AMMONIA, WATER ACTIVITY, AND PH IN THE SALMONELLACIDAL EFFECT OF LONG-USED
300	77 4301	PH	NUTRITIVE VALUE OF ENSILED BROILER LITTER KEYWORDS: REFEEDING POULTRY-LITTER ENSILING M
300	76 4355	PH	EVALUATION OF ENSILING SWINE FECAL WASTE WITH GROUND ORCHARDGRASS HAY, PRELIMINARY REPO
200	77 4422	PH	MICROFLORA OF ENSILED MANURE-BLENDED FEED, CORN AND SORGHUM SILAGES KEYWORDS: ENSILING
300	77 4423	PH	NO FERTILIZER, SOIL TEST FERTILIZATION, AND HEAVY FERTILIZATION OF CORN--WHAT HAPPENS W
200	76 4433	PH	WILLE COMPOST TANK--A DESIGN STUDY FOR A CONTINUOUS FLOW COMPOST TANK USED IN RECLAIMIN
300	74 4453	PH	STATE OF THE ART-METHANE GAS GENERATION FROM AGRICULTURAL WASTES KEYWORDS: AGRICULTURAL
100	75 4490	PH	EXPERIMENTS MADE ON STACKYARD FIELD, WOBURN, 1876-1974 II EFFECTS OF TREATMENTS ON SOI
700	76 4545	PH	EVALUATION OF A FLUSHING-GUTTER MANURE-REMOVAL SYSTEM TO IMPROVE ATMOSPHERIC QUALITY IN
300	75 4586	PH	ADDITIVES FOR MANURE ODOR CONTROL KEYWORDS: ODOR-CONTROL LAND-APPLICATION BIOLOGICAL-TR
100	75 4589	PH	PROPERTIES OF MANURE ACCUMULATIONS FROM MIDWEST BEEF CATTLE FEEDLOTS KEYWORDS. FEEDLOTS
300	75 4593	PH	*TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 1 KEYWORDS: WASTE-TREATMENT*
300	76 4595	PH	CONTROLLED ADDITION OF ANIMAL WASTE TO AEROBIC BIOLOGICAL TREATMENT PLANTS A COMPARISON
100	76 4634	PH	ANALYSIS OF THE ROTTING PROCESS OF SAWDUST BARNYARD MANURE KEYWORDS: ANIMAL-WASTES SAW
100	77 4636	PH	A COMPARISON ON PH-CONTROLLED AND DISSOLVED OXYGEN- CONTROLLED NUTRIENT ADDITION FOR TH
100	77 4470	PH-BUFFERING-CAPAC	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
100	77 4365	PIPE-SIZE	HEAD LOSS OF BEEF MANURE SLURRY FLOW IN POLYVINYLCHLORIDE PIPE KEYWORDS: CATTLE-WASTES
400	77 4411	PITS	WAYS TO SPEED UP DRYING OF MANURE IN PITS KEYWORDS POULTRY-WASTES DEHYDRATION VENTILAT
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100	77 4419	POULTRY-WASTES	EFFECTS OF FERMENTED AND NON-FERMENTED POULTRY MANURE SILAGE ON BROILER CHICK GROWTH KE
100	75 4420	POULTRY-WASTES	A STUDY ON THE RELATIVE EFFICIENCY OF ORGANIC MANURES AND THE EFFECT OF SALINITY ON ITS
100	77 4421	POULTRY-WASTES	EFFECT OF INCLUDING ENSILED BROILER-HOUSE LITTER IN THE RATIONS OF SHEEP ON THE DIGESTI
100	76 4446	POULTRY-WASTES	EXAMINATION OF POULTRY LITTER FOR SALMONELLAE BY DIRECT CULTURE AND FLUORESCENT ANTIBOD
300	77 4449	POULTRY-WASTES	A RAPID METHOD OF MEASURING MOISTURE IN LITTER USED FOR BROILERS BROODED AT HIGH DENSIT
100	69 4460	POULTRY-WASTES	STUDIES ON THE USE OF ANIMAL SLURRIES TO MANURE BARLEY 2-- THE EFFECT OF AUTUMN, WINTE
700	73 4467	POULTRY-WASTES	*EFFECT OF DRYING ON THE LOSSES OF NITROGEN AND TOTAL SOLIDS FROM POULTRY MANURE* KEYWORD
400	77 4473	POULTRY-WASTES	FEEDING POULTRY LITTER KEYWORDS: REFEEDING ENSILING POULTRY-WASTES POULTRY-LITTER CATT
100	76 4497	POULTRY-WASTES	POULTRY LITTER FOR INTENSIVE BEEF PRODUCTION KEYWORDS: POULTRY-WASTES REFEEDING DIGESTI
400	77 4515	POULTRY-WASTES	SOLAR ENERGY HELPS DRY POULTRY WASTE KEYWORDS: SOLAR-DRYING POULTRY-WASTES HEATING RECY
400	77 4520	POULTRY-WASTES	PROFITS FROM MANURE-WORKERS LIST TREATMENTS, APPLICATION KEYWORDS: POULTRY-WASTES LAND-
400	77 4522	POULTRY-WASTES	ON STRAW AND GOLD, MANURE AND ALGAE--FEEDING WASTE--IT'S BEING DONE IN A VARIETY OF WAY
400	77 4524	POULTRY-WASTES	CHICKEN MANURE PLUS KEYWORDS: RECLAMATION SURFACE-MINED-LANDS LAND-APPLICATION ASH SEW
400	73 4528	POULTRY-WASTES	IN-HOUSE MANURE DRYING KEYWORDS: POULTRY-WASTES DEHYDRATION DEEP-PIT-HOUSES STERILIZATI
400	77 4530	POULTRY-WASTES	BACTERIA POWER GENERATOR, PRODUCE FERTILIZER IN IOWA KEYWORDS: POULTRY-WASTES RECYCLING
700	76 4541	POULTRY-WASTES	NITROGEN REMOVAL AND TRANSFORMATIONS IN THE OVERLAND FLOW TREATMENT OF POULTRY WASTES K
100	75 4560	POULTRY-WASTES	A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND-- PART 2 KEYWORDS: WATER-POLLUT
700	72 4561	POULTRY-WASTES	USE OF AN ACTIVATED SLUDGE PROCESS IN TREATING CHICKEN MANURE COMBINED WITH DOMESTIC SE
400	71 4569	POULTRY-WASTES	POWER-HAROLD BATE AND HIS MARVELOUS CHICKEN-POWERED CAR KEYWORDS: POULTRY-WASTES RECYCL
400	77 4571	POULTRY-WASTES	A PLACE FOR POULTRY WASTE KEYWORDS: REFEEDING POULTRY-WASTES WASTE-STORAGE ENSILING SIL
400	70 4575	POULTRY-WASTES	MANURE DISPOSAL KEYWORDS: POULTRY-WASTES SOLID-WASTES SLURRIES LAND-APPLICATION DEHYDRA
100	76 4602	POULTRY-WASTES	TREATMENT OF POULTRY MANURE WASTEWATER USING A ROTATING BIOLOGICAL CONTACTOR KEYWORDS:
100	75 4607	POULTRY-WASTES	FLY PROTEIN PRODUCTION FROM MECHANICALLY MIXED ANIMAL WASTES KEYWORDS: RECYCLING POULTR
100	75 4608	POULTRY-WASTES	THE USE OF RESPIROMETRIC METHODS FOR ASSESSING THE BIODEGRADABILITY OF DIFFERENT COMPON
400	77 4609	POULTRY-WASTES	WET CAGE LAYER MANURE FED TO FEEDLOT CATTLE KEYWORDS: POULTRY-WASTES PRESERVATIVES REFE
200	76 4619	POULTRY-WASTES	ENGINEERING EVALUATION OF A POULTRY MANURE DEHYDRATING MACHINE KEYWORDS: DEHYDRATION PO
100	76 4631	POULTRY-WASTES	LIQUID DIETS CONTAINING POULTRY WASTES FOR RUMINANTS KEYWORDS: DIETS SHEEP LIQUID-WASTE
200	75 4641	POULTRY-WASTES	RECYCLING AND DEGRADATION OF ANABOLIC AGENTS IN ANIMAL EXCRETA KEYWORDS: REFEEDING LIVE
200	75 4650	POULTRY-WASTES	ANIMAL MANURES IN GRASS PRODUCTION KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES
100	76 4654	POULTRY-WASTES	ANAEROBIC DIGESTION OF AGRICULTURAL WASTES KEYWORDS: ANAEROBIC-DIGESTION SWINE-WASTES C
300	77 4655	POULTRY-WASTES	NOTES ON ANAEROBIC DIGESTION AND ANAEROBIC DIGESTERS BASED ON EXPERIMENTAL PLANT IN ABE
100	74 4661	POULTRY-WASTES	DEVELOPMENT OF A SYNTHETIC COMPOST FOR MUSHROOM GROWING BASED ON WHEAT STRAW AND CHICKE
100	73 4666	POULTRY-WASTES	STUDIES ON POULTRY MANURE IN RELATION TO VEGETABLE PRODUCTION II. POTATO KEYWORDS: POUL
100	77 4019	POULTRY-WASTES-DRI	ALFALFA VERSUS POULTRY EXCRETA AS NITROGEN SUPPLEMENTS FOR LAMBS KEYWORDS: REFEEDING SH
100	76 4020	POULTRY-WASTES-DRI	DEHYDRATED BROILER EXCRETA VERSUS SOYBEAN MEAL AS NITROGEN SUPPLEMENTS FOR SHEEP KEYWO
100	77 4041	POULTRY-WASTES-DRI	THE LAYING PERFORMANCE OF TWO STRAINS OF HENS OFFERED DIETS CONTAINING DRIED POULTRY MA

200 77 4063 POULTRY-WASTES-DRI RESIDUE TRANSFER AND ACCUMULATION KEYWORDS: REFEEDING FEED-ADDITIVES ANIMAL-HEALTH CATT
400 77 4070 POULTRY-WASTES-DRI POULTRY WASTE FED TO CATTLE, SHEEP KEYWORDS: REFEEDING POULTRY-WASTES-DRIED WASTE-COMPO
100 76 4098 POULTRY-WASTES-DRI COMPLETE RATIONS FOR DAIRY CATTLE VII. DRIED POULTRY WASTE FOR LACTATING COWS KEYWORDS:
100 77 4146 POULTRY-WASTES-DRI COMPOSITION OF CORN PLANT ENSILED WITH EXCRETA OR NITROGEN SUPPLEMENTS AND ITS EFFECT
400 77 4159 POULTRY-WASTES-DRI INTEREST IN DPW APPEARS TO HAVE SUBSIDED KEYWORDS: POULTRY-WASTES-DRIED RECYCLING REFEE
400 71 4173 POULTRY-WASTES-DRI A POLLUTION SOLUTION WITH BUILT-IN PROFITS KEYWORDS: DEHYDRATION POULTRY-WASTES-DRIED RE
100 77 4210 POULTRY-WASTES-DRI INFLUENCE OF FEEDING DEHYDRATED POULTRY WASTE ON COMPOSITION AND ORGANOLEPTIC QUALITY O
100 76 4232 POULTRY-WASTES-DRI HEN EXCRETA COMPOSITION AND RUMEN PARAMETERS KEYWORDS: SHEEP REFEEDING POULTRY-WASTES-D
100 76 4234 POULTRY-WASTES-DRI DRIED POULTRY WASTE AS A SUPPLEMENT FOR BEEF CATTLE KEYWORDS: POULTRY-WASTES-DRIED REFE
100 76 4236 POULTRY-WASTES-DRI HEN EXCRETA COMPOSITION AND METABOLISM BY SHEEP KEYWORDS: POULTRY-WASTES-DRIED REFEEDIN
100 73 4248 POULTRY-WASTES-DRI CHEMICAL AND BACTERIOLOGICAL COMPOSITION AND THE METABOLISABLE ENERGY VALUE OF EIGHT SA
100 72 4249 POULTRY-WASTES-DRI THE GROWTH OF BROILER CHICKENS FED LOW-PROTEIN DIETS CONTAINING TRIAMMONIUM CITRATE, DI
400 77 4253 POULTRY-WASTES-DRI CATTLE FEEDING GAINS REPORTED GOOD ON MISSISSIPPI COMPANY'S POULTRY WASTE KEYWORDS: POU
400 77 4257 POULTRY-WASTES-DRI IOWA FARMERS FEED DRIED POULTRY WASTE TO CATTLE KEYWORDS: POULTRY-WASTES-DRIED REFEEDIN
400 75 4313 POULTRY-WASTES-DRI DPW VALUE AS ANIMAL FEED SEEN REACHING 100 A TON KEYWORDS: REFEEDING POULTRY-WASTES-DR
100 76 4325 POULTRY-WASTES-DRI THE POTENTIAL TOXICITY OF COPPER-RICH ANIMAL EXCRETA TO SHEEP KEYWORDS: REFEEDING COPPE
100 77 4348 POULTRY-WASTES-DRI AVAILABLE AMINO ACID CONTENT AND MICROBIOLOGICAL CONDITION OF DRIED POULTRY MANURE KEY
200 72 4400 POULTRY-WASTES-DRI RECYCLING ANIMAL WASTES KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CRUDE-PROTEINS PERFORM
400 77 4410 POULTRY-WASTES-DRI POULTRY WASTE--NITROGEN FOR LACTATING DAIRY COWS KEYWORDS: REFEEDING POULTRY-WASTES-DRI
400 77 4431 POULTRY-WASTES-DRI GOOD GAINS ON POULTRY WASTE, HIGH FIBER DIET KEYWORDS: POULTRY-WASTES-DRIED REFEEDING N
100 72 4475 POULTRY-WASTES-DRI EFFECTS ON CHICK GROWTH OF ADDING VARIOUS NON-PROTEIN NITROGEN SOURCES OR DRIED AUTOCLA
400 73 4488 POULTRY-WASTES-DRI RUMINANTS AND PIGS ARE THE BEST USERS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE S
100 72 4508 POULTRY-WASTES-DRI THE EFFECTS OF CONTINUOUS RECYCLING DRIED POULTRY WASTE IN LAYING HEN DIETS ON TRACE M
400 76 4539 POULTRY-WASTES-DRI MCNALLY TURNS OUT A UNIFORM HIGH-QUALITY DPW KEYWORDS: REFEEDING POULTRY-WASTES-DRIED F
100 76 4639 POULTRY-WASTES-DRI USING DEHYDRATED POULTRY WASTE IN POULTRY RATIONS--A REVIEW KEYWORDS: POULTRY-WASTES-DR
100 71 4500 POULTRY-WASTE-FAUN SOME EFFECTS OF THE AMBIENT ARTHROPOD COMPLEX ON THE DENSITY AND POTENTIAL PARASITIZATI
700 76 4545 POWER-REQUIREMENTS EVALUATION OF A FLUSHING-GUTTER MANURE-REMOVAL SYSTEM TO IMPROVE ATMOSPHERIC QUALITY IN
400 76 4096 PRECIPITATION EPA WILL USE KSU MODEL AS WASTE CONTROL SYSTEMS TOOL KEYWORDS: WATER-QUALITY-INDEX COMP
100 74 4035 PREDATORS SUCCESSION AND ABUNDANCE OF INSECTS IN PASTURE MANURE RELATIONSHIP TO FACE FLY SURVIVAL
400 77 4609 PRESERVATIVES WET CAGE LAYER MANURE FED TO FEEDLOT CATTLE KEYWORDS: POULTRY-WASTES PRESERVATIVES REFE
300 76 4207 PRETREATMENT STATE-OF-THE-ART SWINE WASTE PRODUCTION AND PRETREATMENT PROCESSES KEYWORDS: SWINE-WAS
200 76 4403 PRETREATMENT RESEARCH AND DEVELOPMENT NEEDS RELATED TO PATHOGENS IN PRETREATMENT-LAND APPLICATION SY
200 74 4506 PRODUCTION ANIMAL PRODUCTION IN SINGAPORE--PRESENT STATUS AND TRENDS KEYWORDS: PRODUCTION SWINE PO
200 76 4185 PROTEINS REFEEDING OF AERATED POULTRY WASTES TO LAYING HENS KEYWORDS: AERATION REFEEDING POULTRY
400 77 4255 PROTEINS BROILER WASTES GOOD PROTEIN SOURCE KEYWORDS: REFEEDING POULTRY-WASTES CATTLE PERFORMAN
200 71 4457 PROTEINS AGRICULTURE S ROLE IN ENVIRONMENTAL QUALITY KEYWORDS: AGRICULTURE FEEDLOTS WATER-POLLUT
400 77 4382 PROTEIN RESEARCHERS STUDY ALGAE PRODUCTION FROM HOG WASTE KEYWORDS: RECYCLING WASTEWATER-RENOVA
400 77 4441 PROTEIN MANURE AND ALGAE PRODUCE ANIMAL FEED KEYWORDS: SWINE-WASTES LIVESTOCK-WASTES RECYCLING
100 77 4464 PROTEIN CHARACTERIZATION OF AN AGENT IN AQUEOUS EXTRACTS OF BEEF CATTLE MANURE THAT INHIBITS TH
100 76 4497 PROTEIN POULTRY LITTER FOR INTENSIVE BEEF PRODUCTION KEYWORDS: POULTRY-WASTES REFEEDING DIGESTI
400 77 4522 PROTEIN ON STRAW AND GOLD, MANURE AND ALGAE--FEEDING WASTE--IT'S BEING DONE IN A VARIETY OF WAY
100 74 4562 PROTEIN CONVERSION OF ORGANIC WASTE INTO PROTEIN KEYWORDS: BIOLOGICAL-TREATMENT ORGANIC-WASTES
400 77 4571 PROTEIN A PLACE FOR POULTRY WASTE KEYWORDS: REFEEDING POULTRY-WASTES WASTE-STORAGE ENSILING SIL
200 72 4603 PROTEIN ROLE OF RECYCLED LARGE ANIMAL WASTE FOR ANIMAL PROTEIN PRODUCTION KEYWORDS: LIQUID-WAST
100 77 4632 PROTEIN-DEGRADATIO SIMPLE PHENOLS AND INDOLES IN ANAEROBICALLY STORED PIGGERY WASTES KEYWORDS: SWINE-WASTE
100 74 4344 PROTEIN-PRODUCTION ANIMAL WASTES AS SUBSTRATES FOR PROTEIN PRODUCTION KEYWORDS: ANIMAL-WASTES SUBSTRATES P
100 75 4137 PROTEIN-SYNTHESIS CHANGES IN MICROBIAL POPULATION DURING FERMENTATION OF FEEDLOT WASTE WITH CORN KEYWORDS
100 75 4577 PROTEOLYTIC-ANAERO MICROFLORA OF NEWLY CUT GRASS AFTER ADDITION OF LIQUID MANURE KEYWORDS: LIQUID-WASTES A
200 76 4053 PUBLIC-HEALTH FATE OF PATHOGENS IN SOILS RECEIVING ANIMAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WA
200 77 4064 PUBLIC-HEALTH PROVISIONS OF STATE AND FEDERAL REGULATIONS ON REFEEDING KEYWORDS: REFEEDING LEGAL-ASPE
500 77 4079 PUBLIC-HEALTH LAND AS A WASTE MANAGEMENT ALTERNATIVE KEYWORDS: WASTE-MANAGEMENT LAND-APPLICATION ANIM
500 77 4083 PUBLIC-HEALTH HEALTH HAZARDS OF AGRICULTURAL, INDUSTRIAL, AND MUNICIPAL WASTES APPLIED TO LAND KEYWOR
500 77 4093 PUBLIC-HEALTH WASTE MANAGEMENT PROBLEMS AND THEIR IMPACT ON THE ENVIRONMENT ANIMAL WASTE MANAGEMENT K
100 76 4104 PUBLIC-HEALTH WATER QUALITY IMPLICATIONS OF CATTLE GRAZING ON A SEMIARID WATERSHED IN S. E. UTAH KEY
100 76 4105 PUBLIC-HEALTH FATE OF ANIMAL VIRUSES IN EFFLUENT FROM LIQUID FARM WASTES KEYWORDS: LAND-APPLICATION
400 77 4149 PUBLIC-HEALTH HOG CONFINEMENT GASES CAUSE MEDICAL PROBLEMS KEYWORDS: SWINE CONFINEMENT-PENS GASES PUB
400 77 4171 PUBLIC-HEALTH MANURE PITS CONTAIN GASES THAT CAN KILL KEYWORDS: MANURE-PITS GASES TOXICITY HYDROGEN-S
100 77 4210 PUBLIC-HEALTH INFLUENCE OF FEEDING DEHYDRATED POULTRY WASTE ON COMPOSITION AND ORGANOLEPTIC QUALITY O
400 74 4220 PUBLIC-HEALTH THE VALUE OF ANIMAL WASTES AS FEEDS FOR RUMINANTS KEYWORDS: REFEEDING WASTELAGE RUMINAN
300 77 4262 PUBLIC-HEALTH CAN CITY SEWAGE BE RECYCLED SAFELY ON FARM LAND KEYWORDS: RECYCLING SEWAGE LAND-APPLICA
100 76 4288 PUBLIC-HEALTH FEEDING TH 6040 TO CATTLE RESIDUES IN TISSUES AND MILK AND BREAKDOWN IN MANURE KEYWORD
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400 77 4314 PUBLIC-HEALTH MORE ON MANURE KEYWORDS: REFEEDING PERFORMANCE COPPER IRON CALCIUM AMPROLIUM PATHOGENIC
100 76 4375 PUBLIC-HEALTH THE DEVELOPMENT IN BEEF CATTLE MANURE OF PETRIELLIDIUM BOYDII SHEAR MALLOCH, A POTENTIA
300 73 4392 PUBLIC-HEALTH NITRATES IN THE UPPER SANTA ANA RIVER BASIN IN RELATION TO GROUNDWATER POLLUTION KEYWOR
200 76 4403 PUBLIC-HEALTH RESEARCH AND DEVELOPMENT NEEDS RELATED TO PATHOGENS IN PRETREATMENT-LAND APPLICATION SY
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400 77 4448 PUBLIC-HEALTH CONVERT CITY SEWAGE TO FARM FERTILIZER KEYWORDS: SEWAGE-SLUDGE FERTILIZERS LAND-APPLICA
100 76 4523 PUBLIC-HEALTH THE OCCURRENCE OF SALMONELLAS, MYCOBACTERIA AND PATHOGENIC STRAINS OF ESCHERICHIA COLI
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700 73 4555 PUBLIC-HEALTH PIT VENTILATION SYSTEM FOR SWINE BUILDINGS KEYWORDS: VENTILATION CONFINEMENT-PENS DESIG
200 75 4641 PUBLIC-HEALTH RECYCLING AND DEGRADATION OF ANABOLIC AGENTS IN ANIMAL EXCRETA KEYWORDS: REFEEDING LIVE
100 75 4645 PUBLIC-HEALTH WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS: WATER-POLLUTION NONPOINT-SOURCES PUBLIC
200 74 4667 PUBLIC-HEALTH SLURRY PROBLEMS IN RELATION TO POLLUTION OF SURFACE WATERS KEYWORDS: SLURRIES WASTE-MAN
400 76 4480 PUMPDOWN KEEP IT DRY KEYWORDS FEEDLOTS ODOR-CONTROL STOCKING-RATES FEEDLOT-RUNOFF HOLDING-PONDS
400 72 4383 PUMPING WHAT ARE YOU DOING ABOUT YOUR 1.57 BILLION TON ANIMAL WASTE PROBLEM KEYWORDS. WASTE-MAN
200 76 4614 PUMPING A MODIFIED CENTRIFUGAL MANURE PUMP FOR HANDLING SEMI-SOLID CATTLE MANURE KEYWORDS: PUM
300 76 4109 PUMPS EVALUATING A LOW-ENERGY, HIGH-VALUE PUMP FOR ODOR REDUCTION FROM LIVESTOCK WASTE LAGOON
400 77 4113 PUMPS MANURE STORAGE AREAS HELP SAVE NUTRIENTS KEYWORDS: WASTE-STORAGE PUMPS NUTRIENTS ECONOM
300 75 4505 PUMPS AN ECONOMIC ANALYSIS OF THE INVESTMENT AND OPERATING COSTS ASSOCIATED WITH LIQUID MANU
400 77 4343 PYRETHRINS AUTOMATIC FLY CONTROL KEYWORDS: FLY-CONTROL POULTRY-FARM ACCUDOSE-R AEROSOLS PYRETHRINS
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200 74 4072 PYROLYSIS FUEL FROM FECES KEYWORDS: FUELS RECYCLING PHYSICAL-TREATMENT CHEMICAL-TREATMENT BIOLOGI
300 76 4207 PYROLYSIS STATE-OF-THE-ART SWINE WASTE PRODUCTION AND PRETREATMENT PROCESSES KEYWORDS: SWINE-WAS
200 77 4373 PYROLYSIS AMMONIA SYNTHESIS GAS AND PETROCHEMICALS FROM CATTLE FEEDLOT MANURE KEYWORDS: CATTLE-WA
300 76 4435 PYROLYSIS OPPORTUNITIES FOR MORE EFFECTIVE USE OF ANIMAL WASTES KEYWORDS WASTE-DISPOSAL LAND-DIS
400 74 4511 PYROLYSIS DESPITE SCIENCE, IT'S STILL MANURE KEYWORDS. LIVESTOCK-WASTES RECYCLING PYROLYSIS HYDRO
200 75 4558 PYROLYSIS HOW TO CLEAN UP AT THE RACES KEYWORDS: HORSE-WASTES RACE-TRACKS WASTE-MANAGEMENT WASTE-
100 75 4584 RABBIT-WASTES RELATIONSHIPS BETWEEN COPROPHILOUS FUNGI AND FECAL SUBSTRATES IN A COLORADO GRASSLAND K
400 76 4055 RACETRACK-PITS HOGMEN SIZE UP OXIDATION SYSTEMS KEYWORDS: LIQUID-WASTES SWINE-WASTES OXIDATION RACETRA
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100 75 4645 RADIOACTIVITY WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS: WATER-POLLUTION NONPOINT-SOURCES PUBLIC
100 75 4648 RAINFALL THE AGRONOMIC ROLE OF INTRODUCED DUNG BEETLES IN GRAZING SYSTEMS KEYWORDS: PASTURES MAN
300 74 4366 RAINFALL-EVAPORATI JOINT LAND SPREADING TRIAL KEYWORDS: SLURRIES SOILS LAND-APPLICATION GRASSLANDS RAINFAL
100 75 4395 RAINFALL-RUNOFF-RE A MODEL FOR RUNOFF OF PESTICIDES FROM SMALL UPLAND WATERSHEDS KEYWORDS: MODEL-STUDIES A
100 76 4104 RANGELAND WATER QUALITY IMPLICATIONS OF CATTLE GRAZING ON A SEMIARID WATERSHED IN S. E. UTAH KEY
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300 72 4501 RATIONS SODIUM LEVELS IN BEEF CATTLE FINISHING RATIONS AS RELATED TO PERFORMANCE AND CONCENTRAT
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300	72 4353	RECLAMATION	DISPOSING OF OUR WASTES--SOIL CAN FILTER, CROPS RECYCLE NUTRIENTS KEYWORDS: LIVESTOCK-W
400	77 4524	RECLAMATION	CHICKEN MANURE PLUS KEYWORDS RECLAMATION SURFACE-MINED-LANDS LAND-APPLICATION ASH SEW
600	74 4013	RECONSTITUTED-FEED	CHARACTERISTICS OF SORGHUM GRAIN RECONSTITUTED WITH EXCREMENT FROM FEEDLOT CATTLE KEYWO
400	77 4014	RECONSTITUTED	EXCREMENT RECONSTITUTED GRAIN FOR GROWING AND FINISHING CATTLE KEYWORDS: REFEEDING ECON
100	76 4192	RECTAL-SWABS	STAPHYLOCOCCI FROM THE FECES OF DIFFERENT ANIMAL SPECIES BIOTYPES OF STAPHYLOCOCCUS AUR
300	76 4004	RECYCLING	CONVERSION OF CATTLE MANURE INTO USEFUL PRODUCTS KEYWORDS: CATTLE-WASTES BYPRODUCTS PYR
400	77 4021	RECYCLING	ENERGY POTENTIAL FROM WASTE SMALL KEYWORDS: ENERGY FEEDLOTS LIVESTOCK-WASTES RECYCLING
400	77 4031	RECYCLING	FEEDERS RECYCLING PLAN SAVES FIVE BUSHELS OF CORN FOR EACH STEER FED KEYWORDS: RECYCLI
400	74 4051	RECYCLING	MANURE KEYWORDS: COMPOSTING RECYCLING FUELS ECONOMICS CATTLE-WASTES ORGANIC-WASTES
200	77 4057	RECYCLING	SEMINAR ON FEEDLOT MANURE RECYCLING FOR NUTRIENT RECOVERY KEYWORDS: REFEEDING LIVESTOCK
200	74 4072	RECYCLING	FUEL FROM FECES KEYWORDS: FUELS RECYCLING PHYSICAL-TREATMENT CHEMICAL-TREATMENT BIOLOGI
300	75 4075	RECYCLING	UTILIZATION AND DISPOSAL OF RESIDUE FROM THE PARTIAL OXIDATION OF CATTLE FEEDLOT MANURE
400	74 4110	RECYCLING	NATURAL GAS FROM THE BARNYARD, OR JUST MOVE BOSSY OVER AND HOOK IT UP KEYWORDS RECYCL
100	46 4115	RECYCLING	DIGESTER GAS FOR AUTOMOBILES KEYWORDS: METHANE ORGANIC-WASTES SEWAGE HORSE-WASTES RECYC
400	77 4119	RECYCLING	HARNESSING ENERGY SOURCES FOR THE FEEDLOT KEYWORDS: ENERGY FEEDLOTS RECYCLING METHANE S
400	77 4133	RECYCLING	AWARDS MADE FOR WASTE MANAGEMENT STUDIES KEYWORDS: AWARDS WASTE-MANAGEMENT RUNOFF-CONTR
100	75 4137	RECYCLING	CHANGES IN MICROBIAL POPULATION DURING FERMENTATION OF FEEDLOT WASTE WITH CORN KEYWORDS
100	76 4138	RECYCLING	RESPONSE OF DAIRY CATTLE GIVEN A FREE CHOICE OF FREE STALL LOCATION AND THREE BEDDING
400	77 4153	RECYCLING	MAKING THE MOST OF WASTE KEYWORDS: POULTRY-WASTES CATTLE-WASTES RECYCLING METHANE FERTI
400	77 4158	RECYCLING	MANURE TO METHANE IS IT FEASIBLE KEYWORDS: ANIMAL-WASTES RECYCLING METHANE ANAEROBIC-DI
400	77 4159	RECYCLING	INTEREST IN DPW APPEARS TO HAVE SUBSIDED KEYWORDS: POULTRY-WASTES-DRIED RECYCLING REFEE
400	77 4165	RECYCLING	RECYCLING IS SUCCESSFUL AT MERTEN'S KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING REFEEDIN
400	76 4166	RECYCLING	RECYCLING OF LITTER FOR TURKEY BROODING SAFE KEYWORDS: POULTRY-LITTER TURKEYS RECYCLING
300	76 4170	RECYCLING	AUTOMATED TREATMENT AND RECYCLE OF SWINE FEEDLOT WASTEWATERS KEYWORDS. SWINE-WASTES LIQ
400	71 4173	RECYCLING	A POLLUTION SOLUTION WITH BUILT-IN PROFITS KEYWORDS DEHYDRATION POULTRY-WASTES-DRIED RE
400	77 4180	RECYCLING	SEPEA ANNOUNCES POULTRY WASTE FEEDING POSITION KEYWORDS: REFEEDING RECYCLING LEGAL-ASPE
400	72 4181	RECYCLING	USDA RESEARCHER USES MANURE TO MAKE FEED AND WALLBOARD KEYWORDS: RECYCLING WALLBOARD RE
300	76 4194	RECYCLING	RECYCLING SEWAGE SOLIDS AS FEEDSTUFFS FOR LIVESTOCK KEYWORDS: RECYCLING SEWAGE-SOLIDS R
300	76 4207	RECYCLING	STATE-OF-THE-ART SWINE WASTE PRODUCTION AND PRETREATMENT PROCESSES KEYWORDS: SWINE-WAS
200	74 4221	RECYCLING	METHANE RECOVERY FROM POULTRY WASTE KEYWORDS: POULTRY-WASTES SEWAGE-SLUDGE RECYCLING ME
100	76 4222	RECYCLING	UTILIZATION OF BIOGAS FOR FARM PRODUCTION ENERGY KEYWORDS: RECYCLING BIOGAS CATTLE-WAST
400	77 4231	RECYCLING	ON METHANE PRODUCTION KEYWORDS: METHANE RECYCLING ANAEROBIC DIGESTERS ECONOMICS
400	76 4241	RECYCLING	THE WEDDING OF CLUCK AND MOO KEYWORDS: POULTRY-WASTES CATTLE-WASTES CONFINEMENT RECYCLI
200	74 4243	RECYCLING	FEEDLOT MANURE AS AN ENERGY SOURCE KEYWORDS: FEEDLOT-WASTES ENERGY ECONOMICS RECYCLING
200	76 4260	RECYCLING	BIOLOGICAL POTENTIAL OF THERMOPHILIC METHANOGENESIS FROM CATTLE WASTES KEYWORDS: RECYCL
300	77 4262	RECYCLING	CAN CITY SEWAGE BE RECYCLED SAFELY ON FARM LAND KEYWORDS: RECYCLING SEWAGE LAND-APPLICA
100	75 4287	RECYCLING	SYNTHESIS GAS FROM BOVINE WASTES KEYWORDS: RECYCLING CATTLE-WASTES GASES FLUIDIZED-BED-
400	77 4292	RECYCLING	ENRICHED POULTRY MANURE AS A BALANCED FERTILIZER KEYWORDS: POULTRY-WASTES FERTILIZERS R
400	77 4296	RECYCLING	FARMERS AS FUEL SUPPLIERS KEYWORDS: ENERGY RECYCLING BIOMASS-CROPS CROP-RESIDUES GRAIN-
300	74 4297	RECYCLING	ENERGY FROM FEEDLOT MANURE KEYWORDS: FUELS RECYCLING LIVESTOCK-WASTES FERTILIZERS REFEE
400	72 4303	RECYCLING	METHANE POWER THE PLOWBOY INTERVIEW KEYWORDS: RECYCLING METHANE ORGANIC-WASTES DIGESTE
200	76 4305	RECYCLING	CONVERSION OF BOVINE MANURE TO OIL KEYWORDS: RECYCLING CATTLE WASTES OIL CARBON-MONOXID
400	70 4311	RECYCLING	IMAGINE YOUR FEEDLOT MANURE CAN POWER YOUR MILL AND BRING CASH FROM SALE OF EXCESS POWE
300	76 4318	RECYCLING	METHANE PRODUCTION FROM CATTLE WASTES KEYWORDS: RECYCLING FEEDLOTS CATTLE-WASTES DAIRY-
400	76 4319	RECYCLING	STORIES MANURE CAN TELL KEYWORDS: ANIMAL-WASTES REFEEDING LAND-APPLICATION RECYCLING FE
200	75 4327	RECYCLING	PRODUCTION OF AMMONIA SYNTHESIS GAS FROM MANURE IN A CYCLONIC BURNER KEYWORDS: RECYCLIN
700	73 4331	RECYCLING	AMMONIA SYNTHESIS GAS FROM MANURE KEYWORDS: OXIDATION FLUIDIZED-BED-REACTOR RECYCLING D
300	77 4334	RECYCLING	UTILIZATION OF LIVESTOCK WASTES-ALTERNATIVE TREATMENTS AND PRODUCTS KEYWORDS: RECYCLIN
100	74 4344	RECYCLING	ANIMAL WASTES AS SUBSTRATES FOR PROTEIN PRODUCTION KEYWORDS: ANIMAL-WASTES SUBSTRATES P
400	71 4370	RECYCLING	FEEDLOT MANURE-THE ECOLOGY INSPIRED BUILDING MATERIAL KEYWORDS: RECYCLING ECOLITE BUILD
200	77 4373	RECYCLING	AMMONIA SYNTHESIS GAS AND PETROCHEMICALS FROM CATTLE FEEDLOT MANURE KEYWORDS: CATTLE-WA
400	77 4378	RECYCLING	140 DEGREES IS CRITICAL--METHANE FROM CATTLE WASTE FERMENTATION STARTS RAPIDLY, CONTINU
400	77 4382	RECYCLING	RESEARCHERS STUDY ALGAE PRODUCTION FROM HOG WASTE KEYWORDS: RECYCLING WASTEWATER-RENOVA
400	77 4404	RECYCLING	CALIFORNIA DAIRYMEN ARE GAINING EXPERIENCE WITH MANURE SEPARATORS KEYWORDS: WASTE-MANAG
100	71 4405	RECYCLING	A CLEAN NEW GAS KEYWORDS: SEWAGE URBAN-WASTES AGRICULTURAL-WASTES RECYCLING ANAEROBIC-D
400	77 4411	RECYCLING	WAYS TO SPEED UP DRYING OF MANURE IN PITS KEYWORDS: POULTRY-WASTES DEHYDRATION VENTILAT
200	76 4433	RECYCLING	WILLE COMPOST TANK--A DESIGN STUDY FOR A CONTINUOUS FLOW COMPOST TANK USED IN RECLAIMIN
300	76 4435	RECYCLING	OPPORTUNITIES FOR MORE EFFECTIVE USE OF ANIMAL WASTES KEYWORDS: WASTE-DISPOSAL LAND-DIS
400	77 4436	RECYCLING	THE HAPPY EARTHWORM KEYWORDS: RECYCLING CATTLE-WASTES PAUNCH-MANURE FEEDLOTS EARTHWORMS
400	77 4441	RECYCLING	MANURE AND ALGAE PRODUCE ANIMAL FEED KEYWORDS: SWINE-WASTES LIVESTOCK-WASTES RECYCLING
300	74 4453	RECYCLING	STATE OF THE ART-METHANE GAS GENERATION FROM AGRICULTURAL WASTES KEYWORDS: AGRICULTURAL
300	77 4454	RECYCLING	A COMPLETE DISPOSAL-RECYCLE SCHEME FOR AGRICULTURAL SOLID WASTES KEYWORDS: SOLID-WASTES
700	73 4467	RECYCLING	EFFECT OF DRYING ON THE LOSSES OF NITROGEN AND TOTAL SOLIDS FROM POULTRY MANURE KEYWORD
300	73 4472	RECYCLING	BIO-GAS PLANT--DESIGNS WITH SPECIFICATIONS KEYWORDS: BIOGAS-PLANTS ANAEROBIC DIGESTERS
100	77 4487	RECYCLING	BIOLOGICAL ENERGY RECOVERY USING DAIRY COW WASTE KEYWORDS: ANAEROBIC-DIGESTION DAIRY-WA
400	77 4504	RECYCLING	MANURE IS NOW A COMMODITY KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING BIOGAS METHANE CAR
300	77 4509	RECYCLING	ENERGY USE IN AGRICULTURE- NOW AND FOR THE FUTURE KEYWORDS: AGRICULTURE ENERGY-CONSUMPT
400	74 4511	RECYCLING	DESPITE SCIENCE, IT'S STILL MANURE KEYWORDS: LIVESTOCK-WASTES RECYCLING PYROLYSIS HYDRO
400	77 4515	RECYCLING	SOLAR ENERGY HELPS DRY POULTRY WASTE KEYWORDS: SOLAR-DRYING POULTRY-WASTES HEATING RECY
400	77 4519	RECYCLING	METHANE GAS ENERGY POSSIBLE FROM MANURE KEYWORDS: RECYCLING LIVESTOCK-WASTES WASTE-TREA
400	77 4530	RECYCLING	BACTERIA POWER GENERATOR, PRODUCE FERTILIZER IN IOWA KEYWORDS: POULTRY-WASTES RECYCLING
200	75 4558	RECYCLING	HOW TO CLEAN UP AT THE RACES KEYWORDS: HORSE-WASTES RACE-TRACKS WASTE-MANAGEMENT WASTE-
400	77 4563	RECYCLING	COWTOWN'S MANURE MEANS MEGAWATTS KEYWORDS: RECYCLING BIOGAS METHANE CATTLE-WASTES FEEDL
400	71 4565	RECYCLING	THE MARVELOUS CHICKEN-POWERED MOTORCAR KEYWORDS: RECYCLING ANIMAL-WASTES METHANE METHAN
400	71 4566	RECYCLING	GOBAR GAS-METHANE EXPERIMENTS IN INDIA KEYWORDS: METHANE GOBAR-GAS RECYCLING CATTLE-WAS
400	70 4567	RECYCLING	HOW TO GENERATE POWER FROM GARBAGE KEYWORDS: METHANE ANAEROBIC DIGESTERS LIVESTOCK-WAST
400	70 4568	RECYCLING	NOW ELECTRICITY FROM MANURE GASES KEYWORDS: ELECTRICITY ENERGY RECYCLING SWINE-WASTES G
400	71 4569	RECYCLING	POWER-HAROLD BATE AND HIS MARVELOUS CHICKEN-POWERED CAR KEYWORDS. POULTRY-WASTES RECYCL
400	77 4582	RECYCLING	GLEANINGS FROM REPORTS AT THE RECENT MEETING OF THE AMERICAN SOCIETY OF ANIMAL SCIENCE
100	75 4607	RECYCLING	FLY PROTEIN PRODUCTION FROM MECHANICALLY MIXED ANIMAL WASTES KEYWORDS: RECYCLING POULTR
400	77 4610	RECYCLING	THERMONETICS--THE GUYMON PROJECT KEYWORDS: RECYCLING CATTLE-WASTES METHANE FERTILIZERS
400	77 4611	RECYCLING	METHANE GAS MADE FROM CONFINEMENT UNIT WASTE KEYWORDS: SWINE-WASTES SLURRIES WASTE-TREA
400	77 4611	RECYCLING	METHANE GAS MADE FROM CONFINEMENT UNIT WASTE KEYWORDS: SWINE-WASTES SLURRIES WASTE-TREA
500	73 4623	RECYCLING	A HOMESITE POWER UNIT--METHANE GENERATOR KEYWORDS: ANAEROBIC DIGESTER SLURRIES WASTE-TR
100	75 4637	RECYCLING	ALGAL GROWTH IN DILUTED PIG WASTE KEYWORDS: SWINE-WASTES BY-PRODUCT-RECOVERY ALGAE METH
100	76 4654	RECYCLING	ANAEROBIC DIGESTION OF AGRICULTURAL WASTES KEYWORDS: ANAEROBIC-DIGESTION SWINE-WASTES C
300	77 4655	RECYCLING	NOTES ON ANAEROBIC DIGESTION AND ANAEROBIC DIGESTERS BASED ON EXPERIMENTAL PLANT IN ABE
100	4658	RECYCLING	PRACTICAL ASPECTS OF ANAEROBIC DIGESTION KEYWORDS: FARM-WASTES DOMESTIC-WASTES FACTORY-
100	75 4662	RECYCLING	THE WASTE PRODUCTS OF AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES LIVESTOCK-WASTES STRAW
400	77 4665	RECYCLING	METHANE FROM CATTLE MANURE TO REPLACE FUEL OIL KEYWORDS: CATTLE-WASTES FERMENTATION REC
200	76 4619	RECYCLING	ENGINEERING EVALUATION OF A POULTRY MANURE DEHYDRATING MACHINE KEYWORDS: DEHYDRATION PO
600	74 4013	REFEEDING	CHARACTERISTICS OF SORGHUM GRAIN RECONSTITUTED WITH EXCREMENT FROM FEEDLOT CATTLE KEYWO
400	77 4014	REFEEDING	EXCREMENT RECONSTITUTED GRAIN FOR GROWING AND FINISHING CATTLE KEYWORDS: REFEEDING ECON
100	77 4019	REFEEDING	ALFALFA VERSUS POULTRY EXCRETA AS NITROGEN SUPPLEMENTS FOR LAMBS KEYWORDS: REFEEDING SH
100	76 4020	REFEEDING	DEHYDRATED BROILER EXCRETA VERSUS SOYBEAN MEAL AS NITROGEN SUPPLEMENTS FOR SHEEP KEYWO
200	75 4026	REFEEDING	RECYCLED EXCRETA AS A NUTRIENT SOURCE FOR SWINE KEYWORDS: OXIDATION-DITCH REFEEDING SWI
400	77 4027	REFEEDING	BIRD PERFORMANCE NOT HURT BY REFEEDING AERATED WASTES KEYWORDS: REFEEDING OXIDATION-DIT
100	77 4041	REFEEDING	THE LAYING PERFORMANCE OF TWO STRAINS OF HENS OFFERED DIETS CONTAINING DRIED POULTRY MA

100 77 4048 REFEEDING MICROBIAL POPULATION CHANGES AND FERMENTATION CHARACTERISTICS OF ENSILED BOVINE MANURE-
200 77 4057 REFEEDING SEMINAR ON FEEDLOT MANURE RECYCLING FOR NUTRIENT RECOVERY KEYWORDS: REFEEDING LIVESTOCK
200 77 4058 REFEEDING REFEEDING POTENTIALS: FACTS AND FANTASIES KEYWORDS: REFEEDING ECONOMICS WASTE-COMPOSITI
200 77 4059 REFEEDING USE OF WASTE FROM OPEN FEEDLOTS FOR FATTENING, GROWING AND MAINTENANCE RATIONS KEYWORD
200 77 4060 REFEEDING HARVESTING AND PROCESSING MANURE FROM CONFINEMENT OPERATIONS FOR REFEEDING KEYWORDS: CO
200 77 4061 REFEEDING FORMULATING AND MILLING FEEDS CONTAINING MANURE FROM OPEN FEEDLOTS KEYWORDS: REFEEDING
200 77 4062 REFEEDING PATHOGEN TRANSMISSION POTENTIAL FROM ANIMAL WASTE REFEEDING KEYWORDS: REFEEDING PATHOGE
200 77 4063 REFEEDING RESIDUE TRANSFER AND ACCUMULATION KEYWORDS: REFEEDING FEED-ADDITIVES ANIMAL-HEALTH CATT
200 77 4064 REFEEDING PROVISIONS OF STATE AND FEDERAL REGULATIONS ON REFEEDING KEYWORDS: REFEEDING LEGAL-ASPE
200 77 4065 REFEEDING PRESERVATION AND REFEEDING POULTRY WASTE TO CATTLE KEYWORDS: REFEEDING POULTRY-LITTER C
300 76 4067 REFEEDING MANURE HARVESTING PRACTICES: EFFECTS ON WASTE CHARACTERISTICS AND RUNOFF KEYWORDS: FEED
400 77 4070 REFEEDING POULTRY WASTE FED TO CATTLE, SHEEP KEYWORDS: REFEEDING POULTRY-WASTES-DRIED WASTE-COMPO
100 76 4098 REFEEDING COMPLETE RATIONS FOR DAIRY CATTLE VII. DRIED POULTRY WASTE FOR LACTATING COWS KEYWORDS:
100 76 4101 REFEEDING NUTRITIONAL EVALUATION OF DEHYDRATED CATTLE MANURE USING SHEEP KEYWORDS: REFEEDING CATT
400 77 4103 REFEEDING PULLETS IN GROW CAGES ABOVE HOGS IN PIT BELOW KEYWORDS: HIGH-RISE-CAGE POULTRY-WASTES M
100 74 4108 REFEEDING POULTRY WASTES AS FEEDSTUFFS FOR RUMINANTS KEYWORDS: POULTRY-WASTES POULTRY-LITTER WAST
100 75 4137 REFEEDING CHANGES IN MICROBIAL POPULATION DURING FERMENTATION OF FEEDLOT WASTE WITH CORN KEYWORDS
400 77 4143 REFEEDING MORE INTEREST EVIDENT IN POULTRY LITTER AS LESS COSTLY, MORE AVAILABLE FERTILIZER KEYWO
100 77 4145 REFEEDING NUTRIENT CHARACTERIZATION OF SWINE FECAL WASTE AND UTILIZATION OF THESE NUTRIENTS BY SW
100 77 4146 REFEEDING COMPOSITION OF CORN PLANT ENSILED WITH EXCRETA OR NITROGEN SUPPLEMENTS AND ITS EFFECT
100 77 4148 REFEEDING PERFORMANCE OF BEEF CATTLE FED WASTELAGE AND DIGESTIBILITY OF WASTELAGE AND DRIED WAST
400 77 4153 REFEEDING MAKING THE MOST OF WASTE KEYWORDS: POULTRY-WASTES CATTLE-WASTES RECYCLING METHANE FERTI
400 77 4159 REFEEDING INTEREST IN DPW APPEARS TO HAVE SUBSIDED KEYWORDS: POULTRY-WASTES-DRIED RECYCLING REFEE
400 77 4164 REFEEDING JAPANESE HOGMEN BATTLE POLLUTION KEYWORDS: SWINE-WASTES POLLUTION WASTE-MANAGEMENT OXID
400 77 4165 REFEEDING RECYCLING IS SUCCESSFUL AT MERTEN'S KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING REFEEDIN
400 71 4173 REFEEDING A POLLUTION SOLUTION WITH BUILT-IN PROFITS KEYWORDS DEHYDRATION POULTRY-WASTES-DRIED RE
400 77 4180 REFEEDING SEPEA ANNOUNCES POULTRY WASTE FEEDING POSITION KEYWORDS: REFEEDING RECYCLING LEGAL-ASPE
400 72 4181 REFEEDING USDA RESEARCHER USES MANURE TO MAKE FEED AND WALLBOARD KEYWORDS: RECYCLING WALLBOARD RE
400 76 4184 REFEEDING FEED GRAIN SUPPLIES, USE OF WASTES AS FEED INGREDIENTS DETAILED AT CONFERENCE KEYWORDS:
200 76 4185 REFEEDING REFEEDING OF AERATED POULTRY WASTES TO LAYING HENS KEYWORDS: AERATION REFEEDING POULTRY
300 75 4187 REFEEDING FEEDING VALUE OF EXCRETA-STOVER SILAGE AND CORN RESIDUE FOR BEEF COWS KEYWORDS: REFEEDI
300 76 4194 REFEEDING RECYCLING SEWAGE SOLIDS AS FEEDSTUFFS FOR LIVESTOCK KEYWORDS: RECYCLING SEWAGE-SOLIDS R
100 76 4201 REFEEDING INCLUSION OF LIVESTOCK FECES INTO CORN SILAGE KEYWORDS: LIVESTOCK-WASTES POULTRY-WASTES
300 76 4207 REFEEDING STATE-OF-THE-ART SWINE WASTE PRODUCTION AND PRETREATMENT PROCESSES KEYWORDS: SWINE-WAS
100 77 4208 REFEEDING FERMENTATION, NITROGEN UTILIZATION, DIGESTIBILITY AND PALATABILITY OF BROILER LITTER EN
100 77 4210 REFEEDING INFLUENCE OF FEEDING DEHYDRATED POULTRY WASTE ON COMPOSITION AND ORGANOLEPTIC QUALITY O
400 77 4215 REFEEDING PELLETED POULTRY LITTER ECONOMICAL CATTLE FEED KEYWORDS POULTRY-LITTER REFEEDING CATT
400 77 4219 REFEEDING SOLID VS LIQUID WASTE PRE-POND WASTE SEPARATION ALLOWS FLUSH RECOVERY RECYCLING KEYWOR
400 74 4220 REFEEDING THE VALUE OF ANIMAL WASTES AS FEEDS FOR RUMINANTS KEYWORDS: REFEEDING WASTELAGE RUMINAN
100 76 4223 REFEEDING EFFECTS OF DAIRY CATTLE MANURE SOLUBLES IN LAMB DIETS KEYWORDS: DAIRY-WASTES REFEEDING
100 76 4232 REFEEDING HEN EXCRETA COMPOSITION AND RUMEN PARAMETERS KEYWORDS: SHEEP REFEEDING POULTRY-WASTES-D
100 76 4234 REFEEDING DRIED POULTRY WASTE AS A SUPPLEMENT FOR BEEF CATTLE KEYWORDS: POULTRY-WASTES-DRIED REFE
100 76 4235 REFEEDING RECYCLING OF SWINE MANURE BY SELECTED FISHES KEYWORDS: REFEEDING SWINE-WASTES FISH PERF
100 76 4236 REFEEDING HEN EXCRETA COMPOSITION AND METABOLISM BY SHEEP KEYWORDS: POULTRY-WASTES-DRIED REFEEDIN
400 76 4241 REFEEDING THE WEDDING OF CLUCK AND MOO KEYWORDS: POULTRY-WASTES CATTLE-WASTES CONFINEMENT RECYCLI
200 74 4243 REFEEDING FEEDLOT MANURE AS AN ENERGY SOURCE KEYWORDS: FEEDLOT-WASTES ENERGY ECONOMICS RECYCLING
100 77 4244 REFEEDING FERMENTATION OF POULTRY MANURE FOR POULTRY DIETS KEYWORDS: POULTRY-WASTES FERMENTATION
100 72 4249 REFEEDING THE GROWTH OF BROILER CHICKENS FED LOW-PROTEIN DIETS CONTAINING TRIAMMONIUM CITRATE, DI
400 77 4253 REFEEDING CATTLE FEEDING GAINS REPORTED GOOD ON MISSISSIPPI COMPANY'S POULTRY WASTE KEYWORDS: POU
400 77 4255 REFEEDING BROILER WASTES GOOD PROTEIN SOURCE KEYWORDS: REFEEDING POULTRY-WASTES CATTLE PERFORMAN
400 77 4257 REFEEDING IOWA FARMERS FEED DRIED POULTRY WASTE TO CATTLE KEYWORDS: POULTRY-WASTES-DRIED REFEEDIN
400 77 4258 REFEEDING RECYCLING SOLVES WASTE MANAGEMENT PROBLEMS KEYWORDS: REFEEDING ENSILING CATTLE-WASTES P
300 77 4262 REFEEDING CAN CITY SEWAGE BE RECYCLED SAFELY ON FARM LAND KEYWORDS: RECYCLING SEWAGE LAND-APPLICA
400 77 4293 REFEEDING FEEDLOT WASTE WORKS IN GROWING RATION TEST KEYWORDS: CATTLE-WASTES DEHYDRATION ENSILING
300 74 4297 REFEEDING ENERGY FROM FEEDLOT MANURE KEYWORDS: FUELS RECYCLING LIVESTOCK-WASTES FERTILIZERS REFEE
400 76 4299 REFEEDING ENERGY AND RESOURCE REQUIREMENTS FOR BEEF CATTLE PRODUCTION KEYWORDS: CATTLE-WASTES FEE
400 77 4300 REFEEDING RE-CYCLING IS NO CURE-ALL KEYWORDS: REFEEDING FEEDLOT-WASTES CATTLE PERFORMANCE ECONOMI
300 77 4301 REFEEDING NUTRITIVE VALUE OF ENSILED BROILER LITTER KEYWORDS: REFEEDING POULTRY-LITTER ENSILING M
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400 77 4309 REFEEDING FOOD WASTE, MANURE HOLD PROMISE AS FEED, VETERINARIANS TOLD KEYWORDS: REFEEDING FOOD-WA
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400 77 4314 REFEEDING MORE ON MANURE KEYWORDS: REFEEDING PERFORMANCE COPPER IRON CALCIUM AMPROLIUM PATHOGENIC
300 76 4318 REFEEDING METHANE PRODUCTION FROM CATTLE WASTES KEYWORDS: RECYCLING FEEDLOTS CATTLE-WASTES DAIRY-
400 76 4319 REFEEDING STORIES MANURE CAN TELL KEYWORDS: ANIMAL-WASTES REFEEDING LAND-APPLICATION RECYCLING FE
100 76 4325 REFEEDING THE POTENTIAL TOXICITY OF COPPER-RICH ANIMAL EXCRETA TO SHEEP KEYWORDS: REFEEDING COPPE
100 75 4329 REFEEDING USE OF DRIED PAUNCH RESIDUE IN RUMINANT DIETS KEYWORDS: PAUNCH-MANURE REFEEDING SHEEP C
300 77 4334 REFEEDING UTILIZATION OF LIVESTOCK WASTES-ALTERNATIVE TREATMENTS AND PRODUCTS KEYWORDS: RECYCLIN
200 72 4338 REFEEDING DRIED CATTLE PAUNCH MANURE AS A FEED SUPPLEMENT FOR CHANNEL CATFISH KEYWORDS: REFEEDING
100 74 4344 REFEEDING ANIMAL WASTES AS SUBSTRATES FOR PROTEIN PRODUCTION KEYWORDS: ANIMAL-WASTES SUBSTRATES P
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100 77 4372 REFEEDING A NEW CONCEPT OF LITTER MANAGEMENT FOR BROILER PRODUCTION KEYWORDS: POULTRY POULTRY-LIT
100 74 4374 REFEEDING NUTRITIONAL VALUE OF CATTLE WASTE FOR CATTLE KEYWORDS: REFEEDING CATTLE-WASTES WASTELAG
100 74 4376 REFEEDING USE OF FLUID COWSHED MANURE IN FISH PONDS KEYWORDS: ISRAEL REFEEDING FISH PONDS CATTLE-
400 77 4378 REFEEDING 140 DEGREES IS CRITICAL--METHANE FROM CATTLE WASTE FERMENTATION STARTS RAPIDLY, CONTINU
300 77 4379 REFEEDING INFLUENCE OF RECYCLING BEEF CATTLE WASTE ON INDIGESTIBLE RESIDUE ACCUMULATION KEYWORDS:
400 77 4380 REFEEDING WINTERING BROOD COWS MAKE BEST USE OF POULTRY LITTER- RESEARCHER KEYWORDS: REFEEDING PO
400 77 4382 REFEEDING RESEARCHERS STUDY ALGAE PRODUCTION FROM HOG WASTE KEYWORDS: RECYCLING WASTEWATER-RENOVA
100 76 4389 REFEEDING NUTRITIVE VALUE OF ENSILED CATTLE WASTE KEYWORDS: ENSILING CATTLE-WASTES REFEEDING CATT
100 77 4399 REFEEDING UTILIZATION OF CATTLE EXCREMENT FOR GROWTH AND MAINTENANCE OF BEEF CATTLE KEYWORDS: RE
200 72 4400 REFEEDING RECYCLING ANIMAL WASTES KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CRUDE-PROTEINS PERFORM
600 4407 REFEEDING EFFECT OF CORN STOVER SILAGE DIETS SUPPLEMENTED WITH NITROGEN FROM POULTRY EXCRETA ON D
400 77 4410 REFEEDING POULTRY WASTE--NITROGEN FOR LACTATING DAIRY COWS KEYWORDS: REFEEDING POULTRY-WASTES-DRI
400 77 4411 REFEEDING WAYS TO SPEED UP DRYING OF MANURE IN PITS KEYWORDS: POULTRY-WASTES DEHYDRATION VENTILAT
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200 77 4422 REFEEDING MICROFLORA OF ENSILED MANURE-BLENDED FEED, CORN AND SORGHUM SILAGES KEYWORDS: ENSILING
400 77 4431 REFEEDING GOOD GAINS ON POULTRY WASTE, HIGH FIBER DIET KEYWORDS: POULTRY-WASTES-DRIED REFEEDING N
300 75 4444 REFEEDING LIVESTOCK WASTE FACILITIES HANDBOOK KEYWORDS: LIVESTOCK-WASTES WASTE-STORAGE WASTE-TREA
200 71 4457 REFEEDING AGRICULTURE S ROLE IN ENVIRONMENTAL QUALITY KEYWORDS: AGRICULTURE FEEDLOTS WATER-POLLUT
700 76 4458 REFEEDING THE SYMBIOTIC GROWTH OF ALGAE AND BACTERIA ON SWINE WASTE KEYWORDS: AEROBIC-TREATMENT B-
700 73 4467 REFEEDING EFFECT OF DRYING ON THE LOSSES OF NITROGEN AND TOTAL SOLIDS FROM POULTRY MANURE KEYWORD
400 77 4473 REFEEDING FEEDING POULTRY LITTER KEYWORDS: REFEEDING ENSILING POULTRY-WASTES POULTRY-LITTER CATT
100 72 4475 REFEEDING EFFECTS ON CHICK GROWTH OF ADDING VARIOUS NON-PROTEIN NITROGEN SOURCES OR DRIED AUTOCLA
400 73 4488 REFEEDING RUMINANTS AND PIGS ARE THE BEST USERS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE S
100 76 4497 REFEEDING POULTRY LITTER FOR INTENSIVE BEEF PRODUCTION KEYWORDS: POULTRY-WASTES REFEEDING DIGESTI
400 77 4504 REFEEDING MANURE IS NOW A COMMODITY KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING BIOGAS METHANE CAR
100 72 4508 REFEEDING THE EFFECTS OF CONTINUOUS RECYCLING DRIED POULTRY WASTE IN LAYING HEN DIETS ON TRACE M
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400	77 4522	REFEEDING	ON STRAW AND GOLD, MANURE AND ALGAE--FEEDING WASTE--IT'S BEING DONE IN A VARIETY OF WAY
200	73 4533	REFEEDING	OBSERVATIONS CONCERNING THE USE OF CATTLE *MANURES IN DRYLOT FEEDING KEYWORDS: REFEEDING*
400	77 4537	REFEEDING	DRIED CATTLE WASTE CAN STRETCH SWINE RATIONS KEYWORDS: REFEEDING SWINE PERFORMANCE CATT
400	76 4539	REFEEDING	MCNALLY TURNS OUT A UNIFORM HIGH-QUALITY DPW KEYWORDS: REFEEDING POULTRY-WASTES-DRIED F
700	75 4544	REFEEDING	NUTRIENT CHARACTERIZATION OF SWINE FECAL WASTE AND UTILIZATION OF THESE NUTRIENTS BY SW
100	75 4560	REFEEDING	A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND-- PART 2 KEYWORDS: WATER-POLLUT
100	74 4562	REFEEDING	CONVERSION OF ORGANIC WASTE INTO PROTEIN KEYWORDS BIOLOGICAL-TREATMENT ORGANIC-WASTES
100	75 4564	REFEEDING	HIGH LEVEL ANTIBIOTICS IN A SWINE WASTE RECYCLING SYSTEM KEYWORDS: SWINE DRINKING-WATER
400	77 4571	REFEEDING	A PLACE FOR POULTRY WASTE KEYWORDS REFEEDING POULTRY-WASTES WASTE-STORAGE ENSILING SIL
100	76 4578	REFEEDING	SWINE FECES RECYCLING IN CARPS FEEDING KEYWORDS: REFEEDING SWINE-WASTES FISH
400	77 4582	REFEEDING	GLEANINGS FROM REPORTS AT THE RECENT MEETING OF THE AMERICAN SOCIETY OF ANIMAL SCIENCE
200	72 4603	REFEEDING	ROLE OF RECYCLED LARGE ANIMAL WASTE FOR ANIMAL PROTEIN PRODUCTION KEYWORDS: LIQUID-WAST
100	75 4607	REFEEDING	*FLY PROTEIN PRODUCTION FROM MECHANICALLY* MIXED ANIMAL WASTES KEYWORDS: RECYCLING POULTR
400	77 4609	REFEEDING	WET CAGE LAYER MANURE FED TO FEEDLOT CATTLE KEYWORDS: POULTRY-WASTES PRESERVATIVES REFE
400	77 4610	REFEEDING	THERMONETICS--THE GUYMON PROJECT KEYWORDS: RECYCLING CATTLE-WASTES METHANE FERTILIZERS
100	76 4631	REFEEDING	LIQUID DIETS CONTAINING POULTRY WASTES FOR RUMINANTS KEYWORDS: DIETS SHEEP LIQUID-WASTE
700	72 4635	REFEEDING	BIOCHEMICAL AND NUTRITIONAL STUDIES ON FERMENTED- AMMONIATED ANIMAL FEED SUPPLEMENTS KE
100	76 4639	REFEEDING	USING DEHYDRATED POULTRY WASTE IN POULTRY RATIONS--A REVIEW KEYWORDS: POULTRY-WASTES-DR
200	72 4640	REFEEDING	LEPTOSPIRES IN ANIMAL WASTE TREATMENT--ANIMAL HEALTH PROBLEM KEYWORDS: ANIMAL-WASTES LE
200	75 4641	REFEEDING	RECYCLING AND DEGRADATION OF ANABOLIC AGENTS IN ANIMAL EXCRETA KEYWORDS: REFEEDING LIVE
100	75 4642	REFEEDING	INTERRELATIONSHIPS BETWEEN ANIMALS AND ENVIRONMENT IN HIGH-INTENSITY LIVESTOCK PRODUCTI
400	77 4643	REFEEDING	ENSILED POULTRY LITTER REDUCES CATTLE FEED COSTS KEYWORDS: POULTRY-LITTER ENSILING REFE
400	77 4664	REFEEDING	NEW RECYCLING TRIAL SHOWS 20 HD EXTRA PROFIT KEYWORDS: REFEEDING CATTLE-WASTES COMPOST
400	77 4665	REFEEDING	METHANE FROM CATTLE MANURE TO REPLACE FUEL OIL KEYWORDS: CATTLE-WASTES FERMENTATION REC
200	71 4457	RESEARCH	AGRICULTURE S ROLE IN ENVIRONMENTAL QUALITY KEYWORDS: AGRICULTURE FEEDLOTS WATER-POLLUT
200	76 4403	RESEARCH-AND-DEVEL	RESEARCH AND DEVELOPMENT NEEDS RELATED TO PATHOGENS IN PRETREATMENT-LAND APPLICATION SY
300	75 4075	RESIDUES	UTILIZATION AND DISPOSAL OF RESIDUE FROM THE PARTIAL OXIDATION OF CATTLE FEEDLOT MANURE
100	76 4288	RESIDUES	FEEDING TH 6040 TO CATTLE RESIDUES IN TISSUES AND MILK AND BREAKDOWN IN MANURE KEYWORD
100	76 4289	RESIDUES	ACCUMULATION AND EXCRETION OF CERTAIN ORGANOCHLORINE INSECTICIDES IN BROILER BREEDER HE
100	77 4290	RESIDUES	LONG-TERM STUDIES OF RESIDUE RETENTION AND EXCRETION BY COWS FED A POLYCHLORINATED BIPH
200	72 4603	RESIDUES	ROLE OF RECYCLED LARGE ANIMAL WASTE FOR ANIMAL PROTEIN PRODUCTION KEYWORDS LIQUID-WAST
100	75 4608	RESPIROMETRY	THE USE OF RESPIROMETRIC METHODS FOR ASSESSING THE BIODEGRADABILITY OF DIFFERENT COMPON
300	76 4318	RETENTION-TIME	METHANE PRODUCTION FROM CATTLE WASTES KEYWORDS: RECYCLING FEEDLOTS CATTLE-WASTES DAIRY-
100	75 4645	RETURN-	WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS: WATER-POLLUTION NONPOINT-SOURCES PUBLIC
100	76 4602	ROTATING-BIOLOGICA	TREATMENT OF POULTRY MANURE WASTEWATER USING A ROTATING BIOLOGICAL CONTACTOR KEYWORDS
100	76 4634	ROTTING	*ANALYSIS OF THE ROTTING PROCESS OF SAWDUST BARNYARD MANURE* KEYWORDS: ANIMAL-WASTES SAW
100	76 4232	RUMEN	HEN EXCRETA COMPOSITION AND RUMEN PARAMETERS KEYWORDS: SHEEP REFEEDING POULTRY-WASTES-D
100	77 4161	RUMEN-FLUID	ISOLATION AND IDENTIFICATION OF FECAL BACTERIA FROM ADULT SWINE KEYWORDS: SWINE-WASTES
400	74 4220	RUMINANTS	THE VALUE OF ANIMAL WASTES AS FEEDS FOR RUMINANTS KEYWORDS: REFEEDING WASTELAGE RUMINAN
500	75 4408	RUMINANTS	FORAGE CROPS GRASS TETANY KEYWORDS: GRASS-TETANY ANIMAL-HEALTH CATTLE RUMINANTS MAGNES
400	77 4644	RUNOFF	PONDER THIS SWITCH-BACK, FIELD SINK SYSTEM KEYWORDS: DAIRY-WASTES RUNOFF SWITCH-BACK-WA
100	75 4645	RUNOFF	WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS: WATER-POLLUTION NONPOINT-SOURCES PUBLIC
100	76 4017	RUNOFF-CONTROL	PERFORMANCE OF FEEDLOT RUNOFF CONTROL SYSTEMS IN NORTHERN CLIMATES KEYWORDS: MATHEMATIC
500	77 4092	RUNOFF-CONTROL	CONTINUOUS WATERSHED MODELING OF WASTEWATER STORAGE AND LAND APPLICATION TO IMPROVE DES
300	75 4130	RUNOFF-CONTROL	FEEDLOTS AND RECREATION LAKES AN EXAMPLE OF HOW THEY CAN BE GOOD NEIGHBORS KEYWORDS: F
400	77 4133	RUNOFF-CONTROL	AWARDS MADE FOR WASTE MANAGEMENT STUDIES KEYWORDS: AWARDS WASTE-MANAGEMENT RUNOFF-CONTR
300	76 4203	RUNOFF-CONTROL	WASTEWATER AND RUNOFF CONTROL SYSTEMS FOR DRYLOT DAIRIES KEYWORDS: DAIRY-INDUSTRY AGRIC
300	73 4310	RUNOFF-CONTROL	LIVESTOCK WASTE MANAGEMENT-STATE OF THE ART KEYWORDS: WASTE-MANAGEMENT FEEDLOTS LIVESTO
300	72 4393	RUNOFF-CONTROL	AN ANALYSIS OF BEEF CATTLE FEEDLOT DESIGNS FOR POLLUTION CONTROL KEYWORDS: FEEDLOTS DES
400	77 4448	RUNOFF-CONTROL	CONVERT CITY SEWAGE TO FARM FERTILIZER KEYWORDS: SEWAGE-SLUDGE FERTILIZERS LAND-APPLICA
300	77 4461	RUNOFF-CONTROL	WASTE MANAGEMENT PRACTICES OF WESTERN CATTLE FEEDLOTS KEYWORDS: WASTE-MANAGEMENT FEEDLO
300	77 4503	RUNOFF-CONTROL	BEEF CATTLE FEEDLOT RUNOFF AND CONTROL IN EASTERN NEBRASKA KEYWORDS: FEEDLOT-RUNOFF RU
400	77 4527	RUNOFF-CONTROL	FEEDER COMPLIES WITH REGULATIONS--EPA OKAYED THESE PLANS TO STOP WASTE AND WATER RUNOFF
200	75 4620	RUNOFF-CONTROL	FEEDLOT RUNOFF CONTROL SYSTEMS FOR COLD CLIMATES KEYWORDS: FEEDLOT-RUNOFF AGRICULTURAL-
700	76 4546	RUNOFF-QUALITY	INFLUENCE OF SURFACES ON POLLUTION FROM FEEDLOTS KEYWORDS: FEEDLOT-SURFACES FEEDLOT-RUN
100	75 4577	SACCHAROLYTES	MICROFLORA OF NEWLY CUT GRASS AFTER ADDITION OF LIQUID MANURE KEYWORDS: LIQUID-WASTES A
400	77 4113	SAFETY	MANURE STORAGE AREAS HELP SAVE NUTRIENTS KEYWORDS: WASTE-STORAGE PUMPS NUTRIENTS ECONOM
400	77 4442	SAFETY	MANURE LOADERS NEED CARE AND MAINTENANCE KEYWORDS: EQUIPMENT-MANURE-LOADERS MAINTENANCE
500	77 4089	SALINITY	SOIL AND CROP RESPONSE TO APPLIED ANIMAL WASTE KEYWORDS: LAND-APPLICATION CROP-RESPONSE
500	77 4090	SALINITY	SALT ACCUMULATION IN SOIL AS A FACTOR FOR DETERMINING APPLICATION RATES OF BEEF-FEEDLOT
300	76 4097	SALINITY	DILUTION OF FEEDLOT RUNOFF KEYWORDS: LAND-APPLICATION FEEDLOT-RUNOFF DILUTION SOIL-WATE
300	77 4112	SALINITY	EFFECTS OF ANIMAL MANURE ON SOYBEANS AND SOIL KEYWORDS: LAND-APPLICATION DAIRY-WASTES C
100	76 4224	SALINITY	SOIL CHARACTERISTICS AND CORN YIELD AS AFFECTED BY PREVIOUS APPLICATIONS OF POULTRY MAN
200	73 4256	SALINITY	SOIL PRODUCTIVITY IN RELATION TO HIGH LOADING RATES WITH MANURE KEYWORDS: MANURE LAND-A
200	75 4385	SALINITY	WASTES--USE OR DISCARD KEYWORDS: AGRICULTURAL-WASTES LAND-APPLICATION NITRIENT-LOSSES N
100	75 4420	SALINITY	A STUDY ON THE RELATIVE EFFICIENCY OF ORGANIC MANURES AND THE EFFECT OF SALINITY ON ITS
200	76 4551	SALINITY	LAND DISPOSAL OF ANIMAL MANURE IN THE RED RIVER VALLEY KEYWORDS: CANADA-LAW LIVESTOCK-W
300	75 4570	SALINITY	GUIDELINES FOR MANURE USE AND DISPOSAL IN THE WESTERN REGION, USA KEYWORDS: LAND-APPLIC
100	76 4591	SALINITY	IRRIGATED AGRICULTURE--NONPOINT AND POINT SOURCE WATER POLLUTION KEYWORDS: FEEDLOT-RUNO
100	76 4624	SALINITY	*EFFECT OF CROP ROTATION, FARM YARD MANURE AND THE QUANTITY OF SALINE IRRIGATION WATER*
100	75 4645	SALINITY	WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS: WATER-POLLUTION NONPOINT-SOURCES PUBLIC
100	76 4446	SALMONELLAE	EXAMINATION OF POULTRY LITTER FOR SALMONELLAE BY DIRECT CULTURE AND FLUORESCENT ANTIBOD
100	73 4131	SALMONELLA	THE ROLES OF AMMONIA, WATER ACTIVITY, AND PH IN THE SALMONELLACIDAL EFFECT OF LONG-USED
100	77 4348	SALMONELLA	AVAILABLE AMINO ACID CONTENT AND MICROBIOLOGICAL CONDITION OF DRIED POULTRY MANURE KEY
100	76 4432	SALMONELLA	STUDIES ON BACTERIOPHAGE DISTRIBUTION--VIRULENT AND TEMPERATE BACTERIOPHAGE CONTENT OF
100	76 4523	SALMONELLA	THE OCCURRENCE OF SALMONELLAS, MYCOBACTERIA AND PATHOGENIC STRAINS OF ESCHERICHIA COLI
200	74 4535	SALMONELLA	SURVIVAL OF PATHOGENS IN FEEDLOT WASTE KEYWORDS: PATHOGENIC-BACTERIA CATTLE-WASTES FEED
400	77 4609	SALMONELLA	WET CAGE LAYER MANURE FED TO FEEDLOT CATTLE KEYWORDS: POULTRY-WASTES PRESERVATIVES REFE
100	71 4629	SALMONELLA	PERSISTENCE OF THREE SALMONELLA SPP IN BOVINE FAECES KEYWORDS: SALMONELLA CATTLE-WASTE
100	71 4657	SALMONELLA	THE SURVIVAL OF SALMONELLA DUBLIN IN CATTLE SLURRY KEYWORDS: SLURRIES DAIRY-WASTES BACT
100	77 4579	SALMONELLA-DUBLIN	THE EFFECT OF THE MICROFLORA IN CATTLE SLURRY ON THE SURVIVAL OF SALMONELLA DUBLIN KEYW
100	73 4646	SALMONELLA-DUBLIN	A FURTHER ASSESSMENT OF THE POTENTIAL HAZARD FOR CALVES ALLOWED TO GRAZE PASTURE CONTAM
100	71 4122	SALMONELLA-TYPHIMU	INHIBITORY EFFECT OF USED LITTER ON SALMONELLA TYPHIMURIUM TRANSMISSION IN THE CHICKEN
100	75 4264	SALMONELLA-TYPHIMU	SURVIVAL OF SALMONELLA TYPHIMURIUM IN DAIRY COW WASTE KEYWORDS: DAIRY-WASTES SALMONELLA
300	76 4016	SALTS	DAIRY MANURE CAN BE USED SAFELY KEYWORDS: DAIRY-WASTES WASTE-MANAGEMENT WASTE-STORAGE W
100	77 4018	SALTS	EFFECT OF DIETARY SALT LEVEL AND LIQUID HANDLING SYSTEMS ON SWINE WASTE COMPOSITION KEY
400	72 4157	SALTS	KANSAN APPLIES FEEDLOT RUN-OFF TO CORN FIELDS KEYWORDS: FEEDLOT-RUNOFF LAND-APPLICATION
300	73 4209	SALTS	SWINE PRODUCTION INDUSTRY WASTE CHARACTERIZATION AND MANAGEMENT KEYWORDS: SWINE-WASTES
200	76 4358	SALTS	CONSIDERATION OF SOILS FOR ACCEPTING WASTES KEYWORDS: LAND-APPLICATION SOIL-PROPERTIES
300	75 4493	SALTS	SWINE MANURE FOR FERTILIZER--RESEARCH REVIEW KEYWORDS: SWINE-WASTES LIQUID-WASTES AEROB
100	75 4590	SALTS	ANALYSIS OF RUNOFF FROM SOUTHERN GREAT PLAINS FEEDLOTS KEYWORDS: FEEDLOT-RUNOFF SALTS I
300	77 4659	SALTS	AEROBIC TREATMENT IN RELATION TO LAND APPLICATION OF SLURRY KEYWORDS: AEROBIC-TREATMENT
300	74 4217	SALT	SOIL POLLUTION FROM FEEDLOTS IN GEORGIA KEYWORDS: *GROUNDWATER-POLLUTION* SOIL-CONTAMINAT
200	74 4221	SALT	METHANE RECOVERY FROM POULTRY WASTE KEYWORDS: POULTRY-WASTES SEWAGE-SLUDGE RECYCLING ME
300	74 4412	SALT-LEVELS	SALT LEVELS IN STEER FINISHING RATIONS KEYWORDS: CATTLE FEEDS SALT-LEVELS PERFORMANCE C
100	77 4381	SALT-REMOVAL	SALT REMOVAL EFFICIENCIES ON LAND DISPOSAL OF SWINE WASTE KEYWORDS: LAND-DISPOSAL SWINE
100	74 4023	SAMPLING	EVALUATION OF PORCELAIN CUP SOIL WATER SAMPLERS FOR BACTERIOLOGICAL SAMPLING KEYWORDS:
100	76 4238	SAMPLING	DETERMINATION OF VANILMANDELIC ACID IN PIG URINE AND CHICKEN FECES BY GAS-LIQUID CHROMA
100	76 4446	SAMPLING	EXAMINATION OF POULTRY LITTER FOR SALMONELLAE BY DIRECT CULTURE AND FLUORESCENT ANTIBOD

100 76 4452	SAMPLING	PHOSPHORUS LOSS BY STREAM TRANSPORT FROM A RURAL WATERSHED--QUANTITIES, PROCESSES, AND
200 71 4583	SAMPLING	ANALYTICAL AND ORGANCLEPTIC MEASUREMENT OF ODOURS FROM ANIMAL WASTES KEYWORDS: ODOR SAM
100 77 4161	SAMPLING-TECHNIQUE	ISOLATION AND IDENTIFICATION OF FECAL BACTERIA FROM ADULT SWINE KEYWORDS: SWINE-WASTES
100 74 4191	SAMPLING-TECHNIQUE	LOSSES FROM CATTLE FAECES DURING CHEMICAL ANALYSIS KEYWORDS: SAMPLING-TECHNIQUES CHEMIC
400 77 4371	SANITATION	SANITATION IS FIRST STEP IN EFFECTIVE FEEDLOT FLY CONTROL KEYWORDS: FLY-CONTROL FEEDLOT
100 74 4374	SANITATION	NUTRITIONAL VALUE OF CATTLE WASTE FOR CATTLE KEYWORDS: REFEEDING CATTLE-WASTES WASTELAG
100 76 4138	SAWDUST	RESPONSE OF DAIRY CATTLE GIVEN A FREE CHOICE OF FREE STALL LOCATION AND THREE BEDDING
100 76 4634	SAWDUST	ANALYSIS OF THE ROTTING PROCESS OF SAWDUST BARNYARD MANURE KEYWORDS: ANIMAL-WASTES SAW
400 77 4295	SCENTOMETERS	STATE ODOR REGULATIONS KEYWORDS: FEEDLOTS NUISANCE-LAWSUITS ODOR LEGAL-ASPECTS ODOR-INT
400 77 4476	SCENTOMETER-READIN	FEEDLOT ODOR INTENSITY KEYWORDS: ODOR FEEDLOTS CATTLE SCENTOMETER-READINGS ODOR-CONTROL
400 72 4383	SCRAPING	WHAT ARE YOU DOING ABOUT YOUR 1.57 BILLION TON ANIMAL WASTE PROBLEM KEYWORDS WASTE-MAN
400 71 4556	SCRAPING	AUTOMATIC SYSTEM SCRAPES MANURE-AND WORK-AWAY KEYWORDS: DAIRY-WASTES CONFINEMENT HOUSIN
200 76 4367	SCREENING	METHANE FERMENTATION OF ANIMAL WASTES KEYWORDS: WASTE-TREATMENT METHANE REFEEDING CATTL
300 75 4593	SCREENING	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 1 KEYWORDS: WASTE-TREATMENT
300 76 4594	SCREENING	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 2 KEYWORDS: SWINE-WASTES WAS
100 76 4074	SEALANTS	INFILTRATION CHARACTERISTICS FROM ANAEROBIC LAGOONS KEYWORDS: ANAEROBIC LAGOONS INFILTR
300 76 4030	SEDIMENTATION	CONTROL OF WATER POLLUTION FROM CROPLAND: VOLUME II--AN OVERVIEW KEYWORDS: AGRICULTURAL
300 76 4068	SEDIMENTATION	DEMONSTRATION OF AERATION SYSTEMS FOR POULTRY WASTES KEYWORDS: POULTRY-WASTES BIOLOGICA
200 76 4182	SEDIMENTATION	RESOURCE ADEQUACY IN LIMITING NONPOINT POLLUTION KEYWORDS: NONPOINT-POLLUTION WATER-POL
200 75 4401	SEDIMENTATION	CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH DENSITY CATFISH CULTURES K
100 75 4451	SEDIMENTS	THE NEEDS FOR WATER QUALITY MODELS ON AGRICULTURAL WATERSHEDS KEYWORDS: WATER-POLLUTION
300 75 4077	SEDIMENT	STATUS OF SEDIMENT FROM CATFISH PRODUCTION PONDS AS A FERTILIZER AND SOIL CONDITIONER K
200 76 4129	SEDIMENT	NONPOINT SOURCES: STATE-OF-THE-ART OVERVIEW KEYWORDS: WATER-POLLUTION AGRICULTURAL-RUNO
100 75 4395	SEDIMENT	A MODEL FOR RUNOFF OF PESTICIDES FROM SMALL UPLAND WATERSHEDS KEYWORDS: MODEL-STUDIES A
100 75 4645	SEDIMENT	WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS: WATER-POLLUTION NONPOINT-SOURCES PUBLIC
100 76 4049	SEEPAGE	ACCUMULATION OF NUTRIENTS IN SOIL BENEATH HOG MANURE LAGOONS KEYWORDS: LAGOONS SWINE-WA
100 73 4361	SEEPAGE	CHANGES IN SEEPAGE RATE FROM AN UNLINED CATTLE WASTE DIGESTION POND KEYWORDS: CATTLE-WA
300 77 4510	SEEPAGE	POLLUTANT MOVEMENT TO SHALLOW GROUND WATER TABLES FROM SWINE WASTE LAGOONS KEYWORDS: SW
400 77 4320	SEMI-CONFINEMENT	SEMI-CONFINEMENT AT 1/3 THE COST KEYWORDS: SEMI-CONFINEMENT CATTLE ECONOMICS WEATHER WA
300 76 4068	SEPARATION-TECHNIQ	DEMONSTRATION OF AERATION SYSTEMS FOR POULTRY WASTES KEYWORDS: POULTRY-WASTES BIOLOGICA
400 77 4133	SEPARATION-TECHNIQ	AWARDS MADE FOR WASTE MANAGEMENT STUDIES KEYWORDS: AWARDS WASTE-MANAGEMENT RUNOFF-CONTR
400 77 4219	SEPARATION-TECHNIQ	SOLID VS LIQUID WASTE PRE-POND WASTE SEPARATION ALLOWS FLUSH RECOVERY RECYCLING KEYWOR
400 77 4404	SEPARATION-TECHNIQ	CALIFORNIA DAIRYMEN ARE GAINING EXPERIENCE WITH MANURE SEPARATORS KEYWORDS: WASTE-MANAG
400 77 4428	SEPARATION-TECHNIQ	ENGINEER EXPLAINS NEW WASTE RUNOFF SYSTEM KEYWORDS: FEEDLOT-RUNOFF WATER-POLLUTION-CONT
300 75 4444	SEPARATION-TECHNIQ	LIVESTOCK WASTE FACILITIES HANDBOOK KEYWORDS: LIVESTOCK-WASTES WASTE-STORAGE WASTE-TREA
700 76 4466	SEPARATION-TECHNIQ	DEWATERING A SWINE MANURE SLURRY BY EXPRESSION KEYWORDS: SWINE-WASTES SLURRIES FILTRATI
400 71 4557	SEPARATION-TECHNIQ	WHAT TO DO WITH ANIMAL WASTES RECYCLING KEYWORDS: WASTE-DISPOSAL WATER-POLLUTION ODOR A
400 77 4664	SEPARATION-TECHNIQ	NEW RECYCLING TRIAL SHOWS 20 HD EXTRA PROFIT KEYWORDS: REFEEDING CATTLE-WASTES COMPOST
400 77 4428	SERPENTINE-GRASSED	ENGINEER EXPLAINS NEW WASTE RUNOFF SYSTEM KEYWORDS: FEEDLOT-RUNOFF WATER-POLLUTION-CONT
200 75 4401	SETTLEABLE-SOLIDS	CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH DENSITY CATFISH CULTURES K
100 75 4205	SETTLING	WASTE CHARACTERIZATION STUDIES FOR RACEWAY PRODUCTION OF CATFISH KEYWORDS: FISH-WASTES
400 77 4428	SETTLING	ENGINEER EXPLAINS NEW WASTE RUNOFF SYSTEM KEYWORDS. FEEDLOT-RUNOFF WATER-POLLUTION-CONT
700 76 4466	SETTLING	DEWATERING A SWINE MANURE SLURRY BY EXPRESSION KEYWORDS: SWINE-WASTES SLURRIES FILTRATI
400 77 4644	SETTLING	PONDER THIS SWITCH-BACK, FIELD SINK SYSTEM KEYWORDS: DAIRY-WASTES RUNOFF SWITCH-BACK-WA
400 72 4240	SETTLING-BASINS	MANURE SYSTEMS PLANNING DATA KEYWORDS: WASTE-STORAGE LAGOONS HOLDING-PONDS SETTLING-BAS
200 77 4275	SETTLING-BASINS	FARMERS AS CLIENTS KEYWORDS: DESIGN WASTE-MANAGEMENT SETTLING-BASINS LAGOONS
400 77 4527	SETTLING-BASINS	FEEDER COMPLIES WITH REGULATIONS--EPA OKAYED THESE PLANS TO STOP WASTE AND WATER RUNOFF
200 76 4186	SETTLING-BASIN	A LOW COST SETTLING BASIN AND INFILTRATION CHANNEL FOR CONTROLLING RUNOFF FROM AN OPEN
200 77 4283	SETTLING-POND	A FARMERS VIEWPOINT, PART I - BEEF WASTE MANAGEMENT KEYWORDS: WASTE-MANAGEMENT CATTLE G
400 76 4132	SETTLING-TANKS	HOGS TO GET FLUSH TOILETS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT FLUSHING SETTLING-TAN
500 77 4079	SEWAGE	LAND AS A WASTE MANAGEMENT ALTERNATIVE KEYWORDS: WASTE-MANAGEMENT LAND-APPLICATION ANIM
500 77 4083	SEWAGE	HEALTH HAZARDS OF AGRICULTURAL, INDUSTRIAL, AND MUNICIPAL WASTES APPLIED TO LAND KEYWOR
500 77 4084	SEWAGE	MICROBIAL CONCERNS WHEN WASTES ARE APPLIED TO LAND KEYWORDS: LAND-DISPOSAL SOIL-MICROBI
500 77 4086	SEWAGE	CONTINUOUS SUBSURFACE INJECTION OF LIQUID ORGANIC WASTES KEYWORDS: LAND-APPLICATION LIQ
100 46 4115	SEWAGE	DIGESTER GAS FOR AUTOMOBILES KEYWORDS: METHANE ORGANIC-WASTES SEWAGE HORSE-WASTES RECYC
700 71 4139	SEWAGE	VARIATION IN THE DENSITY OF POLLUTION INDICATOR BACTERIA IN THE COTTONWOOD RIVER AS REL
500 75 4197	SEWAGE	TRANSPORT IN STREAMS KEYWORDS: WATER-POLLUTION POLLUTANT-SOURCES NITROGEN PHOSPHORUS AG
300 77 4262	SEWAGE	CAN CITY SEWAGE BE RECYCLED SAFELY ON FARM LAND KEYWORDS: RECYCLING SEWAGE LAND-APPLICA
400 77 4333	SEWAGE	USE OF AGRICULTURE WASTES IN AQUACULTURE KEYWORDS: AQUACULTURE FISH FEEDS ORGANIC-WASTE
300 72 4339	SEWAGE	WASTEWATER RESEARCH EXPANDS KEYWORDS: MUNICIPAL-WASTES SEWAGE LAND-APPLICATION FORAGES
100 71 4405	SEWAGE	A CLEAN NEW GAS KEYWORDS: SEWAGE URBAN-WASTES AGRICULTURAL-WASTES RECYCLING ANAEROBIC-D
100 76 4425	SEWAGE	GROUND-WATER QUALITY VARIATION IN PHELPS COUNTY, MISSOURI KEYWORDS GROUNDWATER-QUALITY
100 76 4452	SEWAGE	PHOSPHORUS LOSS BY STREAM TRANSPORT FROM A RURAL WATERSHED--QUANTITIES, PROCESSES, AND
400 77 4524	SEWAGE	CHICKEN MANURE PLUS KEYWORDS: RECLAMATION SURFACE-MINED-LANDS LAND-APPLICATION ASH SEW
200 74 4050	SEWAGE-LAGOONS	THE IMPLICATION OF HYDROGEOLOGIC FACTORS IN WASTE MANAGEMENT ON LAND WITH SPECIAL REFE
300 75 4037	SEWAGE-SLUDGE	LAND AVAILABILITY, CROP PRODUCTION, AND FERTILIZER REQUIREMENTS IN THE UNITED STATES KE
500 77 4082	SEWAGE-SLUDGE	MONITORING SEWAGE SLUDGES, SOILS AND CROPS FOR ZINC AND CADMIUM KEYWORDS: ZINC CADMIUM
200 74 4221	SEWAGE-SLUDGE	METHANE RECOVERY FROM POULTRY WASTE KEYWORDS: POULTRY-WASTES SEWAGE-SLUDGE RECYCLING ME
400 77 4448	SEWAGE-SLUDGE	CONVERT CITY SEWAGE TO FARM FERTILIZER KEYWORDS: SEWAGE-SLUDGE FERTILIZERS LAND-APPLICA
400 77 4587	SEWAGE-SLUDGE	COMPOSTING CONVERTS WASTE INTO VALUABLE RESOURCES KEYWORDS: COMPOSTING FEEDLOT-WASTES P
300 76 4194	SEWAGE-SOLIDS	RECYCLING SEWAGE SOLIDS AS FEEDSTUFFS FOR LIVESTOCK KEYWORDS: RECYCLING SEWAGE-SOLIDS R
700 72 4561	SEWAGE-TREATMENT	USE OF AN ACTIVATED SLUDGE PROCESS IN TREATING CHICKEN MANURE COMBINED WITH DOMESTIC SE
100 73 4128	SHEAR-RATES	FLOW PROPERTIES OF DAIRY WASTE SLURRIES KEYWORDS: DAIRY-WASTES SLURRIES SHEAR-RATES FLO
100 77 4019	SHEEP	ALFALFA VERSUS POULTRY EXCRETA AS NITROGEN SUPPLEMENTS FOR LAMBS KEYWORDS: REFEEDING SH
100 76 4020	SHEEP	DEHYDRATED BROILER EXCRETA VERSUS SOYBEAN MEAL AS NITROGEN SUPPLEMENTS FOR SHEEP KEYWO
200 77 4063	SHEEP	RESIDUE TRANSFER AND ACCUMULATION KEYWORDS: REFEEDING FEED-ADDITIVES ANIMAL-HEALTH CATT
400 77 4070	SHEEP	POULTRY WASTE FED TO CATTLE, SHEEP KEYWORDS: REFEEDING POULTRY-WASTES-DRIED WASTE-COMPO
100 76 4101	SHEEP	NUTRITIONAL EVALUATION OF DEHYDRATED CATTLE MANURE USING SHEEP KEYWORDS: REFEEDING CATT
100 74 4108	SHEEP	POULTRY WASTES AS FEEDSTUFFS FOR RUMINANTS KEYWORDS: POULTRY-WASTES POULTRY-LITTER WAST
100 76 4121	SHEEP	THE EFFECT OF DISPOSING HIGH RATES OF COPPER-RICH PIG SLURRY ON GRASSLAND ON THE HEALTH
100 77 4146	SHEEP	COMPOSITION OF CORN PLANT ENSILED WITH EXCRETA OR NITROGEN SUPPLEMENTS AND ITS EFFECT
300 76 4194	SHEEP	RECYCLING SEWAGE SOLIDS AS FEEDSTUFFS FOR LIVESTOCK KEYWORDS: RECYCLING SEWAGE-SOLIDS R
100 76 4223	SHEEP	EFFECTS OF DAIRY CATTLE MANURE SOLUBLES IN LAMB DIETS KEYWORDS: DAIRY-WASTES REFEEDING
100 77 4229	SHEEP	DESIGN CRITERIA FOR AIR CARGO SYSTEMS FOR SHEEP KEYWORDS: SHEEP AIR-TRANSPORT DESIGN CA
100 76 4232	SHEEP	HEN EXCRETA COMPOSITION AND RUMEN PARAMETERS KEYWORDS: SHEEP REFEEDING POULTRY-WASTES-D
100 76 4236	SHEEP	HEN EXCRETA COMPOSITION AND METABOLISM BY SHEEP KEYWORDS: POULTRY-WASTES-DRIED REFEEDIN
100 76 4325	SHEEP	THE POTENTIAL TOXICITY OF COPPER-RICH ANIMAL EXCRETA TO SHEEP KEYWORDS: REFEEDING COPPE
100 75 4329	SHEEP	USE OF DRIED PAUNCH RESIDUE IN RUMINANT DIETS KEYWORDS: PAUNCH-MANURE REFEEDING SHEEP C
100 74 4374	SHEEP	NUTRITIONAL VALUE OF CATTLE WASTE FOR CATTLE KEYWORDS: REFEEDING CATTLE-WASTES WASTELAG
100 76 4387	SHEEP	EXPOSURE OF LAMBS TO ATMOSPHERIC AMMONIA KEYWORDS: SHEEP ANIMAL-HEALTH AIR-POLLUTION AM
100 76 4389	SHEEP	NUTRITIVE VALUE OF ENSILED CATTLE WASTE KEYWORDS: ENSILING CATTLE-WASTES REFEEDING CATT
100 77 4391	SHEEP	GASTROINTESTINAL TRACT PH AND STARCH IN FECES OF RUMINANTS KEYWORDS: DIETS INTESTINAL-
100 77 4418	SHEEP	LAMB PERFORMANCE ON CAGE HEN MANURE ENSILED WITH CORRUGATED CARDBOARD KEYWORDS: REFEEDI
100 77 4421	SHEEP	EFFECT OF INCLUDING ENSILED BROILER-HOUSE LITTER IN THE RATIONS OF SHEEP ON THE DIGESTI
400 77 4431	SHEEP	GOOD GAINS ON POULTRY WASTE, HIGH FIBER DIET KEYWORDS: POULTRY-WASTES-DRIED REFEEDING N
400 77 4486	SHEEP	MORE ON SHEEP FLOORING KEYWORDS: CONFINEMENT-PENS SHEEP MANAGEMENT FLOORING ANIMAL-HEAL
400 73 4488	SHEEP	RUMINANTS AND PIGS ARE THE BEST USERS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE S
100 76 4497	SHEEP	POULTRY LITTER FOR INTENSIVE BEEF PRODUCTION KEYWORDS: POULTRY-WASTES REFEEDING DIGESTI
100 75 4514	SHEEP	RETENTION BY SHEEP OF COPPER FROM AEROBIC DIGESTS OF PIG FAECAL SLURRY KEYWORDS: SWINE-
100 76 4631	SHEEP	LIQUID DIETS CONTAINING POULTRY WASTES FOR RUMINANTS KEYWORDS: DIETS SHEEP LIQUID-WASTE

700	72	4635	SHEEP BIOCHEMICAL AND NUTRITIONAL STUDIES ON FERMENTED- AMMONIATED ANIMAL FEED SUPPLEMENTS KE
100	76	4192	SHEEP-WASTES STAPHYLOCOCCI FROM THE FECES OF DIFFERENT ANIMAL SPECIES BIOTYPES OF STAPHYLOCOCCUS AUR
200	76	4625	SHEEP-WASTES SMALL DUNG BEETLES AS BIOLOGICAL CONTROL AGENTS-- LABORATORY STUDIES OF BEETLE ACTION O
300	75	4187	SILAGES FEEDING VALUE OF EXCRETA-STOVER SILAGE AND CORN RESIDUE FOR BEEF COWS KEYWORDS: REFEEDI
100	77	4419	SILAGES EFFECTS OF FERMENTED AND NON-FERMENTED POULTRY MANURE SILAGE ON BROILER CHICK GROWTH KE
200	77	4422	SILAGES MICROFLORA OF ENSILED MANURE-BLENDED FEED, CORN AND SORGHUM SILAGES KEYWORDS: ENSILING
400	77	4571	SILAGES A PLACE FOR POULTRY WASTE KEYWORDS: REFEEDING POULTRY-WASTES WASTE-STORAGE ENSILING SIL
200	77	4335	SILAGE UTILIZATION OF SUNFLOWER SILAGE, SUNFLOWER HULLS WITH POULTRY LITTER AND SUNFLOWER HULL
400	73	4352	SILOS UNDERGROUND SILOS FOR LIQUID MANURE KEYWORDS DAIRY-WASTES WASTE-STORAGE SILOS LAND-APP
200	76	4129	SILVICULTURAL-POLL NONPOINT SOURCES STATE-OF-THE-ART OVERVIEW KEYWORDS: WATER-POLLUTION AGRICULTURAL-RUNO
100	75	4645	SILVICULTURE WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS WATER-POLLUTION NONPOINT-SOURCES PUBLIC
100	76	4246	SIMAZINE EFFECT OF SIMAZINE AND ATRAZINE ON THE FERMENTATION OF FERTILIZER AND MANURE NITROGEN K
400	77	4156	SITE-SELECTION ODORS MAY LEAD TO COURTROOM KEYWORDS: ODOR LEGAL-ASPECTS LIQUID-WASTES LIVESTOCK-WASTES
200	76	4360	SITE-SELECTION LAND USE OF ANIMAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WASTES NITROGEN WASTE-COMPO
300	73	4100	SLATTED-FLOORS LIQUID WASTE MANAGEMENT AT A SLATTED FLOOR SWINE BARN KEYWORDS: SWINE-WASTES LIQUID-WAS
400	76	4141	SLATTED-FLOORS HOUSING AND FLOOR DESIGN CAN INFLUENCE PIG PERFORMANCE KEYWORDS: HOUSING SLATTED-FLOORS
400	77	4149	SLATTED-FLOORS HOG CONFINEMENT GASES CAUSE MEDICAL PROBLEMS KEYWORDS: SWINE CONFINEMENT-PENS GASES PUB
400	77	4160	SLATTED-FLOORS KSU TRIES PLASTIC SLATS AND WALLS IN PIG NURSERY KEYWORDS: SWINE MANAGEMENT DESIGN SLAT
400	77	4259	SLATTED-FLOORS FAMILY FORMS PARTNERSHIP TO FINISH HOGS KEYWORDS: SWINE-WASTES CONFINEMENT-PENS SLATTED
400	74	4322	SLATTED-FLOORS THERE'S MONEY IN MANURE IF HANDLED RIGHT KEYWORDS: DAIRY-WASTES WASTE-MANAGEMENT FERTIL
400	77	4402	SLATTED-FLOORS RALPH KISSINGER, JR --1977 FARMER-FEEDER OF THE YEAR KEYWORDS: MANAGEMENT CATTLE CONFIN
400	77	4437	SLATTED-FLOORS HIS HOGS DON T STINK KEYWORDS: CONFINEMENT-PENS LEGAL-ASPECTS IOWA-LAW ODOR-CONTROL SWI
400	77	4443	SLATTED-FLOORS NEW WASTE COLLECTION AND STORAGE SYSTEM KEYWORDS: WASTE-COLLECTION WASTE-STORAGE LIQUID
400	77	4445	SLATTED-FLOORS GUIDE TO EFFECTIVE MANURE PIT VENTILATION KEYWORDS: ODOR GASES AIR-POLLUTION SWINE-WAST
400	77	4552	SLAT-MATERIALS FIT FLOOR TO YOUR SWINE OPERATION KEYWORDS: SWINE CONFINEMENT-PENS SLOTTED-FLOORS SLAT-
400	77	4239	SLAT-SCRAPE-SYSTEM SLAT-SCRAPE RECAPTURES RATION NUTRIENTS FOR REFEEDING MANURE KEYWORDS: CATTLE-WASTES-EN
700	76	4546	SLOPES INFLUENCE OF SURFACES ON POLLUTION FROM FEEDLOTS KEYWORDS: FEEDLOT-SURFACES FEEDLOT-RUN
100	75	4589	SLOPES PROPERTIES OF MANURE ACCUMULATIONS FROM MIDWEST BEEF CATTLE FEEDLOTS KEYWORDS: FEEDLOTS
100	75	4592	SLOPES ADSORPTION OF POULTRY LITTER EXTRACTS BY SOIL AND CLAY KEYWORDS: POULTRY-LITTER-EXTRACT
400	77	4071	SLOTTED-FLOORS GETTING MORE OUT OF LIQUID MANURE KEYWORDS: LIQUID-WASTES SLOTTED-FLOORS DEEP-PITS SOIL
100	73	4126	SLOTTED-FLOORS EFFECTS OF BEEF HOUSING SYSTEMS ON MOISTURE REMOVED BY VENTILATION KEYWORDS: HOUSING CA
400	77	4302	SLOTTED-FLOORS DIVERSIFY--BUT STAY EFFICIENT, SAYS IOWA CATTLE FEEDER KEYWORDS: MANAGEMENT CONFINEMENT
400	77	4552	SLOTTED-FLOORS FIT FLOOR TO YOUR SWINE OPERATION KEYWORDS: SWINE CONFINEMENT-PENS SLOTTED-FLOORS SLAT-
500	77	4086	SLUDGE CONTINUOUS SUBSURFACE INJECTION OF LIQUID ORGANIC WASTES KEYWORDS: LAND-APPLICATION LIQ
200	70	4384	SLUDGE STATE OF THE ART - ANAEROBIC LAGOONS KEYWORDS' LAGOONS WASTE-TREATMENT ANAEROBIC DESIGN
100	71	4405	SLUDGE A CLEAN NEW GAS KEYWORDS' SEWAGE URBAN-WASTES AGRICULTURAL-WASTES RECYCLING ANAEROBIC-D
300	77	4655	SLUDGE NOTES ON ANAEROBIC DIGESTION AND ANAEROBIC DIGESTERS BASED ON EXPERIMENTAL PLANT IN ABE
300	77	4659	SLUDGE AEROBIC TREATMENT IN RELATION TO LAND APPLICATION OF SLURRY KEYWORDS: AEROBIC-TREATMENT
300	76	4203	SLUDGE-MANAGEMENT WASTEWATER AND RUNOFF CONTROL SYSTEMS FOR DRYLOT DAIRIES KEYWORDS: DAIRY-INDUSTRY AGRIC
100	74	4023	SLURRIES EVALUATION OF PORCELAIN CUP SOIL WATER SAMPLERS FOR BACTERIOLOGICAL SAMPLING KEYWORDS:
100	74	4032	SLURRIES CHANGES IN THE RHIZOSPHERE EFFECT OF MILLET ASSOCIATED WITH SPRINKLER IRRIGATION WITH A
100	76	4038	SLURRIES NITROGEN TRANSFORMATIONS IN AERATED SWINE MANURE SLURRIES KEYWORDS: SLURRIES SWINE-WAST
200	74	4052	SLURRIES HAZARDS ASSOCIATED WITH SPREADING ANIMAL-WASTE SLURRIES KEYWORDS: SLURRIES LAND-APPLICA
100	76	4121	SLURRIES THE EFFECT OF DISPOSING HIGH RATES OF COPPER-RICH PIG SLURRY ON GRASSLAND ON THE HEALTH
100	73	4128	SLURRIES FLOW PROPERTIES OF DAIRY WASTE SLURRIES KEYWORDS: DAIRY-WASTES SLURRIES SHEAR-RATES FLO
100	77	4140	SLURRIES THERMOPHILIC METHANE PRODUCTION FROM CATTLE WASTE KEYWORDS: ANAEROBIC-DIGESTION CATTLE-
200	76	4178	SLURRIES ANAEROBIC DIGESTION STABILITY AND FOOD-PROCESSING WASTE TREATMENT KEYWORDS: ANAEROBIC-D
100	74	4193	SLURRIES THE EFFECT OF PIG SLURRY APPLIED TO A SOIL SURFACE ON THE COMPOSITION OF THE SOIL ATMOS
100	72	4214	SLURRIES AERATION UNDER CAGED LAYING HENS KEYWORDS: AERATION POULTRY-WASTES SLURRIES WASTE-COMPO
100	76	4306	SLURRIES AN EVALUATION OF FARMYARD SLURRY ENRICHED WITH EITHER POULTRY MANURE OR INORGANIC N-P-K
100	76	4325	SLURRIES THE POTENTIAL TOXICITY OF COPPER-RICH ANIMAL EXCRETA TO SHEEP KEYWORDS: REFEEDING COPPE
100	77	4365	SLURRIES HEAD LOSS OF BEEF MANURE SLURRY FLOW IN POLYVINYLCHLORIDE PIPE KEYWORDS: CATTLE-WASTES
300	74	4366	SLURRIES JOINT LAND SPREADING TRIAL KEYWORDS: SLURRIES SOILS LAND-APPLICATION GRASSLANDS RAINFAL
400	77	4443	SLURRIES NEW WASTE COLLECTION AND STORAGE SYSTEM KEYWORDS: WASTE-COLLECTION WASTE-STORAGE LIQUID
100	69	4459	SLURRIES STUDIES ON THE USE OF ANIMAL SLURRIES TO MANURE BARLEY 1-- THE EFFECT OF AGE AND DILUT
100	69	4460	SLURRIES STUDIES ON THE USE OF ANIMAL SLURRIES TO MANURE BARLEY 2-- THE EFFECT OF AUTUMN, WINTE
700	76	4466	SLURRIES DEWATERING A SWINE MANURE SLURRY BY EXPRESSION KEYWORDS: SWINE-WASTES SLURRIES FILTRATI
100	73	4478	SLURRIES THE HANDLING TREATMENT, AND DISPOSAL OF FARM WASTES-- APPLICATION OF FARM SLURRIES TO A
700	74	4502	SLURRIES THE EFFECT OF TOTAL SOLIDS CONTENT, PARTICLE SIZE, FLOW VELOCITY, AND VISCOSITY OF BEEF
100	75	4514	SLURRIES RETENTION BY SHEEP OF COPPER FROM AEROBIC DIGESTS OF PIG FAECAL SLURRY KEYWORDS: SWINE-
100	76	4523	SLURRIES THE OCCURRENCE OF SALMONELLAS, MYCOBACTERIA AND PATHOGENIC STRAINS OF ESCHERICHIA COLI
100	74	4559	SLURRIES A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND-- PART 1 KEYWORDS: ANIMAL-WASTE
100	75	4560	SLURRIES A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND-- PART 2 KEYWORDS: WATER-POLLUT
400	70	4575	SLURRIES MANURE DISPOSAL KEYWORDS: POULTRY-WASTES SOLID-WASTES SLURRIES LAND-APPLICATION DEHYDRA
100	77	4579	SLURRIES THE EFFECT OF THE MICROFLORA IN CATTLE SLURRY ON THE SURVIVAL OF SALMONELLA DUBLIN KEYW
100	74	4598	SLURRIES SOME BACTERIOLOGICAL CHANGES ASSOCIATED WITH THE APPLICATION OF COW SLURRY TO GRASSLAND
100	75	4608	SLURRIES THE USE OF RESPIROMETRIC METHODS FOR ASSESSING THE BIODEGRADABILITY OF DIFFERENT COMPON
400	77	4611	SLURRIES METHANE GAS MADE FROM CONFINEMENT UNIT WASTE KEYWORDS: SWINE-WASTES SLURRIES WASTE-TREA
200	76	4617	SLURRIES STUDIES ON A MIXING DISTRIBUTION SYSTEM FOR SWINE MANURE LAGOONS KEYWORDS: SWINE-WASTES
100	73	4621	SLURRIES A METHOD FOR THE QUANTITATIVE EXTRACTION OF ADENOSINETRIPHOSPHATE (ATP) FROM COW SLURRY
100	71	4622	SLURRIES THE SURVIVAL OF ESCHERICHIA COLI AND SALMONELLA DUBLIN IN SLURRY ON PASTURE AND THE INF
500	73	4623	SLURRIES A HOMESITE POWER UNIT--METHANE GENERATOR KEYWORDS: ANAEROBIC DIGESTER SLURRIES WASTE-TR
100	77	4628	SLURRIES SPREADING SLURRY ON LAND KEYWORDS: SLURRIES LIVESTOCK-WASTES LAND-APPLICATION DRAINAGE
100	77	4633	SLURRIES CHANGES IN THE SHORT-CHAIN CARBOXYLIC ACID CONTENT AND CHEMICAL OXYGEN DEMAND OF STORED
200	72	4640	SLURRIES LEPTOSPIRES IN ANIMAL WASTE TREATMENT--ANIMAL HEALTH PROBLEM KEYWORDS: ANIMAL-WASTES LE
100	73	4646	SLURRIES A FURTHER ASSESSMENT OF THE POTENTIAL HAZARD FOR CALVES ALLOWED TO GRAZE PASTURE CONTAM
200	75	4650	SLURRIES ANIMAL MANURES IN GRASS PRODUCTION KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES
200	76	4651	SLURRIES FERTILIZER VALUE OF ANIMAL MANURES KEYWORDS: SWINE-WASTES CATTLE-WASTES WASTE-STORAGE L
100	76	4654	SLURRIES ANAEROBIC DIGESTION OF AGRICULTURAL WASTES KEYWORDS: ANAEROBIC-DIGESTION SWINE-WASTES C
300	77	4655	SLURRIES NOTES ON ANAEROBIC DIGESTION AND ANAEROBIC DIGESTERS BASED ON EXPERIMENTAL PLANT IN ABE
100	71	4657	SLURRIES THE SURVIVAL OF SALMONELLA DUBLIN IN CATTLE SLURRY KEYWORDS: SLURRIES DAIRY-WASTES BACT
300	77	4659	SLURRIES AEROBIC TREATMENT IN RELATION TO LAND APPLICATION OF SLURRY KEYWORDS: AEROBIC-TREATMENT
200	74	4667	SLURRIES SLURRY PROBLEMS IN RELATION TO POLLUTION OF SURFACE WATERS KEYWORDS: SLURRIES WASTE-MAN
300	76	4099	SNOWMELT DESIGN PARAMETERS FOR THE LAND APPLICATION OF DAIRY MANURE KEYWORDS: DAIRY-WASTES LAND
100	76	4267	SNOWMELT-RUNOFF POLLUTION POTENTIAL OF MANURE SPREAD ON FROZEN GROUND KEYWORDS: WATER-POLLUTION LAND-AP
100	76	4496	SNOWMELT-RUNOFF NONPOINT SOURCE POLLUTION FROM AGRICULTURAL RUNOFF KEYWORDS: WATER-POLLUTION NONPOINT-S
200	76	4551	SNOWMELT-RUNOFF LAND DISPOSAL OF ANIMAL MANURE IN THE RED RIVER VALLEY KEYWORDS: CANADA-LAW LIVESTOCK-W
100	76	4045	SODIUM NUTRIENT CONCENTRATION OF CORN AS EFFECTED BY POULTRY MANURE KEYWORDS: POULTRY-WASTES L
100	76	4047	SODIUM FEEDLOT WASTE RUNOFF AND MORTALITY OF WINDBREAK TREES KEYWORDS: FEEDLOT-RUNOFF TREE-MOR
500	77	4090	SODIUM SALT ACCUMULATION IN SOIL AS A FACTOR FOR DETERMINING APPLICATION RATES OF BEEF-FEEDLOT
300	76	4097	SODIUM DILUTION OF FEEDLOT RUNOFF KEYWORDS: LAND-APPLICATION FEEDLOT-RUNOFF DILUTION SOIL-WATE
100	76	4213	SODIUM SOLUBLE CATIONS BENEATH A FEEDLOT AND AN ADJACENT CROPPED FIELD KEYWORDS: FEEDLOTS CATI
100	76	4306	SODIUM AN EVALUATION OF FARMYARD SLURRY ENRICHED WITH EITHER POULTRY MANURE OR INORGANIC N-P-K
300	72	4501	SODIUM SODIUM LEVELS IN BEEF CATTLE FINISHING RATIONS AS RELATED TO PERFORMANCE AND CONCENTRAT
100	76	4074	SODIUM-CARBONATE INFILTRATION CHARACTERISTICS FROM ANAEROBIC LAGOONS KEYWORDS: ANAEROBIC LAGOONS INFILTR
200	74	4221	SODIUM-CHLORIDE METHANE RECOVERY FROM POULTRY WASTE KEYWORDS: POULTRY-WASTES SEWAGE-SLUDGE RECYCLING ME
100	75	4206	SODIUM-NITRATE CHEMICAL CONTROL OF HYDROGEN SULFIDE FROM ANAEROBIC SWINE MANURE: I. OXIDIZING AGENTS KEY
100	76	4074	SODIUM-TRIPOLYPHOS INFILTRATION CHARACTERISTICS FROM ANAEROBIC LAGOONS KEYWORDS: ANAEROBIC LAGOONS INFILTR
100	76	4074	SOILS INFILTRATION CHARACTERISTICS FROM ANAEROBIC LAGOONS KEYWORDS: ANAEROBIC LAGOONS INFILTR
100	76	4163	SOILS TRANSFORMATIONS OF NITROGEN ADDED AS AMMONIUM AND MANURE TO SOIL WITH A HIGH AMMONIUM-F

700 72 4189	SOILS	NITRATE LEACHING FROM ANIMAL WASTE APPLICATIONS KEYWORDS: GROUNDWATER-POLLUTION LEACHIN
200 77 4273	SOILS	AN INTRODUCTION TO ILLINOIS AGRICULTURE KEYWORDS: SOILS VEGETATION WEATHERING CLIMATE T
300 74 4366	SOILS	JOINT LAND SPREADING TRIAL KEYWORDS: SLURRIES SOILS LAND-APPLICATION GRASSLANDS RAINFAL
100 75 4420	SOILS	A STUDY ON THE RELATIVE EFFICIENCY OF ORGANIC MANURES AND THE EFFECT OF SALINITY ON ITS
100 76 4630	SOILS	EFFECT OF GYPSUM, FARMYARD MANURE AND ZINC ON THE YIELD OF BERSEEM, RICE AND MAIZE GRO
100 75 4592	SOIL-ADSORPTION	ADSORPTION OF POULTRY LITTER EXTRACTS BY SOIL AND CLAY KEYWORDS: POULTRY-LITTER-EXTRACT
400 71 4173	SOIL-AMENDMENTS	A POLLUTION SOLUTION WITH BUILT-IN PROFITS KEYWORDS: DEHYDRATION POULTRY-WASTES-DRIED RE
400 77 4404	SOIL-AMENDMENTS	CALIFORNIA DAIRYMEN ARE GAINING EXPERIENCE WITH MANURE SEPARATORS KEYWORDS: WASTE-MANAG
200 75 4558	SOIL-AMENDMENTS	HOW TO CLEAN UP AT THE RACES KEYWORDS: HORSE-WASTES RACE-TRACKS WASTE-MANAGEMENT WASTE-
100 74 4559	SOIL-AMENDMENTS	A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND-- PART 1 KEYWORDS: ANIMAL-WASTE
100 75 4560	SOIL-AMENDMENTS	A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND-- PART 2 KEYWORDS: WATER-POLLUT
700 70 4268	SOIL-ANALYSIS	CATTLE MANURE: I EFFECT ON CROPS AND SOILS II RETENTION PROPERTIES FOR CU, MN, AND ZN
100 76 4588	SOIL-ANALYSIS	ON THE INFLUENCE OF MANURE AND FERTILIZERS ON THE DISTRIBUTION AND AMOUNTS OF PLANT-AVA
100 74 4193	SOIL-ATMOSPHERE	THE EFFECT OF PIG SLURRY APPLIED TO A SOIL SURFACE ON THE COMPOSITION OF THE SOIL ATMOS
500 77 4088	SOIL-CHEMISTRY	OVERLAND RECYCLING OF ANIMAL WASTE KEYWORDS: WASTE-TREATMENT OVERLAND-SPRAY-IRRIGATION
500 77 4089	SOIL-CHEMISTRY	SOIL AND CROP RESPONSE TO APPLIED ANIMAL WASTE KEYWORDS: LAND-APPLICATION CROP-RESPONSE
500 77 4090	SOIL-CHEMISTRY	SALT ACCUMULATION IN SOIL AS A FACTOR FOR DETERMINING APPLICATION RATES OF BEEF-FEEDLOT
100 76 4306	SOIL-CHEMISTRY	AN EVALUATION OF FARMYARD SLURRY ENRICHED WITH EITHER POULTRY MANURE OR INORGANIC N-P-K
100 76 4377	SOIL-CHEMISTRY	EFFECT ON SOIL AND PLANT MINERAL LEVELS FOLLOWING APPLICATION OF MANURES OF DIFFERENT C
300 75 4077	SOIL-CONDITIONERS	STATUS OF SEDIMENT FROM CATFISH PRODUCTION PONDS AS A FERTILIZER AND SOIL CONDITIONER K
200 76 4433	SOIL-CONDITIONERS	WILLE COMPOST TANK--A DESIGN STUDY FOR A CONTINUOUS FLOW COMPOST TANK USED IN RECLAIMIN
100 75 4607	SOIL-CONDITIONERS	FLY PROTEIN PRODUCTION FROM MECHANICALLY MIXED ANIMAL WASTES KEYWORDS: RECYCLING POULTR
200 77 4279	SOIL-CONSERVATION-	SERVICES PROVIDED BY THE SOIL CONSERVATION SERVICE KEYWORDS: SOIL-CONSERVATION-SERVICE
500 77 4081	SOIL-CONTAMINATION	THE ADMISSIBLE RATE OF WASTE RESIDUE APPLICATION ON LAND WITH REGARD TO HIGH EFFICIE
500 77 4082	SOIL-CONTAMINATION	MONITORING SEWAGE SLUDGES, SOILS AND CROPS FOR ZINC AND CADMIUM KEYWORDS: ZINC CADMIUM
500 77 4084	SOIL-CONTAMINATION	MICROBIAL CONCERNS WHEN WASTES ARE APPLIED TO LAND KEYWORDS: LAND-DISPOSAL SOIL-MICROBI
500 77 4086	SOIL-CONTAMINATION	CONTINUOUS SUBSURFACE INJECTION OF LIQUID ORGANIC WASTES KEYWORDS: LAND-APPLICATION CIQ
100 76 4105	SOIL-CONTAMINATION	FATE OF ANIMAL VIRUSES IN EFFLUENT FROM LIQUID FARM WASTES KEYWORDS: LAND-APPLICATION
300 74 4217	SOIL-CONTAMINATION	SOIL POLLUTION FROM FEEDLOTS IN GEORGIA KEYWORDS: GROUNDWATER-POLLUTION SOIL-CONTAMINAT
300 73 4310	SOIL-CONTAMINATION	LIVESTOCK WASTE MANAGEMENT-STATE OF THE ART KEYWORDS: WASTE-MANAGEMENT FEEDLOTS LIVESTO
400 76 4319	SOIL-CONTAMINATION	STORIES MANURE CAN TELL KEYWORDS: ANIMAL-WASTES REFEEDING LAND-APPLICATION RECYCLING FE
300 73 4332	SOIL-CONTAMINATION	USING ORGANIC WASTES AS NITROGEN FERTILIZERS KEYWORDS: ORGANIC-WASTES LAND-APPLICATION
300 74 4412	SOIL-CORES	SALT LEVELS IN STEER FINISHING RATIONS KEYWORDS: CATTLE FEEDS SALT-LEVELS PERFORMANCE C
100 73 4478	SOIL-DAMAGE	THE HANDLING TREATMENT, AND DISPOSAL OF FARM WASTES-- APPLICATION OF FARM SLURRIES TO A
200 76 4358	SOIL-ENVIRONMENT	CONSIDERATION OF SOILS FOR ACCEPTING WASTES KEYWORDS: LAND-APPLICATION SOIL-PROPERTIES
400 77 4071	SOIL-INJECTION	GETTING MORE OUT OF LIQUID MANURE KEYWORDS: LIQUID-WASTES SLOTTED-FLOORS DEEP-PITS SOIL
500 77 4087	SOIL-INJECTION	ENGINEERING DESIGN CRITERIA FOR SLURRY INJECTORS KEYWORDS: DESIGN SOIL-INJECTION EQUIPM
200 76 4172	SOIL-INJECTION	LAND DISPOSAL OF BLOOD AND PAUNCH MANURE KEYWORDS: LAND-DISPOSAL BLOOD PAUNCH-MANURE PA
300 76 4251	SOIL-INJECTION	DESIGN CRITERIA FOR FIELD APPLICATION OF LIVESTOCK WASTE KEYWORDS: LIVESTOCK-WASTES LAN
400 77 4439	SOIL-INJECTION	INJECTING MANURE CUTS CORN FERTILIZER COSTS KEYWORDS: LAND-APPLICATION SOIL-INJECTION C
400 77 4440	SOIL-INJECTION	INJECTING MANURE PAYS WITH SAVED NITROGEN KEYWORDS: SWINE-WASTES CATTLE-WASTES LAND-APP
400 77 4498	SOIL-INJECTION	NITROGEN LOSS IN SWINE WASTE APPLICATION STUDIED KEYWORDS LAND-APPLICATION NITROGEN-LO
400 75 4531	SOIL-INJECTION	STORAGE-STORE MANURE AS IF IT WERE VALUABLE-BECAUSE IT IS KEYWORDS: FERTILIZERS CATTLE-
200 76 4613	SOIL-INJECTION	AN INJECTOR-TANKER DESIGN TO APPLY LIQUID MANURE BETWEEN CORN CROP ROWS KEYWORDS: LIQUI
200 76 4615	SOIL-INJECTORS	ENGINEERING DESIGN OF LIQUID MANURE INJECTORS KEYWORDS: LIQUID-WASTES SOIL-INJECTORS EQ
100 76 4246	SOIL-INVESTIGATION	EFFECT OF SIMAZINE AND ATRAZINE ON THE FERMENTATION OF FERTILIZER AND MANURE NITROGEN K
300 76 4097	SOIL-MANAGEMENT	DILUTION OF FEEDLOT RUNOFF KEYWORDS LAND-APPLICATION FEEDLOT-RUNOFF DILUTION SOIL-WATE
100 73 4168	SOIL-MECHANICS	ORGANIC MANAGEMENT REDUCES LEACHING OF NITRATE KEYWORDS: LAND-APPLICATION LEACHING NITR
100 74 4193	SOIL-MECHANICS	THE EFFECT OF PIG SLURRY APPLIED TO A SOIL SURFACE ON THE COMPOSITION OF THE SOIL ATMOS
100 77 4381	SOIL-MECHANICS	SALT REMOVAL EFFICIENCIES ON LAND DISPOSAL OF SWINE WASTE KEYWORDS: LAND-DISPOSAL SWINE
500 77 4084	SOIL-MICROBIOLOGY	MICROBIAL CONCERNS WHEN WASTES ARE APPLIED TO LAND KEYWORDS: LAND-DISPOSAL SOIL-MICROBI
100 75 4652	SOIL-MICROBIOLOGY	SUCCESSIONS OF MICROORGANISMS AND INVERTEBRATA AND THEIR CONNECTIONS WITH BIOCHEMICAL P
100 74 4032	SOIL-MICROORGANISM	CHANGES IN THE RHIZOSPHERE EFFECT OF MILLET ASSOCIATED WITH SPRINKLER IRRIGATION WITH A
100 75 4450	SOIL-PROFILES	NITRATE-NITROGEN REMOVAL FROM SOIL PROFILES BY ALFALFA KEYWORDS: NITRATES SOIL-PROFILES
300 77 4462	SOIL-PROFILES	THE SELECTION AND MANAGEMENT OF FEEDLOT SITES AND LAND DISPOSAL OF ANIMAL WASTE IN BOIS
100 77 4468	SOIL-PROFILES	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
300 77 4112	SOIL-PROPERTIES	EFFECTS OF ANIMAL MANURE ON SOYBEANS AND SOIL KEYWORDS: LAND-APPLICATION DAIRY-WASTES C
100 76 4224	SOIL-PROPERTIES	SOIL CHARACTERISTICS AND CORN YIELD AS AFFECTED BY PREVIOUS APPLICATIONS OF POULTRY MAN
200 76 4358	SOIL-PROPERTIES	CONSIDERATION OF SOILS FOR ACCEPTING WASTES KEYWORDS: LAND-APPLICATION SOIL-PROPERTIES
100 77 4468	SOIL-PROPERTIES	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
100 75 4490	SOIL-PROPERTIES	EXPERIMENTS MADE ON STACKYARD FIELD, WOBURN, 1876-1974 II EFFECTS OF TREATMENTS ON SOI
100 75 4491	SOIL-PROPERTIES	EXPERIMENTS MADE ON STACKYARD FIELD, WOBURN, 1876-1974 III EFFECTS OF NPK FERTILIZERS
300 75 4493	SOIL-PROPERTIES	SWINE MANURE FOR FERTILIZER--RESEARCH REVIEW KEYWORDS SWINE-WASTES LIQUID-WASTES AEROB
300 76 4532	SOIL-PROPERTIES	DAIRY CATTLE WASTE MANAGEMENT-ITS EFFECT ON FORAGE PRODUCTION AND RUNOFF WATER QUALITY
400 76 4548	SOIL-PROPERTIES	EFFLUENT DISPOSAL, A PILOT STUDY AT CRESSY RESEARCH STATION KEYWORDS SWINE-WASTES EFFL
100 76 4624	SOIL-PROPERTIES	EFFECT OF CROP ROTATION, FARM YARD MANURE AND THE QUANTITY OF SALINE IRRIGATION WATER
100 76 4630	SOIL-PROPERTIES	EFFECT OF GYPSUM, FARMYARD MANURE AND ZINC ON THE YIELD OF BERSEEM, RICE AND MAIZE GRO
100 74 4193	SOIL-SEALING	THE EFFECT OF PIG SLURRY APPLIED TO A SOIL SURFACE ON THE COMPOSITION OF THE SOIL ATMOS
200 76 4359	SOIL-SELECTION	CONSIDERATION OF SOILS FOR ACCEPTING PLANT NUTRIENTS AND POTENTIALLY TOXIC NONESSENTIAL
700 76 4541	SOIL-SORPTION	NITROGEN REMOVAL AND TRANSFORMATIONS IN THE OVERLAND FLOW TREATMENT OF POULTRY WASTES K
200 76 4403	SOIL-SYSTEMS	RESEARCH AND DEVELOPMENT NEEDS RELATED TO PATHOGENS IN PRETREATMENT-LAND APPLICATION SY
400 77 4553	SOIL-TESTS	GET MORE VALUE FROM HOG MANURE KEYWORDS: SWINE-WASTES CONFINEMENT-PENS LIQUID-WASTES WA
200 75 4650	SOIL-TESTS	ANIMAL MANURES IN GRASS PRODUCTION KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES
400 77 4498	SOIL-TYPES	NITROGEN LOSS IN SWINE WASTE APPLICATION STUDIED KEYWORDS: LAND-APPLICATION NITROGEN-LO
500 77 4090	SOIL-WATER-PLANT	SALT ACCUMULATION IN SOIL AS A FACTOR FOR DETERMINING APPLICATION RATES OF BEEF-FEEDLOT
300 76 4097	SOIL-WATER-PLANT	DILUTION OF FEEDLOT RUNOFF KEYWORDS: LAND-APPLICATION FEEDLOT-RUNOFF DILUTION SOIL-WATE
200 76 4144	SOIL-WATER-PLANT	OVERLAND FLOW PRETREATMENT OF POULTRY MANURE KEYWORDS: OVERLAND-FLOW-PRETREATMENT POULT
100 76 4588	SOIL-WATER-PLANT	ON THE INFLUENCE OF MANURE AND FERTILIZERS ON THE DISTRIBUTION AND AMOUNTS OF PLANT-AVA
400 77 4515	SOLAR-DRYING	SOLAR ENERGY HELPS DRY POULTRY WASTE KEYWORDS: SOLAR-DRYING POULTRY-WASTES HEATING RECY
400 77 4119	SOLAR-ENERGY	HARNESSING ENERGY SOURCES FOR THE FEEDLOT KEYWORDS: ENERGY FEEDLOTS RECYCLING METHANE S
100 73 4128	SOLIDS	FLOW PROPERTIES OF DAIRY WASTE SLURRIES KEYWORDS DAIRY-WASTES SLURRIES SHEAR-RATES FLO
700 76 4545	SOLIDS	EVALUATION OF A FLUSHING-GUTTER MANURE-REMOVAL SYSTEM TO IMPROVE ATMOSPHERIC QUALITY IN
100 77 4573	SOLIDS	RUNOFF FROM A LOW-COST MANURE STORAGE FACILITY KEYWORDS: AGRICULTURAL-RUNOFF WASTE-STOR
100 77 4573	SOLIDS	RUNOFF FROM A LOW-COST MANURE STORAGE FACILITY KEYWORDS: AGRICULTURAL-RUNOFF WASTE-STOR
300 75 4593	SOLIDS	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 1 KEYWORDS: WASTE-TREATMENT
300 76 4594	SOLIDS	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 2 KEYWORDS: SWINE-WASTES WAS
100 77 4599	SOLIDS	DENITRIFICATION OF AEROBICALLY STABILISED PIG WASTE KEYWORDS: SWINE-WASTES LIQUID-WASTE
100 76 4138	SOLID	RESPONSE OF DAIRY CATTLE GIVEN A FREE CHOICE OF FREE STALL LOCATION AND THREE BEDDING
100 72 4006	SOLID-WASTES	PROCESSING SOLID MANURE FROM LIVESTOCK-FARMING TO ORGANIC FERTILIZER FOR VEGETABLE GARD
300 76 4016	SOLID-WASTES	DAIRY MANURE CAN BE USED SAFELY KEYWORDS: DAIRY-WASTES WASTE-MANAGEMENT WASTE-STORAGE W
500 77 4090	SOLID-WASTES	SALT ACCUMULATION IN SOIL AS A FACTOR FOR DETERMINING APPLICATION RATES OF BEEF-FEEDLOT
300 74 4106	SOLID-WASTES	HANDLING AND DISPOSING OF POULTRY MANURE KEYWORDS: POULTRY-WASTES WASTE-MANAGEMENT SOLI
100 76 4118	SOLID-WASTES	NITRATE CONTENTS OF SUDANGRASS AND BARLEY FORAGES GROWN ON PLOTS TREATED WITH ANIMAL M
300 77 4134	SOLID-WASTES	COSTS OF DAIRY WASTE DISPOSAL ON TENNESSEE EXPERIMENT STATION FARMS KEYWORDS DAIRY-WAS
100 76 4163	SOLID-WASTES	TRANSFORMATIONS OF NITROGEN ADDED AS AMMONIUM AND MANURE TO SOIL WITH A HIGH AMMONIUM-F
400 77 4165	SOLID-WASTES	RECYCLING IS SUCCESSFUL AT MERTEN S KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING REFEEDIN
300 73 4188	SOLID-WASTES	ECONOMICS OF DAIRY WASTE DISPOSAL SYSTEM FOR ALABAMA KEYWORDS: DAIRY-WASTES LIQUID-WAST
400 77 4219	SOLID-WASTES	SOLID VS LIQUID WASTE PRE-POND WASTE SEPARATION ALLOWS FLUSH RECOVERY RECYCLING KEYWOR
300 72 4226	SOLID-WASTES	WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA DAIRYMEN KEYWORDS: WASTE-MANAGEMENT
300 72 4227	SOLID-WASTES	WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA POULTRYMEN KEYWORDS: WASTE-TREATMENT

300	72 4228	SOLID-WASTES	WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA SWINE PRODUCERS KEYWORDS: WASTE-DISP
400	72 4240	SOLID-WASTES	MANURE SYSTEMS PLANNING DATA KEYWORDS: WASTE-STORAGE LAGOONS HOLDING-PONDS SETTLING-BAS
400	72 4383	SOLID-WASTES	WHAT ARE YOU DOING ABOUT YOUR 1.57 BILLION TON ANIMAL WASTE PROBLEM KEYWORDS: WASTE-MAN
300	76 4394	SOLID-WASTES	A FOUR-YEAR FIELD TRIAL WITH ANIMAL MANURES: I. NITROGEN BALANCES AND YIELDS II: MINERAL
400	77 4404	SOLID-WASTES	CALIFORNIA DAIRYMEN ARE GAINING EXPERIENCE WITH MANURE SEPARATORS KEYWORDS: WASTE-MANAG
700	74 4447	SOLID-WASTES	DECISION MODEL FOR ANIMAL MANURE HANDLING KEYWORDS: WASTE-MANAGEMENT WASTE-TREATMENT_WA
300	77 4454	SOLID-WASTES	A COMPLETE DISPOSAL-RECYCLE SCHEME FOR AGRICULTURAL SOLID WASTES KEYWORDS: SOLID-WASTES
300	77 4461	SOLID-WASTES	WASTE MANAGEMENT PRACTICES OF WESTERN CATTLE FEEDLOTS KEYWORDS: WASTE-MANAGEMENT FEEDLO
400	76 4471	SOLID-WASTES	AWARD FOR NEBRASKAN KEYWORDS: FEEDLOTS WASTE-MANAGEMENT DEBRIS-BASINS HOLDING-PONDS LAN
400	77 4495	SOLID-WASTES	PREPARE FOR WINTER KEYWORDS: FEEDLOT-MANAGEMENT MANURE-PACK DRAINAGE CLEANING SOLID-WA
400	73 4549	SOLID-WASTES	EFFLUENT STORAGE AND DISPOSAL FROM INTENSIVE PIG UNITS KEYWORDS SWINE-WASTES WASTE-STO
400	70 4575	SOLID-WASTES	MANURE DISPOSAL KEYWORDS: POULTRY-WASTES SOLID-WASTES SLURRIES LAND-APPLICATION DEHYDRA
100	71 4629	SOLID-WASTES	PERSISTENCE OF THREE SALMONELLA SPP IN BOVINE FAECES KEYWORDS: SALMONELLA CATTLE-WASTE
100	77 4469	SOLUBILITY	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
400	71 4413	SOUTH-DAKOTA-LAW	PREVENTING POLLUTION WHILE EXPANDING THE LIVESTOCK INDUSTRY IN SOUTH DAKOTA KEYWORDS: F
400	77 4552	SPACING	FIT FLOOR TO YOUR SWINE OPERATION KEYWORDS: SWINE CONFINEMENT-PENS SLOTTED-FLOORS SLAT-
400	74 4547	SPRAY-IRRIGATION	AN ANSWER TO MANURE DISPOSAL PROBLEMS KEYWORDS: SPRAY-IRRIGATION LAND-APPLICATION EQUIP
100	76 4602	SPRAY-IRRIGATION	TREATMENT OF POULTRY MANURE WASTEWATER USING A ROTATING BIOLOGICAL CONTACTOR KEYWORDS:
100	76 4638	SPRAY-IRRIGATION	EARTHWORM POPULATION OF A PASTURE SPRAY-IRRIGATED WITH DAIRY SHED EFFLUENT KEYWORDS: DA
300	72 4339	SPRINKLER-IRRIGATI	WASTEWATER RESEARCH EXPANDS KEYWORDS: MUNICIPAL-WASTES SEWAGE LAND-APPLICATION FORAGES
300	72 4353	SPRINKLER-IRRIGATI	DISPOSING OF OUR WASTES--SOIL CAN FILTER, CROPS RECYCLE NUTRIENTS KEYWORDS: LIVESTOCK-W
200	76 4403	SPRINKLER-IRRIGATI	RESEARCH AND DEVELOPMENT NEEDS RELATED TO PATHOGENS IN PRETREATMENT-LAND APPLICATION SY
400	76 4548	SPRINKLER-IRRIGATI	EFFLUENT DISPOSAL, A PILOT STUDY AT CRESSY RESEARCH STATION KEYWORDS: SWINE-WASTES EFFL
200	76 4617	SPRINKLER-IRRIGATI	STUDIES ON A MIXING DISTRIBUTION SYSTEM FOR SWINE MANURE LAGOONS KEYWORDS: SWINE-WASTES
400	71 4557	STACKING	*WHAT TO DO WITH ANIMAL WASTES RECYCLING KEYWORDS: WASTE-DISPOSAL WATER-POLLUTION ODOR A*
100	76 4192	STAPHYLOCOCCUS-AUR	STAPHYLOCOCCI FROM THE FECES OF DIFFERENT ANIMAL SPECIES BIOTYPES OF STAPHYLOCOCCUS AUR
100	77 4391	STARCH-DIGESTION	GASTROINTESTINAL TRACT PH AND STARCH IN FECES OF RUMINANTS KEYWORDS: DIETS INTESTINAL-
400	77 4153	STERILIZATION	MAKING THE MOST OF WASTE KEYWORDS: POULTRY-WASTES CATTLE-WASTES RECYCLING METHANE FERTI
400	73 4528	STERILIZATION	IN-HOUSE MANURE DRYING KEYWORDS: POULTRY-WASTES DEHYDRATION DEEP-PIT-HOUSES STERILIZATI
100	75 4135	STIROFOS	INSECT GROWTH REGULATORS DEVELOPMENT OF HOUSE FLIES IN FECES OF BOVINES FED TH 6040 IN
400	77 4204	STIROFOS	FEED-THROUGH LARVICIDE KILLS MAGGOTS IN MANURE KEYWORDS: FEED-ADDITIVES FLY-CONTROL LAR
400	77 4411	STIRRING	WAYS TO SPEED UP DRYING OF MANURE IN PITS KEYWORDS: POULTRY-WASTES DEHYDRATION VENTILAT
400	76 4480	STOCKING-RATES	KEEP IT DRY KEYWORDS: FEEDLOTS ODOR-CONTROL STOCKING-RATES FEEDLOT-RUNOFF HOLDING-PONDS
100	74 4015	STOCKYARDS	LAGOONS AND OXIDATION PONDS KEYWORDS: LAGOONS LIVESTOCK-WASTES DAIRY-WASTES KRAFT-PULPI
400	77 4328	STORAGE-SYSTEMS	DAIRY WASTE--FIELD APPLICATION STILL BEST KEYWORDS: DAIRY-WASTES STORAGE-SYSTEMS LIQUID
200	72 4338	STORING	DRIED CATTLE PAUNCH MANURE AS A FEED SUPPLEMENT FOR CHANNEL CATFISH KEYWORDS: REFEEDING
100	76 4634	STRATIFICATION	ANALYSIS OF THE ROTTING PROCESS OF SAWDUST BARNYARD MANURE KEYWORDS: ANIMAL-WASTES SAW
100	75 4662	STRAWBOARD	THE WASTE PRODUCTS OF AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES LIVESTOCK-WASTES STRAW
100	74 4661	STRAW	DEVELOPMENT OF A SYNTHETIC COMPOST FOR MUSHROOM GROWING BASED ON WHEAT STRAW AND CHICKE
100	75 4662	STRAW	THE WASTE PRODUCTS OF AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES LIVESTOCK-WASTES STRAW
100	75 4577	STREPTOCOCCI	MICROFLORA OF NEWLY CUT GRASS AFTER ADDITION OF LIQUID MANURE KEYWORDS: LIQUID-WASTES A
300	75 4037	STRIP-MINED-LAND	LAND AVAILABILITY, CROP PRODUCTION, AND FERTILIZER REQUIREMENTS IN THE UNITED STATES KE
100	77 4469	STRUVITE	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
100	74 4344	SUBSTRATES	ANIMAL WASTES AS SUBSTRATES FOR PROTEIN PRODUCTION KEYWORDS: ANIMAL-WASTES SUBSTRATES P
400	77 4441	SUBSTRATES	MANURE AND ALGAE PRODUCE ANIMAL FEED KEYWORDS SWINE-WASTES LIVESTOCK-WASTES RECYCLING
100	77 4633	SUBSTRATES	CHANGES IN THE SHORT-CHAIN CARBOXYLIC ACID CONTENT AND CHEMICAL OXYGEN DEMAND OF STORED
300	76 4595	SUBSTRATE-ADDITION	CONTROLLED ADDITION OF ANIMAL WASTE TO AEROBIC BIOLOGICAL TREATMENT PLANTS A COMPARISON
500	77 4086	SUBSURFACE-INJECTI	CONTINUOUS SUBSURFACE INJECTION OF LIQUID ORGANIC WASTES KEYWORDS: LAND-APPLICATION LIQ
100	77 4417	SUGAR-BAITS	AN EVALUATION OF FIELD STUDIES ON CONTROLLING THE HOUSE FLY, MUSCA DOMESTICA KEYWORDS
300	76 4097	SULFATES	DILUTION OF FEEDLOT RUNOFF KEYWORDS: LAND-APPLICATION FEEDLOT-RUNOFF DILUTION SOIL-WATE
700	70 4268	SULFUR	CATTLE MANURE: I. EFFECT ON CROPS AND SOILS II. RETENTION PROPERTIES FOR CU, MN, AND ZN
400	77 4587	SULFUR	COMPOSTING CONVERTS WASTE INTO VALUABLE RESOURCES KEYWORDS: COMPOSTING FEEDLOT-WASTES P
200	77 4335	SUNFLOWERS	UTILIZATION OF SUNFLOWER SILAGE, SUNFLOWER HULLS WITH POULTRY LITTER AND SUNFLOWER HULL
400	77 4520	SUPERPHOSPHATE	PROFITS FROM MANURE-WORKERS LIST TREATMENTS, APPLICATION KEYWORDS POULTRY-WASTES LAND-
100	74 4660	SUPERPHOSPHATE-PHO	SUPPRESSION OF SUPERPHOSPHATE-PHOSPHORUS FIXATION BY FARMYARD MANURE--I. HIGH PHOSPHORU
400	77 4524	SURFACE-MINED-LAND	CHICKEN MANURE PLUS KEYWORDS: RECLAMATION SURFACE-MINED-LANDS LAND-APPLICATION ASH SEW
100	73 4131	SURVIVAL-RATES	THE ROLES OF AMMONIA, WATER ACTIVITY, AND PH IN THE SALMONELLACIDAL EFFECT OF LONG-USED
100	77 4579	SURVIVAL-RATES	THE EFFECT OF THE MICROFLORA IN CATTLE SLURRY ON THE SURVIVAL OF SALMONELLA DUBLIN KEYW
100	71 4629	SURVIVAL-RATE	PERSISTENCE OF THREE SALMONELLA SPP IN BOVINE FAECES KEYWORDS: SALMONELLA CATTLE-WASTE
200	74 4535	SURVIVAL-TIME	SURVIVAL OF PATHOGENS IN FEEDLOT WASTE KEYWORDS: PATHOGENIC-BACTERIA CATTLE-WASTES FEED
100	71 4622	SURVIVAL-TIME	THE SURVIVAL OF ESCHERICHIA COLI AND SALMONELLA DUBLIN IN SLURRY ON PASTURE AND THE INF
100	77 4381	SUSPENDED-SOLIDS	SALT REMOVAL EFFICIENCIES ON LAND DISPOSAL OF SWINE WASTE KEYWORDS: LAND-DISPOSAL SWINE
200	75 4401	SUSPENDED-SOLIDS	CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH DENSITY CATFISH CULTURES K
100	76 4452	SUSPENDED-SOLIDS	PHOSPHORUS LOSS BY STREAM TRANSPORT FROM A RURAL WATERSHED--QUANTITIES, PROCESSES, AND
200	75 4026	SWINE	RECYCLED EXCRETA AS A NUTRIENT SOURCE FOR SWINE KEYWORDS: OXIDATION-DITCH REFEEDING SWI
100	75 4102	SWINE	DIURNAL AND ANNUAL FLUCTUATIONS OF AERIAL BACTERIAL AND DUST LEVELS IN ENCLOSED SWINE H
400	77 4103	SWINE	PULLETS IN GROW CAGES ABOVE HOGS IN PIT BELOW KEYWORDS: HIGH-RISE-CAGE POULTRY-WASTES M
400	76 4141	SWINE	HOUSING AND FLOOR DESIGN CAN INFLUENCE PIG PERFORMANCE KEYWORDS: HOUSING SLATTED-FLOORS
100	77 4147	SWINE	EFFECT OF ARSANILIC ACID IN SWINE DIETS ON FRESH WASTE PRODUCTION, COMPOSITION AND ANAE
400	77 4149	SWINE	HOG CONFINEMENT GASES CAUSE MEDICAL PROBLEMS KEYWORDS: SWINE CONFINEMENT-PENS GASES PUB
400	77 4160	SWINE	KSU TRIES PLASTIC SLATS AND WALLS IN PIG NURSERY KEYWORDS: SWINE MANAGEMENT DESIGN SLAT
100	75 4162	SWINE	RELATIVE AND QUALITATIVE ASPECTS OF AERIAL BACTERIA AND DUST IN SWINE HOUSES KEYWORDS:
200	77 4278	SWINE	CASE STUDIES OF WATER POLLUTION CAUSED BY FEEDLOT OPERATIONS AND FUTURE DEMAND FOR PRIV
400	77 4438	SWINE	HOG HOUSE DUST CONTROL HELPS YOU BREATHE EASIER KEYWORDS: SWINE CONFINEMENT-BUILDINGS A
400	73 4488	SWINE	RUMINANTS AND PIGS ARE THE BEST USERS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE S
200	74 4506	SWINE	ANIMAL PRODUCTION IN SINGAPORE--PRESENT STATUS AND TRENDS KEYWORDS: PRODUCTION SWINE PO
400	77 4537	SWINE	DRIED CATTLE WASTE CAN STRETCH SWINE RATIONS KEYWORDS: REFEEDING SWINE PERFORMANCE CATT
700	75 4544	SWINE	NUTRIENT CHARACTERIZATION OF SWINE FECAL WASTE AND UTILIZATION OF THESE NUTRIENTS BY SW
400	77 4552	SWINE	FIT FLOOR TO YOUR SWINE OPERATION KEYWORDS: SWINE CONFINEMENT-PENS SLOTTED-FLOORS SLAT-
700	73 4555	SWINE	PIT VENTILATION SYSTEM FOR SWINE BUILDINGS KEYWORDS: VENTILATION CONFINEMENT-PENS DESIG
100	75 4564	SWINE	HIGH LEVEL ANTIBIOTICS IN A SWINE WASTE RECYCLING SYSTEM KEYWORDS: SWINE DRINKING-WATER
400	77 4582	SWINE	GLEANINGS FROM REPORTS AT THE RECENT MEETING OF THE AMERICAN SOCIETY OF ANIMAL SCIENCE
400	77 4538	SWINE-MANAGEMENT	FOR THIS HOG FARMER NEW PORK PRODUCTION UNIT ELIMINATES WASTE DISPOSAL KEYWORDS: SWINE-
100	76 4238	SWINE-URINE	DETERMINATION OF VANILMANDELIC ACID IN PIG URINE AND CHICKEN FECES BY GAS-LIQUID CHROMA
300	76 4003	SWINE-WASTES	DESIGN CRITERIA FOR SWINE WASTE TREATMENT SYSTEMS KEYWORDS: DESIGN LAGOONS SWINE-WASTES
100	77 4018	SWINE-WASTES	EFFECT OF DIETARY SALT LEVEL AND LIQUID HANDLING SYSTEMS ON SWINE WASTE COMPOSITION KEY
100	76 4024	SWINE-WASTES	THE EFFECTS OF MANURE APPLICATIONS ON RUNOFF, EROSION AND NITRATE LOSSES KEYWORDS: LAND
200	75 4026	SWINE-WASTES	RECYCLED EXCRETA AS A NUTRIENT SOURCE FOR SWINE KEYWORDS: OXIDATION-DITCH REFEEDING SWI
100	76 4038	SWINE-WASTES	NITROGEN TRANSFORMATIONS IN AERATED SWINE MANURE SLURRIES KEYWORDS: SLURRIES SWINE-WAST
400	77 4040	SWINE-WASTES	BACK TO BASICS--175-BUSHEL CORN FROM LEGUMES AND WASTES KEYWORDS: LAND-APPLICATION SWIN
100	77 4042	SWINE-WASTES	HOG MANURE WORTH 3.50 PER TON AS FERTILIZER KEYWORDS: LIQUID-WASTES SWINE-WASTES LAND-
100	76 4049	SWINE-WASTES	ACCUMULATION OF NUTRIENTS IN SOIL BENEATH HOG MANURE LAGOONS KEYWORDS: LAGOONS SWINE-WA
400	76 4055	SWINE-WASTES	HOGMEN SIZE UP OXIDATION SYSTEMS KEYWORDS: LIQUID-WASTES SWINE-WASTES OXIDATION RACETRA
400	77 4071	SWINE-WASTES	GETTING MORE OUT OF LIQUID MANURE KEYWORDS: LIQUID-WASTES SLOTTED-FLOORS DEEP-PITS SOIL
100	75 4095	SWINE-WASTES	A SYSTEM OF OPTIMIZING THE USE OF ANIMAL MANURES ON A GRASSLAND FARM KEYWORDS: MATHEMAT
300	73 4100	SWINE-WASTES	LIQUID WASTE MANAGEMENT AT A SLATTED FLOOR SWINE BARN KEYWORDS: SWINE-WASTES LIQUID-WAS
100	76 4105	SWINE-WASTES	FATE OF ANIMAL VIRUSES IN EFFLUENT FROM LIQUID FARM WASTES KEYWORDS: LAND-APPLICATION
300	76 4109	SWINE-WASTES	EVALUATING A LOW-ENERGY, HIGH-VALUE PUMP FOR ODOR REDUCTION FROM LIVESTOCK WASTE LAGOON
400	76 4116	SWINE-WASTES	FLUSHING GUTTERS FOR HOG BUILDINGS KEYWORDS: SWINE-WASTES FLUSHING LAGOONS DESIGN
100	76 4121	SWINE-WASTES	THE EFFECT OF DISPOSING HIGH RATES OF COPPER-RICH PIG SLURRY ON GRASSLAND ON THE HEALTH

400	76 4132	SWINE-WASTES	HOGS TO GET FLUSH TOILETS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT FLUSHING SETTLING-TAN
100	75 4135	SWINE-WASTES	INSECT GROWTH REGULATORS DEVELOPMENT OF HOUSE FLIES IN FECES OF BOVINES FED TH 6040 IN
100	77 4145	SWINE-WASTES	NUTRIENT CHARACTERIZATION OF SWINE FECAL WASTE AND UTILIZATION OF THESE NUTRIENTS BY SW
100	72 4154	SWINE-WASTES	ISOLATION OF ERYSIPELOTHRIX RHUSIOPATHIAE FROM SOIL AND MANURE OF SWINE-RAISING PREMISE
100	77 4161	SWINE-WASTES	ISOLATION AND IDENTIFICATION OF FECAL BACTERIA FROM ADULT SWINE KEYWORDS SWINE-WASTES
400	77 4164	SWINE-WASTES	JAPANESE HOGMEN BATTLE POLLUTION KEYWORDS: SWINE-WASTES POLLUTION WASTE-MANAGEMENT OXID
300	76 4170	SWINE-WASTES	AUTOMATED TREATMENT AND RECYCLE OF SWINE FEEDLOT WASTEWATERS KEYWORDS: SWINE-WASTES LIQ
200	76 4178	SWINE-WASTES	ANAEROBIC DIGESTION STABILITY AND FOOD-PROCESSING WASTE TREATMENT KEYWORDS: ANAEROBIC-D
400	77 4183	SWINE-WASTES	MANURE IMPORTANT FACTOR IN 338 BUSHEL RECORD CORN YIELD KEYWORDS: SWINE-WASTES CATTLE-W
200	76 4186	SWINE-WASTES	A LOW COST SETTLING BASIN AND INFILTRATION CHANNEL FOR CONTROLLING RUNOFF FROM AN OPEN
100	74 4193	SWINE-WASTES	THE EFFECT OF PIG SLURRY APPLIED TO A SOIL SURFACE ON THE COMPOSITION OF THE SOIL ATMOS
400	77 4202	SWINE-WASTES	175 BUSHEL CORN YIELD WITH MANURE AND ONLY STARTER FERTILIZER KEYWORDS: LIQUID-WASTES S
100	75 4206	SWINE-WASTES	CHEMICAL CONTROL OF HYDROGEN SULFIDE FROM ANAEROBIC SWINE MANURE: I. OXIDIZING AGENTS KEY
300	76 4207	SWINE-WASTES	STATE-OF-THE-ART SWINE WASTE PRODUCTION AND PRETREATMENT PROCESSES KEYWORDS: SWINE-WAS
300	73 4209	SWINE-WASTES	SWINE PRODUCTION INDUSTRY WASTE CHARACTERIZATION AND MANAGEMENT KEYWORDS: SWINE-WASTES
200	75 4225	SWINE-WASTES	RECYCLING SWINE WASTE KEYWORDS: SWINE-WASTES OXIDATION-DITCH AEROBIC-TREATMENT ANAEROBI
300	72 4228	SWINE-WASTES	WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA SWINE PRODUCERS KEYWORDS: WASTE-DISP
100	76 4235	SWINE-WASTES	RECYCLING OF SWINE MANURE BY SELECTED FISHES KEYWORDS: REFEEDING SWINE-WASTES FISH PERF
400	77 4259	SWINE-WASTES	FAMILY FORMS PARTNERSHIP TO FINISH HOGS KEYWORDS: SWINE-WASTES CONFINEMENT-PENS SLATTED
200	76 4261	SWINE-WASTES	OVERLAND FLOW TREATMENT OF SWINE LAGOON EFFLUENT KEYWORDS: OVERLAND-FLOW-TREATMENT SWIN
400	77 4263	SWINE-WASTES	HANDLE WASTE CHEAPLY WITH PARTIAL SLATS KEYWORDS: SWINE-WASTES FLOORS FLUSHING WASTE-MA
700	72 4271	SWINE-WASTES	SHORT TERM MINIMUM AERATION OF SWINE MANURE KEYWORDS: SWINE-WASTES WASTE-TREATMENT AERA
200	77 4284	SWINE-WASTES	THE FARMER S VIEWPOINT, PART II - SWINE WASTE MANAGEMENT KEYWORDS: WASTE-MANAGEMENT SWI
200	74 4347	SWINE-WASTES	LIVESTOCK ODOR CONTROL RESEARCH AT THE UNIVERSITY OF ILLINOIS KEYWORDS: ODOR-CONTROL SW
100	77 4349	SWINE-WASTES	LAGOON PRETREATMENT- SWINE WASTE LOADING RATE AND RESPONSE TO LOADING RATE CHANGE-LABO
300	76 4355	SWINE-WASTES	EVALUATION OF ENSILING SWINE FECAL WASTE WITH GROUND ORCHARDGRASS HAY, PRELIMINARY REPO
300	76 4357	SWINE-WASTES	EXPERIMENTS IN RECYCLING SWINE MANURE IN FISHPONDS KEYWORDS: SWINE-WASTES FISH-FEEDING
100	77 4362	SWINE-WASTES	EFFECT OF ARSANILIC ACID LEVEL IN SWINE DIETS AND WASTE LOADING RATE ON MODEL ANAEROBIC
100	76 4377	SWINE-WASTES	EFFECT ON SOIL AND PLANT MINERAL LEVELS FOLLOWING APPLICATION OF MANURES OF DIFFERENT C
100	77 4381	SWINE-WASTES	SALT REMOVAL EFFICIENCIES ON LAND DISPOSAL OF SWINE WASTE KEYWORDS: LAND-DISPOSAL SWINE
400	77 4382	SWINE-WASTES	RESEARCHERS STUDY ALGAE PRODUCTION FROM HOG WASTE KEYWORDS: RECYCLING WASTEWATER-RENOVA
100	76 4386	SWINE-WASTES	DIETARY ARSENIC EFFECTS ON STORED SWINE WASTE KEYWORDS: FEED-ADDITIVES ARSANILIC-ACID S
400	77 4388	SWINE-WASTES	2,057 POUNDS OF BEEF PER ACRE FROM FORAGE KEYWORDS: SWINE-WASTES LAND-APPLICATION LIQUI
700	73 4414	SWINE-WASTES	BACTERIOLOGICAL STUDIES OF CONFINEMENT ANIMAL WASTE AND SURVIVAL STUDIES OF INDICATOR B
100	76 4432	SWINE-WASTES	STUDIES ON BACTERIOPHAGE DISTRIBUTION--VIRULENT AND TEMPERATE BACTERIOPHAGE CONTENT OF
400	77 4437	SWINE-WASTES	HIS HOGS DON T STINK KEYWORDS: CONFINEMENT-PENS LEGAL-ASPECTS IOWA-LAW ODOR-CONTROL SWI
400	77 4440	SWINE-WASTES	INJECTING MANURE PAYS WITH SAVED NITROGEN KEYWORDS: SWINE-WASTES CATTLE-WASTES LAND-APP
400	77 4441	SWINE-WASTES	MANURE AND ALGAE PRODUCE ANIMAL FEED KEYWORDS: SWINE-WASTES LIVESTOCK-WASTES RECYCLING
400	77 4445	SWINE-WASTES	GUIDE TO EFFECTIVE MANURE PIT VENTILATION KEYWORDS: ODOR GASES AIR-POLLUTION SWINE-WAST
700	76 4458	SWINE-WASTES	THE SYMBIOTIC GROWTH OF ALGAE AND BACTERIA ON SWINE WASTE KEYWORDS: AEROBIC-TREATMENT B
100	69 4459	SWINE-WASTES	STUDIES ON THE USE OF ANIMAL SLURRIES TO MANURE BARLEY 1-- THE EFFECT OF AGE AND DILUT
100	69 4460	SWINE-WASTES	STUDIES ON THE USE OF ANIMAL SLURRIES TO MANURE BARLEY 2-- THE EFFECT OF AUTUMN, WINTE
100	77 4465	SWINE-WASTES	CHEMICAL CONTROL OF HYDROGEN SULFIDE FROM ANAEROBIC SWINE MANURE: II. IRON COMPOUNDS KEYW
700	76 4466	SWINE-WASTES	DEWATERING A SWINE MANURE SLURRY BY EXPRESSION KEYWORDS: SWINE-WASTES SLURRIES FILTRATI
300	75 4493	SWINE-WASTES	SWINE MANURE FOR FERTILIZER--RESEARCH REVIEW KEYWORDS: SWINE-WASTES LIQUID-WASTES AEROB
400	77 4498	SWINE-WASTES	NITROGEN LOSS IN SWINE WASTE APPLICATION STUDIED KEYWORDS: LAND-APPLICATION NITROGEN-LO
300	75 4505	SWINE-WASTES	AN ECONOMIC ANALYSIS OF THE INVESTMENT AND OPERATING COSTS ASSOCIATED WITH LIQUID MANU
200	74 4506	SWINE-WASTES	ANIMAL PRODUCTION IN SINGAPORE--PRESENT STATUS AND TRENDS KEYWORDS: PRODUCTION SWINE PO
300	77 4510	SWINE-WASTES	POLLUTANT MOVEMENT TO SHALLOW GROUND WATER TABLES FROM SWINE WASTE LAGOONS KEYWORDS: SW
100	75 4514	SWINE-WASTES	RETENTION BY SHEEP OF COPPER FROM AEROBIC DIGESTS OF PIG FAECAL SLURRY KEYWORDS: SWINE-
400	77 4518	SWINE-WASTES	MANURE CAN BE A PROFITABLE FERTILIZER KEYWORDS ANIMAL-WASTES SWINE-WASTES LAND-APPLICA
400	77 4522	SWINE-WASTES	ON STRAW AND GOLD, MANURE AND ALGAE--FEEDING WASTE--IT S BEING DONE IN A VARIETY OF WAY
100	76 4523	SWINE-WASTES	THE OCCURRENCE OF SALMONELLAS, MYCOBACTERIA AND PATHOGENIC STRAINS OF ESCHERICHIA COLI
400	75 4531	SWINE-WASTES	STORAGE-STORE MANURE AS IF IT WERE VALUABLE-BECAUSE IT IS KEYWORDS: FERTILIZERS CATTLE-
700	76 4543	SWINE-WASTES	GROUNDWATER LEVELS AS AFFECTED BY SWINE WASTE LAGOONS IN HIGH WATER TABLE SOILS KEYWORD
700	75 4544	SWINE-WASTES	NUTRIENT CHARACTERIZATION OF SWINE FECAL WASTE AND UTILIZATION OF THESE NUTRIENTS BY SW
400	76 4548	SWINE-WASTES	EFFLUENT DISPOSAL, A PILOT STUDY AT CRESSY RESEARCH STATION KEYWORDS: SWINE-WASTES EFFL
400	73 4549	SWINE-WASTES	EFFLUENT STORAGE AND DISPOSAL FROM INTENSIVE PIG UNITS KEYWORDS: SWINE-WASTES WASTE-STO
400	77 4553	SWINE-WASTES	GET MORE VALUE FROM HOG MANURE KEYWORDS: SWINE-WASTES CONFINEMENT-PENS LIQUID-WASTES WA
100	75 4564	SWINE-WASTES	HIGH LEVEL ANTIBIOTICS IN A SWINE WASTE RECYCLING SYSTEM KEYWORDS: SWINE DRINKING-WATER
400	70 4568	SWINE-WASTES	NOW ELECTRICITY FROM MANURE GASES KEYWORDS: ELECTRICITY ENERGY RECYCLING SWINE-WASTES G
100	76 4578	SWINE-WASTES	SWINE FECES RECYCLING IN CARPS FEEDING KEYWORDS: REFEEDING SWINE-WASTES FISH
400	77 4582	SWINE-WASTES	GLEANINGS FROM REPORTS AT THE RECENT MEETING OF THE AMERICAN SOCIETY OF ANIMAL SCIENCE
300	75 4593	SWINE-WASTES	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 1 KEYWORDS: WASTE-TREATMENT
300	76 4594	SWINE-WASTES	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 2 KEYWORDS: SWINE-WASTES WAS
300	76 4595	SWINE-WASTES	CONTROLLED ADDITION OF ANIMAL WASTE TO AEROBIC BIOLOGICAL TREATMENT PLANTS A COMPARISON
100	77 4599	SWINE-WASTES	DENITRIFICATION OF AEROBICALLY STABILISED PIG WASTE KEYWORDS: SWINE-WASTES LIQUID-WASTE
200	75 4605	SWINE-WASTES	AN ECONOMIC COMPARISON OF FIVE WASTE MANAGEMENT SYSTEMS FOR SWINE FINISHING OPERATIONS
100	75 4608	SWINE-WASTES	THE USE OF RESPIROMETRIC METHODS FOR ASSESSING THE BIODEGRADABILITY OF DIFFERENT COMPON
400	77 4611	SWINE-WASTES	METHANE GAS MADE FROM CONFINEMENT UNIT WASTE KEYWORDS: SWINE-WASTES SLURRIES WASTE-TREA
200	76 4617	SWINE-WASTES	STUDIES ON A MIXING DISTRIBUTION SYSTEM FOR SWINE MANURE LAGOONS KEYWORDS: SWINE-WASTES
200	76 4618	SWINE-WASTES	INFLUENCES OF LAND SPREADING LIVESTOCK WASTES ON GROUNDWATER QUALITY KEYWORDS: GROUNDWA
100	77 4632	SWINE-WASTES	SIMPLE PHENOLS AND INDOLES IN ANAEROBICALLY STORED PIGGERY WASTES KEYWORDS: SWINE-WASTE
100	77 4633	SWINE-WASTES	CHANGES IN THE SHORT-CHAIN CARBOXYLIC ACID CONTENT AND CHEMICAL OXYGEN DEMAND OF STORED
100	77 4636	SWINE-WASTES	A COMPARISON ON PH-CONTROLLED AND DISSOLVED OXYGEN- CONTROLLED NUTRIENT ADDITION FOR TH
100	75 4637	SWINE-WASTES	ALGAL GROWTH IN DILUTED PIG WASTE KEYWORDS: SWINE-WASTES BY-PRODUCT-RECOVERY ALGAE METH
100	74 4647	SWINE-WASTES	GROWTH OF ALGAE ON PIG MANURE KEYWORDS: SWINE-WASTES LAGOONS ALGAE WASTE-DISPOSAL WASTE
200	75 4650	SWINE-WASTES	ANIMAL MANURES IN GRASS PRODUCTION KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES
200	76 4651	SWINE-WASTES	FERTILIZER VALUE OF ANIMAL MANURES KEYWORDS: SWINE-WASTES CATTLE-WASTES WASTE-STORAGE L
100	76 4654	SWINE-WASTES	ANAEROBIC DIGESTION OF AGRICULTURAL WASTES KEYWORDS: ANAEROBIC-DIGESTION SWINE-WASTES C
300	77 4655	SWINE-WASTES	NOTES ON ANAEROBIC DIGESTION AND ANAEROBIC DIGESTERS BASED ON EXPERIMENTAL PLANT IN ABE
100	76 4656	SWINE-WASTES	THREE-STEP TREATMENT FOR PIGGERY WASTES KEYWORDS: SWINE-WASTES AERUBIC-TREATMENT ANAERO
400	77 4644	SWITCH-BACK-WATERW	PONDER THIS SWITCH-BACK, FIELD SINK SYSTEM KEYWORDS: DAIRY-WASTES RUNOFF SWITCH-BACK-WA
200	77 4373	SYNTHESIS-GAS	AMMONIA SYNTHESIS GAS AND PETROCHEMICALS FROM CATTLE FEEDLOT MANURE KEYWORDS: CATTLE-WA
100	76 4000	SYSTEMS-ANALYSIS	THE ROLE OF SYSTEMS ANALYSIS IN THE USE OF AGRICULTURAL WASTES KEYWORDS: SYSTEMS-ANALYS
200	77 4373	TAR	AMMONIA SYNTHESIS GAS AND PETROCHEMICALS FROM CATTLE FEEDLOT MANURE KEYWORDS: CATTLE-WA
300	76 4435	TECHNOLOGY	OPPORTUNITIES FOR MORE EFFECTIVE USE OF ANIMAL WASTES KEYWORDS: WASTE-DISPOSAL LAND-DIS
100	77 4140	TEMPERATURE	THERMOPHILIC METHANE PRODUCTION FROM CATTLE WASTE KEYWORDS: ANAEROBIC-DIGESTION CATTLE-
100	74 4191	TEMPERATURE	LOSSES FROM CATTLE FAECES DURING CHEMICAL ANALYSIS KEYWORDS: SAMPLING-TECHNIQUES CHEMIC
100	77 4233	TEMPERATURE	STUDIES ON THE VIABILITY OF PATHOGENIC BACTERIA DURING SHORT-TIME-COMPOSTING OF POULTRY
100	74 4254	TEMPERATURE	EFFECT OF DRYING TEMPERATURE AND LENGTH OF DRYING TIME ON SURVIVAL OF MICROORGANISMS IN
200	76 4260	TEMPERATURE	BIOLOGICAL POTENTIAL OF THERMOPHILIC METHANOGENESIS FROM CATTLE WASTES KEYWORDS: RECYCL
100	75 4264	TEMPERATURE	SURVIVAL OF SALMONELLA TYPHIMURIUM IN DAIRY COW WASTE KEYWORDS DAIRY-WASTES SALMONELLA
400	72 4303	TEMPERATURE	METHANE POWER THE PLOWBOY INTERVIEW KEYWORDS: RECYCLING METHANE ORGANIC-WASTES DIGESTE
300	76 4318	TEMPERATURE	METHANE PRODUCTION FROM CATTLE WASTES KEYWORDS: RECYCLING FEEDLOTS CATTLE-WASTES DAIRY-
200	75 4327	TEMPERATURE	PRODUCTION OF AMMONIA SYNTHESIS GAS FROM MANURE IN A CYCLONIC BURNER KEYWORDS: RECYCLIN
100	77 4368	TEMPERATURE	ANAEROBIC DEGRADATION OF DAIRY MANURE UNDER MESOPHILIC AND THERMOPHILIC TEMPERATURES K
100	77 4369	TEMPERATURE	DECOMPOSITION AND NITROGEN LOSS OF DAIRY WASTES DEPOSITED ON SIMULATED ANIMAL CONFINEME
200	70 4384	TEMPERATURE	STATE OF THE ART - ANAEROBIC LAGOONS KEYWORDS: LAGOONS WASTE-TREATMENT ANAEROBIC DESIGN
300	77 4430	TEMPERATURE	LABORATORY SIZE COMPOSTING UNIT FOR AGRICULTURAL WASTE MATERIALS KEYWORDS: COMPOSTING E

300 74 4453	TEMPERATURE	STATE OF THE ART-METHANE GAS GENERATION FROM AGRICULTURAL WASTES KEYWORDS: AGRICULTURAL
400 77 4519	TEMPERATURE	METHANE GAS ENERGY POSSIBLE FROM MANURE KEYWORDS: RECYCLING LIVESTOCK-WASTES WASTE-TREA
700 76 4545	TEMPERATURE	EVALUATION OF A FLUSHING-GUTTER MANURE-REMOVAL SYSTEM TO IMPROVE ATMOSPHERIC QUALITY IN
100 75 4592	TEMPERATURE	ADSORPTION OF POULTRY LITTER EXTRACTS BY SOIL AND CLAY KEYWORDS: POULTRY-LITTER-EXTRACT
300 75 4593	TEMPERATURE	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 1 KEYWORDS: WASTE-TREATMENT
300 76 4594	TEMPERATURE	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 2 KEYWORDS: SWINE-WASTES WAS
100 77 4599	TEMPERATURE	DENITRIFICATION OF AEROBICALLY STABILISED PIG WASTE KEYWORDS: SWINE-WASTES LIQUID-WASTE
100 75 4607	TEMPERATURE	FLY PROTEIN PRODUCTION FROM MECHANICALLY MIXED ANIMAL WASTES KEYWORDS: RECYCLING POULTR
200 76 4625	TEMPERATURE	SMALL DUNG BEETLES AS BIOLOGICAL CONTROL AGENTS-- LABORATORY STUDIES OF BEETLE ACTION O
100 77 4633	TEMPERATURE	CHANGES IN THE SHORT-CHAIN CARBOXYLIC ACID CONTENT AND CHEMICAL OXYGEN DEMAND OF STORED
100 75 4648	TEMPERATURE	THE AGRONOMIC ROLE OF INTRODUCED DUNG BEETLES IN GRAZING SYSTEMS KEYWORDS: PASTURES MAN
300 77 4655	TEMPERATURE	NOTES ON ANAEROBIC DIGESTION AND ANAEROBIC DIGESTERS BASED ON EXPERIMENTAL PLANT IN ABE
300 77 4659	TEMPERATURE	AEROBIC TREATMENT IN RELATION TO LAND APPLICATION OF SLURRY KEYWORDS: AEROBIC-TREATMENT
400 77 4484	TEXAS-LAW	ODOR COMPLAINTS KEYWORDS: ODOR FEEDLOTS LEGAL-ASPECTS TEXAS-LAW NUISANCE-LAWSUITS
100 75 4645	THERMAL-DISCHARGES	WATER POLLUTION FROM NONPOINT SOURCES KEYWORDS: WATER-POLLUTION NONPOINT-SOURCES PUBLIC
400 77 4610	THERMONETICS	THERMONETICS--THE GUYMON PROJECT KEYWORDS: RECYCLING CATTLE-WASTES METHANE FERTILIZERS
200 76 4433	THERMOPHILIC	WILLE COMPOST TANK--A DESIGN STUDY FOR A CONTINUOUS FLOW COMPOST TANK USED IN RECLAIMIN
100 75 4286	THOMPSON-HAYWARD-6	RESIDUE DETERMINATION OF THOMPSON-HAYWARD 6040 IN BOVINE MANURE BY HIGH PERFORMANCE LIQ
100 75 4135	TH-6040	INSECT GROWTH REGULATORS DEVELOPMENT OF HOUSE FLIES IN FECES OF BOVINES FED TH 6040 IN
400 77 4151	TILE-DISPOSAL-FIEL	POULTRY WASTE GOES DOWN THE DRAIN KEYWORDS: POULTRY-WASTES LAGOONS FLUSHING FLY-CONTROL
300 77 4341	TIME	LONG TERM MANURE STORAGE KEYWORDS: WASTE-STORAGE FERTILIZERS LAND-APPLICATION TIME LABO
300 76 4312	TIME-MOTION-STUDIE	FEEDLOT MANURE COLLECTION EFFICIENCY KEYWORDS: WASTE-COLLECTION FEEDLOTS TIME-MOTION-ST
100 77 4210	TOCOPHEROL	INFLUENCE OF FEEDING DEHYDRATED POULTRY WASTE ON COMPOSITION AND ORGANOLEPTIC QUALITY O
100 75 4585	TOTAL-CARBON	MONITORING AGRICULTURAL POLLUTION USING NATURAL FLUORESCENCE KEYWORDS: FEEDLOT-WASTES P
100 77 4349	TOTAL-KJELDAHL-NIT	*LAGOON PRETREATMENT- SWINE WASTE LOADING RATE AND RESPONSE* TO LOADING RATE CHANGE-LABO
100 77 4349	TOTAL-OXIDIZABLE-C	LAGOON PRETREATMENT- SWINE WASTE LOADING RATE AND RESPONSE TO LOADING RATE CHANGE-LABO
200 77 4337	TOTAL-SOLIDS	FEED INTAKE AND MANURE SOLIDS FROM LACTATING HOLSTEIN COWS KEYWORDS: FEED-INTAKE DAIRY
700 74 4345	TOTAL-SOLIDS	AN EVALUATION OF A FULL-SCALE IN-HOUSE OXIDATION DITCH FOR POULTRY WASTE KEYWORDS: POU
100 77 4365	TOTAL-SOLIDS	HEAD LOSS OF BEEF MANURE SLURRY FLOW IN POLYVINYLCHLORIDE PIPE KEYWORDS: CATTLE-WASTES
700 74 4502	TOTAL-SOLIDS	THE EFFECT OF TOTAL SOLIDS CONTENT, PARTICLE SIZE, FLOW VELOCITY, AND VISCOSITY OF BEEF
100 75 4589	TOTAL-SOLIDS	PROPERTIES OF MANURE ACCUMULATIONS FROM MIDWEST BEEF CATTLE FEEDLOTS KEYWORDS: FEEDLOTS
700 73 4467	TOTAL-SOLIDS-LOSSE	EFFECT OF DRYING ON THE LOSSES OF NITROGEN AND TOTAL SOLIDS FROM POULTRY MANURE KEYWORD
700 74 4345	TOTAL-VOLATILE-SOL	AN EVALUATION OF A FULL-SCALE IN-HOUSE OXIDATION DITCH FOR POULTRY WASTE KEYWORDS: POU
400 77 4314	*TOXICITYY*	*MORE ON MANURE KEYWORDS: REFEEDING PERFORMANCE COPPER IRON CALCIUM AMPROLIUM PATHOGENIC*
100 76 4047	TOXICITY	FEEDLOT WASTE RUNOFF AND MORTALITY OF WINDBREAK TREES KEYWORDS: FEEDLOT-RUNOFF TREE-MOR
500 77 4082	TOXICITY	MONITORING SEWAGE SLUDGES, SOILS AND CROPS FOR ZINC AND CADMIUM KEYWORDS: ZINC CADMIUM
400 77 4171	TOXICITY	MANURE PITS CONTAIN GASES THAT CAN KILL KEYWORDS: MANURE-PITS GASES TOXICITY HYDROGEN-S
200 76 4178	TOXICITY	ANAEROBIC DIGESTION STABILITY AND FOOD-PROCESSING WASTE TREATMENT KEYWORDS: ANAEROBIC-D
200 71 4457	TOXICITY	AGRICULTURE'S ROLE IN ENVIRONMENTAL QUALITY KEYWORDS: AGRICULTURE FEEDLOTS WATER-POLLUT
100 76 4600	TOXICITY	EUTROPHICATION POTENTIAL OF DAIRY CATTLE WASTE RUNOFF KEYWORDS: CATTLE-WASTES DAIRY-WAS
700 72 4635	TOXICITY	BIOCHEMICAL AND NUTRITIONAL STUDIES ON FERMENTED- AMMONIATED ANIMAL FEED SUPPLEMENTS KE
500 77 4082	TOXIC-METALS	MONITORING SEWAGE SLUDGES, SOILS AND CROPS FOR ZINC AND CADMIUM KEYWORDS: ZINC CADMIUM
100 76 4020	TOXIC-MINERALS	*DEHYDRATED BROILER EXCRETA VERSUS SOYBEAN MEAL AS NITROGEN SUPPLEMENTS FOR SHEEP KEYWO*
100 76 4044	TOXIC-MINERALS	ARSENIC CONTENT OF CORN GRAIN ON A COASTAL PLAIN SOIL AMENDED WIH POULTRY MANURE KEYWOR
500 77 4090	TOXIC-MINERALS	SALT ACCUMULATION IN SOIL AS A FACTOR FOR DETERMINING APPLICATION RATES OF BEEF-FEEDLOT
300 76 4097	TOXIC-MINERALS	DILUTION OF FEEDLOT RUNOFF KEYWORDS: LAND-APPLICATION FEEDLOT-RUNOFF DILUTION SOIL-WATE
100 74 4108	TOXIC-MINERALS	POULTRY WASTES AS FEEDSTUFFS FOR RUMINANTS KEYWORDS: POULTRY-WASTES POULTRY-LITTER WAST
100 76 4121	TOXIC-MINERALS	THE EFFECT OF DISPOSING HIGH RATES OF COPPER-RICH PIG SLURRY ON GRASSLAND ON THE HEALTH
100 72 4508	TOXIC-MINERALS	THE EFFECTS OF CONTINUOUS RECYCLING DRIED POULTRY WASTE IN LAYING HEN DIETS ON TRACE M
100 72 4247	TOXINS	TOXIGENIC FUNGI FROM POULTRY FEED AND LITTER KEYWORDS: POULTRY-LITTER FUNGI FEEDS TOXIN
100 72 4010	TRACE-ELEMENTS	POSSIBLE TREATMENT METHODS FOR LIQUID MANURE FOR THE MODIFICATION OF ITS PHYSICAL, CHEM
100 76 4045	*TRACE-ELEMENTS*	*NUTRIENT CONCENTRATION OF CORN AS EFFECTED BY POULTRY MANURE KEYWORDS:* POULTRY-WASTES L
300 76 4028	TRACE-METALS	TERTIARY TREATMENT AND REUSE OF ANIMAL WASTES KEYWORDS: DAIRY-WASTES LIQUID-WASTES BIOL
400 77 4070	TRACE-METALS	POULTRY WASTE FED TO CATTLE, SHEEP KEYWORDS: REFEEDING POULTRY-WASTES-DRIED WASTE-COMPO
300 76 4194	TRACE-MINERALS	RECYCLING SEWAGE SOLIDS AS FEEDSTUFFS FOR LIVESTOCK KEYWORDS: RECYCLING SEWAGE-SOLIDS R
100 76 4213	TRACE-MINERALS	SOLUBLE CATIONS BENEATH A FEEDLOT AND AN ADJACENT CROPPED FIELD KEYWORDS: FEEDLOTS CATI
300 74 4217	TRACE-MINERALS	SOIL POLLUTION FROM FEEDLOTS IN GEORGIA KEYWORDS: GROUNDWATER-POLLUTION SOIL-CONTAMINAT
700 70 4268	TRACE-MINERALS	CATTLE MANURE: I. EFFECT ON CROPS AND SOILS II. RETENTION PROPERTIES FOR CU, MN, AND ZN
400 76 4316	TRACE-MINERALS	WHAT'S MANURE WORTH AS A FERTILIZER KEYWORDS: LIVESTOCK-WASTES WASTE-PRODUCTION-RATE FE
100 76 4377	TRACE-MINERALS	EFFECT ON SOIL AND PLANT MINERAL LEVELS FOLLOWING APPLICATION OF MANURES OF DIFFERENT C
300 75 4429	TRACE-MINERALS	MANURE--LONG-TERM STUDY KEYWORDS: ANIMAL-WASTES LAND-APPLICATION CROP-RESPONSE NUTRIENT
100 72 4508	TRACE-MINERALS	THE EFFECTS OF CONTINUOUS RECYCLING DRIED POULTRY WASTE IN LAYING HEN DIETS ON TRACE M
400 77 4587	TRACE-MINERALS	COMPOSTING CONVERTS WASTE INTO VALUABLE RESOURCES KEYWORDS: COMPOSTING FEEDLOT-WASTES P
100 73 4478	TRAFFICABILITY	THE HANDLING TREATMENT, AND DISPOSAL OF FARM WASTES-- APPLICATION OF FARM SLURRIES TO A
700 72 4189	TRANSFORMATIONS	NITRATE LEACHING FROM ANIMAL WASTE APPLICATIONS KEYWORDS: GROUNDWATER-POLLUTION LEACHIN
200 77 4273	TRANSPORTATION	AN INTRODUCTION TO ILLINOIS AGRICULTURE KEYWORDS: SOILS VEGETATION WEATHERING CLIMATE T
100 74 4559	TRANSPORT-SYSTEM	A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND-- PART 1.KEYWORDS: ANIMAL-WASTE
100 76 4047	TREE-MORTALITY	FEEDLOT WASTE RUNOFF AND MORTALITY OF WINDBREAK TREES KEYWORDS: FEEDLOT-RUNOFF TREE-MOR
300 76 4315	TREE-RESPONSE	WASTE DISPOSAL IN FORESTS KEYWORDS: LAND-APPLICATION FOREST-LANDS CROPLANDS TREE-RESPON
200 76 4625	TRICHOSTRONGYLID	SMALL DUNG BEETLES AS BIOLOGICAL CONTROL AGENTS-- LABORATORY STUDIES OF BEETLE ACTION O
100 77 4469	TRIMAGNESIUM-PHOSP	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
400 77 4441	TRYPTOPHAN	MANURE AND ALGAE PRODUCE ANIMAL FEED KEYWORDS: SWINE-WASTES LIVESTOCK-WASTES RECYCLING
200 76 4034	TURKEYS	ENVIRONMENTAL FACTORS AFFECTING GROWTH PERFORMANCE OF TURKEYS KEYWORDS: TURKEYS PERFORM
400 77 4056	TURKEYS	BUILT-UP LITTER SAVES US TIME AND MONEY KEYWORDS: ECONOMICS TURKEYS MANAGEMENT DISEASE
100 76 4124	TURKEYS	EFFECT OF DIETARY OXYTETRACYCLINE ON MICROORGANISMS IN TURKEY FECES KEYWORDS: DIETS OXY
400 76 4166	TURKEYS	RECYCLING OF LITTER FOR TURKEY BROODING SAFE KEYWORDS: POULTRY-LITTER TURKEYS RECYCLING
100 74 4254	TURKEYS	EFFECT OF DRYING TEMPERATURE AND LENGTH OF DRYING TIME ON SURVIVAL OF MICROORGANISMS IN
400 77 4606	TURKEYS	NO NEED TO CONTROL MANURE EATING BY TURKEYS KEYWORDS: TURKEYS MANURE-EATING ANIMAL-HEAL
100 77 4470	TYROSINE	COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
100 71 4405	URBAN-WASTES	A CLEAN NEW GAS KEYWORDS: SEWAGE URBAN-WASTES AGRICULTURAL-WASTES RECYCLING ANAEROBIC-D
100 72 4006	UREA-FORMALDEHYDE-	PROCESSING SOLID MANURE FROM LIVESTOCK-FARMING TO ORGANIC FERTILIZER FOR VEGETABLE GARD
100 76 4232	UREA-NITROGEN	HEN EXCRETA COMPOSITION AND RUMEN PARAMETERS KEYWORDS: SHEEP REFEEDING POULTRY-WASTES-D
100 76 4232	URIC-ACID	HEN EXCRETA COMPOSITION AND RUMEN PARAMETERS KEYWORDS: SHEEP REFEEDING POULTRY-WASTES-D
100 77 4244	URIC-ACID	FERMENTATION OF POULTRY MANURE FOR POULTRY DIETS KEYWORDS: POULTRY-WASTES FERMENTATION
100 76 4534	URINE	URINARY ALLANTOIN EXCRETION AND DIGESTIBLE DRY-MATTER INTAKE IN CATTLE AND BUFFALO KEYW
200 76 4053	VECTORS	FATE OF PATHOGENS IN SOILS RECEIVING ANIMAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WA
400 77 4056	VECTORS	*BUILT-UP LITTER SAVES US TIME AND MONEY KEYWORDS: ECONOMICS TURKEYS MANAGEMENT DISEASE*
300 76 4203	VECTORS	WASTEWATER AND RUNOFF CONTROL SYSTEMS FOR DRYLOT DAIRIES KEYWORDS: DAIRY-INDUSTRY AGRIC
200 76 4360	VECTORS	LAND USE OF ANIMAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WASTES NITROGEN WASTE-COMPO
200 77 4273	VEGETATION	AN INTRODUCTION TO ILLINOIS AGRICULTURE KEYWORDS: SOILS VEGETATION WEATHERING CLIMATE T
400 77 4133	VEGETATIVE-FILTERS	AWARDS MADE FOR WASTE MANAGEMENT STUDIES KEYWORDS: AWARDS WASTE-MANAGEMENT RUNOFF-CONTR
100 76 4238	VENILMANDELIC-ACID	DETERMINATION OF VANILMANDELIC ACID IN PIG URINE AND CHICKEN FECES BY GAS-LIQUID CHROMA
400 77 4066	VENTILATION	DON'T BE CAUGHT DEAD PUMPING MANURE KEYWORDS: LIQUID-WASTES WASTE-STORAGE GASES AGITATI
100 73 4125	VENTILATION	EFFECTS OF BEEF HOUSING SYSTEMS ON GASEOUS CONTAMINANTS REMOVED BY VENTILATION KEYWORDS
100 73 4126	VENTILATION	EFFECTS OF BEEF HOUSING SYSTEMS ON MOISTURE REMOVED BY VENTILATION KEYWORDS HOUSING CA
400 77 4171	*VENTILATION*	*MANURE PITS CONTAIN GASES THAT CAN KILL KEYWORDS MANURE-PITS GASES TOXICITY* HYDROGEN-S
200 73 4323	VENTILATION	CONTROL OF GASES AND ODORS FROM LIVESTOCK UNITS KEYWORDS: AIR-POLLUTION GASES ODOR LEGA
400 77 4328	VENTILATION	DAIRY WASTE--FIELD APPLICATION STILL BEST KEYWORDS: DAIRY-WASTES STORAGE-SYSTEMS LIQUID
100 77 4350	VENTILATION	DRYING CAGED LAYER WASTE KEYWORDS: MODEL-STUDIES POULTRY-WASTES DEEP-PITS VENTILATION M
100 77 4372	VENTILATION	A NEW CONCEPT OF LITTER MANAGEMENT FOR BROILER PRODUCTION KEYWORDS: POULTRY POULTRY-LIT

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400 77 4445 VENTILATION GUIDE TO EFFECTIVE MANURE PIT VENTILATION KEYWORDS: ODOR GASES AIR-POLLUTION SWINE-WAST
300 77 4449 VENTILATION A RAPID METHOD OF MEASURING MOISTURE IN LITTER USED FOR BROILERS BROODED AT HIGH DENSIT
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200 76 4403 VIRUSES RESEARCH AND DEVELOPMENT NEEDS RELATED TO PATHOGENS IN PRETREATMENT-LAND APPLICATION SY
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400 77 4572 WASTEWATER IRRIGATING WITH WASTEWATER KEYWORDS: WASTEWATER LAND-APPLICATION EQUIPMENT-IRRIGATION
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300 75 4039 WASTEWATER-PURIFIC NATURAL METHODS OF PURIFYING WASTE WATERS AND UTILIZING THEM IN AGRICULCTURE, BIBLIOGRAP
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300 76 4170 WASTEWATER-REUSE AUTOMATED TREATMENT AND RECYCLE OF SWINE FEEDLOT WASTEWATERS KEYWORDS: SWINE-WASTES LIQ
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300	75 4570	WASTE-COMPOSITION	GUIDELINES FOR MANURE USE AND DISPOSAL IN THE WESTERN REGION, USA KEYWORDS: LAND-APPLIC
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400	70 4575	WASTE-COMPOSITION	MANURE DISPOSAL KEYWORDS: POULTRY-WASTES SOLID-WASTES SLURRIES LAND-APPLICATION DEHYDRA
100	73 4580	WASTE-COMPOSITION	EVALUATION OF ORGANIC MANURES KEYWORDS: ORGANIC-WASTES LAND-APPLICATION CROP-RESPONSE P
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300	76 4594	WASTE-COMPOSITION	TREATMENT OF WHOLE PIG SLURRY IN AN OXIDATION DITCH--STAGE 2 KEYWORDS: SWINE-WASTES WAS
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100	76 4602	WASTE-COMPOSITION	TREATMENT OF POULTRY MANURE WASTEWATER USING A ROTATING BIOLOGICAL CONTACTOR KEYWORDS:
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100	77 4628	WASTE-COMPOSITION	SPREADING SLURRY ON LAND KEYWORDS: SLURRIES LIVESTOCK-WASTES LAND-APPLICATION DRAINAGE
100	77 4632	WASTE-COMPOSITION	SIMPLE PHENOLS AND INDOLES IN ANAEROBICALLY STORED PIGGERY WASTES KEYWORDS: SWINE-WASTE
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300	77 4659	WASTE-COMPOSITION	AEROBIC TREATMENT IN RELATION TO LAND APPLICATION OF SLURRY KEYWORDS: AEROBIC-TREATMENT
100	74 4647	WASTE-DIGESTION	GROWTH OF ALGAE ON PIG MANURE KEYWORDS: SWINE-WASTES LAGOONS ALGAE WASTE-DISPOSAL WASTE
100	73 4361	WASTE-DIGESTION	CHANGES IN SEEPAGE RATE FROM AN UNLINED CATTLE WASTE DIGESTION POND KEYWORDS CATTLE-WA
100	72 4012	WASTE-DISPOSAL	WATER MANAGEMENT PROBLEMS INVOLVED IN THE TREATMENT AND UTILIZATION OF LIQUID MANURE KE
300	75 4075	WASTE-DISPOSAL	UTILIZATION AND DISPOSAL OF RESIDUE FROM THE PARTIAL OXIDATION OF CATTLE FEEDLOT MANURE
300	72 4227	WASTE-DISPOSAL	WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA POULTRYMEN KEYWORDS: WASTE-TREATMENT
300	72 4228	WASTE-DISPOSAL	WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA SWINE PRODUCERS KEYWORDS: WASTE-DISP
300	73 4265	WASTE-DISPOSAL	DESIGN OF ANIMAL WASTE DISPOSAL SYSTEMS KEYWORDS: ENGINEERING-STANDARDS LEGAL-ASPECTS O
200	77 4272	WASTE-DISPOSAL	DESIGN CONFERENCE ON LIVESTOCK WASTE MANAGEMENT SYSTEMS IN ILLINOIS KEYWORDS: WASTE-MA
200	77 4282	WASTE-DISPOSAL	TYPES OF WASTE MANAGEMENT SYSTEMS ON ILLINOIS FARMS KEYWORDS: WASTE-STORAGE WASTE-TREAT
300	76 4435	WASTE-DISPOSAL	OPPORTUNITIES FOR MORE EFFECTIVE USE OF ANIMAL WASTES KEYWORDS: WASTE-DISPOSAL LAND-DIS
300	75 4444	WASTE-DISPOSAL	LIVESTOCK WASTE FACILITIES HANDBOOK KEYWORDS: LIVESTOCK-WASTES WASTE-STORAGE WASTE-TREA
300	77 4461	WASTE-DISPOSAL	WASTE MANAGEMENT PRACTICES OF WESTERN CATTLE FEEDLOTS KEYWORDS: WASTE-MANAGEMENT FEEDLO
300	75 4505	WASTE-DISPOSAL	AN ECONOMIC ANALYSIS OF THE INVESTMENT AND OPERATING COSTS ASSOCIATED WITH LIQUID MANU
200	74 4506	WASTE-DISPOSAL	ANIMAL PRODUCTION IN SINGAPORE--PRESENT STATUS AND TRENDS KEYWORDS: PRODUCTION SWINE PO
300	77 4510	WASTE-DISPOSAL	POLLUTANT MOVEMENT TO SHALLOW GROUND WATER TABLES FROM SWINE WASTE LAGOONS KEYWORDS: SW
400	73 4549	WASTE-DISPOSAL	EFFLUENT STORAGE AND DISPOSAL FROM INTENSIVE PIG UNITS KEYWORDS: SWINE-WASTES WASTE-STO
400	71 4557	WASTE-DISPOSAL	WHAT TO DO WITH ANIMAL WASTES RECYCLING KEYWORDS: WASTE-DISPOSAL WATER-POLLUTION ODOR A
100	75 4560	WASTE-DISPOSAL	A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND-- PART 2 KEYWORDS WATER-POLLUT
100	74 4647	WASTE-DISPOSAL	GROWTH OF ALGAE ON PIG MANURE KEYWORDS: SWINE-WASTES LAGOONS ALGAE WASTE-DISPOSAL WASTE
100	76 4512	WASTE-DISTRIBUTION	THE SPATIAL DISTRIBUTION OF EXCRETA UNDER INTENSIVE CATTLE GRAZING KEYWORDS: CATTLE-WAS
100	76 4000	WASTE-MANAGEMENT	THE ROLE OF SYSTEMS ANALYSIS IN THE USE OF AGRICULTURAL WASTES KEYWORDS: SYSTEMS-ANALYS
300	76 4016	WASTE-MANAGEMENT	DAIRY MANURE CAN BE USED SAFELY KEYWORDS: DAIRY-WASTES WASTE-MANAGEMENT WASTE-STORAGE W
400	75 4043	WASTE-MANAGEMENT	ANIMAL WASTES MANAGEMENT KEYWORDS: LIVESTOCK-WASTES WASTE-MANAGEMENT WATER-POLLUTION LE
200	74 4050	WASTE-MANAGEMENT	THE IMPLICATION OF HYDROGEOLOGIC FACTORS IN WASTE MANAGEMENT ON LAND WITH SPECIAL REFE
200	74 4052	WASTE-MANAGEMENT	HAZARDS ASSOCIATED WITH SPREADING ANIMAL-WASTE SLURRIES KEYWORDS: SLURRIES LAND-APPLICA
200	77 4057	WASTE-MANAGEMENT	SEMINAR ON FEEDLOT MANURE RECYCLING FOR NUTRIENT RECOVERY KEYWORDS: REFEEDING LIVESTOCK
300	76 4067	WASTE-MANAGEMENT	MANURE HARVESTING PRACTICES EFFECTS ON WASTE CHARACTERISTICS AND RUNOFF KEYWORDS: FEED
500	76 4078	WASTE-MANAGEMENT	SYSTEMS ANALYSIS OF ANIMAL WASTE HANDLING ALTERNATIVES KEYWORDS: COMPUTER-MODELS WASTE-
500	77 4079	WASTE-MANAGEMENT	LAND AS A WASTE MANAGEMENT ALTERNATIVE KEYWORDS: WASTE-MANAGEMENT LAND-APPLICATION ANIM
500	77 4093	WASTE-MANAGEMENT	WASTE MANAGEMENT PROBLEMS AND THEIR IMPACT ON THE ENVIRONMENT ANIMAL WASTE MANAGEMENT K
400	76 4096	WASTE-MANAGEMENT	EPA WILL USE KSU MODEL AS WASTE CONTROL SYSTEMS TOOL KEYWORDS: WATER-QUALITY-INDEX COMP
300	74 4106	WASTE-MANAGEMENT	HANDLING AND DISPOSING OF POULTRY MANURE KEYWORDS: POULTRY-WASTES WASTE-MANAGEMENT SOLI
200	74 4127	WASTE-MANAGEMENT	GOOD ANIMAL WASTE MANAGEMENT REDUCES ODORS AND COMPLAINTS KEYWORDS: ODOR-CONTROL WASTE-
400	76 4132	WASTE-MANAGEMENT	HOGS TO GET FLUSH TOILETS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT FLUSHING SETTLING-TAN-
400	77 4133	WASTE-MANAGEMENT	AWARDS MADE FOR WASTE MANAGEMENT STUDIES KEYWORDS: AWARDS WASTE-MANAGEMENT RUNOFF-CONTR
300	77 4134	WASTE-MANAGEMENT	COSTS OF DAIRY WASTE DISPOSAL ON TENNESSEE EXPERIMENT STATION FARMS KEYWORDS: DAIRY-WAS
400	72 4150	WASTE-MANAGEMENT	POLLUTION RESEARCHERS FINDING MANY ANSWERS, EXPERT REPORTS KEYWORDS: LIVESTOCK-WASTES
400	77 4164	WASTE-MANAGEMENT	JAPANESE HOGMEN BATTLE POLLUTION KEYWORDS: SWINE-WASTES POLLUTION WASTE-MANAGEMENT OXID
500	75 4196	WASTE-MANAGEMENT	NITROGEN AND PHOSPHORUS FOOD PRODUCTION, WASTE AND THE ENVIRONMENT KEYWORDS: WATER-POL
300	74 4216	WASTE-MANAGEMENT	FINDING WAYS TO USE THE VALUABLE PLANT NUTRIENTS IN POULTRY MANURE KEYWORDS: WASTE-MANA
300	72 4226	WASTE-MANAGEMENT	WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA DAIRYMEN KEYWORDS: WASTE-MANAGEMENT
300	74 4252	WASTE-MANAGEMENT	LIVESTOCK WASTE REGULATIONS CHAPTER 5 AGRICULTURE RELATED POLLUTION KEYWORDS: LIVESTO
400	77 4263	WASTE-MANAGEMENT	HANDLE WASTE CHEAPLY WITH PARTIAL SLATS KEYWORDS: SWINE-WASTES FLOORS FLUSHING WASTE-MA

200 77 4272 WASTE-MANAGEMENT DESIGN CONFERENCE ON LIVESTOCK WASTE MANAGEMENT SYSTEMS IN ILLINOIS KEYWORDS: WASTE-MA
200 77 4275 WASTE-MANAGEMENT FARMERS AS CLIENTS KEYWORDS: DESIGN WASTE-MANAGEMENT SETTLING-BASINS LAGOONS
200 77 4279 WASTE-MANAGEMENT SERVICES PROVIDED BY THE SOIL CONSERVATION SERVICE KEYWORDS: SOIL-CONSERVATION-SERVICE
200 77 4280 WASTE-MANAGEMENT SERVICES PROVIDED BY THE UNIVERSITY OF ILLINOIS FOR THE DESIGN OF LIVESTOCK WASTE MANAG
200 77 4281 WASTE-MANAGEMENT PROPERTIES AND CHARACTERISTICS OF LIVESTOCK WASTES KEYWORDS: LIVESTOCK-WASTES WASTE-COM
200 77 4283 WASTE-MANAGEMENT A FARMERS VIEWPOINT, PART I - BEEF WASTE MANAGEMENT KEYWORDS: WASTE-MANAGEMENT CATTLE G
200 77 4284 WASTE-MANAGEMENT THE FARMER S VIEWPOINT, PART II - SWINE WASTE MANAGEMENT KEYWORDS: WASTE-MANAGEMENT SWI
400 77 4294 WASTE-MANAGEMENT FEEDLOT ODOR CONTROL RELIES ON DRY MANURE AND RAPID REMOVAL KEYWORDS: ODOR-CONTROL FEED
300 73 4310 WASTE-MANAGEMENT LIVESTOCK WASTE MANAGEMENT-STATE OF THE ART KEYWORDS: WASTE-MANAGEMENT FEEDLOTS LIVESTO
400 77 4320 WASTE-MANAGEMENT SEMI-CONFINEMENT AT 1 3 THE COST KEYWORDS: SEMI-CONFINEMENT CATTLE ECONOMICS WEATHER WA
400 77 4321 WASTE-MANAGEMENT WASTE HANDLING-WHICH MANURE MOVING SYSTEM FOR YOU KEYWORDS: DAIRY-WASTES WASTE-MANAGEME
400 74 4322 WASTE-MANAGEMENT THERE S MONEY IN MANURE IF HANDLED RIGHT KEYWORDS: DAIRY-WASTES WASTE-MANAGEMENT FERTIL
400 77 4340 WASTE-MANAGEMENT CAST REVIEWS USDA WASTE MANUAL KEYWORDS: MANUALS LAND-APPLICATION GUIDELINES ENVIRONMEN
400 72 4383 WASTE-MANAGEMENT WHAT ARE YOU DOING ABOUT YOUR 1.57 BILLION TON ANIMAL WASTE PROBLEM KEYWORDS: WASTE-MAN
400 77 4404 WASTE-MANAGEMENT CALIFORNIA DAIRYMEN ARE GAINING EXPERIENCE WITH MANURE SEPARATORS KEYWORDS: WASTE-MANAG
100 72 4409 WASTE-MANAGEMENT THE NEED FOR INTENSIFICATION IN ANIMAL PRODUCTION AND THE CONSEQUENT POLLUTION PROBLEM
700 74 4447 WASTE-MANAGEMENT DECISION MODEL FOR ANIMAL MANURE HANDLING KEYWORDS: WASTE-MANAGEMENT WASTE-TREATMENT WA
200 71 4457 WASTE-MANAGEMENT AGRICULTURE S ROLE IN ENVIRONMENTAL QUALITY KEYWORDS: AGRICULTURE FEEDLOTS WATER-POLLUT
300 77 4461 WASTE-MANAGEMENT WASTE MANAGEMENT PRACTICES OF WESTERN CATTLE FEEDLOTS KEYWORDS: WASTE-MANAGEMENT FEEDLO
400 76 4471 WASTE-MANAGEMENT AWARD FOR NEBRASKAN KEYWORDS: FEEDLOTS WASTE-MANAGEMENT DEBRIS-BASINS HOLDING-PONDS LAN
300 75 4505 WASTE-MANAGEMENT AN ECONOMIC ANALYSIS OF THE INVESTMENT AND OPERATING COSTS ASSOCIATED WITH LIQUID MANU
400 77 4517 WASTE-MANAGEMENT MANAGING MANURE WILL SAVE YOU THE MOST ENERGY DOLLARS KEYWORDS: WASTE-MANAGEMENT DAIRY-
700 76 4545 WASTE-MANAGEMENT EVALUATION OF A FLUSHING-GUTTER MANURE-REMOVAL SYSTEM TO IMPROVE ATMOSPHERIC QUALITY IN
200 75 4558 WASTE-MANAGEMENT HOW TO CLEAN UP AT THE RACES KEYWORDS: HORSE-WASTES RACE-TRACKS WASTE-MANAGEMENT WASTE-
400 76 4576 WASTE-MANAGEMENT HOUSING AND EQUIPMENT--OPTIONS FOR CONFINEMENT HOUSING KEYWORDS: CONFINEMENT-PENS HOUSI
200 75 4605 WASTE-MANAGEMENT *AN ECONOMIC COMPARISON OF FIVE WASTE MANAGEMENT SYSTEMS FOR SWINE FINISHING OPERATIONS*
100 75 4662 WASTE-MANAGEMENT THE WASTE PRODUCTS OF AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES LIVESTOCK-WASTES STRAW
200 77 4663 WASTE-MANAGEMENT DECISION TOOLS FOR DAIRY MANURE HANDLING SYSTEMS SELECTION KEYWORDS: COMPUTER-MODELS D
200 74 4667 WASTE-MANAGEMENT SLURRY PROBLEMS IN RELATION TO POLLUTION OF SURFACE WATERS KEYWORDS: SLURRIES WASTE-MAN
300 76 4170 WASTE-POLLUTION AUTOMATED TREATMENT AND RECYCLE OF SWINE FEEDLOT WASTEWATERS KEYWORDS: SWINE-WASTES LIQ
400 76 4316 WASTE-PRODUCTION WHAT S MANURE WORTH AS A FERTILIZER KEYWORDS LIVESTOCK-WASTES WASTE-PRODUCTION-RATE FE
400 77 4167 WASTE-REMOVAL MINI LOADERS PROVIDE FAST MANURE REMOVAL KEYWORDS: WASTE-REMOVAL EQUIPMENT-MANURE-REMOV
100 77 4653 WASTE-REMOVAL AN EXPERIMENT ON DUNG REMOVAL BY APHODIUS LARVAE SCARABAEIDAE AND EARTHWORMS KEYWORDS:
200 77 4354 WASTE-SOLIDS FEED FED, MILK PRODUCED, AND EXPECTED EXCRETA SOLIDS OF DAIRY COWS KEYWORDS: DAIRY-CATT
300 76 4016 WASTE-STORAGE DAIRY MANURE CAN BE USED SAFELY KEYWORDS: DAIRY-WASTES WASTE-MANAGEMENT WASTE-STORAGE W
400 77 4040 WASTE-STORAGE BACK TO BASICS--175-BUSHEL CORN FROM LEGUMES AND WASTES KEYWORDS: LAND-APPLICATION SWIN
100 76 4049 WASTE-STORAGE ACCUMULATION OF NUTRIENTS IN SOIL BENEATH HOG MANURE LAGOONS KEYWORDS: LAGOONS SWINE-WA
400 76 4055 WASTE-STORAGE HOGMEN SIZE UP OXIDATION SYSTEMS KEYWORDS: LIQUID-WASTES SWINE-WASTES OXIDATION RACETRA
400 77 4066 WASTE-STORAGE DON'T BE CAUGHT DEAD PUMPING MANURE KEYWORDS: LIQUID-WASTES WASTE-STORAGE GASES AGITATI
500 76 4078 WASTE-STORAGE SYSTEMS ANALYSIS OF ANIMAL WASTE HANDLING ALTERNATIVES KEYWORDS: COMPUTER-MODELS WASTE-
400 77 4113 WASTE-STORAGE MANURE STORAGE AREAS HELP SAVE NUTRIENTS KEYWORDS: WASTE-STORAGE PUMPS NUTRIENTS ECONOM
400 72 4114 WASTE-STORAGE FEEDLOT POLLUTION CONTROL IS NOT AN EXPENSIVE ITEM LINDER KEYWORDS: POLLUTION-CONTROL
300 74 4152 WASTE-STORAGE ODORS FROM CONFINED LIVESTOCK PRODUCTION KEYWORDS: ODOR-CONTROL LIVESTOCK LEGAL-ASPECTS
400 74 4174 WASTE-STORAGE OPEN COMPOUNDS FOR SHORT TERM MANURE STORAGE KEYWORDS: WASTE-STORAGE ECONOMICS DESIGN C
400 72 4240 WASTE-STORAGE MANURE SYSTEMS PLANNING DATA KEYWORDS: WASTE-STORAGE LAGOONS HOLDING-PONDS SETTLING-BAS
200 77 4272 WASTE-STORAGE DESIGN CONFERENCE ON LIVESTOCK WASTE MANAGEMENT SYSTEMS IN ILLINOIS KEYWORDS: WASTE-MA
200 77 4281 WASTE-STORAGE PROPERTIES AND CHARACTERISTICS OF LIVESTOCK WASTES KEYWORDS: LIVESTOCK-WASTES WASTE-COM
200 77 4282 WASTE-STORAGE TYPES OF WASTE MANAGEMENT SYSTEMS ON ILLINOIS FARMS KEYWORDS: WASTE-STORAGE WASTE-TREAT
300 77 4341 WASTE-STORAGE LONG TERM MANURE STORAGE KEYWORDS WASTE-STORAGE FERTILIZERS LAND-APPLICATION TIME LABO
400 77 4342 WASTE-STORAGE C+P+S+T+A=-N OR WHY POOR WASTE MANAGEMENT COSTS YOU MONEY KEYWORDS: LIVESTOCK-WASTES PO
100 77 4348 WASTE-STORAGE AVAILABLE AMINO ACID CONTENT AND MICROBIOLOGICAL CONDITION OF DRIED POULTRY MANURE KEY
400 73 4352 WASTE-STORAGE UNDERGROUND SILOS FOR LIQUID MANURE KEYWORDS: DAIRY-WASTES WASTE-STORAGE SILOS LAND-APP
200 76 4360 WASTE-STORAGE LAND USE OF ANIMAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WASTES NITROGEN WASTE-COMPO
400 72 4383 WASTE-STORAGE WHAT ARE YOU DOING ABOUT YOUR 1.57 BILLION TON ANIMAL WASTE PROBLEM KEYWORDS: WASTE-MAN
300 72 4393 WASTE-STORAGE AN ANALYSIS OF BEEF CATTLE FEEDLOT DESIGNS FOR POLLUTION CONTROL KEYWORDS: FEEDLOTS DES
100 73 4396 WASTE-STORAGE WINTER OPERATION OF AERATED LIQUID ANIMAL WASTE STORAGE SYSTEMS KEYWORDS: WASTE-STORAGE
100 76 4398 WASTE-STORAGE ANNUAL DYNAMICS OF CHANGES IN CHARACTERISTIC PROPERTIES OF CATTLE LIQUID MANURE FROM L
400 77 4406 WASTE-STORAGE CONTROLLING FLIES WITH IN-HOUSE MANURE STORAGE KEYWORDS: FLY-CONTROL POULTRY-WASTES WAS
400 77 4443 WASTE-STORAGE NEW WASTE COLLECTION AND STORAGE SYSTEM KEYWORDS: WASTE-COLLECTION WASTE-STORAGE LIQUID
300 75 4444 WASTE-STORAGE LIVESTOCK WASTE FACILITIES HANDBOOK KEYWORDS. LIVESTOCK-WASTES WASTE-STORAGE WASTE-TREA
700 74 4447 WASTE-STORAGE DECISION MODEL FOR ANIMAL MANURE HANDLING KEYWORDS: WASTE-MANAGEMENT WASTE-TREATMENT WA
100 76 4456 WASTE-STORAGE NITROGEN MOVEMENT NEAR SURFACE MANURE STORAGES KEYWORDS: WASTE-STORAGE MANURE-PIT WASTE
300 77 4461 WASTE-STORAGE WASTE MANAGEMENT PRACTICES OF WESTERN CATTLE FEEDLOTS KEYWORDS: WASTE-MANAGEMENT FEEDLO
100 77 4470 WASTE-STORAGE COMPOSITION AND REACTIONS OF LIQUID MANURE GULLE , WITH PARTICULAR REFERENCE TO PHOSPHA
300 75 4505 WASTE-STORAGE AN ECONOMIC ANALYSIS OF THE INVESTMENT AND OPERATING COSTS ASSOCIATED WITH LIQUID MANU
400 73 4507 WASTE-STORAGE KEEP YOUR SLURRY SMELLING SWEET KEYWORDS: DAIRY-WASTES WASTE-TREATMENT WASTE-STORAGE OD
400 75 4531 WASTE-STORAGE STORAGE-STORE MANURE AS IF IT WERE VALUABLE-BECAUSE IT IS KEYWORDS: FERTILIZERS CATTLE-
400 77 4536 WASTE-STORAGE FARM PROGRESS SHOW MORE CATTLE AND LESS WORK WITH CONFINEMENT KEYWORDS: CONFINEMENT-PEN
400 73 4549 WASTE-STORAGE EFFLUENT STORAGE AND DISPOSAL FROM INTENSIVE PIG UNITS KEYWORDS: SWINE-WASTES WASTE-STO
400 71 4556 WASTE-STORAGE AUTOMATIC SYSTEM SCRAPES MANURE-AND WORK-AWAY KEYWORDS: DAIRY-WASTES CONFINEMENT HOUSIN
400 71 4557 WASTE-STORAGE WHAT TO DO WITH ANIMAL WASTES RECYCLING KEYWORDS: WASTE-DISPOSAL WATER-POLLUTION ODOR A
400 77 4571 WASTE-STORAGE A PLACE FOR POULTRY WASTE KEYWORDS: REFEEDING POULTRY-WASTES WASTE-STORAGE ENSILING SIL
100 77 4573 WASTE-STORAGE RUNOFF FROM A LOW-COST MANURE STORAGE FACILITY KEYWORDS: AGRICULTURAL-RUNOFF WASTE-STOR
400 70 4575 WASTE-STORAGE MANURE DISPOSAL KEYWORDS: POULTRY-WASTES SOLID-WASTES SLURRIES LAND-APPLICATION DEHYDRA
200 75 4605 WASTE-STORAGE AN ECONOMIC COMPARISON OF FIVE WASTE MANAGEMENT SYSTEMS FOR SWINE FINISHING OPERATIONS
200 76 4614 WASTE-STORAGE A MODIFIED CENTRIFUGAL MANURE PUMP FOR HANDLING SEMI-SOLID CATTLE MANURE KEYWORDS: PUM
200 75 4620 WASTE-STORAGE FEEDLOT RUNOFF CONTROL SYSTEMS FOR COLD CLIMATES KEYWORDS: FEEDLOT-RUNOFF AGRICULTURAL-
100 71 4629 WASTE-STORAGE PERSISTENCE OF THREE SALMONELLA SPP IN BOVINE FAECES KEYWORDS: SALMONELLA CATTLE-WASTE
100 77 4632 WASTE-STORAGE SIMPLE PHENOLS AND INDOLES IN ANAEROBICALLY STORED PIGGERY WASTES KEYWORDS: SWINE-WASTE
100 77 4633 WASTE-STORAGE CHANGES IN THE SHORT-CHAIN CARBOXYLIC ACID CONTENT AND CHEMICAL OXYGEN DEMAND OF STORED
100 72 4649 WASTE-STORAGE CONSERVATION OF CATTLE MANURE IN PITS KEYWORDS: CATTLE-WASTES WASTE-STORAGE NITROGEN-TR
200 76 4651 WASTE-STORAGE FERTILIZER VALUE OF ANIMAL MANURES KEYWORDS: SWINE-WASTES CATTLE-WASTES WASTE-STORAGE L
300 75 4444 WASTE-TRANSPORT LIVESTOCK WASTE FACILITIES HANDBOOK KEYWORDS: LIVESTOCK-WASTES WASTE-STORAGE WASTE-TREA
300 76 4001 WASTE-TREATMENT DESIGN PARAMETERS FOR ANIMAL WASTE TREATMENT SYSTEMS NITROGEN CONTROL KEYWORDS: DESIG
300 76 4003 WASTE-TREATMENT DESIGN CRITERIA FOR SWINE WASTE TREATMENT SYSTEMS KEYWORDS: DESIGN LAGOONS SWINE-WASTES
100 72 4006 WASTE-TREATMENT PROCESSING SOLID MANURE FROM LIVESTOCK-FARMING TO ORGANIC FERTILIZER FOR VEGETABLE GARD
100 72 4008 WASTE-TREATMENT SOME POSSIBILITIES AND ASPECTS OF THE CHEMICAL AND BIOLOGICAL TREATMENT OF LIQUID MANUR
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100 72 4012 WASTE-TREATMENT WATER MANAGEMENT PROBLEMS INVOLVED IN THE TREATMENT AND UTILIZATION OF LIQUID MANURE KE
400 76 4055 WASTE-TREATMENT HOGMEN SIZE UP OXIDATION SYSTEMS KEYWORDS: LIQUID-WASTES SWINE-WASTES OXIDATION RACETRA
200 77 4060 WASTE-TREATMENT HARVESTING AND PROCESSING MANURE FROM CONFINEMENT OPERATIONS FOR REFEEDING KEYWORDS: CO
200 77 4062 WASTE-TREATMENT PATHOGEN TRANSMISSION POTENTIAL FROM ANIMAL WASTE REFEEDING KEYWORDS: REFEEDING PATHOGE
200 77 4065 WASTE-TREATMENT PRESERVATION AND REFEEDING POULTRY WASTE TO CATTLE KEYWORDS: REFEEDING POULTRY-LITTER C
300 76 4067 WASTE-TREATMENT MANURE HARVESTING PRACTICES EFFECTS ON WASTE CHARACTERISTICS AND RUNOFF KEYWORDS: FEED
500 77 4088 WASTE-TREATMENT OVERLAND RECYCLING OF ANIMAL WASTE KEYWORDS: WASTE-TREATMENT OVERLAND-SPRAY-IRRIGATION
200 76 4144 WASTE-TREATMENT OVERLAND FLOW PRETREATMENT OF POULTRY MANURE KEYWORDS: OVERLAND-FLOW-PRETREATMENT POULT
300 76 4170 WASTE-TREATMENT AUTOMATED TREATMENT AND RECYCLE OF SWINE FEEDLOT WASTEWATERS KEYWORDS: SWINE-WASTES LIQ
200 76 4186 WASTE-TREATMENT A LOW COST SETTLING BASIN AND INFILTRATION CHANNEL FOR CONTROLLING RUNOFF FROM AN OPEN
100 75 4205 WASTE-TREATMENT WASTE CHARACTERIZATION STUDIES FOR RACEWAY PRODUCTION OF CATFISH KEYWORDS: FISH-WASTES
300 76 4207 WASTE-TREATMENT STATE-OF-THE-ART SWINE WASTE PRODUCTION AND PRETREATMENT PROCESSES KEYWORDS: SWINE-WAS

300	72 4227	WASTE-TREATMENT	WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA POULTRYMEN KEYWORDS: WASTE-TREATMENT
200	76 4230	WASTE-TREATMENT	THE OXIDATION DITCH A POSITIVE METHOD OF ODOR CONTROL KEYWORDS: ODOR-CONTROL WASTE-TRE
700	72 4271	WASTE-TREATMENT	SHORT TERM MINIMUM AERATION OF SWINE MANURE KEYWORDS: SWINE-WASTES WASTE-TREATMENT AERA
200	77 4272	WASTE-TREATMENT	DESIGN CONFERENCE ON LIVESTOCK WASTE MANAGEMENT SYSTEMS IN ILLINOIS KEYWORDS: WASTE-MA
200	77 4282	WASTE-TREATMENT	TYPES OF WASTE MANAGEMENT SYSTEMS ON ILLINOIS FARMS KEYWORDS: WASTE-STORAGE WASTE-TREAT
200	76 4305	WASTE-TREATMENT	CONVERSION OF BOVINE MANURE TO OIL KEYWORDS: RECYCLING CATTLE WASTES OIL CARBON-MONOXID
400	77 4317	WASTE-TREATMENT	WASTE CONTROL CUT HIS FERTILIZER BILL IN HALF KEYWORDS: DAIRY-WASTES WASTE-TREATMENT CO
200	75 4327	WASTE-TREATMENT	PRODUCTION OF AMMONIA SYNTHESIS GAS FROM MANURE IN A CYCLONIC BURNER KEYWORDS: RECYCLIN
300	77 4334	WASTE-TREATMENT	UTILIZATION OF LIVESTOCK WASTES-ALTERNATIVE TREATMENTS AND PRODUCTS KEYWORDS: RECYCLIN
700	74 4345	WASTE-TREATMENT	AN EVALUATION OF A FULL-SCALE IN-HOUSE OXIDATION DITCH FOR POULTRY WASTE KEYWORDS: POU
200	74 4347	WASTE-TREATMENT	LIVESTOCK ODOR CONTROL RESEARCH AT THE UNIVERSITY OF ILLINOIS KEYWORDS: ODOR-CONTROL SW
200	76 4367	WASTE-TREATMENT	METHANE FERMENTATION OF ANIMAL WASTES KEYWORDS: WASTE-TREATMENT METHANE REFEEDING CATTL
400	71 4370	WASTE-TREATMENT	FEEDLOT MANURE-THE ECOLOGY INSPIRED BUILDING MATERIAL KEYWORDS: RECYCLING ECOLITE BUILD
200	70 4384	WASTE-TREATMENT	STATE OF THE ART - ANAEROBIC LAGOONS KEYWORDS: LAGOONS WASTE-TREATMENT ANAEROBIC DESIGN
200	76 4403	WASTE-TREATMENT	RESEARCH AND DEVELOPMENT NEEDS RELATED TO PATHOGENS IN PRETREATMENT-LAND APPLICATION SY
300	75 4444	WASTE-TREATMENT	LIVESTOCK WASTE FACILITIES HANDBOOK KEYWORDS: LIVESTOCK-WASTES WASTE-STORAGE WASTE-TREA
700	74 4447	WASTE-TREATMENT	DECISION MODEL FOR ANIMAL MANURE HANDLING KEYWORDS: WASTE-MANAGEMENT WASTE-TREATMENT WA
400	77 4499	WASTE-TREATMENT	LAGOONS & GATORS KEYWORDS: LAGOONS ALLIGATORS WASTE-TREATMENT AERATION
200	74 4506	WASTE-TREATMENT	ANIMAL PRODUCTION IN SINGAPORE--PRESENT STATUS AND TRENDS KEYWORDS: PRODUCTION SWINE PO
400	73 4507	WASTE-TREATMENT	KEEP YOUR SLURRY SMELLING SWEET KEYWORDS: DAIRY-WASTES WASTE-TREATMENT WASTE-STORAGE OD
400	77 4519	WASTE-TREATMENT	METHANE GAS ENERGY POSSIBLE FROM MANURE KEYWORDS: RECYCLING LIVESTOCK-WASTES WASTE-TREA
700	76 4541	WASTE-TREATMENT	NITROGEN REMOVAL AND TRANSFORMATIONS IN THE OVERLAND FLOW TREATMENT OF POULTRY WASTES K
400	73 4549	WASTE-TREATMENT	EFFLUENT STORAGE AND DISPOSAL FROM INTENSIVE PIG UNITS KEYWORDS: SWINE-WASTES WASTE-STO
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SECTION 6

KEYWORD INDEX (VOLUME VI)

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100 77 4853	AGITATION-RATES	THE EFFECT OF ANAEROBIC DIGESTION UPON SWINE MANURE ODORS KEYWORDS: SWINE-WASTES ODOR A
200 76 5125	AGRICULTURAL-RESID	AGRICULTURAL RESIDUES, INCLUDING FEEDLOT WASTES KEYWORDS: AGRICULTURAL-RESIDUES FEEDLOT
400 77 4672	AGRICULTURAL-RUNOF	CONTROL RUNOFF FROM OPEN LIVESTOCK FEEDLOTS KEYWORDS: AGRICULTURAL-RUNOFF RUNOFF-CONTRO
300 74 4700	AGRICULTURAL-RUNOF	QUANTIFICATION OF POLLUTANTS IN AGRICULTURAL RUNOFF KEYWORDS: AGRICULTURAL-RUNOFF EROSI
700 74 4704	AGRICULTURAL-RUNOF	AGRICULTURAL AND FOREST LAND RUNOFF IN UPPER SOUTH RIVER NEAR WAYNESBORO, VIRGINIA KEYW
200 76 4716	AGRICULTURAL-RUNOF	RUNOFF AS A FACTOR IN EUTROPHICATION OF SURFACE WATERS IN RELATION TO PHOSPHORUS MANURI
200 76 4717	AGRICULTURAL-RUNOF	RELATIONS BETWEEN PEDOLOGICAL URGANISATION OF THE SOIL AND PIG SLURRY LANDSPREADINGS IN
200 76 4718	AGRICULTURAL-RUNOF	THE EFFECT OF SOIL TYPE AND SEASON OF APPLICATION ON INFILTRATION AND RUNOFF OF NUTRIEN
300 78 4745	AGRICULTURAL-RUNOF	COSTS OF SELECTED WASTE-HANDLING SYSTEMS FOR DAIRY FARMS KEYWORDS: DAIRY-WASTES LEGAL-A
300 76 4754	AGRICULTURAL-RUNOF	MICROBIOLOGY AND CHEMISTRY STUDIES OF WATER QUALITY FACTORS IN A WATERSHED USED FOR MUN
200 77 4764	AGRICULTURAL-RUNOF	LONG-TERM FESCUE AND COASTAL BERMUDAGRASS CROP RESPONSE TO SWINE LAGOON EFFLUENT KEYWOR
200 77 4772	AGRICULTURAL-RUNOF	CONCEPTUAL MODELLING OF NONPOINT SOURCE POLLUTION FROM LAND AREAS RECEIVING ANIMAL WAST
200 77 4786	AGRICULTURAL-RUNOF	NONPOINT POLLUTION CONTROL FOR WINTERING RANGE CATTLE KEYWORDS: CATTLE WATER-POLLUTION
200 77 4794	AGRICULTURAL-RUNOF	ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS KEYWORDS: CATTLE MANAGEMENT PAST
700 76 4804	AGRICULTURAL-RUNOF	DIFFUSE AGRICULTURAL POLLUTION--THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS KEYWORDS:
200 72 4818	AGRICULTURAL-RUNOF	THE FATE OF ENTERIC BACTERIA DURING STORAGE AND DISPOSAL OF ANIMAL EXCRETA KEYWORDS: PA
100 77 4881	AGRICULTURAL-RUNOF	WINTER-APPLIED MANURE--EFFECTS ON ANNUAL RUNOFF, EROSION, AND NUTRIENT MOVEMENT KEYWORD
700 74 4898	AGRICULTURAL-RUNOF	CHARACTERISTICS OF RUNOFF FROM DISPOSAL OF CATTLE FEEDLOT WASTES ON LAND KEYWORDS CATT
300 77 4915	AGRICULTURAL-RUNOF	CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE KEYWORDS: LIQUID-WASTES DAIRY-WA
300 76 4925	AGRICULTURAL-RUNOF	MODELING PESTICIDES AND NUTRIENTS ON AGRICULTURAL LANDS KEYWORDS: AGRICULTURAL-RUNOFF M
300 77 4927	AGRICULTURAL-RUNOF	AGRICULTURE RUNOFF MANAGEMENT (ARM) MODEL - VERSION II. REFINEMENT AND TESTING KEYWORDS
300 77 4937	AGRICULTURAL-RUNOF	ANIMAL WASTE MANAGEMENT AND OUR WATER QUALITY KEYWORDS: WATER-POLLUTION GROUNDWATER-POL
100 77 4950	AGRICULTURAL-RUNOF	MANURE EFFECTS ON WATER INTAKE AND RUNOFF QUALITY FROM IRRIGATED GRAIN SORGHUM PLOTS KE
300 78 4951	AGRICULTURAL-RUNOF	ENVIRONMENTAL IMPACT RESULTING FROM UNCONFINED ANIMAL PRODUCTION KEYWORDS: ENVIRONMENTA
300 78 5023	AGRICULTURAL-RUNOF	ULTIMATE DISPOSAL OF BEEF FEEDLOT WASTES ONTO LAND KEYWORDS: FEEDLOTS CATTLE-WASTES LAN
400 77 5058	AGRICULTURAL-RUNOF	CONTROL OF NONPOINT WATER POLLUTION FROM AGRICULTURE: SOME CONCEPTS KEYWORDS: NONPOINT
200 75 5083	AGRICULTURAL-RUNOF	NON-POINT SOURCES OF WATER POLLUTION KEYWORDS: WATER-POLLUTION NON-POINT-SOURCES AGRICU
200 78 5106	AGRICULTURAL-RUNOF	WINTER AND SPRING RUNOFF FROM MANURE APPLICATION PLOTS KEYWORDS: LAND-APPLICATION AGRIC
200 78 5115	AGRICULTURAL-RUNOF	SURFACE APPLICATION AND INJECTION OF LIQUID DAIRY MANURE KEYWORDS: DAIRY-WASTES LIQUID-
300 77 5129	AGRICULTURAL-RUNOF	RECYCLING AGRICULTURE RUNOFF KEYWORDS: MODEL-STUDIES AGRICULTURAL-RUNOFF WASTE-STORAGE
600 75 5150	AGRICULTURAL-RUNOF	FEEDLOT RUNOFF CONTROL FROM POINT NON-POINT SOURCES KEYWORDS: LEGAL-ASPECTS NPDES AGRIC
100 78 5178	AGRICULTURAL-RUNOF	NONPOINT SOURCES- STATE-OF-THE-ART OVERVIEW KEYWORDS: NONPOINT-SOURCES WATER-POLLUTION
200 78 5214	AGRICULTURAL-RUNOF	TRANSPORT OF POTENTIAL POLLUTANTS IN RUNOFF WATER FROM LAND AREAS RECEIVING ANIMAL WAST
200 78 5227	AGRICULTURAL-RUNOF	BARNYARD SEDIMENT AND NUTRIENT REMOVAL BY GRASS FILTERS KEYWORDS: AGRICULTURAL-RUNOFF S
400 78 4669	AGRICULTURAL-WASTE	CROP, LIVESTOCK RESIDUES: A FUTURE SOURCE OF FUEL KEYWORDS: AGRICULTURAL-WASTES FOREST
400 78 4675	AGRICULTURAL-WASTE	MONTANA RESEARCHER SEES METHANE PRODUCTION PROFITABLE IN FUTURE KEYWORDS: AGRICULTURAL-
200 77 4776	AGRICULTURAL-WASTE	AGRICULTURAL WASTE MANAGEMENT IN NORTH CAROLINA KEYWORDS: AGRICULTURAL-WASTES MANAGEMEN
300 76 4824	AGRICULTURAL-WASTE	ENERGY POTENTIAL THROUGH BIO-CONVERSION OF AGRICULTURAL WASTES KEYWORDS: AGRICULTURAL-W
100 77 4855	AGRICULTURAL-WASTE	AGRICULTURAL BIOMASS WASTES--UTILIZATION ROUTES KEYWORDS: AGRICULTURAL-WASTES RECYCLING
500 77 4903	AGRICULTURAL-WASTE	RECYCLING ELEMENTS IN WASTES THROUGH SOIL-PLANT SYSTEMS KEYWORDS: LAND-APPLICATION MUNI
500 77 4904	AGRICULTURAL-WASTE	SPECIAL OPPORTUNITIES AND PROBLEMS IN USING FOREST SOILS FOR ORGANIC WASTE APPLICATION
300 78 4952	AGRICULTURAL-WASTE	CONVERSION OF CATTLE FEEDLOT MANURE TO ETHYLENE AND AMMONIA SYNTHESIS GAS KEYWORDS: FEE
300 78 5065	AGRICULTURAL-WASTE	ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUE: POTENTIAL FOR IMPROVEMENT AND IMPLEME
300 76 5090	AGRICULTURAL-WASTE	BIOCONVERSION OF AGRICULTURAL WASTES FOR POLLUTION CONTROL AND ENERGY CONSERVATION KEY
500 77 5123	AGRICULTURAL-WASTE	POLLUTION CONTROL FOR AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES ANIMAL-WASTES WASTE-TRE
300 78 5130	AGRICULTURAL-WASTE	ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUES INTO BIOGAS KEYWORDS: ANAEROBIC DIGESTE
100 77 5138	AGRICULTURAL-WASTE	AGRICULTURAL AND FORESTRY WASTES AS AN ENERGY RESOURCE KEYWORDS: AGRICULTURAL-WASTES FO

200	78 5105	AGRICULTURAL-WATER	MODELING NITROGEN MOVEMENT IN AGRICULTURAL WATERSHEDS KEYWORDS: MODEL-STUDIES WATERSHED
100	77 4766	AGRICULTURE	THE APPLICATION OF NATURAL ZEOLITES IN ANIMAL SCIENCE AND AQUACULTURE KEYWORDS: ZEOLITE
200	76 4792	AGRICULTURE	HOW AIR POLLUTION REGULATIONS AFFECT AGRICULTURAL OPERATIONS KEYWORDS: AIR-POLLUTION LE
300	73 4826	AGRICULTURE	METHODS FOR IDENTIFYING AND EVALUATING THE NATURE AND EXTENT OF NON-POINT SOURCES OF PO
300	77 4926	AGRICULTURE	ENVIRONMENTAL IMPLICATIONS OF TRENDS IN AGRICULTURE AND SILVICULTURE, VOLUME I-TREND IDE
100	78 5045	AIRSACCULITIS	EFFECT OF ATMOSPHERIC AMMONIA AND STRESS ON BROILER MALES KEYWORDS: AIR-POLLUTION AMMON
400	78 4671	AIR-POLLUTION	LIQUID MANURE GAS MAY POSE DANGER KEYWORDS: AIR-POLLUTION SAFETY LIQUID-WASTES HYDROGEN
300	75 4701	AIR-POLLUTION	ENVIRONMENTAL PROTECTION REQUIREMENTS FOR SWINE OPERATIONS KEYWORDS: SWINE FEEDLOTS AI
200	76 4707	AIR-POLLUTION	FARMYARD MANURE AND CROP PRODUCTION IN DENMARK KEYWORDS: SOLID-WASTES LIQUID-WASTES DEN
200	77 4775	AIR-POLLUTION	SIMPLIFIED DESIGN OF RIGID PLASTIC DUCTS FOR UNIFORM AIR REMOVAL FROM LIQUID MANURE PIT
200	71 4788	AIR-POLLUTION	SALMONELLA AND OTHER MICROORGANISMS POSE A NEW PARAMETER TO DESIGNERS OF POULTRY HOUSES
200	76 4792	AIR-POLLUTION	HOW AIR POLLUTION REGULATIONS AFFECT AGRICULTURAL OPERATIONS KEYWORDS: AIR-POLLUTION LE
300	73 4820	AIR-POLLUTION	ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS. PROCESSING AND BOOKS, INC AN ILLINOI
300	74 4822	AIR-POLLUTION	ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS. LESTER KIPLING, D B A KIPLING CHICKEN
400	78 4828	AIR-POLLUTION	WHICH WASTE SYSTEM IS BEST KEYWORDS: WASTE-MANAGEMENT DESIGN CONFINEMENT-PENS LIQUID-WA
400	78 4841	AIR-POLLUTION	ATMOSPHERIC AMMONIA AFFECTS SWINE HEALTH KEYWORDS: AIR-POLLUTION CONFINEMENT-PENS SWINE
300	77 4866	AIR-POLLUTION	ATMOSPHERIC AMMONIA AFFECTS SWINE HEALTH KEYWORDS: AIR-POLLUTION SWINE HOUSING AMMONIA
500	77 4905	AIR-POLLUTION	LAND UTILIZATION AND DISPOSAL OF ORGANIC WASTES IN ARID REGIONS KEYWORDS: ANIMAL-WASTES
400	77 4936	AIR-POLLUTION	GRAVITY-DRAIN SYSTEM KEYWORDS: LIQUID-WASTES SWINE-WASTES ODOR AIR-POLLUTION GRAVITY-DR
300	74 4960	AIR-POLLUTION	FEEDLOT POLLUTION CONTROL GUIDELINES KEYWORDS: FEEDLOTS TEXAS-LAW PERMITS LEGAL-ASPECTS
400	78 5011	AIR-POLLUTION	TOXIC GASES KILL WORKER KEYWORDS AIR-POLLUTION PUBLIC-HEALTH CONFINEMENT-PENS CATTLE-W
100	76 5013	AIR-POLLUTION	ANIMAL FEEDING FACTORIES AND THE ENVIRONMENT; A SUMMARY OF FEEDLOT POLLUTION, FEDERAL CO
300	78 5025	AIR-POLLUTION	CONTROL OF ANIMAL PRODUCTION ODORS--THE STATE-OF-THE-ART KEYWORDS: AIR-POLLUTION ODOR-C
100	77 5032	AIR-POLLUTION	LITTER REUSE EFFECTS ON SELECTED TURKEY PRODUCTION AND PROCESSING PARAMETERS KEYWORDS:
100	78 5044	AIR-POLLUTION	MICROFLORA OF AIR SAMPLES FROM POULTRY HOUSES KEYWORDS: POULTRY-HOUSES AIR-POLLUTION MI
100	78 5045	AIR-POLLUTION	EFFECT OF ATMOSPHERIC AMMONIA AND STRESS ON BROILER MALES KEYWORDS: AIR-POLLUTION AMMON
100	78 5053	AIR-POLLUTION	AEROSOL CONCENTRATION IN A TURKEY BARN ENVIRONMENT KEYWORDS: AIR-POLLUTION BACTERIA TUR
400	78 5067	AIR-POLLUTION	CATTLEMEN INFLUENCE ODOR CONTROL RULES KEYWORDS: AIR-POLLUTION SULFATES ODOR-CONTROL LE
200	76 5070	AIR-POLLUTION	USING POULTRY MANURE FOR VEGETABLES AND HYDROSEEDING KEYWORDS: POULTRY-WASTES CHEMICAL-
200	78 5108	AIR-POLLUTION	DUST REDUCTION IN THE BIRD RECEIVING AREA OF A POULTRY PROCESSING PLANT KEYWORDS: AIR-P
500	77 5123	AIR-POLLUTION	POLLUTION CONTROL FOR AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES ANIMAL-WASTES WASTE-TRE
300	78 5139	AIR-POLLUTION	DEATH IN A FARM WORKER ASSOCIATED WITH TOXIC GASES FROM A LIQUID MANURE SYSTEM - WISCON
100	73 5167	AIR-POLLUTION	PRINCIPLES OF TREATMENT OF ANIMAL SLURRIES KEYWORDS: SLURRIES WASTE-TREATMENT AEROBIC A
400	78 5174	AIR-POLLUTION	AMMONIA AFFECTS SWINE HEALTH KEYWORDS: AMMONIA SWINE ANIMAL-HEALTH AIR-POLLUTION
100	78 5186	AIR-POLLUTION	MODEL STUDY OF FIVE TYPES OF MANURE PIT VENTILATION SYSTEMS KEYWORDS: VENTILATION SWINE
300	78 5194	AIR-POLLUTION	MANAGING HORSE MANURE FOR ENVIRONMENTAL PROTECTION KEYWORDS: WATER-POLLUTION AIR-POLLUT
500	77 5197	AIR-POLLUTION	PARTICULATE AND ODOR CONTROL IN THE ORGANIC FERTILIZER INDUSTRY: A CASE HISTORY KEYWOR
300	78 5229	AIR-POLLUTION	ANALYSIS OF STATE LAWS AND REGULATIONS IMPACTING ANIMAL WASTE MANAGEMENT KEYWORDS: LEGA
100	77 5242	AIR-POLLUTION	A METHOD FOR SAMPLING AIR IN ANIMAL HOUSES TO ANALYSE TRACE GASES INCLUDING ODORANTS WI
100	77 5257	AIR-POLLUTION	BELGIAN LEGISLATION CONCERNING THE BUILDING AND EXPLOITATION OF STOCK-FARMS KEYWORDS: A
100	77 5306	AIR-POLLUTION	MYCOFLORA OF A TURKEY CONFINEMENT BROODER HOUSE KEYWORDS. POULTRY AIR-POLLUTION LITTERS
300	77 5035	AIR-POLLUTION-CONT	SOURCE ASSESSMENT--BEEF CATTLE FEEDLOTS KEYWORDS CATTLE DUSTS GASES AMMONIA THIOLS AIR
100	77 5251	AIR-SCRUBBERS	ODOUR REMOVAL FROM THE EXHAUST AIR OF ANIMAL SHELTERS KEYWORDS: ODOR-CONTROL CONFINEMEN
100	77 5250	AIR-SCRUBBING	ODOUR CONTROL WITH BIOLOGICAL AIR WASHERS KEYWORDS ODOR-CONTROL AIR-SCRUBBING DESIGN
500	77 5299	AIR-SCRUBBING	ANIMAL WASTE MANAGEMENT IN THE NETHERLANDS KEYWORDS LEGAL-ASPECTS FEEDLOTS ODOR-CONTRO
400	78 4981	ALBUMEN	TOO MUCH MAGNESIUM MAKES WETTER DROPPINGS KEYWORDS DIETS POULTRY FEED-ADDITIVES MAGNES
200	77 4765	ALGAE	MICROALGAE AS A MEANS OF RECYCLING ANIMAL WASTES KEYWORDS: RECYCLING WASTE-TREATMENT SW
400	77 4817	ALGAE	POULTRY MANURE MAKES DEBUT AS ENERGY SOURCE KEYWORDS. POULTRY-WASTES ANIMAL-WASTES FERM
300	76 4824	ALGAE	ENERGY POTENTIAL THROUGH BIO-CONVERSION OF AGRICULTURAL WASTES KEYWORDS. AGRICULTURAL-W
100	77 4895	ALGAE	NUTRITIONAL EVALUATION WITH RATS OF ALGAE CHLORELLA GROWN ON SWINE MANURE KEYWORDS: LI
100	78 4958	ALGAE	HARVESTING ALGAE FROM LAGOON EFFLUENT KEYWORDS LAGOONS WASTE-TREATMENT FLOCCULANTS BY-
500	76 4965	ALGAE	THE LAMAR BIO-CONVERSION PLANT DESIGN KEYWORDS: BIO-CONVERSION ANAEROBIC-DIGESTION CATT
400	78 4973	ALGAE	KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA-PART THREE KEYWORDS. LIQUID-WASTES WASTEWATER-TRE
500	77 5026	ALGAE	BIOLOGICAL RECLAMATION OF SOLID WASTES KEYWORDS RECYCLING SOLID-WASTES MUNICIPAL-WASTE
400	77 5050	ALGAE	IT S NO BULL COLORADO TOWN TO CONVERT COW MANURE TO NATURAL GAS KEYWORDS CATTLE-WASTES
100	77 5135	ALGAE	CONTINUOUS CULTIVATION OF CHLORELLA EMERSONII ON PIG MANURE KEYWORDS SWINE-WASTES WAST
400	73 5192	ALGAE	AN ALGAL REGENERATIVE SYSTEM FOR SINGLE-FAMILY FARMS AND VILLAGES KEYWORDS: RECYCLING A
500	77 5283	ALGAE	LAGOON SYSTEMS FOR ANIMAL WASTES KEYWORDS LAGOONS DESIGN FEEDLOTS ECONOMICS AEROBIC AN
400	78 5305	ALGAE	COLORADO BIOGAS PLANT WINS ACEC TOP PRIZE KEYWORDS FEEDLOTS CATTLE-WASTES RECYCLING BI
200	77 4769	ALKALINITY	PERFORMANCE OF A LARGE SIZE ANAEROBIC DIGESTER FOR POULTRY MANURE KEYWORDS: ANAEROBIC D
200	77 4867	ALKALINITY	THREE YEARS OF EVALUATING A MIDWEST ANAEROBIC DAIRY LAGOON KEYWORDS DAIRY-WASTES ANAE
300	77 4969	ALUMINUM-STAINLESS	FLOOR MATERIALS FOR SHEEP HOUSING KEYWORDS SLOTTED-FLOORS SHEEP CONFINEMENT-PENS FLOOR
100	76 4827	AMBIENT-AMMONIA	EXPERIMENTAL STUDY OF NITROGEN EXCRETION OF BASS DICENTRARCHUS LABRAX DURING GROWTH (.
400	78 4684	AMINES	PUTTING THE LID ON ODOR KEYWORDS. ODOR-CONTROL SWINE-WASTES CONFINEMENT-PENS HYDROGEN-S
200	78 4947	AMINO-ACIDS	METHANE AND BIOMASS PRODUCTION SYSTEMS FOR BEEF CATTLE MANURE KEYWORDS: LIVESTOCK-WASTE
100	77 5062	AMINO-ACID	FERMENTATION OF SWINE WASTE-CORN MIXTURES FOR ANIMAL FEED: PILOT-PLANT STUDIES KEYWORD
400	78 4671	AMMONIA	LIQUID MANURE GAS MAY POSE DANGER KEYWORDS. AIR-POLLUTION SAFETY LIQUID-WASTES HYDROGEN
400	78 4684	AMMONIA	PUTTING THE LID ON ODOR KEYWORDS. ODOR-CONTROL SWINE-WASTES CONFINEMENT-PENS HYDROGEN-S
100	77 4766	AMMONIA	THE APPLICATION OF NATURAL ZEOLITES IN ANIMAL SCIENCE AND AQUACULTURE KEYWORDS ZEOLITE
200	74 4781	AMMONIA	SWINE BUILDING AIR CONTAMINATE CONTROL WITH PIT VENTILATION KEYWORDS: SWINE-WASTES GASE
400	78 4841	AMMONIA	ATMOSPHERIC AMMONIA AFFECTS SWINE HEALTH KEYWORDS: AIR-POLLUTION CONFINEMENT-PENS SWINE
300	77 4866	AMMONIA	ATMOSPHERIC AMMONIA AFFECTS SWINE HEALTH KEYWORDS AIR-POLLUTION SWINE HOUSING AMMONIA
200	77 4867	AMMONIA	THREE YEARS OF EVALUATING A MIDWEST ANAEROBIC DAIRY LAGOON KEYWORDS DAIRY-WASTES ANAE
100	77 4934	AMMONIA	A DYNAMIC MODEL FOR SIMULATION OF ANIMAL WASTE DIGESTION KEYWORDS: MATHEMATICAL-MODELS
300	78 4952	AMMONIA	CONVERSION OF CATTLE FEEDLOT MANURE TO ETHYLENE AND AMMONIA SYNTHESIS GAS KEYWORDS: FEE
200	77 4966	AMMONIA	EFFECT OF SURFACE AERATION ON GASES EVOLVED BY A SWINE-WASTE ANAEROBIC LAGOON KEYWORDS.
300	77 5035	AMMONIA	SOURCE ASSESSMENT--BEEF CATTLE FEEDLOTS KEYWORDS CATTLE DUSTS GASES AMMONIA THIOLS AIR
100	78 5045	AMMONIA	EFFECT OF ATMOSPHERIC AMMONIA AND STRESS ON BROILER MALES KEYWORDS AIR-POLLUTION AMMON
100	78 5046	AMMONIA	ORGANOLEPTIC EVALUATION OF POULTRY EXCRETA FROM HENS CONSUMING FEED TREATED WITH AN ODO
200	78 5106	AMMONIA	WINTER AND SPRING RUNOFF FROM MANURE APPLICATION PLOTS KEYWORDS LAND-APPLICATION AGRIC
400	78 5174	AMMONIA	AMMONIA AFFECTS SWINE HEALTH KEYWORDS: AMMONIA SWINE ANIMAL-HEALTH AIR-POLLUTION
400	78 5212	AMMONIA	WARNING-MANURE GASES ARE DANGEROUS KEYWORDS. GASES HYDROGEN-SULFIDE METHANE CARBON-DIOX
100	77 5241	AMMONIA	CHARACTERIZATION OF ODORS AND OTHER VOLATILE EMISSIONS KEYWORDS. ODOR-CONTROL VOLATILE-
100	77 5244	AMMONIA	SAMPLING AND ANALYSIS OF AIR IN PIG HOUSES KEYWORDS ODOR SWINE-WASTES SPECTROPHOTOMETR
500	77 5276	AMMONIA	NOXIOUS GASES AND ODOURS KEYWORDS. ODOR-CONTROL ANIMAL-HEALTH PUBLIC-HEALTH TOXICITY HY
100	72 4673	AMMONIA-LOSSES	THE CATTLE DUNG PATCH: 2. EFFECT OF A DUNG PATCH ON THE CHEMICAL STATUS OF THE SOIL, AN
700	74 4908	AMMONIA-SYNTHESIS	CYCLONIC BURNER FOR PARTIAL COMBUSTION OF MANURE TO AMMONIA SYNTHESIS GAS KEYWORDS: OXI
400	78 5212	AMMONIUM	WARNING-MANURE GASES ARE DANGEROUS KEYWORDS: GASES HYDROGEN-SULFIDE METHANE CARBON-DIOX
200	76 4733	AMMONIUM-OXIDATION	MATHEMATICAL MODELLING OF AMMONIUM OXIDATION IN EFFLUENTS KEYWORDS: MATHEMATICAL-MODELS
100	77 5022	AMPROLIUM	RECOVERY AND REACTIONS OF AMPROLIUM FROM POULTRY MANURE ADDED TO SOIL KEYWORDS: POULTRY
400	78 4693	ANAEROBIC	LAGOONS-WHAT SIZE NEEDED FOR YOUR HERD KEYWORDS DAIRY-WASTES LAGOONS ANAEROBIC DESIGN
200	77 4765	ANAEROBIC	MICROALGAE AS A MEANS OF RECYCLING ANIMAL WASTES KEYWORDS RECYCLING WASTE-TREATMENT SW
200	77 4767	ANAEROBIC	COMMERCIAL SIZE ANAEROBIC DIGESTER PERFORMANCE WITH DAIRY MANURE KEYWORDS DAIRY-WASTES
200	77 4769	ANAEROBIC	PERFORMANCE OF A LARGE SIZE ANAEROBIC DIGESTER FOR POULTRY MANURE KEYWORDS ANAEROBIC D
200	77 4770	ANAEROBIC	DAIRY LAGOON EFFECTS ON GROUNDWATER QUALITY KEYWORDS. DAIRY-WASTES HOLDING-PONDS LAGOON
200	77 4777	ANAEROBIC	EXPERIENCES FROM OPERATING A FULL SIZE ANAEROBIC DIGESTER KEYWORDS. ANAEROBIC DIGESTERS
200	74 4781	ANAEROBIC	SWINE BUILDING AIR CONTAMINATE CONTROL WITH PIT VENTILATION KEYWORDS SWINE-WASTES GASE
700	76 4795	ANAEROBIC	ANAEROBIC DIGESTION OF SCREENED DAIRY CATTLE WASTE USING A FIBER WALL REACTOR KEYWORDS
300	77 4800	ANAEROBIC	METHANE ON THE MOVE--A DISCUSSION OF SMALL ANAEROBIC DIGESTERS KEYWORDS METHANE ANAERO
200	77 4807	ANAEROBIC	BACTERIAL RESPONSE TO SALTS IN AN ANAEROBIC DAIRY LAGOON KEYWORDS DAIRY-WASTES LAGOONS

200 77 4808 ANAEROBIC PREDICTION OF EFFECTS OF LAGOON DESIGN VARIABLES-NITROGEN CONSERVATION OR REMOVAL KEYWO
400 77 4850 ANAEROBIC MANURE DIGESTER BEING BUILT ON MINNESOTA FARM KEYWORDS: ANAEROBIC DIGESTERS RECYCLING P
400 77 4852 ANAEROBIC MANURE MAKES THE ROUNDS KEYWORDS: FEEDLOT-WASTES ANAEROBIC DIGESTERS CARBON-DIOXIDE MET
100 78 4858 ANAEROBIC HORMONAL ACTIVITY IN POULTRY EXCRETA PROCESSED FOR LIVESTOCK FEED KEYWORDS: POULTRY-WAS
100 77 4868 ANAEROBIC THE PHOSPHORUS CYCLE IN PIG SLURRY MEASURED FROM 32PO4 DISTRIBUTION RATES KEYWORDS: SWI
300 4916 ANAEROBIC METHANE PRODUCTION SYSTEMS FOR SWINE MANURE KEYWORDS: SWINE-WASTES CONFINEMENT-PENS ANA
100 77 4934 ANAEROBIC A DYNAMIC MODEL FOR SIMULATION OF ANIMAL WASTE DIGESTION KEYWORDS: MATHEMATICAL-MODELS
300 78 4944 ANAEROBIC BIOGAS PRODUCTION FROM POULTRY MANURE KEYWORDS: POULTRY-WASTES RECYCLING ANAEROBIC DIGE
200 77 4966 ANAEROBIC EFFECT OF SURFACE AERATION ON GASES EVOLVED BY A SWINE-WASTE ANAEROBIC LAGOON KEYWORDS:
400 78 4974 ANAEROBIC EUROPEAN COMPOSTING METHODS-TREATMENT AND USE OF FARM YARD MANURE AND SLURRY KEYWORDS.
400 74 4990 ANAEROBIC ENGINEERS OUTLINE WASTE DESIGN FACTORS KEYWORDS. SWINE-WASTES WASTE-MANAGEMENT DESIGN S
200 76 5005 ANAEROBIC EXPERIENCES IN BUILDING AND OPERATING A FIELD SCALE ANAEROBIC DIGESTER KEYWORDS: ANAERO
200 77 5019 ANAEROBIC HANDLING OF MANURE FROM DIFFERENT ANIMALS AND MANAGEMENT SYSTEMS KEYWORDS. WASTE-MANAGE
300 78 5055 ANAEROBIC SWINE LAGOON EFFLUENT ON A SOIL-PLANT ENVIRONMENT--AN IMPACT ASSESSMENT KEYWORDS: SWINE
300 78 5065 ANAEROBIC ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUE: POTENTIAL FOR IMPROVEMENT AND IMPLEME
400 78 5067 ANAEROBIC CATTLEMEN INFLUENCE ODOR CONTROL RULES KEYWORDS: AIR-POLLUTION SULFATES ODOR-CONTROL LE
200 76 5073 ANAEROBIC PROGRESS REPORT FROM THE FIRST YEAR OF OPERATION OF THE PENN STATE ANAEROBIC DIGESTER K
300 76 5090 ANAEROBIC BIOCONVERSION OF AGRICULTURAL WASTES FOR POLLUTION CONTROL AND ENERGY CONSERVATION KEY
500 77 5123 ANAEROBIC POLLUTION CONTROL FOR AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES ANIMAL-WASTES WASTE-TRE
300 78 5130 ANAEROBIC ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUES INTO BIOGAS KEYWORDS ANAEROBIC DIGESTE
100 78 5144 ANAEROBIC CARBON NITROGEN RATIO AND ANAERUBIC DIGESTION OF SWINE WASTE KEYWORDS: ANAEROBIC DIGEST
300 78 5152 ANAEROBIC METHANE PRODUCTION FROM LIVESTOCK WASTE KEYWORDS: RECYCLING LIVESTOCK-WASTES POULTRY-WA
100 73 5167 ANAEROBIC PRINCIPLES OF TREATMENT OF ANIMAL SLURRIES KEYWORDS: SLURRIES WASTE-TREATMENT AEROBIC A
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400	78 5220	BACTERIA	BACTERIA CONTENT SOLVES LAGOON PROBLEMS KEYWORDS LAGOONS ANAEROBIC BACTERIA SALTS HEAV
100	78 5308	BACTERIA	DISTRIBUTION OF ENTEROBACTERIACEAE IN RECYCLED MANURE BEDDING ON CALIFORNIA DAIRIES KEY
100	78 4694	BARRIERED-LANDSCAP	TREATMENT OF DAIRY CATTLE WASTES BY A BARRIERED WASTEWATER RENOVATION SYSTEM KEYWORDS:
200	73 4783	BEDDING	SWINE HOUSING AND WASTE DISPOSAL RESEARCH AND DEVELOPMENTS KEYWORDS SWINE-WASTES WAST
400	78 4979	BEDDING	NOW LOOK WHAT THEY'RE MAKING FROM MANURE KEYWORDS DAIRY-WASTES RECYCLING IRRIGATION FE
400	77 5099	BEDDING	RESEARCH DAIRY STUDIES CONFINEMENT & WASTE REUSE KEYWORDS DAIRY-WASTES SLURRIES SEPARA

400 78 5151	BEDDING		HOW CONNECTICUT DAIRYMEN HANDLE MANURE KEYWORDS: WASTE-MANAGEMENT DAIRY-INDUSTRY BEDDIN
400 78 5234	BEDDING		BEAT EXPENSIVE SYSTEMS--SUN, WIND BEST FOR HANDLING WASTE KEYWORDS: DESIGN CONFINEMENT
100 78 5308	BEDDING		DISTRIBUTION OF ENTEROBACTERIACEAE IN RECYCLED MANURE BEDDING ON CALIFORNIA DAIRIES KEY
400 78 5221	BEETLES		LESSER MEALWORM BEETLES INVADE MAINE RESIDENCES KEYWORDS: BEETLES POULTRY-WASTES INSECT
200 71 4687	BIOCHEMICAL-OXYGEN		STORAGE OF BEEF CATTLE WASTES UNDER AEROBIC AND ANAEROBIC CONDITIONS KEYWORDS: CATTLE-W
100 77 4856	BIOCHEMICAL-OXYGEN		RUNOFF FROM FEEDLOTS AND MANURE STORAGES IN SOUTHERN ONTARIO KEYWORDS: FEEDLOT-RUNOFF W
100 78 5057	BIOCHEMICAL-OXYGEN		EFFLUENTS FROM CATFISH PONDS DURING FISH HARVEST KEYWORDS: FISH-FARMING EFFLUENT-QUALIT
100 75 5200	BIOCHEMICAL-OXYGEN		AEROBIC TREATMENT OF FARM WASTES KEYWORDS: AEROBIC-TREATMENT ANIMAL-WASTES SETTLEMENT F
100 77 5249	BIOCHEMICAL-OXYGEN		TECHNIQUES AND COSTS RELATING TO ODOUR CONTROL KEYWORDS: ODOR-CONTROL SLURRIES CHEMICAL
300 78 5183	BIOCHEMICAL-PROPER		SPECIFIC COMPOSITION OF REPRESENTATIVE FEEDLOT WASTES: A CHEMICAL AND MICROBIAL PROFILE
400 77 5050	BIOCONVERSION		IT'S NO BULL! COLORADO TOWN TO CONVERT COW MANURE TO NATURAL GAS KEYWORDS CATTLE-WASTES
200 77 4763	BIODEGRADABILITY		MODELING TECHNIQUES AND COMPUTER SIMULATION OF AGRICULTURAL WASTE TREATMENT PROCESSES K
200 77 4777	BIOGAS		EXPERIENCES FROM OPERATING A FULL SIZE ANAEROBIC DIGESTER KEYWORDS: ANAEROBIC DIGESTERS
300 78 5130	BIOGAS		ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUES INTO BIOGAS KEYWORDS: ANAEROBIC DIGESTE
400 78 5224	BIOGAS		SMALL FARM ENERGY PROJECT KEYWORDS: RECYCLING BIOGAS METHANE REFEEDING ANAEROBIC DIGEST
400 78 5302	BIOGAS		BIOCONVERSION NO PANACEA AS DISPOSAL ALTERNATIVE KEYWORDS: BIOGAS METHANE ECONOMICS REC
400 78 5305	BIOGAS		COLORADO BIOGAS PLANT WINS ACEC TOP PRIZE KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING BI
300 74 4700	BIOINDICATORS		QUANTIFICATION OF POLLUTANTS IN AGRICULTURAL RUNOFF KEYWORDS: AGRICULTURAL-RUNOFF EROSI
100 77 5033	BIOLOGICAL-CONTROL		MECHANICAL ROTAVATION OF POULTRY MANURE AS A METHOD OF FLY CONTROL KEYWORDS: FLY-CONTR
300 77 5088	BIOLOGICAL-FILTRAT		FARM WASTE MANAGEMENT -- PIGS: 1. BIOLOGICAL FILTRATION TOWER -- TERRINGTON EHF REPORT
200 76 4744	BIOLOGICAL-FIXATIO		THE NITROGEN BALANCE SHEET KEYWORDS: NITROGEN-TRANSFORMATIONS ORGANIC-WASTES SOIL-CHEMI
300 74 4752	BIOLOGICAL-TREATME		PRACTICAL TREATMENT OF FEEDLOT RUNOFF KEYWORDS: FEEDLOT-RUNOFF WASTEWATER-TREATMENT BIO
200 77 4763	BIOLOGICAL-TREATME		MODELING TECHNIQUES AND COMPUTER SIMULATION OF AGRICULTURAL WASTE TREATMENT PROCESSES K
400 78 4823	BIOLOGICAL-TREATME		MORE DEAR MOTHER A LETTER FROM JIM LAWRENCE KEYWORDS: HEATING PHYSICAL-TREATMENT BIOLOG
700 74 4882	BIOLOGICAL-TREATME		A COMPUTER SIMULATION OF BIOLOGICAL TREATMENT, STORAGE, AND LAND DISPOSAL OF SWINE WAST
500 77 4902	BIOLOGICAL-TREATME		PROPERTIES OF WASTE WATERS KEYWORDS: WASTEWATER-MANAGEMENT WASTE-COMPOSITION BIOLOGICAL
100 78 4929	BIOLOGICAL-TREATME		A ROTATING FLIGHTED CYLINDER FOR BIOLOGICAL WASTE TREATMENT KEYWORDS: ROTATING-FLIGHTED
200 77 4959	BIOLOGICAL-TREATME		A GRAPHICAL ANALYSIS OF LIVESTOCK PRODUCTION AND WASTE-MANAGEMENT SYSTEMS KEYWORDS: SYS
100 77 5016	BIOLOGICAL-TREATME		PROTEIN PRODUCTION FROM FEEDLOT WASTE KEYWORDS: FEEDLOTS CATTLE-WASTES REFEEDING SUBSTR
400 77 5050	BIOLOGICAL-TREATME		IT'S NO BULL! COLORADO TOWN TO CONVERT COW MANURE TO NATURAL GAS KEYWORDS: CATTLE-WASTES
300 78 5055	BIOLOGICAL-TREATME		SWINE LAGOON EFFLUENT ON A SOIL-PLANT ENVIRONMENT--AN IMPACT ASSESSMENT KEYWORDS: SWINE
100 77 5249	BIOLOGICAL-TREATME		TECHNIQUES AND COSTS RELATING TO ODOUR CONTROL KEYWORDS: ODOR-CONTROL SLURRIES CHEMICAL
500 77 5274	BIOLOGICAL-TREATME		MANAGEMENT OF HYGIENIC PROBLEMS IN LARGE ANIMAL FEEDLOTS KEYWORDS: EPIDEMIOLOGY ANIMAL-
500 77 5284	BIOLOGICAL-TREATME		AEROBIC STABILIZATION OF PIG FEEDLOT WASTEWATERS IN CZECHOSLOVAKIA KEYWORDS: SWINE-WAST
500 77 5286	BIOLOGICAL-TREATME		NUTRIENT CONTROL APPLICABLE TO ANIMAL WASTES KEYWORDS: BIOLOGICAL-TREATMENT LAND-APPLIC
500 77 5298	BIOLOGICAL-TREATME		ANIMAL WASTE MANAGEMENT IN GREECE KEYWORDS. FEEDLOTS POULTRY-WASTES SWINE-WASTES LIQUID
500 77 5300	BIOLOGICAL-TREATME		FEEDLOT WASTE MANAGEMENT IN BULGARIA KEYWORDS. FEEDLOTS SWINE-WASTES DAIRY-INDUSTRY POL
100 77 5138	BIOMASS		AGRICULTURAL AND FORESTRY WASTES AS AN ENERGY RESOURCE KEYWORDS: AGRICULTURAL-WASTES FO
500 76 4965	BIO-CONVERSION		THE LAMAR BIO-CONVERSION PLANT DESIGN KEYWORDS BIO-CONVERSION ANAEROBIC-DIGESTION CATT
100 75 4678	BORON		NOTE ON SECONDARY AND MICRO-ELEMENT CONTENTS OF FERTILIZERS AND MANURES KEYWORDS: FERT
100 73 4801	BREEDING-HABITATS		INFLUENCE OF AVAILABLE POULTRY MANURE BREEDING HABITAT ON EMERGENCE DENSITY OF SYNANTHR
400 77 4847	BREWERY-WASTES		YOU MAY FIND PROFITS IN WASTE FEEDS KEYWORDS: FEEDS FOOD-PROCESSING-WASTES BREWERY-WAST
200 78 5106	BUFFER-STRIPS		WINTER AND SPRING RUNOFF FROM MANURE APPLICATION PLOTS KEYWORDS: LAND-APPLICATION AGRIC
700 76 4921	BULK-DENSITY		EFFECT OF BEEF CATTLE MANURE ON SOIL PROPERTIES AND CROP GROWTH KEYWORDS: CATTLE-WASTES
400 78 4669	BY-PRODUCT-RECOVER		CROP, LIVESTOCK RESIDUES. A FUTURE SOURCE OF FUEL KEYWORDS: AGRICULTURAL-WASTES FOREST
400 78 4675	BY-PRODUCT-RECOVER		MONTANA RESEARCHER SEES METHANE PRODUCTION PROFITABLE IN FUTURE KEYWORDS: AGRICULTURAL-
200 76 4732	BY-PRODUCT-RECOVER		INVENTIONS AND INNOVATIONS TO REDUCE POLLUTION OF WATER RESOURCES KEYWORDS: WATER-POLLU
300 77 4751	BY-PRODUCT-RECOVER		DISPOSAL OF FEEDLOT WASTES USING A TWO-STAGE PROCESS WITH NET ENERGY PRODUCTION KEYWORD
400 77 4817	BY-PRODUCT-RECOVER		POULTRY MANURE MAKES DEBUT AS ENERGY SOURCE KEYWORDS: POULTRY-WASTES ANIMAL-WASTES FERM
100 78 4958	BY-PRODUCT-RECOVER		HARVESTING ALGAE FROM LAGOON EFFLUENT KEYWORDS: LAGOONS WASTE-TREATMENT FLOCCULANTS BY-
500 76 4965	BY-PRODUCT-RECOVER		THE LAMAR BIO-CONVERSION PLANT DESIGN KEYWORDS: BIO-CONVERSION ANAEROBIC-DIGESTION CATT
100 77 5135	BY-PRODUCT-RECOVER		CONTINUOUS CULTIVATION OF CHLORELLA EMERSONII ON PIG MANURE KEYWORDS: SWINE-WASTES WAST
400 78 5228	BY-PRODUCT-RECOVER		AUSTRALIANS UTILIZE FARM WASTE TO PRODUCE EDIBLE PROTEIN PRODUCTS KEYWORDS: SWINE-WASTE
100 75 4678	CALCIUM		NOTE ON SECONDARY AND MICRO-ELEMENT CONTENTS OF FERTILIZERS AND MANURES KEYWORDS: FERT
500 77 4907	CALCIUM		FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS: MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP
100 78 5060	CALCIUM		DISSOLVED ORGANIC AND INORGANIC PHOSPHORUS COMPOUNDS IN PIG SLURRY. EFFECT OF DRYING K
200 76 5074	CALCIUM		POULTRY MANURE FED TO LAMBS KEYWORDS REFEEDING POULTRY-WASTES-DRIED SHEEP CRUDE-PROTEI
200 78 5156	CALCIUM		NUTRIENTS AVAILABLE IN LIVESTOCK AND POULTRY MANURE RESIDUE AS REFLECTED BY MANAGEMENT
400 78 5305	CALCIUM		COLORADO BIOGAS PLANT WINS ACEC TOP PRIZE KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING BI
400 77 4875	CALCIUM-BENTONITE		FEEDLOT ODORS KEYWORDS: ODOR-INTENSITY ODOR-MEASUREMENT ODOR-CONTROL WASTE-MANAGEMENT C
100 74 5087	CALCIUM-CARBONATE		EFFECT OF FARMYARD MANURE FYM ON THE YIELD, CHEMICAL COMPOSITION AND CALCIUM AVAILABI
200 71 4747	CANADA-LAW		POLLUTION LEGISLATION IN CANADA AFFECTING THE LIVESTOCK INDUSTRY KEYWORDS WASTE-DISPOS
100 77 5016	CANDIDA-UTILIS		PROTEIN PRODUCTION FROM FEEDLOT WASTE KEYWORDS: FEEDLOTS CATTLE-WASTES REFEEDING SUBSTR
100 78 4956	CARBARYL		RESPONSE OF COLIFORM POPULATIONS IN POULTRY WASTE DIGESTERS TO THREE INSECTICIDES KEYWO
400 77 4887	CARBON		COMPOSTING AS A MANURE MANAGEMENT SYSTEM KEYWORDS FARM-WASTES COMPOSTING ODOR-CONTROL
500 77 4901	CARBON		PROPERTIES OF AGRICULTURAL AND MUNICIPAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WASTE
100 78 5144	CARBON		CARBON NITROGEN RATIO AND ANAEROBIC DIGESTION OF SWINE WASTE KEYWORDS ANAEROBIC DIGEST
400 78 4671	CARBON-DIOXIDE		LIQUID MANURE GAS MAY POSE DANGER KEYWORDS: AIR-POLLUTION SAFETY LIQUID-WASTES HYDROGEN
200 74 4781	CARBON-DIOXIDE		SWINE BUILDING AIR CONTAMINATE CONTROL WITH PIT VENTILATION KEYWORDS SWINE-WASTES GASE
400 77 4852	CARBON-DIOXIDE		MANURE MAKES THE ROUNDS KEYWORDS: FEEDLOT-WASTES ANAEROBIC DIGESTERS CARBON-DIOXIDE MET
400 78 4972	CARBON-DIOXIDE		KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA-PART TWO KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLI
100 77 4993	CARBON-DIOXIDE		BIOGASIFICATION USING NAOH TREATED PIG FAECES KEYWORDS: LIQUID-WASTES SWINE-WASTES CHEM
400 78 5212	CARBON-DIOXIDE		WARNING-MANURE GASES ARE DANGEROUS KEYWORDS: GASES HYDROGEN-SULFIDE METHANE CARBON-DIOX
400 78 5143	CARCASS-QUALITY		FEEDING CATTLE WASTE MAKES SENSE CANADIANS KEYWORDS: REFEEDING CATTLE-WASTES PERFORMA
200 77 4807	CATIONS		BACTERIAL RESPONSE TO SALTS IN AN ANAEROBIC DAIRY LAGOON KEYWORDS DAIRY-WASTES LAGOONS
100 77 4946	CATIONS		MANURE MANAGEMENT IN AN IRRIGATED BASIN RELATIVE TO SALT LEACHATE TO GROUND WATER KEYWO
400 78 4674	CATTLE		ARIZONA RECYCLING TRIAL ENDS SUCCESSFULLY KEYWORDS: REFEEDING CURRAL-INDUSTRIES CATTLE-
100 73 4689	CATTLE		A TECHNIQUE FOR THE STUDY OF FOULING BY GRAZING CATTLE KEYWORDS: CATTLE DEFOLIATION TRE
400 78 4699	CATTLE		FEEDING FEEDLOT WASTE TO CATTLE KEYWORDS REFEEDING FEEDLOT-WASTES CATTLE HARVESTING EN
200 76 4714	CATTLE		THE INFLUENCE OF ANIMAL MANURES ON THE GRAZING BEHAVIOR AND HERBAGE INTAKE OF CATTLE KE
200 76 4730	CATTLE		A STUDY OF THE EFFECTS OF ANIMAL EFFLUENT UTILISATION FOR GRASSLAND PRODUCTION ON LEVEL
200 76 4755	CATTLE		BEEF FEEDLOTS IN THE HUMID SOUTHEAST KEYWORDS FEEDLOTS CATTLE MANAGEMENT DESIGN
200 74 4758	CATTLE		HANDLING HOUSED BEEF CATTLE FEEDLOT MANURE KEYWORDS DESIGN FEEDLOTS CATTLE WASTE-MANAG
200 77 4778	CATTLE		ANAEROBIC BEEF SLURRY AS A FERTILIZER FOR BERMUDA GRASS AND BAHIA GRASS KEYWORDS SLURR
200 77 4786	CATTLE		NONPOINT POLLUTION CONTROL FOR WINTERING RANGE CATTLE KEYWORDS CATTLE WATER-POLLUTION
400 77 4791	CATTLE		RECYCLED POULTRY WASTES OFFER MORE POTENTIAL TO COW-CALF OPERATORS KEYWORDS. REFEEDING
200 77 4794	CATTLE		ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS KEYWORDS: CATTLE MANAGEMENT PAST
100 77 4813	CATTLE		LISTERIA-ENCEFALITIS IN COWS THROUGH LITTER FROM A BROILER-FARM KEYWORDS. ANIMAL-HEALTH
300 76 4825	CATTLE		RECENT TRENDS IN ODOR NUISANCE LAWSUITS KEYWORDS ODOR NUISANCE-LAWSUITS LEGAL-ASPECTS
400 78 4830	CATTLE		INNOVATIONS ARE SEEN IN 1980S CATTLE FEEDING KEYWORDS: CATTLE FEED-ADDITIVES STIMULANTS
400 78 4834	CATTLE		BROILER LITTER IMPROVED GAIN DURING WINTER, STUDY SAYS KEYWORDS POULTRY-LITTER REFEEDI
400 78 4839	CATTLE		MISSISSIPPI APPROVES SALE OF POULTRY WASTE FEED KEYWORDS: POULTRY-WASTES-DRIED REFEEDIN
400 78 4840	CATTLE		FEEDLOT SELLS MANURE KEYWORDS WASTE-MANAGEMENT FEEDLOTS CATTLE LIQUID-WASTES FLUSHING
100 78 4842	CATTLE		COMPARATIVE VALUE OF ENSILED CATTLE WASTE FOR LAMBS AND GROWING-FINISHING CATTLE KEYWOR
400 77 4861	CATTLE		THE BEST OF FOUR BARNS KEYWORDS CONFINEMENT-PENS DESIGN CATTLE PERFORMANCE LAND-APPLIC
100 78 4878	CATTLE		ANIMAL PERFORMANCE AND MICROBIAL ADAPTATION OF RUMINANTS FED FORMALDEHYDE TREATED POULT
100 75 4883	CATTLE		DIRECT INJECTION OF SLURRY INTO SOIL TO AVOID HERBAGE REJECTION KEYWORDS CATTLE-WASTES
300 77 4913	CATTLE		WASTE AS A FEED EXTENDER KEYWORDS REFEEDING DIGESTIBILTIY CATTLE PERFORMANCE WASTE-REC
200 76 4918	CATTLE		FEEDING POULTRY WASTE TO RUMINANTS KEYWORDS REFEEDING POULTRY-WASTES-DRIED CATTLE PROT
300 77 4923	CATTLE		POULTRY EXCRETA DEHYDRATION AND UTILIZATION-SYSTEM DEVELOPMENT AND DEMONSTRATION KEYWOR

400 77 4933 CATTLE PROCESS MANURE FOR REFEEDING KEYWORDS: REFEEDING ANIMAL-WASTES ENSILING CHEMICAL-TREATM
400 78 4939 CATTLE BROILER FERTILIZED FESCUE A MIXED BLESSING KEYWORDS: POULTRY-WASTES LAND-APPLICATION PA
400 78 4941 CATTLE DRIED POULTRY MANURE BENEFITS DAIRY COWS *KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTL*
100 75 4948 CATTLE VOLUNTARY INTAKE AND NUTRITIVE VALUE OF SILAGE MADE OF POULTRY DROPPINGS AND GREEN MAIZ
400 72 4992 CATTLE IOWA BEEF TESTS SHOW PROFIT FOR FEEDING DITCH EFFLUENT KEYWORDS: OXIDATION-DITCH EFFLUE
400 78 5012 CATTLE NON-STOP FLUSHING KEEPS BARN CLEAN KEYWORDS: CONFINEMENT-PENS CATTLE FLUSHING LAGOONS I
100 76 5021 CATTLE TRICHOSTRONGYLE INFESTATIONS IN AUTUMN ON PASTURES GRAZED EXCLUSIVELY BY COWS OR BY CAL
300 77 5035 CATTLE SOURCE ASSESSMENT--BEEF CATTLE FEEDLOTS KEYWORDS: CATTLE DUSTS GASES AMMONIA THIOLS AIR
300 77 5048 CATTLE MANURE REFEEDING TO BEEF CATTLE KEYWORDS: CATTLE-WASTES REFEEDING CATTLE PERFORMANCE
100 78 5095 CATTLE FRACTIONATION OF NITROGEN ISOTOPES BY ANIMALS: A FURTHER COMPLICATION TO THE USE OF VA
100 78 5124 CATTLE BROILER GROWERS WITH CATTLE CAN MAKE BEST USE OF LITTER KEYWORDS: POULTRY-LITTER RECYCL
400 78 5147 CATTLE CATTLE MILKED WELL AND GAINED ON RATIONS CONTAINING MANURE KEYWORDS: REFEEDING CATTLE-
300 78 5176 CATTLE SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
300 78 5203 CATTLE *ENSILED CORN FORAGE AND BROILER LITTER FOR FINISHING HEIFERS KEYWORDS:* SILAGES ENSILING
400 78 5208 CATTLE RUNOFF CONTROL SYSTEMS FOR CATTLE FEEDLOTS KEYWORDS: FEEDLOT-RUNOFF CATTLE WASTE-STORAG
400 78 5217 CATTLE DPW PROVIDES NITROGEN FOR COWS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE PERFORMA
100 78 5233 CATTLE COMBINED EFFECTS OF SCREENED MANURE SOLIDS AND CRUDE FIBER IN RATIONS OF LACTATING COW
500 77 5267 CATTLE ANIMAL FEEDLOTS-DEVELOPMENT, TRENDS, PROBLEMS KEYWORDS: FEEDLOTS WASTE-MANAGEMENT CATTL
500 77 5270 CATTLE LAYOUT AND DESIGN OF ANIMAL FEEDLOT STRUCTURES AND EQUIPMENT KEYWORDS: FEEDLOTS DESIGN
100 72 4673 CATTLE-WASTES THE CATTLE DUNG PATCH: 2. EFFECT OF A DUNG PATCH ON THE CHEMICAL STATUS OF THE SOIL, AN
400 78 4674 CATTLE-WASTES ARIZONA RECYCLING TRIAL ENDS SUCCESSFULLY KEYWORDS: REFEEDING CORRAL-INDUSTRIES CATTLE-
100 70 4676 CATTLE-WASTES FOULING OF PASTURES BY DUNG KEYWORDS: CATTLE-WASTES PASTURES WASTE-COMPOSITION DEGRADAT
200 71 4687 CATTLE-WASTES STORAGE OF BEEF CATTLE WASTES UNDER AEROBIC AND ANAEROBIC CONDITIONS KEYWORDS: CATTLE-W
200 76 4710 CATTLE-WASTES EFFECT OF RATE OF APPLICATION OF ORGANIC AND INORGANIC NITROGEN ON CROP PRODUCTION AND
200 76 4711 CATTLE-WASTES EFFICIENT RECYCLING OF NUTRIENTS KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES SH
200 76 4714 CATTLE-WASTES THE INFLUENCE OF ANIMAL MANURES ON THE GRAZING BEHAVIOR AND HERBAGE INTAKE OF CATTLE KE
200 76 4718 CATTLE-WASTES THE EFFECT OF SOIL TYPE AND SEASON OF APPLICATION ON INFILTRATION AND RUNOFF OF NUTRIEN
200 76 4728 CATTLE-WASTES AN APPROACH TO THE PROBLEM OF SLURRY AS A POSSIBLE SOURCE OF PASTURE CONTAMINATION WITH
200 76 4736 CATTLE-WASTES WASTE MANAGEMENTS SYSTEMS IN ANIMAL HUSBANDRY-APPLICATION OF FARM MODEL STUDIES AND SYS
200 76 4743 CATTLE-WASTES MICROBIOLOGICAL ANALYSIS OF ANIMAL MANURES WITH PARTICULAR REFERENCE TO THE ISOLATION
300 76 4754 CATTLE-WASTES MICROBIOLOGY AND CHEMISTRY STUDIES OF WATER QUALITY FACTORS IN A WATERSHED USED FOR MUN
200 77 4772 CATTLE-WASTES CONCEPTUAL MODELLING OF NONPOINT SOURCE POLLUTION FROM LAND AREAS RECEIVING ANIMAL WAST
200 77 4773 CATTLE-WASTES SOME MECHANICAL ASPECTS OF ANAEROBIC DIGESTION OF BEEF MANURE KEYWORDS: ANAEROBIC-DIGES
200 77 4778 CATTLE-WASTES ANAEROBIC BEEF SLURRY AS A FERTILIZER FOR BERMUDA GRASS AND BAHIA GRASS KEYWORDS: SLURR
200 75 4784 CATTLE-WASTES UTILIZATION OF METHANE FOR FARM PRODUCTION ENERGY-DISCUSSION KEYWORDS: CATTLE-WASTES DA
700 76 4805 CATTLE-WASTES DESIGN AND DEVELOPMENT OF A SEPARATOR FOR BOVINE MANURE KEYWORDS: SEPARATION-TECHNIQUES
700 75 4812 CATTLE-WASTES *UTILIZATION AND DISPOSAL OF RESIDUE FROM THE PARTIAL OXIDATION OF CATTLE MANURE KEYWORD*
300 72 4821 CATTLE-WASTES ENVIRONMENTAL PROTECTION AGENCY VS ROBERT R DETERS-FABIAN J DETERS-MARCELLUS J DETERS
100 78 4842 CATTLE-WASTES COMPARATIVE VALUE OF ENSILED CATTLE WASTE FOR LAMBS AND GROWING-FINISHING CATTLE KEYWOR
100 72 4844 CATTLE-WASTES UTILIZATION OF COW-MANURE, HATCHERY-WASTE AND PARTLY DRIED MOLASSES IN POULTRY FEEDS K
400 77 4847 CATTLE-WASTES YOU MAY FIND PROFITS IN WASTE FEEDS KEYWORDS: FEEDS FOOD-PROCESSING-WASTES BREWERY-WAST
400 78 4849 CATTLE-WASTES STATE-BASED PLANT TURNING CATTLE MANURE INTO METHANE GAS KEYWORDS: CATTLE-WASTES RECYCL
100 77 4860 CATTLE-WASTES EFFECTS OF SOIL, COVER CROP, AND NUTRIENT SOURCE ON MOVEMENT OF SOIL, WATER, AND NITROG
100 70 4874 CATTLE-WASTES CHANGES IN BIOCHEMICAL CONSTITUENT OF SOME ORGANIC WASTE MATERIALS UNDER ANAEROBIC METH
100 75 4883 CATTLE-WASTES DIRECT INJECTION OF SLURRY INTO SOIL TO AVOID HERBAGE REJECTION KEYWORDS: CATTLE-WASTES
700 77 4888 CATTLE-WASTES COMPOSITION AND DIGESTIBILITY OF UNTREATED AND SODIUM HYDROXIDE TREATED FECAL WASTE FRO
700 74 4898 CATTLE-WASTES CHARACTERISTICS OF RUNOFF FROM DISPOSAL OF CATTLE FEEDLOT WASTES ON LAND KEYWORDS: CATT
700 74 4908 CATTLE-WASTES CYCLONIC BURNER FOR PARTIAL COMBUSTION OF MANURE TO AMMONIA SYNTHESIS GAS KEYWORDS: OXI
100 78 4911 CATTLE-WASTES EFFECTS OF RUMEN CONTENTS OR FRACTIONS THEREOF ON PERFORMANCE OF BROILERS KEYWORDS: RUM
100 77 4914 CATTLE-WASTES EFFECTS OF RATION ROUGHAGE CONTENT ON VISCOSITY AND THEORETICAL HEAD LOSSES IN PIPE FLO
600 4917 CATTLE-WASTES THE CALORIFIC PROJECT: I. BACKGROUND AND DESIGN CRITERIA KEYWORDS RECYCLING CATTLE-WA
700 76 4921 CATTLE-WASTES EFFECT OF BEEF CATTLE MANURE ON SOIL PROPERTIES AND CROP GROWTH KEYWORDS: CATTLE-WASTES
700 73 4922 CATTLE-WASTES SOIL AS AN ANIMAL WASTES DISPOSAL SYSTEM KEYWORDS: CATTLE-WASTES DAIRY-WASTES LAND-APPL
100 77 4945 CATTLE-WASTES EFFECTS ON SOLID AND LIQUID BEEF MANURE AND LIQUID HOG MANURE ON SOIL CHARACTERISTICS A
100 77 4949 CATTLE-WASTES RESIDUE CONTENT OF BEEF FEEDLOT MANURE AFTER FEEDING DIETHYLSTILBESTROL, CHLORTETRACYCL
300 78 4951 CATTLE-WASTES ENVIRONMENTAL IMPACT RESULTING FROM UNCONFINED ANIMAL PRODUCTION KEYWORDS: ENVIRONMENTA
300 78 4952 CATTLE-WASTES CONVERSION OF CATTLE FEEDLOT MANURE TO ETHYLENE AND AMMONIA SYNTHESIS GAS KEYWORDS: FEE
100 77 4953 CATTLE-WASTES SELECTIVE MORTALITY OF INSECTS IN MANURE FROM CATTLE FED RABON AND DIMILIN KEYWORDS: IN
100 78 4954 CATTLE-WASTES CHEMICAL COMPOSITION OF FEEDLOT MANURE KEYWORDS: CATTLE-WASTES FEEDLOTS WASTE-COMPOSITI
100 78 4955 CATTLE-WASTES NITRIFICATION AND DENITRIFICATION IN CATTLE MANURE-AMENDED SOIL KEYWORDS: LAND-APPLICA
200 77 4961 CATTLE-WASTES VEGETATIVE FILTER TREATMENT OF FEEDLOT RUNOFF KEYWORDS: VEGETATIVE-FILTER-SYSTEMS FEEDL
500 76 4965 CATTLE-WASTES THE LAMAR BIO-CONVERSION PLANT DESIGN KEYWORDS: BIO-CONVERSION ANAEROBIC-DIGESTION CATT
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400	78 4828	CONFINEMENT-PENS	WHICH WASTE SYSTEM IS BEST KEYWORDS' WASTE-MANAGEMENT DESIGN CONFINEMENT-PENS LIQUID-WA
400	77 4831	CONFINEMENT-PENS	FLUSH GUTTER SYSTEMS-CUT COSTS, IMPROVE ANIMAL ENVIRONMENT KEYWORDS: CONFINEMENT-PENS
400	78 4832	CONFINEMENT-PENS	GRAVITY DRAIN SYSTEMS FOR FARROWING AND NURSERY FACILITIES KEYWORDS: GRAVITY-DRAIN-SYS
400	78 4841	CONFINEMENT-PENS	ATMOSPHERIC AMMONIA AFFECTS SWINE HEALTH KEYWORDS: AIR-POLLUTION CONFINEMENT-PENS SWINE
400	78 4846	CONFINEMENT-PENS	FLUSH SYSTEM CLEANS SWINE PENS KEYWORDS: SWINE-WASTES CONFINEMENT-PENS FLUSHING DESIGN
400	77 4861	CONFINEMENT-PENS	THE BEST OF FOUR BARNS KEYWORDS: CONFINEMENT-PENS DESIGN CATTLE PERFORMANCE LAND-APPLIC
700	74 4882	CONFINEMENT-PENS	A COMPUTER SIMULATION OF BIOLOGICAL TREATMENT, STORAGE, AND LAND DISPOSAL OF SWINE WAST
300	4916	CONFINEMENT-PENS	METHANE PRODUCTION SYSTEMS FOR SWINE MANURE KEYWORDS: SWINE-WASTES CONFINEMENT-PENS ANA
500	77 4969	CONFINEMENT-PENS	FLOOR MATERIALS FOR SHEEP HOUSING KEYWORDS: SLOTTED-FLOORS SHEEP CONFINEMENT-PENS FLOOR
400	78 4977	CONFINEMENT-PENS	QUESTIONS AND ANSWERS ABOUT MANURE FLUSHING SYSTEMS FOR SWINE BUILDINGS KEYWORDS: SWINE
400	78 4978	CONFINEMENT-PENS	GEORGIA FARMERS CUT COSTS WITH CORNLAGE KEYWORDS: SWINE-WASTES CONFINEMENT-PENS SLURRIE
100	77 4987	CONFINEMENT-PENS	QUANTITATION OF INDOLE AND SKATULE IN A HOUSED SWINE UNIT KEYWORDS: SWINE-WASTES CONFIN
100	77 4991	CONFINEMENT-PENS	EFFECT OF SLATTED AND DEEP LITTER FLOORS ON THE PRODUCTIVE PERFORMANCE AND ENERGY UTIL
400	78 5011	CONFINEMENT-PENS	TOXIC GASES KILL WORKER KEYWORDS: AIR-POLLUTION PUBLIC-HEALTH CONFINEMENT-PENS CATTLE-W
400	78 5012	CONFINEMENT-PENS	NON-STOP FLUSHING KEEPS BARN CLEAN KEYWORDS: CONFINEMENT-PENS CATTLE FLUSHING LAGOONS I
200	77 5019	CONFINEMENT-PENS	HANDLING OF MANURE FROM DIFFERENT ANIMALS AND MANAGEMENT SYSTEMS KEYWORDS: WASTE-MANAGE
400	78 5059	CONFINEMENT-PENS	WELL BUILT MOUNDS MANAGE THEMSELVES KEYWORDS: FEEDLOTS MOUNDS CONFINEMENT-PENS DESIGN S
300	78 5131	CONFINEMENT-PENS	A MANUAL ON EVALUATION AND ECONOMIC ANALYSIS OF LIVESTOCK WASTE MANAGEMENT SYSTEMS KE
300	73 4826	CONSTRUCTION	METHODS FOR IDENTIFYING AND EVALUATING THE NATURE AND EXTENT OF NON-POINT SOURCES OF PO
300	77 4938	CONSTRUCTION	DESIGN AND OPERATION OF LIVESTOCK WASTE LAGOONS KEYWORDS: LAGOONS LIVESTOCK-WASTES DESI
500	77 5285	CONTINUOUS-FLOW	COMPOSTING OF FEEDLOT WASTES KEYWORDS: COMPOSTING FEEDLOTS LIVESTOCK-WASTES WINDROWS CO
300	76 4870	CONTROL	APPLICATION OF SEWAGE TO CROPLAND--APPRAISAL OF POTENTIAL HAZARDS OF THE HEAVY METALS T
100	78 5145	CONVECTIVE-HEAT-TR	CONVECTIVE HEAT TRANSFER COEFFICIENT FOR POULTRY EXCRETA KEYWORDS: POULTRY-WASTES DEHYD
100	75 4678	COPPER	NOTE ON SECONDARY AND MICRO-ELEMENT CONTENTS OF FERTILIZERS AND MANURES KEYWORDS: FERT
200	76 4711	COPPER	EFFICIENT RECYCLING OF NUTRIENTS KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES SH
200	76 4723	COPPER	ASPECTS OF CU ACCUMULATION IN SOIL FOLLOWING HOG MANURE APPLICATION-SOME PRELIMINARY RE
400	78 4834	COPPER	BROILER LITTER IMPROVED GAIN DURING WINTER, STUDY SAYS KEYWORDS POULTRY-LITTER REFEEDI
400	74 4990	COPPER	ENGINEERS OUTLINE WASTE DESIGN FACTORS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT DESIGN S
300	78 5055	COPPER	SWINE LAGOON EFFLUENT ON A SOIL-PLANT ENVIRONMENT--AN IMPACT ASSESSMENT KEYWORDS: SWINE
100	78 5060	COPPER	DISSOLVED ORGANIC AND INORGANIC PHOSPHORUS COMPOUNDS IN PIG SLURRY: EFFECT OF DRYING K
200	78 5156	COPPER	NUTRIENTS AVAILABLE IN LIVESTOCK AND POULTRY MANURE RESIDUE AS REFLECTED BY MANAGEMENT
300	78 5079	COPPER-TOXICITY	FEEDING ANIMAL WASTE KEYWORDS: REFEEDING SAFETY ANIMAL-HEALTH PUBLIC-HEALTH COPPER-TOXI
400	78 4978	CORNLAGE	GEORGIA FARMERS CUT COSTS WITH CORNLAGE KEYWORDS: SWINE-WASTES CONFINEMENT-PENS SLURRIE
500	77 5288	CORRAL	UTILIZATION OF LIVESTOCK WASTES AS FEED AND OTHER DIETARY PRODUCTS KEYWORDS: REFEEDING
400	78 4674	CORRAL-INDUSTRIES	ARIZONA RECYCLING TRIAL ENDS SUCCESSFULLY KEYWORDS: REFEEDING CORRAL-INDUSTRIES CATTLE-
100	77 5247	COSTS	FRENCH EXPERIMENT IN PIG SLURRY DEODORIZATION KEYWORDS: ODOR-CONTROL SWINE-WASTES SLURR
100	77 5251	COSTS	ODOUR REMOVAL FROM THE EXHAUST AIR OF ANIMAL SHELTERS KEYWORDS: ODOR-CONTROL CONFINEMEN
400	78 5092	COST-SHARING	FEDERAL FUNDS AVAILABLE TO SOLVE WATER POLLUTION KEYWORDS: WATER-POLLUTION LEGAL-ASPECT
400	78 4849	CRAP, INC.	STATE-BASED PLANT TURNING CATTLE MANURE INTO METHANE GAS KEYWORDS: CATTLE-WASTES RECYCL
300	78 5176	CROPLAND	SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
100	77 5179	CROPLAND	SLUDGE DISPOSAL STRATEGY: PROCESSES AND COSTS KEYWORDS: SEWAGE SLUDGE LAND-APPLICATION
300	78 5188	CROPLAND	ESTIMATING U S LIVESTOCK AND POULTRY MANURE AND NUTRIENT PRODUCTION KEYWORDS: LIVESTOC
200	76 4742	CROP-ANALYSIS	HARMONISATION OF METHODS FOR SAMPLING AND FOR CHEMICAL AND PHYSICAL ANALYSIS KEYWORDS:
300	77 4926	CROP-PRODUCTION	ENVIRONMENTAL IMPLICATIONS OF TRENDS IN AGRICULTURE AND SILVICULTURE VOLUME I-TREND IDE
100	77 4753	CROP-RESIDUES	A REVIEW OF MULCHES TO CONTROL WIND EROSION KEYWORDS WIND-EROSION MULCHES CROP-RESIDUE
300	76 4859	CROP-RESIDUES	ENERGY RELATIONSHIPS FOR A 32-ACRE IOWA FARM--AN ATTEMPT TO INCREASE PRODUCTION OF GRAI
500	77 5026	CROP-RESIDUES	BIOLOGICAL RECLAMATION OF SOLID WASTES KEYWORDS: RECYCLING SOLID-WASTES MUNICIPAL-WASTE
100	75 4678	CROP-RESPONSE	NOTE ON SECONDARY AND MICRO-ELEMENT CONTENTS OF FERTILIZERS AND MANURES KEYWORDS: FERT
100	75 4679	CROP-RESPONSE	NOTE ON DETOXICATION OF LINDANE BY FARMYARD MANURE KEYWORDS: INSECTICIDES LINDANE SOIL-
200	76 4705	CROP-RESPONSE	UTILIZATION OF MANURE BY LAND SPREADING KEYWORDS: LIVESTOCK-WASTES EFFLUENTS LAND-APPLI
200	76 4708	CROP-RESPONSE	CONSEQUENCES OF SEMI-LIQUID PIG MANURE SPREADING KEYWORDS: SLURRIES SWINE-WASTES LAND-A
200	76 4709	CROP-RESPONSE	SLURRY UTILISATION ON THE DAIRY FARM KEYWORDS: DAIRY-WASTES SLURRIES LAND-APPLICATION G
200	76 4710	CROP-RESPONSE	EFFECT OF RATE OF APPLICATION OF ORGANIC AND INORGANIC NITROGEN ON CROP PRODUCTION AND
200	76 4712	CROP-RESPONSE	THE AGRONOMIC UTILISATION OF PIG SLURRY-EFFECT ON FORAGE CROPS AND ON SOIL FERTILITY KE
200	76 4713	CROP-RESPONSE	THE YIELD EFFICIENT NITROGEN PORTION IN TREATED AND UNTREATED MANURE KEYWORDS: LIVESTOC
200	76 4715	CROP-RESPONSE	ANIMAL ORGANIC MANURES IN DUTCH FORESTRY-APPLICATION AND RESTRICTIONS KEYWORDS: LIQUID-
200	76 4718	CROP-RESPONSE	THE EFFECT OF SOIL TYPE AND SEASON OF APPLICATION ON INFILTRATION AND RUNOFF OF NUTRIEN
200	76 4722	CROP-RESPONSE	HEAVY APPLICATION OF LIQUID MANURE ON SOIL-EFFECT ON SOIL SALINITY KEYWORDS: LIQUID-WAS
200	76 4723	CROP-RESPONSE	ASPECTS OF CU ACCUMULATION IN SOIL FOLLOWING HOG MANURE APPLICATION-SOME PRELIMINARY RE
200	77 4764	CROP-RESPONSE	LONG-TERM FESCUE AND COASTAL BERMUDAGRASS CROP RESPONSE TO SWINE LAGOON EFFLUENT KEYWOR
200	77 4778	CROP-RESPONSE	ANAEROBIC BEEF SLURRY AS A FERTILIZER FOR BERMUDA GRASS AND BAHIA GRASS KEYWORDS: SLURR
200	74 4780	CROP-RESPONSE	SOIL AND CROP CONSIDERATIONS FOR RECYCLING WASTES KEYWORDS LAND-APPLICATION SOIL-PROPE

400 77 4797 CROP-RESPONSE THEY TRAP EVERY DROP OF RUNOFF KEYWORDS: FEEDLOT-RUNOFF WASTE-STORAGE-PONDS LAND-APPLIC
400 77 4798 CROP-RESPONSE TOP YIELDS FROM ANIMAL WASTE KEYWORDS: DAIRY-WASTES SEWAGE-SLUDGE FERTILIZERS LAND-APPL
100 73 4819 CROP-RESPONSE EFFECT OF FARMYARD MANURE ON THE YIELD AND CHEMICAL COMPOSITION OF THE WHEAT CROP KEYWO
400 77 4838 CROP-RESPONSE FEEDLOT MANURE, SUPERPHOSPHATE FERTILIZING STUDIED KEYWORDS: LAND-APPLICATION FERTILIZE
300 76 4870 CROP-RESPONSE APPLICATION OF SEWAGE TO CROPLAND--APPRAISAL OF POTENTIAL HAZARDS OF THE HEAVY METALS T
100 77 4881 CROP-RESPONSE WINTER-APPLIED MANURE--EFFECTS ON ANNUAL RUNOFF, EROSION, AND NUTRIENT MOVEMENT KEYWORD
400 77 4887 CROP-RESPONSE COMPOSTING AS A MANURE MANAGEMENT SYSTEM KEYWORDS: FARM-WASTES COMPOSTING ODOR-CONTROL
500 77 4907 CROP-RESPONSE FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS: MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP
700 76 4921 CROP-RESPONSE EFFECT OF BEEF CATTLE MANURE ON SOIL PROPERTIES AND CROP GROWTH KEYWORDS: CATTLE-WASTES
700 73 4922 CROP-RESPONSE SOIL AS AN ANIMAL WASTES DISPOSAL SYSTEM KEYWORDS: CATTLE-WASTES DAIRY-WASTES LAND-APPL
700 76 4942 CROP-RESPONSE THE EFFECT OF APPLICATION OF POULTRY MANURE WHICH WAS SUBJECTED TO DIFFERENT WASTE MANA
100 77 4945 CROP-RESPONSE EFFECTS ON SOLID AND LIQUID BEEF MANURE AND LIQUID HOG MANURE ON SOIL CHARACTERISTICS A
100 77 4950 CROP-RESPONSE MANURE EFFECTS ON WATER INTAKE AND RUNOFF QUALITY FROM IRRIGATED GRAIN SORGHUM PLOTS KE
400 78 4967 CROP-RESPONSE FEEDLOT MANURE CAN BOOST IRRIGATED ALFALFA YIELDS KEYWORDS: FEEDLOT-WASTES LAND-APPLICA
400 78 4978 CROP-RESPONSE GEORGIA FARMERS CUT COSTS WITH CORNLAGE KEYWORDS: SWINE-WASTES CONFINEMENT-PENS SLURRIE
400 74 4990 CROP-RESPONSE ENGINEERS OUTLINE WASTE DESIGN FACTORS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT DESIGN S
100 76 5018 CROP-RESPONSE COW SLURRY MANAGEMENT WITH PARTICULAR REFERENCE TO BRIDGETS KEYWORDS: CATTLE-WASTES SLU
300 78 5023 CROP-RESPONSE ULTIMATE DISPOSAL OF BEEF FEEDLOT WASTES ONTO LAND KEYWORDS: FEEDLOTS CATTLE-WASTES LAN
100 74 5027 CROP-RESPONSE EFFECT OF QUALITY OF IRRIGATION WATER, LEACHING LEVELS AND FARMYARD MANURE ON THE PERF
100 76 5029 CROP-RESPONSE EFFECT OF ORGANIC AMENDMENTS ON THE NODULATION AND NITROGEN FIXATION BY SOYBEAN KEYWORD
100 76 5036 CROP-RESPONSE ASKOV 1984--FERTILIZERS AND MANURE ON SANDY AND LOAMY SOILS KEYWORDS: ANIMAL-WASTES FER
300 78 5055 CROP-RESPONSE SWINE LAGOON EFFLUENT ON A SOIL-PLANT ENVIRONMENT--AN IMPACT ASSESSMENT KEYWORDS: SWINE
200 76 5070 CROP-RESPONSE USING POULTRY MANURE FOR VEGETABLES AND HYDROSEEDING KEYWORDS: POULTRY-WASTES CHEMICAL-
100 76 5080 CROP-RESPONSE EFFECT OF FERTILIZERS AND MANURE ON THE ROOT CATION EXCHANGE CAPACITY OF SOME RICE AND
100 75 5081 CROP-RESPONSE EFFECT OF LONG TERM APPLICATION OF P, K AND FARMYARD MANURE ON THE ZINC CONTENT OF SOIL
100 76 5082 CROP-RESPONSE EFFECT OF CONTINUOUS USE OF CHEMICAL FERTILISERS AND MANURES ON SOIL PHYSICAL AND CHEMI
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100 74 5087 CROP-RESPONSE EFFECT OF FARMYARD MANURE (FYM) ON THE YIELD, CHEMICAL COMPOSITION AND CALCIUM AVAILABI
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300 77 5129 CROP-RESPONSE RECYCLING AGRICULTURE RUNOFF KEYWORDS: MODEL-STUDIES AGRICULTURAL-RUNOFF WASTE-STURAGE
400 78 5132 CROP-RESPONSE GRASS A BY-PRODUCT OF POULTRY KEYWORDS: POULTRY-LITTER LAND-DISPOSAL FERTILIZERS FESCUE
100 77 5137 CROP-RESPONSE EFFECT OF SULPHUR AND FYM APPLICATION ON THE EFFICIENCY OF ROCK PHOSPHATE FOR WHEAT KE
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100 78 5173 CROP-RESPONSE CROP RESPONSE AND QUALITY OF SOIL LEACHATE AS AFFECTED BY LAND APPLICATION OF BEEF CATT
700 77 5182 CROP-RESPONSE SOME PHYSICAL, CHEMICAL, AND BIOLOGICAL EFFECTS OF HEAVY POULTRY MANURE APPLICATIONS ON
400 78 5187 CROP-RESPONSE USES OF ORGANIC RESIDUES AT NEBRASKA EXPERIMENT STATIONS KEYWORDS: ORGANIC-WASTES LAND-
700 77 5198 CROP-RESPONSE RECOVERY OF 15-N LABELED FERTILIZER AND PLANT GROWTH IN MANURE AND SLUDGE-AMENDED SOIL
400 78 5207 CROP-RESPONSE YOU CAN PUT LIQUID MANURE ON YOUR ALFALFA KEYWORDS: LIQUID-WASTES DAIRY-WASTES LAND-APP
100 76 5232 CROP-RESPONSE EFFECT OF AMENDMENTS TO SAND TO INCREASE THE MOISTURE LEVEL FOR THE GROWTH OF BAJRA PE
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100 78 5233 CRUDE-FIBER COMBINED EFFECTS OF SCREENED MANURE SOLIDS AND CRUDE FIBER IN RATIONS OF LACTATING COW
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400 78 4682 DAIRY-CATTLE POULTRY WASTES PROVIDE NITROGEN SOURCE KEYWORDS: REFEEDING POULTRY-WASTES DAIRY-CATTLE
200 76 4785 DAIRY-INDUSTRY VENTILATION OF TIE-STALL DAIRY BARNS IN ONTARIO KEYWORDS: VENTILATION DAIRY-INDUSTRY PO
700 76 4804 DAIRY-INDUSTRY DIFFUSE AGRICULTURAL POLLUTION--THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS KEYWORDS:
200 77 4872 DAIRY-INDUSTRY METHOD FOR INEXPENSIVE DISTRIBUTION OF LIQUID WASTE FROM DAIRY AND FEEDLOT KEYWORDS: LI
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400 78 4941 DAIRY-INDUSTRY DRIED POULTRY MANURE BENEFITS DAIRY COWS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTL
300 78 5142 DAIRY-INDUSTRY THE FEASIBILITY OF METHANE PRODUCTION FROM DAIRY ANIMAL WASTES: THE FARMER'S PERSPECTI
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100 77 4691 DAIRY-WASTES INJECTION OF DAIRY WASTE KEYWORDS: DAIRY-WASTES LAND-APPLICATION SOIL-INJECTION PASTURE
400 78 4693 DAIRY-WASTES LAGOONS-WHAT SIZE NEEDED FOR YOUR HERD KEYWORDS: DAIRY-WASTES LAGOONS ANAEROBIC DESIGN
100 78 4694 DAIRY-WASTES TREATMENT OF DAIRY CATTLE WASTES BY A BARRIERED WASTEWATER RENOVATION SYSTEM KEYWORDS:
200 76 4709 DAIRY-WASTES SLURRY UTILISATION ON THE DAIRY FARM KEYWORDS: DAIRY-WASTES SLURRIES LAND-APPLICATION G
300 78 4745 DAIRY-WASTES COSTS OF SELECTED WASTE-HANDLING SYSTEMS FOR DAIRY FARMS KEYWORDS: DAIRY-WASTES LEGAL-A
200 74 4759 DAIRY-WASTES MECHANIZED COMPOSTING SYSTEM EVALUATION KEYWORDS: COMPOSTING MICROORGANISMS DAIRY-WASTE
200 77 4767 DAIRY-WASTES COMMERCIAL SIZE ANAEROBIC DIGESTER PERFORMANCE WITH DAIRY MANURE KEYWORDS: DAIRY-WASTES
200 77 4770 DAIRY-WASTES DAIRY LAGOON EFFECTS ON GROUNDWATER QUALITY KEYWORDS: DAIRY-WASTES HOLDING-PONDS LAGOON
200 77 4779 DAIRY-WASTES FIBER WALL REACTOR DIGESTION OF DAIRY CATTLE MANURE KEYWORDS: DAIRY-WASTES ANAEROBIC-TR
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200 75 4784 DAIRY-WASTES UTILIZATION OF METHANE FOR FARM PRODUCTION ENERGY-DISCUSSION KEYWORDS: CATTLE-WASTES DA
400 77 4798 DAIRY-WASTES TOP YIELDS FROM ANIMAL WASTE KEYWORDS: DAIRY-WASTES SEWAGE-SLUDGE FERTILIZERS LAND-APPL
200 77 4806 DAIRY-WASTES A POLLUTANT AND NUTRIENT BUDGET FOR A SURFACE-AERATED DAIRY STORAGE LAGOON KEYWORDS: DA
200 77 4807 DAIRY-WASTES BACTERIAL RESPONSE TO SALTS IN AN ANAEROBIC DAIRY LAGOON KEYWORDS: DAIRY-WASTES LAGOONS
300 72 4821 DAIRY-WASTES ENVIRONMENTAL PROTECTION AGENCY VS ROBERT R DETERS-FABIAN J DETERS-MARCELLUS J DETERS
400 78 4848 DAIRY-WASTES LIQUID COW MANURE GOES TO MARKET KEYWORDS: DAIRY-WASTES LIQUID-WASTES WASTE-TREATMENT D
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400 78 4899 DAIRY-WASTES LOW-LABOR FLUSH SYSTEM CLEANS MILKING AREAS IN MINUTES KEYWORDS: LIQUID-WASTES DAIRY-WA
300 77 4915 DAIRY-WASTES CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE KEYWORDS: LIQUID-WASTES DAIRY-WA
700 73 4922 DAIRY-WASTES SOIL AS AN ANIMAL WASTES DISPOSAL SYSTEM KEYWORDS: CATTLE-WASTES DAIRY-WASTES LAND-APPL
100 77 4946 DAIRY-WASTES MANURE MANAGEMENT IN AN IRRIGATED BASIN RELATIVE TO SALT LEACHATE TO GROUND WATER KEYWO
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200 77 4961 DAIRY-WASTES VEGETATIVE FILTER TREATMENT OF FEEDLOT RUNOFF KEYWORDS: VEGETATIVE-FILTER-SYSTEMS FEEDL
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300 77 5049 DAIRY-WASTES REFEEDING WASTES TO DAIRY CATTLE KEYWORDS: DAIRY-WASTES SEPARATION TECHNIQUES DEHYDRATI
300 78 5063 DAIRY-WASTES ALTERNATE METHODS OF MANURE HANDLING KEYWORDS: WASTE-STORAGE DAIRY-WASTES FEEDLOT-RUNOF
100 73 5085 DAIRY-WASTES THE EFFECT OF APPLYING LARGE QUANTITIES OF SLURRY TO GRASSLAND KEYWORDS: LAND-APPLICATI
300 76 5090 DAIRY-WASTES BIOCONVERSION OF AGRICULTURAL WASTES FOR POLLUTION CONTROL AND ENERGY CONSERVATION KEY
400 77 5099 DAIRY-WASTES RESEARCH DAIRY STUDIES CONFINEMENT & WASTE REUSE KEYWORDS: DAIRY-WASTES SLURRIES SEPARA
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400 77 5141 DAIRY-WASTES THE DESIGN AND OPERATION OF SPRAY DISPOSAL SYSTEMS FOR DAIRY FARMS IN NEW ZEALAND KEYWO
200 78 5154 DAIRY-WASTES MANAGEMENT OF DAIRY MANURE HANDLING SYSTEMS KEYWORDS: DAIRY-WASTES WASTE-MANAGEMENT WAS
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100 73 5184 DAIRY-WASTES EQUIPMENT AND METHODS FOR THE SOLID LIQUID SEPARATION OF SLURRIES KEYWORDS: SLURRIES SE
400 77 5193 DAIRY-WASTES KEEPING DAIRY WASTE UNDER CONTROL KEYWORDS: DAIRY-WASTES WASTE-DISPOSAL WATER-POLLUTION
400 78 5207 DAIRY-WASTES YOU CAN PUT LIQUID MANURE ON YOUR ALFALFA KEYWORDS: LIQUID-WASTES DAIRY-WASTES LAND-APP
400 78 5209 DAIRY-WASTES SALT BUILDUP CAUSES LAGOON FAILURE KEYWORDS: LAGOONS DAIRY-WASTES ANAEROBIC ELECTRICAL-
300 78 5231 DAIRY-WASTES WATER QUALITY RENOVATION OF ANIMAL WASTE LAGOONS UTILIZING AQUATIC PLANTS KEYWORDS LA

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100	78 5308	DAIRY-WASTES	DISTRIBUTION OF ENTEROBACTERIACEAE IN RECYCLED MANURE BEDDING ON CALIFORNIA DAIRIES KEY
300	74 4702	DEAD-ANIMAL-DISPOS	ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS ALLEN BECKER, D B A BECKER S CHICKEN-
400	78 4829	DEBRIS-BASINS	RUNOFF CONTROL KEYWORDS: FEEDLOT-RUNOFF RUNOFF-CONTROL DESIGN DEBRIS-BASINS LOCATION HO
400	78 4996	DEBRIS-BASINS	STUDY CONTROL OPTIONS FOR FEEDLOT RUNOFF SYSTEMS KEYWORDS: FEEDLOT-RUNOFF DEBRIS-BASINS
400	78 5208	DEBRIS-BASINS	RUNOFF CONTROL SYSTEMS FOR CATTLE FEEDLOTS KEYWORDS: FEEDLOT-RUNOFF CATTLE WASTE-STORAG
100	70 4874	DECOMPOSITION	CHANGES IN BIOCHEMICAL CONSTITUENT OF SOME ORGANIC WASTE MATERIALS UNDER ANAEROBIC METH
700	73 4922	DECOMPOSITION	SOIL AS AN ANIMAL WASTES DISPOSAL SYSTEM KEYWORDS CATTLE-WASTES DAIRY-WASTES LAND-APPL
200	76 4729	DECONTAMINATION	POSSIBILITIES OF POULTRY DROPPINGS DECONTAMINATION AS RELATED TO FARM LEVEL MANAGEMENT
300	77 5205	DEEP-PITS	RESEARCH IN ANIMAL WASTE MANAGEMENT KEYWORDS: SWINE-WASTES DIGESTERS METHANE AGITATION
300	78 5218	DEEP-PITS	DOMESTIC FLY PROBLEMS IN DEEP PIT POULTRY HOUSES KEYWORDS: FLY-CONTROL DEEP-PITS POULTR
200	76 5000	DEEP-PIT-SYSTEMS	IN-HOUSE MANURE DRYING IN THE DEEP-PIT HIGH-RISE SYSTEM KEYWORDS: DEHYDRATION DEEP-PI
100	78 5124	DEEP-STACKING	BROILER GROWERS WITH CATTLE CAN MAKE BEST USE OF LITTER KEYWORDS: POULTRY-LITTER RECYCL
100	73 4689	DEFOLIATION	A TECHNIQUE FOR THE STUDY OF FOULING BY GRAZING CATTLE KEYWORDS: CATTLE DEFOLIATION TRE
100	70 4676	DEGRADATION	FOULING OF PASTURES BY DUNG KEYWORDS CATTLE-WASTES PASTURES WASTE-COMPOSITION DEGRADAT
200	77 4957	DEGRADATION	ANAEROBIC LAGOONING OF MANURES AND MILKING PARLOR WASTEWATER KEYWORDS: DAIRY-WASTES AER
200	76 4729	DEHYDRATION	POSSIBILITIES OF POULTRY DROPPINGS DECONTAMINATION AS RELATED TO FARM LEVEL MANAGEMENT
200	74 4748	DEHYDRATION	A MATHEMATICAL DRYING MODEL FOR MANURE BASED ON THE CONCEPT OF A RECEDING EVAPORATIVE I
200	74 4757	DEHYDRATION	ENVIRONMENT AS A RESULT OF IN-HOUSE DRYING OF POULTRY EXCRETA KEYWORDS: POULTRY-WASTES
100	78 4858	DEHYDRATION	HORMONAL ACTIVITY IN POULTRY EXCRETA PROCESSED FOR LIVESTOCK FEED KEYWORDS: POULTRY-WAS
700	77 4888	DEHYDRATION	COMPOSITION AND DIGESTIBILITY OF UNTREATED AND SODIUM HYDROXIDE TREATED FECAL WASTE FRO
300	77 4923	DEHYDRATION	POULTRY EXCRETA DEHYDRATION AND UTILIZATION-SYSTEM DEVELOPMENT AND DEMONSTRATION KEYWOR
300	77 4924	DEHYDRATION	POULTRY WASTE MANAGEMENT ALTERNATIVES-A DESIGN AND APPLICATION MANUAL KEYWORDS: POULTRY
100	78 4958	DEHYDRATION	HARVESTING ALGAE FROM LAGOON EFFLUENT KEYWORDS. LAGOONS WASTE-TREATMENT FLOCCULANTS BY-
200	76 5000	DEHYDRATION	IN-HOUSE MANURE DRYING IN THE DEEP-PIT HIGH-RISE SYSTEM KEYWORDS: DEHYDRATION DEEP-PI
100	78 5038	DEHYDRATION	COMPARISON OF PROBE HAY MOISTURE DETECTOR AND CONVENTIONAL METHOD FOR DETERMINING POUL
300	77 5049	DEHYDRATION	REFEEDING WASTES TO DAIRY CATTLE KEYWORDS. DAIRY-WASTES SEPARATION TECHNIQUES DEHYDRATI
100	78 5060	DEHYDRATION	DISSOLVED ORGANIC AND INORGANIC PHOSPHORUS COMPOUNDS IN PIG SLURRY: EFFECT OF DRYING K
200	76 5068	DEHYDRATION	PROCEEDINGS OF SYMPOSIUM ON THE CONVERSION OF POULTRY WASTE TO ENERGY, FEED, OR FERTILI
200	76 5070	DEHYDRATION	USING POULTRY MANURE FOR VEGETABLES AND HYDROSEEDING KEYWORDS: POULTRY-WASTES CHEMICAL-
200	76 5075	DEHYDRATION	MARKETING MANURE KEYWORDS: POULTRY-WASTES-DRIED DEHYDRATION FERTILIZERS WASTE-STORAGE L
100	78 5136	DEHYDRATION	DRYING CHARACTERISTICS OF BROILER WASTE ON A HEATED CONCRETE SLAB KEYWORDS: DEHYDRATION
100	78 5145	DEHYDRATION	CONVECTIVE HEAT TRANSFER COEFFICIENT FOR POULTRY EXCRETA KEYWORDS: POULTRY-WASTES DEHYD
400	78 5161	DEHYDRATION	ANOTHER POSITIVE STEP IN RECYCLING KEYWORDS: SALT GROUNDWATER-POLLUTION DAIRY-WASTES DE
200	70 5191	DEHYDRATION	AIR DRYING POULTRY MANURE KEYWORDS: DEHYDRATION POULTRY-WASTES FLY-CONTROL ODOR-CONTROL
500	77 5197	DEHYDRATION	PARTICULATE AND ODOR CONTROL IN THE ORGANIC FERTILIZER INDUSTRY: A CASE HISTORY KEYWOR
100	77 5258	DEHYDRATION	INVESTIGATIONS IN THE U K INTO METHODS OF ODOUR CONTROL FOR FARMS KEYWORDS: ODOR-CONTR
500	77 5265	DEHYDRATION	ANIMAL WASTES KEYWORDS FEEDLOTS DESIGN EFFLUENTS GASES ODOR ANIMAL-WASTES WASTE-STORAG
500	77 5282	DEHYDRATION	DEHYDRATION SYSTEMS FOR FEEDLOT WASTES KEYWORDS: DEHYDRATION LIVESTOCK-WASTES DESIGN EC
200	77 5311	DEHYDRATION	SUMMER UTILIZATION OF SOLAR ENERGY FOR DRYING POULTRY EXCRETA KEYWORDS: DEHYDRATION POU
200	76 4720	DENITRIFICATION	LEACHING OF NITRATE AND DENITRIFICATION IN A SANDY SOIL AS INFLUENCED BY MANURE APPLIC
100	78 4955	DENITRIFICATION	NITRIFICATION AND DENITRIFICATION IN CATTLE MANURE-AMENDED SOIL KEYWORDS: LAND-APPLICA
200	78 5117	DENITRIFICATION	DENITRIFICATION: I. USE OF 15N FOR EVALUATION OF THE HYPOTHETICAL EXCRETION OF MOLECULA
100	76 5119	DENITRIFICATION	EFFECT OF THE APPLICATION OF COW SLURRY TO GRASSLAND ON THE COMPOSITION OF THE SOIL ATM
200	76 4707	DENMARK-LAW	FARMYARD MANURE AND CROP PRODUCTION IN DENMARK KEYWORDS: SOLID-WASTES LIQUID-WASTES DEN
400	78 4848	DEODORIZERS	LIQUID COW MANURE GOES TO MARKET KEYWORDS: DAIRY-WASTES LIQUID-WASTES WASTE-TREATMENT D
400	78 4688	DESIGN	TOUGHER RULES COMING FOR BUILDING LAGOONS KEYWORDS: LAGOONS DESIGN LEGAL-ASPECTS PERMIT
300	76 4690	DESIGN	GUTTER FLUSHING SYSTEMS FOR SWINE BUILDINGS KEYWORDS: FLUSHING SWINE-WASTES DESIGN LAGO
400	78 4693	DESIGN	LAGOONS-WHAT SIZE NEEDED FOR YOUR HERD KEYWORDS: DAIRY-WASTES LAGOONS ANAEROBIC DESIGN
100	78 4694	DESIGN	TREATMENT OF DAIRY CATTLE WASTES BY A BARRIERED WASTEWATER RENOVATION SYSTEM KEYWORDS:
400	78 4695	DESIGN	METHANE DIGESTERS KEYWORDS: METHANE RECYCLING DIGESTERS DESIGN ECONOMICS
200	76 4749	DESIGN	THE APPLICATION OF FLUSHING MANURE-HANDLING SYSTEMS TO POULTRY BUILDINGS KEYWORDS: POUL
200	75 4750	DESIGN	ALTERNATIVE CONSTRUCTION MATERIALS FOR UNDERFLOOR MANURE~ STORAGE TANKS KEYWORDS: WASTE
300	74 4752	DESIGN	PRACTICAL TREATMENT OF FEEDLOT RUNOFF KEYWORDS: FEEDLOT-RUNOFF WASTEWATER-TREATMENT BIO
200	76 4755	DESIGN	BEEF FEEDLOTS IN THE HUMID SOUTHEAST KEYWORDS: FEEDLOTS CATTLE MANAGEMENT DESIGN
200	76 4756	DESIGN	DEVELOPMENT OF A LIQUID MANURE SPREADING AND INJECTION SYSTEM KEYWORDS: EQUIPMENT-LAND-
200	74 4758	DESIGN	HANDLING HOUSED BEEF CATTLE FEEDLOT MANURE KEYWORDS: DESIGN FEEDLOTS CATTLE WASTE-MANAG
200	74 4760	DESIGN	A NEW APPROACH IN NON-SLATTED LIQUID WASTE SWINE HOUSING SYSTEMS KEYWORDS: SWINE-WASTES
200	77 4763	DESIGN	MODELING TECHNIQUES AND COMPUTER SIMULATION OF AGRICULTURAL WASTE TREATMENT PROCESSES K
200	77 4771	DESIGN	MODELING THE EFFECT OF MANAGEMENT POLICIES ON CATTLE FEEDLOT POLLUTION CONTROL COSTS KE
200	77 4773	DESIGN	SOME MECHANICAL ASPECTS OF ANAEROBIC DIGESTION OF BEEF MANURE KEYWORDS: ANAEROBIC-DIGES
200	77 4775	DESIGN	SIMPLIFIED DESIGN OF RIGID PLASTIC DUCTS FOR UNIFORM AIR REMOVAL FROM LIQUID MANURE PIT
200	77 4777	DESIGN	EXPERIENCES FROM OPERATING A FULL SIZE ANAEROBIC DIGESTER KEYWORDS: ANAEROBIC DIGESTERS
200	73 4783	DESIGN	SWINE HOUSING AND WASTE DISPOSAL RESEARCH AND DEVELOPMENTS KEYWORDS: SWINE-WASTES WAST
200	76 4785	DESIGN	VENTILATION OF TIE-STALL DAIRY BARNS IN ONTARIO KEYWORDS: VENTILATION DAIRY-INDUSTRY PO
200	71 4788	DESIGN	SALMONELLA AND OTHER MICROORGANISMS POSE A NEW PARAMETER TO DESIGNERS OF POULTRY HOUSES
400	77 4789	DESIGN	RED WIGGLERS-TURN WORMS TO PROTEIN SUPPLEMENT-RESEARCHERS KEYWORDS: FEEDS RECYCLING WOR
700	76 4795	DESIGN	ANAEROBIC DIGESTION OF SCREENED DAIRY CATTLE WASTE USING A FIBER WALL REACTOR KEYWORDS:
300	77 4800	DESIGN	METHANE ON THE MOVE--A DISCUSSION OF SMALL ANAEROBIC DIGESTERS KEYWORDS: METHANE ANAERO
200	77 4808	DESIGN	PREDICTION OF EFFECTS OF LAGOON DESIGN VARIABLES-NITROGEN CONSERVATION OR REMOVAL KEYWO
300	76 4824	DESIGN	ENERGY POTENTIAL THROUGH BIO-CONVERSION OF AGRICULTURAL WASTES KEYWORDS: AGRICULTURAL-W
400	78 4828	DESIGN	WHICH WASTE SYSTEM IS BEST KEYWORDS: WASTE-MANAGEMENT DESIGN CONFINEMENT-PENS LIQUID-WA
400	78 4829	DESIGN	RUNOFF CONTROL KEYWORDS: FEEDLOT-RUNOFF RUNOFF-CONTROL DESIGN DEBRIS-BASINS LOCATION HO
400	77 4831	DESIGN	FLUSH GUTTER SYSTEMS-CUT COSTS, IMPROVE ANIMAL ENVIRONMENT KEYWORDS: CONFINEMENT-PENS
400	78 4832	DESIGN	GRAVITY DRAIN SYSTEMS FOR FARROWING AND NURSERY FACILITIES KEYWORDS: GRAVITY-DRAIN-SYS
400	78 4835	DESIGN	MORE ON WASTE HANDLING KEYWORDS WASTE-MANAGEMENT DESIGN CONCRETE-TRENCHES PLASTIC-LINE
400	78 4846	DESIGN	FLUSH SYSTEM CLEANS SWINE PENS KEYWORDS: SWINE-WASTES CONFINEMENT-PENS FLUSHING DESIGN
100	77 4854	DESIGN	DESIGN CONCEPTS AND CONSTRUCTION COSTS OF EIGHT DIFFERENT MANURE STORAGES KEYWORDS: DES
400	77 4861	DESIGN	THE BEST OF FOUR BARNS KEYWORDS: CONFINEMENT-PENS DESIGN CATTLE PERFORMANCE LAND-APPLIC
200	77 4867	DESIGN	THREE YEARS OF EVALUATING A MIDWEST ANAEROBIC DAIRY LAGOON KEYWORDS: DAIRY-WASTES ANAE
200	76 4869	DESIGN	UNIFORM SLURRY SPREADING WITH A CENTER PIVOT IRRIGATION SYSTEM KEYWORDS: SLURRIES LAND-
200	77 4872	DESIGN	METHOD FOR INEXPENSIVE DISTRIBUTION OF LIQUID WASTE FROM DAIRY AND FEEDLOT KEYWORDS: LI
700	74 4882	DESIGN	A COMPUTER SIMULATION OF BIOLOGICAL TREATMENT, STORAGE, AND LAND DISPOSAL OF SWINE WAST
100	77 4892	DESIGN	MECHANICAL MANURE HARVESTING FROM FEEDLOTS KEYWORDS: FEEDLOT-WASTES EQUIPMENT-MANURE-HA
500	77 4900	DESIGN	SOILS FOR MANAGEMENT OF ORGANIC WASTES AND WASTE WATERS KEYWORDS: ORGANIC-WASTES SOILS
700	74 4908	DESIGN	CYCLONIC BURNER FOR PARTIAL COMBUSTION OF MANURE TO AMMONIA SYNTHESIS GAS KEYWORDS: OXI
300	4916	DESIGN	METHANE PRODUCTION SYSTEMS FOR SWINE MANURE KEYWORDS. SWINE-WASTES CONFINEMENT-PENS ANA
600	4917	DESIGN	THE CALORIFIC PROJECT. I. BACKGROUND AND DESIGN CRITERIA KEYWORDS: RECYCLING CATTLE-WA
300	77 4923	DESIGN	POULTRY EXCRETA DEHYDRATION AND UTILIZATION-SYSTEM DEVELOPMENT AND DEMONSTRATION KEYWOR
300	77 4924	DESIGN	POULTRY WASTE MANAGEMENT ALTERNATIVES-A DESIGN AND APPLICATION MANUAL KEYWORDS: POULTRY
100	78 4929	DESIGN	A ROTATING FLIGHTED CYLINDER FOR BIOLOGICAL WASTE TREATMENT KEYWORDS: ROTATING-FLIGHTED
100	78 4930	DESIGN	MODELING THE EFFECT OF MANAGEMENT POLICIES ON CATTLE FEEDLOT POLLUTION CONTROL COSTS KE
100	77 4934	DESIGN	A DYNAMIC MODEL FOR SIMULATION OF ANIMAL WASTE DIGESTION KEYWORDS: MATHEMATICAL-MODELS
400	77 4936	DESIGN	GRAVITY-DRAIN SYSTEM KEYWORDS: LIQUID-WASTES SWINE-WASTES ODOR AIR-POLLUTION GRAVITY-DR
300	77 4938	DESIGN	DESIGN AND OPERATION OF LIVESTOCK WASTE LAGOONS KEYWORDS: LAGOONS LIVESTOCK-WASTES DESI
200	77 4943	DESIGN	DAIRY CHORE REDUCTION PROGRAM PROGRESS REPORT KEYWORDS: ANIMAL-WASTES MANAGEMENT DESIGN
200	77 4961	DESIGN	VEGETATIVE FILTER TREATMENT OF FEEDLOT RUNOFF KEYWORDS: VEGETATIVE-FILTER-SYSTEMS FEEDL

400	74	4990	DESIGN	ENGINEERS OUTLINE WASTE DESIGN FACTORS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT DESIGN S
400	78	4996	DESIGN	STUDY CONTROL OPTIONS FOR FEEDLOT RUNOFF SYSTEMS KEYWORDS: FEEDLOT-RUNOFF DEBRIS-BASINS
400	76	4999	DESIGN	VEGETATIVE FILTER SYSTEM CLEANS FEEDLOT RUNOFF KEYWORDS: FEEDLOT-RUNOFF WASTE-TREATMENT
400	78	5001	DESIGN	SCRAPING AWAY WASTE KEYWORDS: CATTLE-WASTES FEEDLOTS DESIGN SCRAPING STORAGE-PIT LAND-A
300	75	5002	DESIGN	SELECTING A SWINE WASTE MANAGEMENT SYSTEM KEYWORDS: SWINE-WASTES MANAGEMENT FLOORS DESI
200	76	5005	DESIGN	EXPERIENCES IN BUILDING AND OPERATING A FIELD SCALE ANAEROBIC DIGESTER KEYWORDS: ANAERO
300		5010	DESIGN	SCALE MODEL OF AN UNDERSLAT FLUSHING SYSTEM KEYWORDS: MODEL-STUDIES FLUSHING DESIGN SLO
400	78	5012	DESIGN	NON-STOP FLUSHING KEEPS BARN CLEAN KEYWORDS: CONFINEMENT-PENS CATTLE FLUSHING LAGOONS I
100	77	5014	DESIGN	FLUSHING PIGGERY WASTES KEYWORDS: FLUSHING SWINE-WASTES DESIGN EFFLUENT
500	77	5026	DESIGN	BIOLOGICAL RECLAMATION OF SOLID WASTES KEYWORDS: RECYCLING SOLID-WASTES MUNICIPAL-WASTE
300	77	5034	DESIGN	A METHOD OF MANURE DISPOSAL FOR A BEEF PACKING OPERATION-- FIRST INTERIM TECHNICAL REP
100	78	5056	DESIGN	FLUSHING SLAT WASTE HANDLING SYSTEM KEYWORDS: SWINE-WASTES LIQUID-WASTES FLUSHING DESIG
400	78	5059	DESIGN	WELL BUILT MOUNDS MANAGE THEMSELVES KEYWORDS: FEEDLOTS MOUNDS CONFINEMENT-PENS DESIGN S
300	78	5065	DESIGN	ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUE: POTENTIAL FOR IMPROVEMENT AND IMPLEME
200	76	5073	DESIGN	PROGRESS REPORT FROM THE FIRST YEAR OF OPERATION OF THE PENN STATE ANAEROBIC DIGESTER K
200	78	5103	DESIGN	CONTOUR FURROW IRRIGATION WITH LIQUID MANURE USING MICROTUBING FOR FLOW CONTROL KEYWOR
200	78	5104	DESIGN	HIGH VOLUME FLUSH DEVICES FOR ANIMAL WASTE MANAGEMENT KEYWORDS: FLUSHING DESIGN WATER-U
200	78	5111	DESIGN	METHANE PRODUCTION FROM ANAEROBIC FERMENTATION OF BEEF MANURE KEYWORDS: CATTLE-WASTES R
200	78	5112	DESIGN	DAIRY SHED EFFLUENT TREATMENT SYSTEMS IN NEW ZEALAND KEYWORDS: DAIRY-WASTES LAGOONS WAS
200	78	5116	DESIGN	DEVELOPMENT OF A SLURRY SPINNER KEYWORDS: SLURRIES LAND-APPLICATION EQUIPMENT-IRRIGATIO
300	78	5131	DESIGN	A MANUAL ON EVALUATION AND ECONOMIC ANALYSIS OF LIVESTOCK WASTE MANAGEMENT SYSTEMS KE
400	77	5141	DESIGN	THE DESIGN AND OPERATION OF SPRAY DISPOSAL SYSTEMS FOR DAIRY FARMS IN NEW ZEALAND KEYWO
400	75	5157	DESIGN	NEW SLURRY COMPOSTING PROCESS KEYWORDS. COMPOSTING SLURRIES EQUIPMENT-COMPOSTING CATTLE
100	78	5158	DESIGN	DESIGN OF LIQUID MANURE TANK ROOF SLABS KEYWORDS: LIQUID-WASTES MANURE-TANKS DESIGN ROO
100	78	5159	DESIGN	EFFECT OF DISSOLVED OXYGEN CONCENTRATION ON THE AEROBIC STABILIZATION OF SWINE WASTE KE
400	78	5160	DESIGN	MORE ON THREE-LEVEL BROILER BREEDER SYSTEM KEYWORDS: POULTRY MANAGEMENT DESIGN PERFORMA
400	78	5163	DESIGN	MOVE HOGS INDOORS-NEXT STEP IN HOG CONFINEMENT KEYWORDS: SWINE MANAGEMENT DESIGN ECONOM
400	78	5164	DESIGN	OPEN LAGOONS MAY DISAPPEAR KEYWORDS: ODOR LEGAL-ASPECTS LAGOONS DESIGN
100	78	5186	DESIGN	MODEL STUDY OF FIVE TYPES OF MANURE PIT VENTILATION SYSTEMS KEYWORDS: VENTILATION SWINE
400	73	5192	DESIGN	AN ALGAL REGENERATIVE SYSTEM FOR SINGLE-FAMILY FARMS AND VILLAGES KEYWORDS: RECYCLING A
400	77	5193	DESIGN	KEEPING DAIRY WASTE UNDER CONTROL KEYWORDS: DAIRY-WASTES WASTE-DISPOSAL WATER-POLLUTION
200	78	5195	DESIGN	BIOLOGICAL AND CHEMICAL FLUCTUATIONS DURING ANAEROBIC DIGESTION OF SWINE MANURE KEYWORD
400	78	5208	DESIGN	RUNOFF CONTROL SYSTEMS FOR CATTLE FEEDLOTS KEYWORDS: FEEDLOT-RUNOFF CATTLE WASTE-STORAG
300	77	5226	DESIGN	METHANE GENERATION FROM HUMAN, ANIMAL, AND AGRICULTURAL WASTES KEYWORDS: RECYCLING METH
200	78	5230	DESIGN	A CONTROL SYSTEM FOR AN AUTOMATED ANAEROBIC DIGESTER KEYWORDS: ANAEROBIC DIGESTERS SWIN
400	78	5234	DESIGN	BEAT EXPENSIVE SYSTEMS--SUN, WIND BEST FOR HANDLING WASTE KEYWORDS: DESIGN CONFINEMENT
100	77	5250	DESIGN	ODOUR CONTROL WITH BIOLOGICAL AIR WASHERS KEYWORDS: ODOR-CONTROL AIR-SCRUBBING DESIGN
100	77	5251	DESIGN	ODOUR REMOVAL FROM THE EXHAUST AIR OF ANIMAL SHELTERS KEYWORDS: ODOR-CONTROL CONFINEMEN
100	77	5259	DESIGN	DISPERSION OF ODORS IN THE NEIGHBOURHOOD OF PIG HOUSES KEYWORDS: ODOR SWINE CONFINEMENT
500	77	5265	DESIGN	ANIMAL WASTES KEYWORDS: FEEDLOTS DESIGN EFFLUENTS GASES ODOR ANIMAL-WASTES WASTE-STORAG
500	77	5270	DESIGN	LAYOUT AND DESIGN OF ANIMAL FEEDLOT STRUCTURES AND EQUIPMENT KEYWORDS: FEEDLOTS DESIGN
500	77	5278	DESIGN	COLLECTION, STORAGE AND TRANSPORT OF CATTLE WASTES KEYWORDS: DAIRY-WASTES SLURRIES SOLI
500	77	5279	DESIGN	COLLECTION, STORAGE AND TRANSPORT OF SWINE WASTES KEYWORDS: SWINE-WASTES WASTE-REMOVAL
500	77	5282	DESIGN	DEHYDRATION SYSTEMS FOR FEEDLOT WASTES KEYWORDS: DEHYDRATION LIVESTOCK-WASTES DESIGN EC
500	77	5283	DESIGN	LAGOON SYSTEMS FOR ANIMAL WASTES KEYWORDS: LAGOONS DESIGN FEEDLOTS ECONOMICS AEROBIC AN
500	77	5287	DESIGN	ENERGY RECOVERY FROM ANIMAL WASTES-ANAEROBIC DIGESTION, PYROLYSIS, HYDROGENATION KEYWOR
400	78	5009	DETENTION-POND	EARTHEN WASTE BASIN KEYWORDS: LIVESTOCK-WASTES WASTE-STORAGE HAULING PICKET-DAM DETENTI
200	77	4779	DETENTION-TIMES	FIBER WALL REACTOR DIGESTION OF DAIRY CATTLE MANURE KEYWORDS: DAIRY-WASTES ANAEROBIC-TR
700	76	4795	DETENTION-TIMES	ANAEROBIC DIGESTION OF SCREENED DAIRY CATTLE WASTE USING A FIBER WALL REACTOR KEYWORDS:
100	77	5303	DETENTION-TIME	ANAEROBIC DIGESTION OF PIGGERY WASTE. 1. THE INFLUENCE OF DETENTION TIME AND MANURE CON
100	75	4679	DETOXICATION	NOTE ON DETOXICATION OF LINDANE BY FARMYARD MANURE KEYWORDS: INSECTICIDES LINDANE SOIL-
200	77	4896	DEWATERING	DEWATERING A SWINE MANURE SLURRY BY EXPRESSION KEYWORDS: SEPARATION-TECHNIQUES SWINE-WA
300	77	4938	DEWATERING	DESIGN AND OPERATION OF LIVESTOCK WASTE LAGOONS KEYWORDS: LAGOONS LIVESTOCK-WASTES DESI
100	78	4956	DICHLORVOS	RESPONSE OF COLIFORM POPULATIONS IN POULTRY WASTE DIGESTERS TO THREE INSECTICIDES KEYWO
100	77	4949	DIETHYLSTILBOESTROL	RESIDUE CONTENT OF BEEF FEEDLOT MANURE AFTER FEEDING DIETHYLSTILBOESTROL, CHLORTETRACYCL
100	77	4815	DIETS	NITROGEN UTILIZATION BY LAMBS FED WHEAT STRAW ALONE OR WITH SUPPLEMENTS CONTAINING DRIE
100	72	4844	DIETS	UTILIZATION OF COW-MANURE, HATCHERY-WASTE AND PARTLY DRIED MOLASSES IN POULTRY FEEDS K
100	78	4912	DIETS	INFLUENCE OF B-GLUCANASE ON FEEDING VALUE OF BARLEY FOR POULTRY AND MOISTURE CONTENT OF
400	78	4981	DIETS	TOO MUCH MAGNESIUM MAKES WETTER DROPPINGS KEYWORDS: DIETS POULTRY FEED-ADDITIVES MAGNES
100	78	5042	DIETS	EFFECT OF FEEDING RAW AND COOKED SOYBEANS AND KIDNEY BEANS AND DRIED POULTRY WASTE IN
100	78	5095	DIETS	FRACTIONATION OF NITROGEN ISOTOPES BY ANIMALS: A FURTHER COMPLICATION TO THE USE OF VA
200	78	5195	DIETS	BIOLOGICAL AND CHEMICAL FLUCTUATIONS DURING ANAEROBIC DIGESTION OF SWINE MANURE KEYWORD
100	76	5304	DIET	EFFECT OF DIETARY SODIUM AND POTASSIUM EXCESS ON WATER CONSUMPTION, URINE EXCRETION AND
100	78	4956	DIE-OFFS	RESPONSE OF COLIFORM POPULATIONS IN POULTRY WASTE DIGESTERS TO THREE INSECTICIDES KEYWO
400	78	4695	DIGESTERS	METHANE DIGESTERS KEYWORDS: METHANE RECYCLING DIGESTERS DESIGN ECONOMICS
200	77	4777	DIGESTERS	EXPERIENCES FROM OPERATING A FULL SIZE ANAEROBIC DIGESTER KEYWORDS: ANAEROBIC DIGESTERS
700	76	4795	DIGESTERS	ANAEROBIC DIGESTION OF SCREENED DAIRY CATTLE WASTE USING A FIBER WALL REACTOR KEYWORDS:
300	77	4800	DIGESTERS	METHANE ON THE MOVE--A DISCUSSION OF SMALL ANAEROBIC DIGESTERS KEYWORDS: METHANE ANAERO
400	77	4850	DIGESTERS	MANURE DIGESTER BEING BUILT ON MINNESOTA FARM KEYWORDS: ANAEROBIC DIGESTERS RECYCLING P
400	77	4852	DIGESTERS	MANURE MAKES THE ROUNDS KEYWORDS: FEEDLOT-WASTES ANAEROBIC DIGESTERS CARBON-DIOXIDE MET
100	77	4934	DIGESTERS	A DYNAMIC MODEL FOR SIMULATION OF ANIMAL WASTE DIGESTION KEYWORDS: MATHEMATICAL-MODELS
100	78	4956	DIGESTERS	RESPONSE OF COLIFORM POPULATIONS IN POULTRY WASTE DIGESTERS TO THREE INSECTICIDES KEYWO
200	76	5005	DIGESTERS	EXPERIENCES IN BUILDING AND OPERATING A FIELD SCALE ANAEROBIC DIGESTER KEYWORDS: ANAERO
200	76	5073	DIGESTERS	PROGRESS REPORT FROM THE FIRST YEAR OF OPERATION OF THE PENN STATE ANAEROBIC DIGESTER K
300	78	5130	DIGESTERS	ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUES INTO BIOGAS KEYWORDS. ANAEROBIC DIGESTE
100	78	5144	DIGESTERS	CARBON NITROGEN RATIO AND ANAEROBIC DIGESTION OF SWINE WASTE KEYWORDS: ANAEROBIC DIGEST
300	78	5152	DIGESTERS	METHANE PRODUCTION FROM LIVESTOCK WASTE KEYWORDS. RECYCLING LIVESTOCK-WASTES POULTRY-WA
400	73	5192	DIGESTERS	AN ALGAL REGENERATIVE SYSTEM FOR SINGLE-FAMILY FARMS AND VILLAGES KEYWORDS: RECYCLING A
200	78	5195	DIGESTERS	BIOLOGICAL AND CHEMICAL FLUCTUATIONS DURING ANAEROBIC DIGESTION OF SWINE MANURE KEYWORD
300	77	5205	DIGESTERS	RESEARCH IN ANIMAL WASTE MANAGEMENT KEYWORDS: SWINE-WASTES DIGESTERS METHANE AGITATION
400	78	5224	DIGESTERS	SMALL FARM ENERGY PROJECT KEYWORDS: RECYCLING BIOGAS METHANE REFEEDING ANAEROBIC DIGEST
300	77	5226	DIGESTERS	METHANE GENERATION FROM HUMAN, ANIMAL, AND AGRICULTURAL WASTES KEYWORDS: RECYCLING METH
200	78	5230	DIGESTERS	A CONTROL SYSTEM FOR AN AUTOMATED ANAEROBIC DIGESTER KEYWORDS: ANAEROBIC DIGESTERS SWIN
500	77	5285	DIGESTERS	COMPOSTING OF FEEDLOT WASTES KEYWORDS: COMPOSTING FEEDLOTS LIVESTOCK-WASTES WINDROWS CO
200	77	4767	DIGESTER	COMMERCIAL SIZE ANAEROBIC DIGESTER PERFORMANCE WITH DAIRY MANURE KEYWORDS: DAIRY-WASTES
200	77	4769	DIGESTER	PERFORMANCE OF A LARGE SIZE ANAEROBIC DIGESTER FOR POULTRY MANURE KEYWORDS: ANAEROBIC D
400	77	4817	DIGESTER	POULTRY MANURE MAKES DEBUT AS ENERGY SOURCE KEYWORDS: POULTRY-WASTES ANIMAL-WASTES FERM
300		4916	DIGESTER	METHANE PRODUCTION SYSTEMS FOR SWINE MANURE KEYWORDS: SWINE-WASTES CONFINEMENT-PENS ANA
200	76	5199	DIGESTER	FERMENTATION FOR METHANE PRODUCTION KEYWORDS: FERMENTATION METHANE GAS-PRODUCTION ANAER
100	77	4815	DIGESTIBILITY	NITROGEN UTILIZATION BY LAMBS FED WHEAT STRAW ALONE OR WITH SUPPLEMENTS CONTAINING DRIE
100	78	4876	DIGESTIBILITY	EFFECTS OF LIQUID FRACTION PRESSED FROM DAIRY CATTLE EXCRETA (LE) IN LAMB DIETS KEYWORD
100	78	4877	DIGESTIBILITY	FERMENTATION AND UTILIZATION OF BROILER LITTER ENSILED AT DIFFERENT MOISTURE LEVELS KEY
700	74	4885	DIGESTIBILITY	A NUTRITIONAL EVALUATION OF RECYCLED SWINE WASTE KEYWORDS: REFEEDING SWINE-WASTES SWINE
700	77	4888	DIGESTIBILITY	COMPOSITION AND DIGESTIBILITY OF UNTREATED AND SODIUM HYDROXIDE TREATED FECAL WASTE FRO
100	75	4948	DIGESTIBILITY	VOLUNTARY INTAKE AND NUTRITIVE VALUE OF SILAGE MADE OF POULTRY DROPPINGS AND GREEN MAIZ
100	77	5020	DIGESTIBILITY	STUDIES WITH HORSES COMPARING 4N-HCL INSOLUBLE ASH AS AN INDEX MATERIAL WITH TOTAL FECA
300	78	5037	DIGESTIBILITY	METHODS OF FECAL COLLECTION AND NUTRIENT LEACHING IN DIGESTIBILITY STUDIES KEYWORDS: FI
300	78	5202	DIGESTIBILITY	FERMENTATION AND DIGESTIBILITY OF BROILER LITTER ENSILED AT DIFFERENT MOISTURE LEVELS B
300	78	5204	DIGESTIBILITY	ENSILING CHARACTERISTICS AND UTILIZATION BY SWINE OF ENSILED SWINE WASTE AND GROUND COR
100	78	5264	DIGESTIBILITY	WET POULTRY WASTE MAKES BETTER FEED KEYWORDS: POULTRY-WASTES REFEEDING SHEEP NITROGEN D

300	77 4913	DIGESTIBILTIY	WASTE AS A FEED EXTENDER KEYWORDS: *REFEEDING DIGESTIBILTIY CATTLE PERFORMANCE WASTE-REC*
300	78 4944	DIGESTION	BIOGAS PRODUCTION FROM POULTRY MANURE KEYWORDS: POULTRY-WASTES RECYCLING ANAEROBIC DIGE
100	77 4914	DILUTION	EFFECTS OF RATION ROUGHAGE CONTENT ON VISCOSITY AND THEORETICAL HEAD LOSSES IN PIPE FLO
100	77 5135	DILUTION-RATE	CONTINUOUS CULTIVATION OF CHLORELLA EMERSONII ON PIG MANURE KEYWORDS: SWINE-WASTES WAST
100	78 4956	DIMETHOATE	RESPONSE OF COLIFORM POPULATIONS IN POULTRY WASTE DIGESTERS TO THREE INSECTICIDES KEYWO
300	70 5086	DIPTERA	WORLDWIDE SURVEY AND COMPARISON OF ADULT PREDATOR AND SCAVENGER INSECT POPULATIONS ASSO
100	77 4813	DISEASE	LISTERIA-ENCEFALITIS IN COWS THROUGH LITTER FROM A BROILER-FARM KEYWORDS: ANIMAL-HEALTH
200	76 4727	DISINFECTION	VETERINARY-HYGIENIC ASPECTS OF LANDSPREADING AND TRANSPORT OF MANURE KEYWORDS: SOLID-W
100	77 4970	DISPERSION-ANALYSI	EFFECTS OF BEEF CATTLE MANURE ON WATER-STABILITY OF SOIL AGGREGATES KEYWORDS: CATTLE-WA
100	77 5135	DISSOLVED-OXYGEN	CONTINUOUS CULTIVATION OF CHLORELLA EMERSONII ON PIG MANURE KEYWORDS: SWINE-WASTES WAST
100	78 5159	DISSOLVED-OXYGEN	EFFECT OF DISSOLVED OXYGEN CONCENTRATION ON THE *AEROBIC STABILIZATION OF SWINE WASTE* KE
100	4997	DISSOLVED-SALTS	MOVEMENT OF NITRATES AND OTHER DISSOLVED SALTS FROM A FISHPOND INTO LAKE KINNERET KEYWO
200	77 4770	DISSOLVED-SOLIDS	DAIRY LAGOON EFFECTS ON GROUNDWATER QUALITY KEYWORDS: DAIRY-WASTES HOLDING-PONDS LAGOON
700	74 4704	DOMESTIC-EFFLUENTS	AGRICULTURAL AND FOREST LAND RUNOFF IN UPPER SOUTH RIVER NEAR WAYNESBORO, VIRGINIA KEYW
200	76 4718	DRAINAGE	THE EFFECT OF SOIL TYPE AND SEASON OF APPLICATION ON INFILTRATION AND RUNOFF OF NUTRIEN
400	78 4851	DRAINAGE	MANAGE FEEDLOT WASTE TO CONTROL ODORS KEYWORDS: LIVESTOCK-WASTES FEEDLOTS ODOR-CONTROL
300	77 5129	DRAINAGE	RECYCLING AGRICULTURE RUNOFF KEYWORDS: MODEL-STUDIES AGRICULTURAL-RUNOFF WASTE-STORAGE
200	76 4717	DRAINAGE-BASINS	RELATIONS BETWEEN PEDOLOGICAL ORGANISATION OF THE SOIL AND PIG SLURRY LANDSPREADINGS IN
100	78 5057	DRAINING	EFFLUENTS FROM CATFISH PONDS DURING FISH HARVEST KEYWORDS: FISH-FARMING EFFLUENT-QUALIT
100	78 4857	DROP-PLATE-ANALYSI	A COMPARISON OF DROP-PLATE AND POUR-PLATE METHODS FOR BACTERIAL POPULATION COUNTS OF PO
200	71 4762	DROWNINGS	SAFETY HAZARDS ASSOCIATED WITH LIVESTOCK WASTE KEYWORDS: FEEDLOTS ACCIDENTS MANAGEMENT
100	75 4963	DRUGS	THE USE OF DRIED POULTRY WASTES AS FEEDINGSTUFFS KEYWORDS: POULTRY-WASTES-DRIED REFEEDI
400	78 4692	DRUG-RESIDUES	LET THEM EAT WASTE KEYWORDS: REFEEDING SWINE-WASTES SWINE ANIMAL-HEALTH LEGAL-ASPECTS D
100	77 4746	DRUG-RESISTANCE	BACTERIOLOGICAL INVESTIGATION OF ALBERTA MEAT-PACKING PLANT WASTES WITH EMPHASIS ON SAL
400	78 5234	DRYING	BEAT EXPENSIVE SYSTEMS--SUN, WIND BEST FOR HANDLING WASTE KEYWORDS: DESIGN CONFINEMENT
500	77 5288	DRYING	UTILIZATION OF LIVESTOCK WASTES AS FEED AND OTHER DIETARY PRODUCTS KEYWORDS: REFEEDING
400	78 4972	DRY-ICE	KAPLAN S BLUEPRINT FOR FEEDLOT UTOPIA-PART TWO KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLI
100	75 4670	DRY-MATTER	FIELD TEST FOR ESTIMATING DRY MATTER AND FERTILIZER VALUE OF SLURRY-- PRELIMINARY REPOR
200	76 4739	DRY-MATTER	SAMPLING TECHNIQUES FOR LIQUID SWINE MANURE KEYWORDS: LIQUID-WASTES WASTE-STORAGE AERAT
100	78 4876	DRY-MATTER	EFFECTS OF LIQUID FRACTION PRESSED FROM DAIRY CATTLE EXCRETA (LE) IN LAMB DIETS KEYWORD
100	78 4954	DRY-MATTER	CHEMICAL COMPOSITION OF FEEDLOT MANURE KEYWORDS: CATTLE-WASTES FEEDLOTS WASTE-COMPOSITI
200	74 5017	DRY-MATTER	MECHANICAL LIQUID-SOLID SEPARATION OF BEEF, DAIRY AND SWINE WASTE SLURRIES KEYWORDS: SE
100	77 5243	DRY-MATTER	CHARACTERIZATION OF MALODOURS DURING ANAEROBIC STORAGE OF PIG WASTES KEYWORDS: WASTE-ST
300	78 5231	DUCKWEEDS	WATER QUALITY RENOVATION OF ANIMAL WASTE LAGOONS UTILIZING AQUATIC PLANTS KEYWORDS: LA
300	78 5153	DUNG-BEETLES	INTRODUCING DUNG BEETLES AS AN AID IN MANURE DISPOSAL AND FLY CONTROL KEYWORDS FLY-CON
400	78 4841	DUSTS	ATMOSPHERIC AMMONIA AFFECTS SWINE HEALTH KEYWORDS: AIR-POLLUTION CONFINEMENT-PENS SWINE
300	77 4866	DUSTS	ATMOSPHERIC AMMONIA AFFECTS SWINE HEALTH KEYWORDS: AIR-POLLUTION SWINE HOUSING AMMONIA
300	77 5035	DUSTS	SOURCE ASSESSMENT--BEEF CATTLE FEEDLOTS KEYWORDS: CATTLE DUSTS GASES AMMONIA THIOLS AIR
300	78 5025	DUST	CONTROL OF ANIMAL PRODUCTION ODORS--THE STATE-OF-THE-ART KEYWORDS: AIR-POLLUTION ODOR-C
200	78 5108	DUST-CONTROL	DUST REDUCTION IN THE BIRD RECEIVING AREA OF A POULTRY PROCESSING PLANT KEYWORDS: AIR-P
200	77 5237	EARTHEN-IMPOUNDMEN	THE CONCENTRATION OF LIQUID MANURE AFFECTS ITS INFILTRATION INTO SOIL KEYWORDS: LIQUID-
100	78 5148	EARTHEN-PITS	EARTHEN PITS FOR MANURE AND RECYCLED FLUSH-WATER STORAGE KEYWORDS: WASTE-STORAGE EARTHE
400	78 4674	ECONOMICS	ARIZONA RECYCLING TRIAL ENDS SUCCESSFULLY KEYWORDS: REFEEDING CORRAL-INDUSTRIES CATTLE-
400	78 4682	ECONOMICS	POULTRY WASTES PROVIDE NITROGEN SOURCE KEYWORDS: REFEEDING POULTRY-WASTES DAIRY-CATTLE
400	78 4692	ECONOMICS	LET THEM EAT WASTE KEYWORDS: REFEEDING SWINE-WASTES SWINE ANIMAL-HEALTH LEGAL-ASPECTS D
100	78 4694	ECONOMICS	TREATMENT OF DAIRY CATTLE WASTES BY A BARRIERED WASTEWATER RENOVATION SYSTEM KEYWORDS:
400	78 4695	ECONOMICS	METHANE DIGESTERS KEYWORDS: METHANE RECYCLING DIGESTERS DESIGN ECONOMICS
100	69 4697	ECONOMICS	DAIRY WASTE DISPOSAL KEYWORDS: WASTE-DISPOSAL LAND-APPLICATION ECONOMICS SPRAY-IRRIGATI
200	76 4705	ECONOMICS	UTILIZATION OF MANURE BY LAND SPREADING KEYWORDS: LIVESTOCK-WASTES EFFLUENTS LAND-APPLI
200	76 4731	ECONOMICS	THE EFFECTS OF SEPARATING SLURRY ON ITS STORAGE, HANDLING AND SPREADING ON LAND KEYWORD
200	76 4732	ECONOMICS	INVENTIONS AND INNOVATIONS TO REDUCE POLLUTION OF WATER RESOURCES KEYWORDS: WATER-POLLU
200	76 4735	ECONOMICS	THE SOCIO ECONOMIC ASPECTS OF LAND SPREADING OF MANURES VERSUS OTHER USES - A SYSTEM AP
200	76 4736	ECONOMICS	WASTE MANAGEMENTS SYSTEMS IN ANIMAL HUSBANDRY-APPLICATION OF FARM MODEL STUDIES AND SYS
200	76 4736	ECONOMICS	WASTE MANAGEMENTS SYSTEMS IN ANIMAL HUSBANDRY-APPLICATION OF FARM MODEL STUDIES AND SYS
300	78 4745	ECONOMICS	COSTS OF SELECTED WASTE-HANDLING SYSTEMS FOR DAIRY FARMS KEYWORDS: DAIRY-WASTES LEGAL-A
200	76 4749	ECONOMICS	THE APPLICATION OF FLUSHING MANURE-HANDLING SYSTEMS TO POULTRY BUILDINGS KEYWORDS: POUL
200	75 4750	ECONOMICS	ALTERNATIVE CONSTRUCTION MATERIALS FOR UNDERFLOOR MANURE- STORAGE TANKS KEYWORDS: WASTE
300	77 4751	ECONOMICS	DISPOSAL OF FEEDLOT WASTES USING A TWO-STAGE PROCESS WITH NET ENERGY PRODUCTION KEYWORD
200	74 4759	ECONOMICS	MECHANIZED COMPOSTING SYSTEM EVALUATION KEYWORDS: COMPOSTING MICROORGANISMS DAIRY-WASTE
200	74 4760	ECONOMICS	A NEW APPROACH IN NON-SLATTED LIQUID WASTE SWINE HOUSING SYSTEMS KEYWORDS: SWINE-WASTES
200	77 4765	ECONOMICS	MICROALGAE AS A MEANS OF RECYCLING ANIMAL WASTES KEYWORDS: RECYCLING WASTE-TREATMENT SW
200	77 4768	ECONOMICS	TIME-MOTION ANALYSIS OF FEEDLOT MANURE COLLECTION SYSTEMS KEYWORDS: WASTE-COLLECTION TI
200	77 4771	ECONOMICS	MODELING THE EFFECT OF MANAGEMENT POLICIES ON CATTLE FEEDLOT POLLUTION CONTROL COSTS KE
200	77 4774	ECONOMICS	A MIXED INTEGER PROGRAMMING MODEL FOR CHOOSING AN OPTIMAL SWINE MANURE HANDLING SYSTEM
200	73 4782	ECONOMICS	MECHANICAL AERATION OF A WASTE DISPOSAL PIT KEYWORDS: MANURE-PITS WASTE-STORAGE AERATID
200	75 4784	ECONOMICS	UTILIZATION OF METHANE FOR FARM PRODUCTION ENERGY-DISCUSSION KEYWORDS: CATTLE-WASTES DA
300	77 4800	ECONOMICS	METHANE ON THE MOVE--A DISCUSSION OF SMALL ANAEROBIC DIGESTERS KEYWORDS: METHANE ANAERO
700	76 4804	ECONOMICS	DIFFUSE AGRICULTURAL POLLUTION--THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS KEYWORDS:
400	77 4817	ECONOMICS	POULTRY MANURE MAKES DEBUT AS ENERGY SOURCE KEYWORDS: POULTRY-WASTES ANIMAL-WASTES FERM
300	76 4824	ECONOMICS	ENERGY POTENTIAL THROUGH BIO-CONVERSION OF AGRICULTURAL WASTES KEYWORDS: AGRICULTURAL-W
400	78 4833	ECONOMICS	RECYCLING TAKES EXTRA MANAGEMENT KEYWORDS: LIVESTOCK-WASTE POULTRY-WASTES REFEEDING ANI
400	78 4840	ECONOMICS	FEEDLOT SELLS MANURE KEYWORDS: WASTE-MANAGEMENT FEEDLOTS CATTLE LIQUID-WASTES FLUSHING
100	72 4844	ECONOMICS	UTILIZATION OF COW-MANURE, HATCHERY-WASTE AND PARTLY DRIED MOLASSES IN POULTRY FEEDS K
400	78 4848	ECONOMICS	LIQUID COW MANURE GOES TO MARKET KEYWORDS: DAIRY-WASTES LIQUID-WASTES WASTE-TREATMENT D
400	78 4849	ECONOMICS	STATE-BASED PLANT TURNING CATTLE MANURE INTO METHANE GAS KEYWORDS: CATTLE-WASTES RECYCL
400	77 4852	ECONOMICS	MANURE MAKES THE ROUNDS KEYWORDS: FEEDLOT-WASTES ANAEROBIC DIGESTERS CARBON-DIOXIDE MET
100	77 4854	ECONOMICS	DESIGN CONCEPTS AND CONSTRUCTION COSTS OF EIGHT DIFFERENT MANURE STORAGES KEYWORDS: DES
300	76 4859	ECONOMICS	ENERGY RELATIONSHIPS FOR A 32-ACRE IOWA FARM--AN ATTEMPT TO INCREASE PRODUCTION OF GRAI
400	78 4871	ECONOMICS	KEEPING FLIES OUT OF THE HEN HOUSE KEYWORDS: FLY-CONTROL POULTRY-HOUSES WASTE-REMOVAL M
200	77 4872	ECONOMICS	METHOD FOR INEXPENSIVE DISTRIBUTION OF LIQUID WASTE FROM DAIRY AND FEEDLOT KEYWORDS: LI
400	78 4886	ECONOMICS	PRORICH CASHES IN ON FEED MARKET WITH DPW KEYWORDS: POULTRY-WASTES-DRIED REFEEDING PRORI
700	77 4888	ECONOMICS	COMPOSITION AND DIGESTIBILITY OF UNTREATED AND SODIUM HYDROXIDE TREATED FECAL WASTE FRO
400	78 4899	ECONOMICS	LOW-LABOR FLUSH SYSTEM CLEANS MILKING AREAS IN MINUTES KEYWORDS: LIQUID-WASTES DAIRY-WA
500	77 4900	ECONOMICS	SOILS FOR MANAGEMENT OF ORGANIC WASTES AND WASTE WATERS KEYWORDS: ORGANIC-WASTES SOILS
300	77 4913	ECONOMICS	WASTE AS A FEED EXTENDER KEYWORDS: REFEEDING DIGESTIBILTIY CATTLE PERFORMANCE WASTE-REC
300	77 4915	ECONOMICS	CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE KEYWORDS: LIQUID-WASTES DAIRY-WA
600	4917	ECONOMICS	THE CALORIFIC PROJECT. I. BACKGROUND AND DESIGN CRITERIA KEYWORDS: RECYCLING CATTLE-WA
300	77 4923	ECONOMICS	POULTRY EXCRETA DEHYDRATION AND UTILIZATION-SYSTEM DEVELOPMENT AND DEMONSTRATION KEYWOR
300	77 4924	ECONOMICS	POULTRY WASTE MANAGEMENT ALTERNATIVES-A DESIGN AND APPLICATION MANUAL KEYWORDS: POULTRY
100	78 4929	ECONOMICS	A ROTATING FLIGHTED CYLINDER FOR BIOLOGICAL WASTE TREATMENT KEYWORDS: ROTATING-FLIGHTED
100	78 4930	ECONOMICS	MODELING THE EFFECT OF MANAGEMENT POLICIES ON CATTLE FEEDLOT POLLUTION CONTROL COSTS KE
400	78 4935	ECONOMICS	KAPLAN S BLUEPRINT FOR FEEDLOT UTOPIA KEYWORDS: KAPLAN FEEDLOTS RECYCLING REFEEDING MET
400	77 4936	ECONOMICS	GRAVITY-DRAIN SYSTEM KEYWORDS: LIQUID-WASTES SWINE-WASTES ODOR AIR-POLLUTION GRAVITY-DR
300	78 4940	ECONOMICS	COST EFFICIENCIES OF LARGE-SCALE INTEGRATED DAIRY PRODUCTION AND WASTE MANAGEMENT SYSTE
400	78 4941	ECONOMICS	DRIED POULTRY MANURE BENEFITS DAIRY COWS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTL
200	77 4943	ECONOMICS	DAIRY CHORE REDUCTION PROGRAM PROGRESS REPORT KEYWORDS: ANIMAL-WASTES MANAGEMENT DESIGN
300	78 4944	ECONOMICS	BIOGAS PRODUCTION FROM POULTRY MANURE KEYWORDS: POULTRY-WASTES RECYCLING ANAEROBIC DIGE
100	78 4958	ECONOMICS	HARVESTING ALGAE FROM LAGOON EFFLUENT KEYWORDS: LAGOONS WASTE-TREATMENT FLOCCULANTS BY-
200	77 4959	ECONOMICS	A GRAPHICAL ANALYSIS OF LIVESTOCK PRODUCTION AND WASTE-MANAGEMENT SYSTEMS KEYWORDS: SYS
100	75 4963	ECONOMICS	THE USE OF DRIED POULTRY WASTES AS FEEDINGSTUFFS KEYWORDS: POULTRY-WASTES-DRIED *REFEEDI*

500	76 4965	ECONOMICS	THE LAMAR BIO-CONVERSION PLANT DESIGN KEYWORDS: BIO-CONVERSION ANAEROBIC-DIGESTION CATT
400	78 4967	ECONOMICS	FEEDLOT MANURE CAN BOOST IRRIGATED ALFALFA YIELDS KEYWORDS: FEEDLOT-WASTES LAND-APPLICA
100	78 4971	ECONOMICS	A STUDY ON THE INTERACTIONS OF ENZYMES WITH MANURES AND SLUDGES KEYWORDS: CATTLE-WASTES
400	78 4972	ECONOMICS	KAPLAN S BLUEPRINT FOR FEEDLOT UTOPIA-PART TWO KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLI
400	78 4975	ECONOMICS	MANURE CONTAINMENT-SLURRY WITH THE CRUST ON TOP KEYWORDS: LIVESTOCK-WASTES SLURRIES WAS
400	78 4977	ECONOMICS	QUESTIONS AND ANSWERS ABOUT MANURE FLUSHING SYSTEMS FOR SWINE BUILDINGS KEYWORDS: SWINE
400	77 4985	ECONOMICS	INJECTING LIQUID MANURE REDUCES NITROGEN LOSS KEYWORDS: LIQUID-WASTES LAND-APPLICATION
400	74 4988	ECONOMICS	PIGGERY UNDER-SLAT SCRAPER SYSTEM KEYWORDS: SWINE-WASTES CONFINEMENT HOUSING SLURRIES W
400	74 4990	ECONOMICS	ENGINEERS OUTLINE WASTE DESIGN FACTORS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT DESIGN S
400	72 4992	ECONOMICS	IOWA BEEF TESTS SHOW PROFIT FOR FEEDING DITCH EFFLUENT KEYWORDS: OXIDATION-DITCH EFFLUE
400	78 5001	ECONOMICS	SCRAPING AWAY WASTE KEYWORDS: CATTLE-WASTES FEEDLOTS DESIGN SCRAPING STORAGE-PIT LAND-A
300	75 5002	ECONOMICS	SELECTING A SWINE WASTE MANAGEMENT SYSTEM KEYWORDS: SWINE-WASTES MANAGEMENT FLOORS DESI
400	77 5004	ECONOMICS	A MARTINI IN YOUR TANK KEYWORDS: RECYCLING ORGANIC-WASTES LIVESTOCK-WASTES ETHYL-ALCOHO
300	74 5006	ECONOMICS	IS ALL THIS PHOSPHATE ON GRASSLAND REALLY NECESSARY KEYWORDS: FERTILIZERS PHOSPHATES GR
200	77 5019	ECONOMICS	HANDLING OF MANURE FROM DIFFERENT ANIMALS AND MANAGEMENT SYSTEMS KEYWORDS: WASTE-MANAGE
500	77 5026	ECONOMICS	BIOLOGICAL RECLAMATION OF SOLID WASTES KEYWORDS: RECYCLING SOLID-WASTES MUNICIPAL-WASTE
100	78 5056	ECONOMICS	FLUSHING SLAT WASTE HANDLING SYSTEM KEYWORDS: SWINE-WASTES LIQUID-WASTES FLUSHING DESIG
300	78 5065	ECONOMICS	ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUE: POTENTIAL FOR IMPROVEMENT AND IMPLEME
200	76 5070	ECONOMICS	USING POULTRY MANURE FOR VEGETABLES AND HYDROSEEDING KEYWORDS: POULTRY-WASTES CHEMICAL-
200	76 5072	ECONOMICS	MARKETING OF CONVERTED POULTRY WASTE KEYWORDS: POULTRY-WASTES-DRIED MARKETING ECONOMICS
200	76 5075	ECONOMICS	MARKETING MANURE KEYWORDS: POULTRY-WASTES-DRIED DEHYDRATION FERTILIZERS WASTE-STORAGE L
200	75 5083	ECONOMICS	NON-POINT SOURCES OF WATER POLLUTION KEYWORDS: WATER-POLLUTION NON-POINT-SOURCES AGRICU
100	74 5089	ECONOMICS	THE EFFECTIVENESS OF LIQUID MANURE OF CATTLE AND PIGS WITH PLOUGHED-IN STRAW IN THE CR
300	76 5090	ECONOMICS	BIOCONVERSION OF AGRICULTURAL WASTES FOR POLLUTION CONTROL AND ENERGY CONSERVATION KEY
400	78 5091	ECONOMICS	SERPENTINE SYSTEM IS THE SOLUTION KEYWORDS: SERPENTINE-WATERWAY FEEDLOT-RUNOFF WASTE-TR
200	78 5114	ECONOMICS	OPTIMIZATION OF RUNOFF DETENTION FOR NONPOINT POLLUTION CONTROL KEYWORDS: NONPOINT-SOUR
100	77 5121	ECONOMICS	POULTRY WASTES IN THE DIET OF ISRAELI CARP KEYWORDS: REFEEDING POULTRY-WASTES FISH PERF
100	78 5124	ECONOMICS	BROILER GROWERS WITH CATTLE CAN MAKE BEST USE OF LITTER KEYWORDS: POULTRY-LITTER RECYCL
200	76 5125	ECONOMICS	AGRICULTURAL RESIDUES, INCLUDING FEEDLOT WASTES KEYWORDS: AGRICULTURAL-RESIDUES FEEDLOT
200	78 5127	ECONOMICS	ALTERNATE MANURE RECYCLING SYSTEMS FOR ENERGY RECOVERY KEYWORDS: RECYCLING GAS-PRODUCTI
300	77 5129	ECONOMICS	RECYCLING AGRICULTURE RUNOFF KEYWORDS: MODEL-STUDIES AGRICULTURAL-RUNOFF WASTE-STORAGE
300	78 5130	ECONOMICS	ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUES INTO BIOGAS KEYWORDS: ANAEROBIC DIGESTE
300	78 5131	ECONOMICS	A MANUAL ON EVALUATION AND ECONOMIC ANALYSIS OF LIVESTOCK WASTE MANAGEMENT SYSTEMS KE
400	78 5132	ECONOMICS	GRASS A BY-PRODUCT OF POULTRY KEYWORDS POULTRY-LITTER LAND-DISPOSAL FERTILIZERS FESCUE
100	77 5138	ECONOMICS	AGRICULTURAL AND FORESTRY WASTES AS AN ENERGY RESOURCE KEYWORDS: AGRICULTURAL-WASTES FO
400	78 5146	ECONOMICS	CATTLE FURNISH CHEAP SWINE FEED KEYWORDS: REFEEDING CATTLE-WASTES SWINE ECONOMICS
600	75 5150	ECONOMICS	FEEDLOT RUNOFF CONTROL FROM POINT NON-POINT SOURCES KEYWORDS: LEGAL-ASPECTS NPDES AGRIC
400	78 5151	ECONOMICS	HOW CONNECTICUT DAIRYMEN HANDLE MANURE KEYWORDS: WASTE-MANAGEMENT DAIRY-INDUSTRY BEDDIN
400	75 5157	ECONOMICS	NEW SLURRY COMPOSTING PROCESS KEYWORDS: COMPOSTING SLURRIES EQUIPMENT-COMPOSTING CATTLE
400	78 5163	ECONOMICS	MOVE HOGS INDOORS-NEXT STEP IN HOG CONFINEMENT KEYWORDS: SWINE MANAGEMENT DESIGN ECONOM
300	78 5172	ECONOMICS	SWINE WASTES AS A NUTRIENT SOURCE IN GROWING-FINISHING SWINE RATIONS KEYWORDS: SWINE-WA
100	77 5179	ECONOMICS	SLUDGE DISPOSAL STRATEGY: PROCESSES AND COSTS KEYWORDS: SEWAGE SLUDGE LAND-APPLICATION
400	78 5190	ECONOMICS	METHANE FROM WASTE KEYWORDS: METHANE RECYCLING REFEEDING ECONOMICS
400	73 5192	ECONOMICS	AN ALGAL REGENERATIVE SYSTEM FOR SINGLE-FAMILY FARMS AND VILLAGES KEYWORDS: RECYCLING A
600	78 5196	ECONOMICS	METHANE FROM MANURE. FACT OR FANTASY KEYWORDS: METHANE ANAEROBIC-DIGESTION RECYCLING L
400	78 5215	ECONOMICS	TWICE THE CATTLE AT HALF THE COST KEYWORDS CATTLE-WASTES CONFINEMENT MANAGEMENT ECONOM
100	78 5216	ECONOMICS	A GRAPHICAL ANALYSIS OF LIVESTOCK PRODUCTION AND WASTE-MANAGEMENT SYSTEMS KEYWORDS: CAT
400	78 5217	ECONOMICS	DPW PROVIDES NITROGEN FOR COWS KEYWORDS. REFEEDING POULTRY-WASTES-DRIED CATTLE PERFORMA
400	78 5222	ECONOMICS	WASTIGATION KEYWORDS: CATTLE-WASTES IRRIGATION WASTE-COMPOSITION LAND-APPLICATION ECONO
400	78 5223	ECONOMICS	MANAGING MANURE ECONOMICS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT ECONOMICS SLATTED-FLO
300	77 5226	ECONOMICS	METHANE GENERATION FROM HUMAN, ANIMAL, AND AGRICULTURAL WASTES KEYWORDS: RECYCLING METH
400	78 5228	ECONOMICS	AUSTRALIANS UTILIZE FARM WASTE TO PRODUCE EDIBLE PROTEIN PRODUCTS KEYWORDS: SWINE-WASTE
400	78 5236	ECONOMICS	MANURE SPREADING BUILDS SOIL AND PROFITS KEYWORDS: ANIMAL-WASTES ECONOMICS FERTILIZERS
100	77 5252	ECONOMICS	DEODORIZATION BY MEANS OF OZONE KEYWORDS: ODOR-CONTROL OZONE SWINE-WASTES ANIMAL-HEALTH
500	77 5265	ECONOMICS	ANIMAL WASTES KEYWORDS: FEEDLOTS DESIGN EFFLUENTS GASES ODOR ANIMAL-WASTES WASTE-STORAG
500	77 5279	ECONOMICS	COLLECTION, STORAGE AND TRANSPORT OF SWINE WASTES KEYWORDS: SWINE-WASTES WASTE-REMOVAL
500	77 5282	ECONOMICS	DEHYDRATION SYSTEMS FOR FEEDLOT WASTES KEYWORDS: DEHYDRATION LIVESTOCK-WASTES DESIGN EC
500	77 5283	ECONOMICS	LAGOON SYSTEMS FOR ANIMAL WASTES KEYWORDS: LAGOONS DESIGN FEEDLOTS ECONOMICS AEROBIC AN
500	77 5287	ECONOMICS	ENERGY RECOVERY FROM ANIMAL WASTES-ANAEROBIC DIGESTION, PYROLYSIS, HYDROGENATION KEYWOR
500	77 5288	ECONOMICS	UTILIZATION OF LIVESTOCK WASTES AS FEED AND OTHER DIETARY PRODUCTS KEYWORDS: REFEEDING
500	77 5289	ECONOMICS	UTILIZATION OF ANIMAL WASTES FOR CROP PRODUCTION KEYWORDS: LIQUID-WASTES FERTILIZERS LA
500	77 5290	ECONOMICS	LAND DISPOSAL OF FEEDLOT WASTES BY IRRIGATION IN CZECHOSLOVAKIA KEYWORDS: LAND-APPLICAT
500	77 5291	ECONOMICS	COSTS OF LIQUID HANDLING AND TREATMENT OF LARGE SWINE FEEDLOT WASTES KEYWORDS: ECONOMIC
500	77 5292	ECONOMICS	COST OF ANIMAL WASTE MANAGEMENT KEYWORDS: WASTE-MANAGEMENT ECONOMICS WATER-POLLUTION CA
500	77 5300	ECONOMICS	FEEDLOT WASTE MANAGEMENT IN BULGARIA KEYWORDS: FEEDLOTS SWINE-WASTES DAIRY-INDUSTRY POL
400	78 5302	ECONOMICS	BIOCONVERSION NO PANACEA AS DISPOSAL ALTERNATIVE KEYWORDS: BIOGAS METHANE ECONOMICS REC
200	76 4705	EFFLUENTS	UTILIZATION OF MANURE BY LAND SPREADING KEYWORDS: LIVESTOCK-WASTES EFFLUENTS LAND-APPLI
200	76 4719	EFFLUENTS	SOIL, WATER, PLANT RELATIONSHIP AS INFLUENCED BY INTENSIVE USE OF EFFLUENTS FROM LIVES
200	76 4730	EFFLUENTS	A STUDY OF THE EFFECTS OF ANIMAL EFFLUENT UTILISATION FOR GRASSLAND PRODUCTION ON LEVEL
200	76 4733	EFFLUENTS	MATHEMATICAL MODELLING OF AMMONIUM OXIDATION IN EFFLUENTS KEYWORDS: MATHEMATICAL-MODELS
100	77 4746	EFFLUENTS	BACTERIOLOGICAL INVESTIGATION OF ALBERTA MEAT-PACKING PLANT WASTES WITH EMPHASIS ON SAL
300	77 4751	EFFLUENTS	DISPOSAL OF FEEDLOT WASTES USING A TWO-STAGE PROCESS WITH NET ENERGY PRODUCTION KEYWORD
200	77 4764	EFFLUENTS	LONG-TERM FESCUE AND COASTAL BERMUDAGRASS CROP RESPONSE TO SWINE LAGOON EFFLUENT KEYWOR
200	77 4767	EFFLUENTS	COMMERCIAL SIZE ANAEROBIC DIGESTER PERFORMANCE WITH DAIRY MANURE KEYWORDS: DAIRY-WASTES
100	78 4929	EFFLUENTS	A ROTATING FLIGHTED CYLINDER FOR BIOLOGICAL WASTE TREATMENT KEYWORDS: ROTATING-FLIGHTED
300	77 5088	EFFLUENTS	FARM WASTE MANAGEMENT -- PIGS. 1. BIOLOGICAL FILTRATION TOWER -- TERRINGTON EHF REPORT
300	78 5175	EFFLUENTS	SEWAGE DISPOSAL ON AGRICULTURAL SOILS- CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
300	78 5176	EFFLUENTS	SEWAGE DISPOSAL ON AGRICULTURAL SOILS- CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
500	77 5265	EFFLUENTS	ANIMAL WASTES KEYWORDS: FEEDLOTS DESIGN EFFLUENTS GASES ODOR ANIMAL-WASTES WASTE-STORAG
400	72 4992	EFFLUENT	IOWA BEEF TESTS SHOW PROFIT FOR FEEDING DITCH EFFLUENT KEYWORDS: OXIDATION-DITCH EFFLUE
100	77 5014	EFFLUENT	FLUSHING PIGGERY WASTES KEYWORDS: FLUSHING SWINE-WASTES DESIGN EFFLUENT
100	78 5052	EFFLUENT	QUALITY VARIATION OF STORED FEEDLOT RUNOFF KEYWORDS: FEEDLOT-WASTES WASTE-STORAGE FEEDL
300	78 5055	EFFLUENT	SWINE LAGOON EFFLUENT ON A SOIL-PLANT ENVIRONMENT--AN IMPACT ASSESSMENT KEYWORDS: SWINE
200	77 4808	EFFLUENT-QUALITY	PREDICTION OF EFFECTS OF LAGOON DESIGN VARIABLES-NITROGEN CONSERVATION OR REMOVAL KEYWO
100	78 5057	EFFLUENT-QUALITY	EFFLUENTS FROM CATFISH PONDS DURING FISH HARVEST KEYWORDS: FISH-FARMING EFFLUENT-QUALIT
100	77 5008	EGG-PRODUCTION	RECYCLING OXIDATION DITCH MIXED LIQUOR TO LAYING HENS KEYWORDS: REFEEDING OXIDATION-DIT
100	78 5042	EGG-PRODUCTION	EFFECT OF FEEDING RAW AND COOKED SOYBEANS AND KIDNEY BEANS AND DRIED POULTRY WASTE IN
100	76 4968	EGG-QUALITY	LAYERS IMPROVE WITH DPW KEYWORDS: REFEEDING POULTRY POULTRY-WASTES-DRIED PERFORMANCE EG
100	78 5042	EGG-WEIGHT	EFFECT OF FEEDING RAW AND COOKED SOYBEANS AND KIDNEY BEANS AND DRIED POULTRY WASTE IN
300	78 4952	EHTYLENE	CONVERSION OF CATTLE FEEDLOT MANURE TO ETHYLENE AND AMMONIA SYNTHESIS GAS KEYWORDS: FEE
200	77 4867	ELECTRICAL-CONDUCT	THREE YEARS OF EVALUATING A MIDWEST ANAEROBIC DAIRY LAGOON KEYWORDS: DAIRY-WASTES ANAE
700	76 4921	ELECTRICAL-CONDUCT	EFFECT OF BEEF CATTLE MANURE ON SOIL PROPERTIES AND CROP GROWTH KEYWORDS: CATTLE-WASTES
100	78 5052	ELECTRICAL-CONDUCT	QUALITY VARIATION OF STORED FEEDLOT RUNOFF KEYWORDS: FEEDLOT-WASTES WASTE-STORAGE FEEDL
400	78 5209	ELECTRICAL-CONDUCT	SALT BUILDUP CAUSES LAGOON FAILURE KEYWORDS: LAGOONS DAIRY-WASTES ANAEROBIC ELECTRICAL-
400	77 4817	ELECTRICITY	POULTRY MANURE MAKES DEBUT AS ENERGY SOURCE KEYWORDS: POULTRY-WASTES ANIMAL-WASTES FERM
400	78 4972	ELECTRICITY	KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA-PART TWO KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLI
200	77 4768	ELEVATING-SCRAPER	TIME-MOTION ANALYSIS OF FEEDLOT MANURE COLLECTION SYSTEMS KEYWORDS: WASTE-COLLECTION TI
300	77 4751	ENERGY	DISPOSAL OF FEEDLOT WASTES USING A TWO-STAGE PROCESS WITH NET ENERGY PRODUCTION KEYWORD
200	77 4768	ENERGY	TIME-MOTION ANALYSIS OF FEEDLOT MANURE COLLECTION SYSTEMS KEYWORDS: WASTE-COLLECTION TI
300	78 4952	ENERGY	CONVERSION OF CATTLE FEEDLOT MANURE TO ETHYLENE AND AMMONIA SYNTHESIS GAS KEYWORDS: FEE

400	77 5050	ENERGY	IT'S NO BULL COLORADO TOWN TO CONVERT COW MANURE TO NATURAL GAS KEYWORDS: CATTLE-WASTES
200	76 5068	ENERGY	PROCEEDINGS OF SYMPOSIUM ON THE CONVERSION OF POULTRY WASTE TO ENERGY, FEED, OR FERTILI
200	78 5102	ENERGY	ESTIMATED INVENTORY OF LIVESTOCK AND POULTRY MANURE RESOURCES IN THE UNITED STATES KEYW
100	77 5138	ENERGY	AGRICULTURAL AND FORESTRY WASTES AS AN ENERGY RESOURCE KEYWORDS: AGRICULTURAL-WASTES FO
100	77 5246	ENERGY-CONSUMPTION	ODOUR CONTROL OF LIQUID SWINE MANURE BY AERATION KEYWORDS: WASTE-STORAGE SWINE-WASTES A
100	76 4928	ENRICHMENT	ORGANIC AND INORGANIC NUTRIENT ENRICHMENT AND THE LIVING CONDITIONS OF CARP FRY IN FIRS
400	78 4699	ENSILING	FEEDING FEEDLOT WASTE TO CATTLE KEYWORDS: REFEEDING FEEDLOT-WASTES CATTLE HARVESTING EN
100	78 4842	ENSILING	COMPARATIVE VALUE OF ENSILED CATTLE WASTE FOR LAMBS AND GROWING-FINISHING CATTLE KEYWOR
100	78 4877	ENSILING	FERMENTATION AND UTILIZATION OF BROILER LITTER ENSILED AT DIFFERENT MOISTURE LEVELS KEY
400	77 4933	ENSILING	PROCESS MANURE FOR REFEEDING KEYWORDS: REFEEDING ANIMAL-WASTES ENSILING CHEMICAL-TREATM
300	77 5049	ENSILING	REFEEDING WASTES TO DAIRY CATTLE KEYWORDS: DAIRY-WASTES SEPARATION TECHNIQUES DEHYDRATI
200	76 5068	ENSILING	PROCEEDINGS OF SYMPOSIUM ON THE CONVERSION OF POULTRY WASTE TO ENERGY, FEED, OR FERTILI
200	76 5069	ENSILING	ENSILING POULTRY LITTER AND SUBSEQUENT FEEDING KEYWORDS: POULTRY-WASTES ENSILING REFEED
200	78 5100	ENSILING	RECYCLING SWINE WASTE IN A GROWING-FINISHING RATION KEYWORDS: REFEEDING SWINE-WASTES SW
300	78 5202	ENSILING	FERMENTATION AND DIGESTIBILITY OF BROILER LITTER ENSILED AT DIFFERENT MOISTURE LEVELS B
300	78 5203	ENSILING	ENSILED CORN FORAGE AND BROILER LITTER FOR FINISHING HEIFERS KEYWORDS: SILAGES ENSILING
300	78 5204	ENSILING	ENSILING CHARACTERISTICS AND UTILIZATION BY SWINE OF ENSILED SWINE WASTE AND GROUND COR
100	78 4956	ENTERIC-COLIFORMS	RESPONSE OF COLIFORM POPULATIONS IN POULTRY WASTE DIGESTERS TO THREE INSECTICIDES KEYWO
400	78 4835	ENVIRONETICS,INC	MORE ON WASTE HANDLING KEYWORDS WASTE-MANAGEMENT DESIGN CONCRETE-TRENCHES PLASTIC-LINE
200	76 4708	ENVIRONMENTAL-EFFE	CONSEQUENCES OF SEMI-LIQUID PIG MANURE SPREADING KEYWORDS: SLURRIES SWINE-WASTES LAND-A
200	76 4736	ENVIRONMENTAL-EFFE	WASTE MANAGEMENTS SYSTEMS IN ANIMAL HUSBANDRY-APPLICATION OF FARM MODEL STUDIES AND SYS
200	76 4737	ENVIRONMENTAL-EFFE	ELABORATION OF STATISTICS ON MANURE PRODUCTION KEYWORDS: FARM-WASTES LAND-APPLICATION E
200	74 4757	ENVIRONMENTAL-EFFE	ENVIRONMENT AS A RESULT OF IN-HOUSE DRYING OF POULTRY EXCRETA KEYWORDS: POULTRY-WASTES
500	77 4905	ENVIRONMENTAL-EFFE	LAND UTILIZATION AND DISPOSAL OF ORGANIC WASTES IN ARID REGIONS KEYWORDS: ANIMAL-WASTES
300	77 4926	ENVIRONMENTAL-EFFE	ENVIRONMENTAL IMPLICATIONS OF TRENDS IN AGRICULTURE AND SILVICULTURE VOLUME I-TREND IDE
300	78 4951	ENVIRONMENTAL-EFFE	ENVIRONMENTAL IMPACT RESULTING FROM UNCONFINED ANIMAL PRODUCTION KEYWORDS: ENVIRONMENTA
400	78 4836	ENZYMATIC-PRODUCTS	DEALING WITH ODORS KEYWORDS: ODOR-CONTROL MASKING-AGENTS ENZYMATIC-PRODUCTS CHEMICAL-TR
100	78 4971	ENZYMES	A STUDY ON THE INTERACTIONS OF ENZYMES WITH MANURES AND SLUDGES KEYWORDS: CATTLE-WASTES
700	76 4668	ENZYME-PRODUCTION	CELLULOLYSIS IN FEEDLOT WASTE KEYWORDS: FEEDLOT-WASTES CHEMICAL-TREATMENT PHYSICAL-TREA
200	76 4727	EPIDEMIOLOGY	VETERINARY-HYGIENIC ASPECTS OF LANDSPREADING AND TRANSPORT OF MANURE KEYWORDS: SOLID-W
500	77 5273	EPIDEMIOLOGY	IMPACT OF INTENSIVE ANIMAL PRODUCTION ON HUMAN ECOLOGY KEYWORDS: FEEDLOTS EPIDEMIOLOGY
500	77 5274	EPIDEMIOLOGY	MANAGEMENT OF HYGIENIC PROBLEMS IN LARGE ANIMAL FEEDLOTS KEYWORDS: EPIDEMIOLOGY ANIMAL-
200	71 4762	EQUIPMENT	SAFETY HAZARDS ASSOCIATED WITH LIVESTOCK WASTE KEYWORDS: FEEDLOTS ACCIDENTS MANAGEMENT
400	77 4984	EQUIPMENT-COMPOSTI	SPECIALIZED EQUIPMENT FOR COMPOSTING MANURE KEYWORDS: EQUIPMENT-COMPOSTING COMPOSTING O
400	75 5157	EQUIPMENT-COMPOSTI	NEW SLURRY COMPOSTING PROCESS KEYWORDS: COMPOSTING SLURRIES EQUIPMENT-COMPOSTING CATTLE
700	74 4908	EQUIPMENT-CYCLONIC	CYCLONIC BURNER FOR PARTIAL COMBUSTION OF MANURE TO AMMONIA SYNTHESIS GAS KEYWORDS: OXI
200	78 5112	EQUIPMENT-IRRIGATI	DAIRY SHED EFFLUENT TREATMENT SYSTEMS IN NEW ZEALAND KEYWORDS: DAIRY-WASTES LAGOONS WAS
200	78 5116	EQUIPMENT-IRRIGATI	DEVELOPMENT OF A SLURRY SPINNER KEYWORDS: SLURRIES LAND-APPLICATION EQUIPMENT-IRRIGATID
100	65 5133	EQUIPMENT-IRRIGATI	BETTER DISPOSAL OF FARM WASTES KEYWORDS: FARM-WASTES LAND-APPLICATION IRRIGATION EQUIPM
500	77 5290	EQUIPMENT-IRRIGATI	LAND DISPOSAL OF FEEDLOT WASTES BY IRRIGATION IN CZECHOSLOVAKIA KEYWORDS: LAND-APPLICAT
200	76 4756	EQUIPMENT-LAND-SPR	DEVELOPMENT OF A LIQUID MANURE SPREADING AND INJECTION SYSTEM KEYWORDS: EQUIPMENT-LAND-
100	77 4892	EQUIPMENT-MANURE-H	MECHANICAL MANURE HARVESTING FROM FEEDLOTS KEYWORDS: FEEDLOT-WASTES EQUIPMENT-MANURE-HA
200	76 4731	EQUIPMENT-SEPARATO	THE EFFECTS OF SEPARATING SLURRY ON ITS STORAGE, HANDLING AND SPREADING ON LAND KEYWORD
700	76 4805	EQUIPMENT-SEPARATO	DESIGN AND DEVELOPMENT OF A SEPARATOR FOR BOVINE MANURE KEYWORDS: SEPARATION-TECHNIQUES
100	73 5184	EQUIPMENT-SEPARATO	EQUIPMENT AND METHODS FOR THE SOLID LIQUID SEPARATION OF SLURRIES KEYWORDS: SLURRIES SE
400	78 5151	EQUIPMENT-WASTE-MA	HOW CONNECTICUT DAIRYMEN HANDLE MANURE KEYWORDS: WASTE-MANAGEMENT DAIRY-INDUSTRY BEDDIN
300	74 4700	EROSION	QUANTIFICATION OF POLLUTANTS IN AGRICULTURAL RUNOFF KEYWORDS: AGRICULTURAL-RUNOFF EROSI
100	77 4881	EROSION	WINTER-APPLIED MANURE--EFFECTS ON ANNUAL RUNOFF, EROSION, AND NUTRIENT MOVEMENT KEYWORD
300	76 4925	EROSION	MODELING PESTICIDES AND NUTRIENTS ON AGRICULTURAL LANDS KEYWORDS: AGRICULTURAL-RUNOFF M
400	77 5058	EROSION	CONTROL OF NONPOINT WATER POLLUTION FROM AGRICULTURE: SOME CONCEPTS KEYWORDS: NONPOINT
200	76 4730	ESCHERICHIA-COLI	A STUDY OF THE EFFECTS OF ANIMAL EFFLUENT UTILISATION FOR GRASSLAND PRODUCTION ON LEVEL
200	76 4743	ESCHERICHIA-COLI	MICROBIOLOGICAL ANALYSIS OF ANIMAL MANURES WITH PARTICULAR REFERENCE TO THE ISOLATION
100	78 4858	ESTROGENS	HORMONAL ACTIVITY IN POULTRY EXCRETA PROCESSED FOR LIVESTOCK FEED KEYWORDS: POULTRY-WAS
200	78 5100	ETHER-EXTRACT	RECYCLING SWINE WASTE IN A GROWING-FINISHING RATION KEYWORDS: REFEEDING SWINE-WASTES SW
400	77 5004	ETHYL-ALCOHOL	A MARTINI IN YOUR TANK KEYWORDS: RECYCLING ORGANIC-WASTES LIVESTOCK-WASTES ETHYL-ALCOHO
200	76 4716	EUTROPHICATION	RUNOFF AS A FACTOR IN EUTROPHICATION OF SURFACE WATERS IN RELATION TO PHOSPHORUS MANURI
200	76 4725	EUTROPHICATION	WATER POLLUTION BY LIVESTOCK EFFLUENTS KEYWORDS: WATER-POLLUTION FISH-KILLS LIVESTOCK-W
200	77 4811	EVAPORATION	SIZING COMPONENTS ON OPEN FEEDLOT RUNOFF CONTROL SYSTEMS KEYWORDS: COMPUTER-MODELS FEED
500	77 5281	EVAPORATION	SOLIDS SEPARATION AND DEWATERING KEYWORDS: SEPARATION-TECHNIQUES CENTRIFUGAL-SEPARATORS
200	71 4762	EXPLOSIONS	SAFETY HAZARDS ASSOCIATED WITH LIVESTOCK WASTE KEYWORDS: FEEDLOTS ACCIDENTS MANAGEMENT
100	78 4956	E-COLI	RESPONSE OF COLIFORM POPULATIONS IN POULTRY WASTE DIGESTERS TO THREE INSECTICIDES KEYWO
500	77 5283	FACULTATIVE	LAGOON SYSTEMS FOR ANIMAL WASTES KEYWORDS: LAGOONS DESIGN FEEDLOTS ECONOMICS AEROBIC AN
300	78 5175	FARMLAND	SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
200	76 4737	FARM-WASTES	ELABORATION OF STATISTICS ON MANURE PRODUCTION KEYWORDS: FARM-WASTES LAND-APPLICATION E
400	77 4887	FARM-WASTES	COMPOSTING AS A MANURE MANAGEMENT SYSTEM KEYWORDS: FARM-WASTES COMPOSTING ODOR-CONTROL
200	76 5097	FARM-WASTES	ANAEROBIC PROCESSES INCLUDING METHANE FROM FARM WASTES KEYWORDS: ANAEROBIC-DIGESTION FA
100	65 5133	FARM-WASTES	BETTER DISPOSAL OF FARM WASTES KEYWORDS: FARM-WASTES LAND-APPLICATION IRRIGATION EQUIPM
100	77 5137	FARM-WASTES	EFFECT OF SULPHUR AND FYM APPLICATION ON THE EFFICIENCY OF ROCK PHOSPHATE FOR WHEAT KE
100	77 5061	FATTY-ACIDS	CHARACTERISTICS OF AEROBIC, SOLID SUBSTRATE FERMENTATION OF SWINE WASTE-CORN MIXTURES K
100	77 5062	FATTY-ACIDS	FERMENTATION OF SWINE WASTE-CORN MIXTURES FOR ANIMAL FEED- PILOT-PLANT STUDIES KEYWORD
100	77 5313	FAT	CATTLE MANURE AND FINAL MOLASSES SILAGE IN CHICKEN FATTENING,I. HIGH SUBSTITUTION LEVE
700	77 5182	FAUNA	SOME PHYSICAL, CHEMICAL, AND BIOLOGICAL EFFECTS OF HEAVY POULTRY MANURE APPLICATIONS ON
400	78 5219	FEATHERS	FEATHERS ON MANURE CAN INCREASE FLY PROBLEM KEYWORDS: FLY-CONTROL POULTRY-WASTES FEATHE
100	77 4746	FECAL-COLIFORMS	BACTERIOLOGICAL INVESTIGATION OF ALBERTA MEAT-PACKING PLANT WASTES WITH EMPHASIS ON SAL
100	77 5061	FECAL-COLIFORMS	CHARACTERISTICS OF AEROBIC, SOLID SUBSTRATE FERMENTATION OF SWINE WASTE-CORN MIXTURES K
100	78 5178	FECAL-COLIFORMS	NONPOINT SOURCES: STATE-OF-THE-ART OVERVIEW KEYWORDS: NONPOINT-SOURCES WATER-POLLUTION
300	78 5201	FECAL-COLIFORMS	CHANGES IN CHARACTERISTICS OF DEEP STACKED BROILER LITTER WITH TIME KEYWORDS: POULTRY-L
300	78 5204	FECAL-COLIFORMS	ENSILING CHARACTERISTICS AND UTILIZATION BY SWINE OF ENSILED SWINE WASTE AND GROUND COR
200	71 4747	FEDERAL-FISHERIES	POLLUTION LEGISLATION IN CANADA AFFECTING THE LIVESTOCK INDUSTRY KEYWORDS: WASTE-DISPOS
400	77 4672	FEEDLOTS	CONTROL RUNOFF FROM OPEN LIVESTOCK FEEDLOTS KEYWORDS: AGRICULTURAL-RUNOFF RUNOFF-CONTRO
400	78 4674	FEEDLOTS	ARIZONA RECYCLING TRIAL ENDS SUCCESSFULLY KEYWORDS: REFEEDING CORRAL-INDUSTRIES CATTLE-
300	75 4701	FEEDLOTS	ENVIRONMENTAL PROTECTION REQUIREMENTS FOR SWINE OPERATIONS KEYWORDS: SWINE FEEDLOTS AI
200	76 4727	FEEDLOTS	VETERINARY-HYGIENIC ASPECTS OF LANDSPREADING AND TRANSPORT OF MANURE'KEYWORDS: SOLID-W
300	77 4751	FEEDLOTS	DISPOSAL OF FEEDLOT WASTES USING A TWO-STAGE PROCESS WITH NET ENERGY PRODUCTION KEYWORD
200	76 4755	FEEDLOTS	BEEF FEEDLOTS IN THE HUMID SOUTHEAST KEYWORDS: FEEDLOTS CATTLE MANAGEMENT DESIGN
200	74 4758	FEEDLOTS	HANDLING HOUSED BEEF CATTLE FEEDLOT MANURE KEYWORDS: DESIGN FEEDLOTS CATTLE WASTE-MANAG
200	74 4761	FEEDLOTS	NITROGEN LEVELS UNDER A SWINE FEEDLOT IN SOUTH CAROLINA KEYWORDS: FEEDLOTS SWINE MANAGE
200	71 4762	FEEDLOTS	SAFETY HAZARDS ASSOCIATED WITH LIVESTOCK WASTE KEYWORDS: FEEDLOTS ACCIDENTS MANAGEMENT
200	77 4768	FEEDLOTS	TIME-MOTION ANALYSIS OF FEEDLOT MANURE COLLECTION SYSTEMS KEYWORDS: WASTE-COLLECTION TI
200	77 4771	FEEDLOTS	MODELING THE EFFECT OF MANAGEMENT POLICIES ON CATTLE FEEDLOT POLLUTION CONTROL COSTS KE
200	75 4784	FEEDLOTS	UTILIZATION OF METHANE FOR FARM PRODUCTION ENERGY-DISCUSSION KEYWORDS: CATTLE-WASTES DA
200	77 4786	FEEDLOTS	NONPOINT POLLUTION CONTROL FOR WINTERING RANGE CATTLE KEYWORDS: CATTLE WATER-POLLUTION
300	76 4814	FEEDLOTS	ODOR REGULATION BY NUISANCE LAWS KEYWORDS: LEGAL-ASPECTS ODOR FEEDLOTS ZONING SITE-SELE
300	76 4825	FEEDLOTS	RECENT TRENDS IN ODOR NUISANCE LAWSUITS KEYWORDS: ODOR NUISANCE-LAWSUITS LEGAL-ASPECTS
400	78 4840	FEEDLOTS	FEEDLOT SELLS MANURE KEYWORDS: WASTE-MANAGEMENT FEEDLOTS CATTLE LIQUID-WASTES FLUSHING
400	78 4851	FEEDLOTS	MANAGE FEEDLOT WASTE TO CONTROL ODORS KEYWORDS: LIVESTOCK-WASTES FEEDLOTS ODOR-CONTROL
200	77 4872	FEEDLOTS	METHOD FOR INEXPENSIVE DISTRIBUTION OF LIQUID WASTE FROM DAIRY AND FEEDLOT KEYWORDS: LI
300	77 4926	FEEDLOTS	ENVIRONMENTAL IMPLICATIONS OF TRENDS IN AGRICULTURE AND SILVICULTURE VOLUME I-TREND IDE
400	78 4935	FEEDLOTS	KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA KEYWORDS: KAPLAN FEEDLOTS RECYCLING REFEEDING MET
100	77 4949	FEEDLOTS	RESIDUE CONTENT OF BEEF FEEDLOT MANURE AFTER FEEDING DIETHYLSTILBESTROL, CHLORTETRACYCL

300	78 4952	FEEDLOTS	CONVERSION OF CATTLE FEEDLOT MANURE TO ETHYLENE AND AMMONIA SYNTHESIS GAS KEYWORDS: FEE
100	78 4954	FEEDLOTS	CHEMICAL COMPOSITION OF FEEDLOT MANURE KEYWORDS: CATTLE-WASTES FEEDLOTS WASTE-COMPOSITI
300	74 4960	FEEDLOTS	FEEDLOT POLLUTION CONTROL GUIDELINES KEYWORDS: FEEDLOTS TEXAS-LAW PERMITS LEGAL-ASPECTS
400	78 4972	FEEDLOTS	KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA-PART TWO KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLI
400	78 5001	FEEDLOTS	SCRAPING AWAY WASTE KEYWORDS: CATTLE-WASTES FEEDLOTS DESIGN SCRAPING STORAGE-PIT LAND-A
100	76 5013	FEEDLOTS	ANIMAL FEEDING FACTORIES AND THE ENVIRONMENT-A SUMMARY OF FEEDLOT POLLUTION, FEDERAL CO
100	77 5016	FEEDLOTS	PROTEIN PRODUCTION FROM FEEDLOT WASTE KEYWORDS: FEEDLOTS CATTLE-WASTES REFEEDING SUBSTR
200	77 5019	FEEDLOTS	HANDLING OF MANURE FROM DIFFERENT ANIMALS AND MANAGEMENT SYSTEMS KEYWORDS: WASTE-MANAGE
300	78 5023	FEEDLOTS	ULTIMATE DISPOSAL OF BEEF FEEDLOT WASTES ONTO LAND KEYWORDS: FEEDLOTS CATTLE-WASTES LAN
300	77 5035	FEEDLOTS	SOURCE ASSESSMENT--BEEF CATTLE FEEDLOTS KEYWORDS: CATTLE DUSTS GASES AMMONIA THIOLS AIR
400	78 5059	FEEDLOTS	WELL BUILT MOUNDS MANAGE THEMSELVES KEYWORDS: FEEDLOTS MOUNDS CONFINEMENT-PENS DESIGN S
300	78 5131	FEEDLOTS	A MANUAL ON EVALUATION AND ECONOMIC ANALYSIS OF LIVESTOCK WASTE MANAGEMENT SYSTEMS KE
300	77 5149	FEEDLOTS	COMMON SCENTS: AN ANALYSIS OF THE LAW OF FEED LOT ODOR CONTROL KEYWORDS: ODOR-CONTROL
300	78 5183	FEEDLOTS	SPECIFIC COMPOSITION OF REPRESENTATIVE FEEDLOT WASTES: A CHEMICAL AND MICROBIAL PROFILE
300	74 5213	FEEDLOTS	SOIL POLLUTION FROM FEEDLOTS IN GEORGIA KEYWORDS: FEEDLOTS CATTLE-WASTES SOIL-CONTAMINA
100	77 5253	FEEDLOTS	DANISH RULES AND REGULATIONS RELATED TO ENVIRONMENTAL PROTECTION KEYWORDS LEGAL-ASPECTS
500	77 5265	FEEDLOTS	ANIMAL WASTES KEYWORDS: FEEDLOTS DESIGN EFFLUENTS GASES ODOR ANIMAL-WASTES WASTE-STORAG
500	77 5267	FEEDLOTS	ANIMAL FEEDLOTS-DEVELOPMENT, TRENDS, PROBLEMS KEYWORDS: FEEDLOTS WASTE-MANAGEMENT CATTL
500	77 5269	FEEDLOTS	CRITERIA AND GUIDELINES FOR THE SELECTION OF ANIMAL FEEDLOT SITES KEYWORDS: FEEDLOTS SI
500	77 5270	FEEDLOTS	LAYOUT AND DESIGN OF ANIMAL FEEDLOT STRUCTURES AND EQUIPMENT KEYWORDS: FEEDLOTS DESIGN
500	77 5271	FEEDLOTS	MANAGEMENT OF THE LIVING ENVIRONMENT KEYWORDS: POLLUTION FEEDLOTS LEGAL-ASPECTS MODEL-S
500	77 5272	FEEDLOTS	EFFLUENT REGULATIONS FOR ANIMAL FEEDLOTS IN THE USA KEYWORDS: WATER-POLLUTION POINT-SOU
500	77 5273	FEEDLOTS	IMPACT OF INTENSIVE ANIMAL PRODUCTION ON HUMAN ECOLOGY KEYWORDS: FEEDLOTS EPIDEMIOLOGY
500	77 5277	FEEDLOTS	BIO-ENGINEERING PROPERTIES OF FEEDLOT WASTES KEYWORDS: WASTE-COMPOSITION FEEDLOTS WASTE
500	77 5283	FEEDLOTS	LAGOON SYSTEMS FOR ANIMAL WASTES KEYWORDS: LAGOONS DESIGN FEEDLOTS ECONOMICS AEROBIC AN
500	77 5285	FEEDLOTS	COMPOSTING OF FEEDLOT WASTES KEYWORDS: COMPOSTING FEEDLOTS LIVESTOCK-WASTES WINDROWS CO
500	77 5291	FEEDLOTS	COSTS OF LIQUID HANDLING AND TREATMENT OF LARGE SWINE FEEDLOT WASTES KEYWORDS: ECONOMIC
500	77 5292	FEEDLOTS	COST OF ANIMAL WASTE MANAGEMENT KEYWORDS: WASTE-MANAGEMENT ECONOMICS WATER-POLLUTION CA
500	77 5294	FEEDLOTS	SWINE FEEDLOT WASTEWATER TREATMENT IN ROMANIA KEYWORDS: SWINE-WASTES FEEDLOTS WASTEWATE
500	77 5295	FEEDLOTS	FEEDLOT WASTE MANAGEMENT IN UPPER SILESIA, POLAND KEYWORDS: SWINE-WASTES LIQUID-WASTES
500	77 5296	FEEDLOTS	FEEDLOT WASTE MANAGEMENT IN HUNGARY KEYWORDS: WATER-POLLUTION LEGAL-ASPECTS FEEDLOTS SW
500	77 5297	FEEDLOTS	FEEDLOT WASTE MANAGEMENT IN THE SOVIET UNION KEYWORDS: FEEDLOTS WASTE-MANAGEMENT FERTIL
500	77 5298	FEEDLOTS	ANIMAL WASTE MANAGEMENT IN GREECE KEYWORDS: FEEDLOTS POULTRY-WASTES SWINE-WASTES LIQUID
500	77 5299	FEEDLOTS	ANIMAL WASTE MANAGEMENT IN THE NETHERLANDS KEYWORDS: LEGAL-ASPECTS FEEDLOTS ODOR-CONTRO
500	77 5300	FEEDLOTS	FEEDLOT WASTE MANAGEMENT IN BULGARIA KEYWORDS: FEEDLOTS SWINE-WASTES DAIRY-INDUSTRY POL
500	77 5301	FEEDLOTS	FEEDLOT WASTE MANAGEMENT IN CZECHOSLOVAKIA KEYWORDS: FEEDLOTS LIQUID-WASTES LAND-APPLIC
400	78 5305	FEEDLOTS	COLORADO BIOGAS PLANT WINS ACEC TOP PRIZE KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING BI
400	78 4693	FEEDLOT-RUNOFF	LAGOONS-WHAT SIZE NEEDED FOR YOUR HERD KEYWORDS: DAIRY-WASTES LAGOONS ANAEROBIC DESIGN
300	74 4752	FEEDLOT-RUNOFF	PRACTICAL TREATMENT OF FEEDLOT RUNOFF KEYWORDS: FEEDLOT-RUNOFF WASTEWATER-TREATMENT BIO
400	77 4797	FEEDLOT-RUNOFF	THEY TRAP EVERY DROP OF RUNOFF KEYWORDS: FEEDLOT-RUNOFF WASTE-STORAGE-PONDS LAND-APPLIC
200	77 4811	FEEDLOT-RUNOFF	SIZING COMPONENTS ON OPEN FEEDLOT RUNOFF CONTROL SYSTEMS KEYWORDS: COMPUTER-MODELS FEED
300	72 4821	FEEDLOT-RUNOFF	ENVIRONMENTAL PROTECTION AGENCY VS ROBERT R DETERS-FABIAN J DETERS-MARCELLUS J DETERS
400	78 4829	FEEDLOT-RUNOFF	RUNOFF CONTROL KEYWORDS: FEEDLOT-RUNOFF RUNOFF-CONTROL DESIGN DEBRIS-BASINS LOCATION HO
100	77 4856	FEEDLOT-RUNOFF	RUNOFF FROM FEEDLOTS AND MANURE STORAGES IN SOUTHERN ONTARIO KEYWORDS: FEEDLOT-RUNOFF W
100	77 4864	FEEDLOT-RUNOFF	FEEDLOT RUNOFF HOLDING PONDS--NUTRIENT LEVELS AND RELATED MANAGEMENT ASPECTS KEYWORDS:
200	77 4872	FEEDLOT-RUNOFF	METHOD FOR INEXPENSIVE DISTRIBUTION OF LIQUID WASTE FROM DAIRY AND FEEDLOT KEYWORDS: LI
100	78 4930	FEEDLOT-RUNOFF	MODELING THE EFFECT OF MANAGEMENT POLICIES ON CATTLE FEEDLOT POLLUTION CONTROL COSTS KE
200	77 4961	FEEDLOT-RUNOFF	VEGETATIVE FILTER TREATMENT OF FEEDLOT RUNOFF KEYWORDS: VEGETATIVE-FILTER-SYSTEMS FEEDL
400	78 4996	FEEDLOT-RUNOFF	STUDY CONTROL OPTIONS FOR FEEDLOT RUNOFF SYSTEMS KEYWORDS: FEEDLOT-RUNOFF DEBRIS-BASINS
400	76 4999	FEEDLOT-RUNOFF	VEGETATIVE FILTER SYSTEM CLEANS FEEDLOT RUNOFF KEYWORDS: FEEDLOT-RUNOFF WASTE-TREATMENT
100	77 5028	FEEDLOT-RUNOFF	INTERNALIZATION IN A STOCHASTIC POLLUTION MODEL KEYWORDS: MODEL-STUDIES FEEDLOT-RUNOFF
100	78 5052	FEEDLOT-RUNOFF	QUALITY VARIATION OF STORED FEEDLOT RUNOFF KEYWORDS: FEEDLOT-WASTES WASTE-STORAGE FEEDL
300	78 5063	FEEDLOT-RUNOFF	ALTERNATE METHODS OF MANURE HANDLING KEYWORDS: WASTE-STORAGE DAIRY-WASTES FEEDLOT-RUNOF
400	78 5091	FEEDLOT-RUNOFF	SERPENTINE SYSTEM IS THE SOLUTION KEYWORDS: SERPENTINE-WATERWAY FEEDLOT-RUNOFF WASTE-TR
100	77 5093	FEEDLOT-RUNOFF	MODEL TO EVALUATE FEEDLOT RUNOFF CONTROL SYSTEMS KEYWORDS: MODEL-STUDIES FEEDLOT-RUNOFF
200	78 5113	FEEDLOT-RUNOFF	METHODOLOGIES AND PRELIMINARY RESULTS FOR EVALUATING SWINE DRYLOT RUNOFF IMPACT ON COA
600	75 5150	FEEDLOT-RUNOFF	FEEDLOT RUNOFF CONTROL FROM POINT NON-POINT SOURCES KEYWORDS: LEGAL-ASPECTS NPDES AGRIC
300	77 5169	FEEDLOT-RUNOFF	EFFECTS OF FEEDLOT RUNOFF ON FREE-LIVING AQUATIC CILIATED PROTOZOA KEYWORDS: FEEDLOT-RU
400	78 5208	FEEDLOT-RUNOFF	RUNOFF CONTROL SYSTEMS FOR CATTLE FEEDLOTS KEYWORDS: FEEDLOT-RUNOFF CATTLE WASTE-STORAG
700	76 4668	FEEDLOT-WASTES	CELLULOLYSIS IN FEEDLOT WASTE KEYWORDS: FEEDLOT-WASTES CHEMICAL-TREATMENT PHYSICAL-TREA
400	78 4699	FEEDLOT-WASTES	FEEDING FEEDLOT WASTE TO CATTLE KEYWORDS: REFEEDING FEEDLOT-WASTES CATTLE HARVESTING EN
100	77 4753	FEEDLOT-WASTES	A REVIEW OF MULCHES TO CONTROL WIND EROSION KEYWORDS: WIND-EROSION MULCHES CROP-RESIDUE
400	77 4852	FEEDLOT-WASTES	MANURE MAKES THE ROUNDS KEYWORDS: FEEDLOT-WASTES ANAEROBIC DIGESTERS CARBON-DIOXIDE MET
100	77 4892	FEEDLOT-WASTES	MECHANICAL MANURE HARVESTING FROM FEEDLOTS KEYWORDS: FEEDLOT-WASTES EQUIPMENT-MANURE-HA
100	77 4950	FEEDLOT-WASTES	MANURE EFFECTS ON WATER INTAKE AND RUNOFF QUALITY FROM IRRIGATED GRAIN SORGHUM PLOTS KE
400	78 4967	FEEDLOT-WASTES	FEEDLOT MANURE CAN BOOST IRRIGATED ALFALFA YIELDS KEYWORDS: FEEDLOT-WASTES LAND-APPLICA
100	78 5052	FEEDLOT-WASTES	QUALITY VARIATION OF STORED FEEDLOT RUNOFF KEYWORDS: FEEDLOT-WASTES WASTE-STORAGE FEEDL
200	78 5101	FEEDLOT-WASTES	ANAEROBIC FERMENTATION OF MANURE INTO SINGLE CELL PROTEIN KEYWORDS: REFEEDING FEEDLOT-W
200	76 5125	FEEDLOT-WASTES	AGRICULTURAL RESIDUES, INCLUDING FEEDLOT WASTES KEYWORDS: AGRICULTURAL-RESIDUES FEEDLOT
500	77 5290	FEEDLOT-WASTES	LAND DISPOSAL OF FEEDLOT WASTES BY IRRIGATION IN CZECHOSLOVAKIA KEYWORDS: LAND-APPLICAT
500	77 4902	FEEDLOT-WASTEWATER	PROPERTIES OF WASTE WATERS KEYWORDS: WASTEWATER-MANAGEMENT WASTE-COMPOSITION BIOLOGICAL
400	77 4789	FEEDS	RED WIGGLERS-TURN WORMS TO PROTEIN SUPPLEMENT-RESEARCHERS KEYWORDS: FEEDS RECYCLING WOR
400	77 4847	FEEDS	YOU MAY FIND PROFITS IN WASTE FEEDS KEYWORDS: FEEDS FOOD-PROCESSING-WASTES BREWERY-WAST
100	77 4895	FEEDS	NUTRITIONAL EVALUATION WITH RATS OF ALGAE CHLORELLA GROWN ON SWINE MANURE KEYWORDS: LI
600	4917	FEEDS	THE CALORIFIC PROJECT: I. BACKGROUND AND DESIGN CRITERIA KEYWORDS RECYCLING CATTLE-WA
200	73 4919	FEEDS	SOME ENERGY AND PROTEIN SOURCES OF THE FUTURE KEYWORDS: FEEDS POULTRY PERFORMANCE
400	77 5050	FEEDS	IT S NO BULL COLORADO TOWN TO CONVERT COW MANURE TO NATURAL GAS KEYWORDS: CATTLE-WASTES
200	78 5102	FEEDS	ESTIMATED INVENTORY OF LIVESTOCK AND POULTRY MANURE RESOURCES IN THE UNITED STATES KEYW
400	78 4680	FEED-ADDITIVES	FUNGASTATIC FEED ADDITIVES IMPROVE LITTER RESULTS KEYWORDS: FEED-ADDITIVES FUNGICIDES L
200	76 4723	FEED-ADDITIVES	ASPECTS OF CU ACCUMULATION IN SOIL FOLLOWING HOG MANURE APPLICATION-SOME PRELIMINARY RE
400	78 4830	FEED-ADDITIVES	INNOVATIONS ARE SEEN IN 1980S CATTLE FEEDING KEYWORDS: CATTLE FEED-ADDITIVES STIMULANTS
400	78 4834	FEED-ADDITIVES	BROILER LITTER IMPROVED GAIN DURING WINTER, STUDY SAYS KEYWORDS: POULTRY-LITTER REFEEDI
400	77 4875	FEED-ADDITIVES	FEEDLOT ODORS KEYWORDS: ODOR-INTENSITY ODOR-MEASUREMENT ODOR-CONTROL WASTE-MANAGEMENT C
100	78 4880	FEED-ADDITIVES	LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF: II.PRESERVATION AND ACCEPTABILITY OF WET EXC
100	77 4949	FEED-ADDITIVES	RESIDUE CONTENT OF BEEF FEEDLOT MANURE AFTER FEEDING DIETHYLSTILBESTROL, CHLORTETRACYCL
100	77 4953	FEED-ADDITIVES	SELECTIVE MORTALITY OF INSECTS IN MANURE FROM CATTLE FED RABON AND DIMILIN KEYWORDS IN
100	75 4963	FEED-ADDITIVES	THE USE OF DRIED POULTRY WASTES AS FEEDINGSTUFFS KEYWORDS: POULTRY-WASTES-DRIED REFEEDI
400	78 4981	FEED-ADDITIVES	TOO MUCH MAGNESIUM MAKES WETTER DROPPINGS KEYWORDS: DIETS POULTRY FEED-ADDITIVES MAGNES
100	77 5022	FEED-ADDITIVES	RECOVERY AND REACTIONS OF AMPROLIUM FROM POULTRY MANURE ADDED TO SOIL KEYWORDS: POULTRY
100	76 5030	FEED-ADDITIVES	GROWTH PERFORMANCE OF BROILERS FED VARIOUS POULTRY WASTES KEYWORDS: REFEEDING POULTRY-W
100	78 5046	FEED-ADDITIVES	ORGANOLEPTIC EVALUATION OF POULTRY EXCRETA FROM HENS CONSUMING FEED TREATED WITH AN ODO
200	76 5071	FEED-ADDITIVES	SIGNIFICANCE OF HEAVY METALS IN DPM FOR FEEDING KEYWORDS: REFEEDING POULTRY-WASTES-DRIE
300	77 5205	FEED-ADDITIVES	RESEARCH IN ANIMAL WASTE MANAGEMENT KEYWORDS: SWINE-WASTES DIGESTERS METHANE AGITATION
100	77 5313	FEED-ADDITIVES	CATTLE MANURE AND FINAL MOLASSES SILAGE IN CHICKEN FATTENING: I. HIGH SUBSTITUTION LEVE
100	77 5007	FEED-CONTAMINATION	RETENTION AND EXCRETION OF POLYCHLORINATED BIPHENYL RESIDUES BY LAYING HENS KEYWORDS: P
100	77 4766	FEED-SUPPLEMENTS	THE APPLICATION OF NATURAL ZEOLITES IN ANIMAL SCIENCE AND AQUACULTURE KEYWORDS: ZEOLITE
100	77 5064	FEED-SUPPLEMENTS	EFFICACY OF METHOPRENE (ALTOSID® IGR), AGAINST THE HORN FLY WHEN FED TO CATTLE IN MINER
200	76 4728	FENBENDAZOLE	AN APPROACH TO THE PROBLEM OF SLURRY AS A POSSIBLE SOURCE OF PASTURE CONTAMINATION WITH
700	76 4668	FERMENTATION	CELLULOLYSIS IN FEEDLOT WASTE KEYWORDS: FEEDLOT-WASTES CHEMICAL-TREATMENT PHYSICAL-TREA
400	78 4675	FERMENTATION	MONTANA RESEARCHER SEES METHANE PRODUCTION PROFITABLE IN FUTURE KEYWORDS: AGRICULTURAL-

100	72 4802	FERMENTATION	STUDIES ON LIVESTOCK EXCRETA DISPOSAL BY METHANE FERMENTATION: I. BASIC EXPERIMENT ON CO
100	72 4803	FERMENTATION	STUDIES ON LIVESTOCK EXCRETA DISPOSAL BY METHANE FERMENTATION: II. OPTIMUM LOAD AND COMPA
400	77 4817	FERMENTATION	POULTRY MANURE MAKES DEBUT AS ENERGY SOURCE KEYWORDS: POULTRY-WASTES ANIMAL-WASTES FERM
100	70 4874	FERMENTATION	CHANGES IN BIOCHEMICAL CONSTITUENT OF SOME ORGANIC WASTE MATERIALS UNDER ANAEROBIC METH
200	78 4947	FERMENTATION	METHANE AND BIOMASS PRODUCTION SYSTEMS FOR BEEF CATTLE MANURE KEYWORDS: LIVESTOCK-WASTE
400	77 5004	FERMENTATION	A MARTINI IN YOUR TANK KEYWORDS: RECYCLING ORGANIC-WASTES LIVESTOCK-WASTES ETHYL-ALCOHO
500	77 5026	FERMENTATION	BIOLOGICAL RECLAMATION OF SOLID WASTES KEYWORDS: RECYCLING SOLID-WASTES MUNICIPAL-WASTE
100	78 5040	FERMENTATION	NUTRITIONAL EVALUATION OF A SINGLE CELL PROTEIN FROM POULTRY MANURE KEYWORDS: REFEEDING
100	77 5061	FERMENTATION	CHARACTERISTICS OF AEROBIC, SOLID SUBSTRATE FERMENTATION OF SWINE WASTE-CORN MIXTURES K
100	77 5062	FERMENTATION	FERMENTATION OF SWINE WASTE-CORN MIXTURES FOR ANIMAL FEED: PILOT-PLANT STUDIES KEYWORD
300	78 5065	FERMENTATION	ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUE: POTENTIAL FOR IMPROVEMENT AND IMPLEME
200	76 5069	FERMENTATION	ENSILING POULTRY LITTER AND SUBSEQUENT FEEDING KEYWORDS: POULTRY-WASTES ENSILING REFEED
300	76 5090	FERMENTATION	BIOCONVERSION OF AGRICULTURAL WASTES FOR POLLUTION CONTROL AND ENERGY CONSERVATION KEY
200	78 5101	FERMENTATION	ANAEROBIC FERMENTATION OF MANURE INTO SINGLE CELL PROTEIN KEYWORDS: REFEEDING FEEDLOT-W
200	78 5111	FERMENTATION	METHANE PRODUCTION FROM ANAEROBIC FERMENTATION OF BEEF MANURE KEYWORDS: CATTLE-WASTES R
300	78 5130	FERMENTATION	ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUES INTO BIOGAS KEYWORDS: ANAEROBIC DIGESTE
100	77 5181	FERMENTATION	THERMOPHILIC FERMENTATION OF PIG FAECES AND STRAW BY ACTINOMYCETES KEYWORDS: WASTE-TREA
200	76 5199	FERMENTATION	FERMENTATION FOR METHANE PRODUCTION KEYWORDS: FERMENTATION METHANE GAS-PRODUCTION ANAER
300	78 5201	FERMENTATION	CHANGES IN CHARACTERISTICS OF DEEP STACKED BROILER LITTER WITH TIME KEYWORDS: POULTRY-L
300	77 5226	FERMENTATION	METHANE GENERATION FROM HUMAN, ANIMAL, AND AGRICULTURAL WASTES KEYWORDS: RECYCLING METH
400	78 5228	FERMENTATION	AUSTRALIANS UTILIZE FARM WASTE TO PRODUCE EDIBLE PROTEIN PRODUCTS KEYWORDS: SWINE-WASTE
100	77 5261	FERMENTATION	A NOTE ON THE FERMENTATIVE CHANGES OF DIETS PREPARED WEEKLY WITH MANURE SILAGE AND FINA
100	75 4670	FERTILIZERS	FIELD TEST FOR ESTIMATING DRY MATTER AND FERTILIZER VALUE OF SLURRY-- PRELIMINARY REPOR
100	75 4678	FERTILIZERS	NOTE ON SECONDARY AND MICRO-ELEMENT CONTENTS OF FERTILIZERS AND MANURES KEYWORDS: FERT
200	76 4732	FERTILIZERS	INVENTIONS AND INNOVATIONS TO REDUCE POLLUTION OF WATER RESOURCES KEYWORDS: WATER-POLLU
200	76 4744	FERTILIZERS	THE NITROGEN BALANCE SHEET KEYWORDS: NITROGEN-TRANSFORMATIONS ORGANIC-WASTES SOIL-CHEMI
200	77 4767	FERTILIZERS	COMMERCIAL SIZE ANAEROBIC DIGESTER PERFORMANCE WITH DAIRY MANURE KEYWORDS: DAIRY-WASTES
400	77 4798	FERTILIZERS	TOP YIELDS FROM ANIMAL WASTE KEYWORDS: DAIRY-WASTES SEWAGE-SLUDGE FERTILIZERS LAND-APPL
700	75 4812	FERTILIZERS	UTILIZATION AND DISPOSAL OF RESIDUE FROM THE PARTIAL OXIDATION OF CATTLE MANURE KEYWORD
100	73 4819	FERTILIZERS	EFFECT OF FARMYARD MANURE ON THE YIELD AND CHEMICAL COMPOSITION OF THE WHEAT CROP KEYWO
400	78 4837	FERTILIZERS	FERTILIZER VALUE OF TURKEY WASTE KEYWORDS: POULTRY-WASTES SOLID-WASTES TURKEYS LIQUID-W
400	77 4838	FERTILIZERS	FEEDLOT MANURE, SUPERPHOSPHATE FERTILIZING STUDIED KEYWORDS: LAND-APPLICATION FERTILIZE
400	78 4848	FERTILIZERS	LIQUID COW MANURE GOES TO MARKET KEYWORDS: DAIRY-WASTES LIQUID-WASTES WASTE-TREATMENT D
400	77 4850	FERTILIZERS	MANURE DIGESTER BEING BUILT ON MINNESOTA FARM KEYWORDS: ANAEROBIC DIGESTERS RECYCLING P
100	77 4860	FERTILIZERS	EFFECTS OF SOIL, COVER CROP, AND NUTRIENT SOURCE ON MOVEMENT OF SOIL, WATER, AND NITROG
300	77 4865	FERTILIZERS	CHEMICAL ANALYSIS AND FERTILIZER VALUE OF TURKEY MANURE KEYWORDS: POULTRY-WASTES WASTE-
400	78 4897	FERTILIZERS	MANURE CAN SLICE FERTILIZER NEEDS KEYWORDS: SWINE-WASTES FERTILIZERS LAND-APPLICATION W
300	77 4915	FERTILIZERS	CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE KEYWORDS: LIQUID-WASTES DAIRY-WA
300	4920	FERTILIZERS	FERTILIZER VALUE OF SWINE MANURE KEYWORDS SWINE-WASTES FERTILIZERS WASTE-COMPOSITION W
300	77 4924	FERTILIZERS	POULTRY WASTE MANAGEMENT ALTERNATIVES-A DESIGN AND APPLICATION MANUAL KEYWORDS: POULTRY
700	76 4942	FERTILIZERS	THE EFFECT OF APPLICATION OF POULTRY MANURE WHICH WAS SUBJECTED TO DIFFERENT WASTE MANA
400	78 4967	FERTILIZERS	FEEDLOT MANURE CAN BOOST IRRIGATED ALFALFA YIELDS KEYWORDS: FEEDLOT-WASTES LAND-APPLICA
400	78 4974	FERTILIZERS	EUROPEAN COMPOSTING METHODS-TREATMENT AND USE OF FARM YARD MANURE AND SLURRY KEYWORDS:
400	78 4979	FERTILIZERS	NOW LOOK WHAT THEY RE MAKING FROM MANURE KEYWORDS: DAIRY-WASTES RECYCLING IRRIGATION FE
400	78 4983	FERTILIZERS	TURKEY MANURE AS FERTILIZER KEYWORDS: TURKEYS POULTRY-WASTES FERTILIZERS PHOSPHORUS POT
100	75 4986	FERTILIZERS	VARIATIONS BETWEEN FARMS IN N, P, K, MG AND DRY MATTER COMPOSITION OF CATTLE, PIG AND PO
400	78 4998	FERTILIZERS	NOBODY LAUGHED ABOUT ORGANIC FARMING AFTER SEEING THE HAUGHLEY EXPERIMENT KEYWORDS: D
300	74 5006	FERTILIZERS	IS ALL THIS PHOSPHATE ON GRASSLAND REALLY NECESSARY KEYWORDS: FERTILIZERS PHOSPHATES GR
400	78 5012	FERTILIZERS	NON-STOP FLUSHING KEEPS BARN CLEAN KEYWORDS: CONFINEMENT-PENS CATTLE FLUSHING LAGOONS I
200	77 5019	FERTILIZERS	HANDLING OF MANURE FROM DIFFERENT ANIMALS AND MANAGEMENT SYSTEMS KEYWORDS: WASTE-MANAGE
300	73 5024	FERTILIZERS	INTENSIVE FARMING AND POLLUTION KEYWORDS: ANIMAL-WASTES LAND-APPLICATION FERTILIZERS NU
100	76 5036	FERTILIZERS	ASKOV 1984--FERTILIZERS AND MANURE ON SANDY AND LOAMY SOILS KEYWORDS: ANIMAL-WASTES FER
400	77 5050	FERTILIZERS	IT S NO BULL!COLORADO TOWN TO CONVERT COW MANURE TO NATURAL GAS KEYWORDS: CATTLE-WASTES
400	77 5058	FERTILIZERS	CONTROL OF NONPOINT WATER POLLUTION FROM AGRICULTURE: SOME CONCEPTS KEYWORDS: NONPOINT
200	76 5068	FERTILIZERS	PROCEEDINGS OF SYMPOSIUM ON THE CONVERSION OF POULTRY WASTE TO ENERGY, FEED, OR FERTILI
200	76 5070	FERTILIZERS	USING POULTRY MANURE FOR VEGETABLES AND HYDROSEEDING KEYWORDS: POULTRY-WASTES CHEMICAL-
200	76 5075	FERTILIZERS	MARKETING MANURE KEYWORDS: POULTRY-WASTES-DRIED DEHYDRATION FERTILIZERS WASTE-STORAGE L
100	76 5080	FERTILIZERS	EFFECT OF FERTILIZERS AND MANURE ON THE ROOT CATION EXCHANGE CAPACITY OF SOME RICE AND
100	76 5082	FERTILIZERS	EFFECT OF CONTINUOUS USE OF CHEMICAL FERTILISERS AND MANURES ON SOIL PHYSICAL AND CHEMI
200	78 5102	FERTILIZERS	ESTIMATED INVENTORY OF LIVESTOCK AND POULTRY MANURE RESOURCES IN THE UNITED STATES KEYW
100	78 5124	FERTILIZERS	BROILER GROWERS WITH CATTLE CAN MAKE BEST USE OF LITTER KEYWORDS: POULTRY-LITTER RECYCL
200	76 5125	FERTILIZERS	AGRICULTURAL RESIDUES, INCLUDING FEEDLOT WASTES KEYWORDS: AGRICULTURAL-RESIDUES FEEDLOT
400	78 5126	FERTILIZERS	FEED AND FERTILIZER VALUE OF BROILER LITTER VARIES KEYWORDS: POULTRY-LITTER RECYCLING W
400	78 5132	FERTILIZERS	GRASS A BY-PRODUCT OF POULTRY KEYWORDS: POULTRY-LITTER LAND-DISPOSAL FERTILIZERS FESCUE
400	77 5177	FERTILIZERS	MANURE IS AN INCREASINGLY ECONOMICAL FERTILIZER SOURCE KEYWORDS: ANIMAL-WASTES LAND-APP
400	78 5189	FERTILIZERS	FEEDLOT MANURE KEEPS HOME FIRES BURNING KEYWORDS: RECYCLING THERMONETICS METHANE REFEED
400	73 5192	FERTILIZERS	AN ALGAL REGENERATIVE SYSTEM FOR SINGLE-FAMILY FARMS AND VILLAGES KEYWORDS: RECYCLING A
500	77 5197	FERTILIZERS	PARTICULATE AND ODOR CONTROL IN THE ORGANIC FERTILIZER INDUSTRY: A CASE HISTORY KEYWOR
400	78 5224	FERTILIZERS	SMALL FARM ENERGY PROJECT KEYWORDS: RECYCLING BIOGAS METHANE REFEEDING ANAEROBIC DIGEST
400	78 5228	FERTILIZERS	AUSTRALIANS UTILIZE FARM WASTE TO PRODUCE EDIBLE PROTEIN PRODUCTS KEYWORDS: SWINE-WASTE
100	75 5235	FERTILIZERS	RELATIVE AVAILABILITY OF PHOSPHORUS FROM SOME ORGANIC MANURES AND PHOSPHATIC FERTILIZER
400	78 5236	FERTILIZERS	MANURE SPREADING BUILDS SOIL AND PROFITS KEYWORDS: ANIMAL-WASTES ECONOMICS FERTILIZERS
500	77 5289	FERTILIZERS	UTILIZATION OF ANIMAL WASTES FOR CROP PRODUCTION KEYWORDS: LIQUID-WASTES FERTILIZERS LA
500	77 5290	FERTILIZERS	LAND DISPOSAL OF FEEDLOT WASTES BY IRRIGATION IN CZECHOSLOVAKIA KEYWORDS LAND-APPLICAT
500	77 5297	FERTILIZERS	FEEDLOT WASTE MANAGEMENT IN THE SOVIET UNION KEYWORDS FEEDLOTS WASTE-MANAGEMENT FERTIL
300	76 4824	FERTILIZER	ENERGY POTENTIAL THROUGH BIO-CONVERSION OF AGRICULTURAL WASTES KEYWORDS: AGRICULTURAL-W
400	78 4849	FERTILIZER	STATE-BASED PLANT TURNING CATTLE MANURE INTO METHANE GAS KEYWORDS: CATTLE-WASTES RECYCL
600	4917	FERTILIZER	THE CALORIFIC PROJECT: I. BACKGROUND AND DESIGN CRITERIA KEYWORDS: RECYCLING CATTLE-WA
400	78 5132	FESCUES	GRASS A BY-PRODUCT OF POULTRY KEYWORDS: POULTRY-LITTER LAND-DISPOSAL FERTILIZERS FESCUE
200	77 4779	FIBER-WALL-REACTOR	FIBER WALL REACTOR DIGESTION OF DAIRY CATTLE MANURE KEYWORDS: DAIRY-WASTES ANAEROBIC-TR
500	77 5281	FILTERS	SOLIDS SEPARATION AND DEWATERING KEYWORDS SEPARATION-TECHNIQUES CENTRIFUGAL-SEPARATORS
100	77 5247	FILTER-TOWERS	FRENCH EXPERIMENT IN PIG SLURRY DEODORIZATION KEYWORDS: ODOR-CONTROL SWINE-WASTES SLURR
100	76 4891	FILTRATE	AN INTEGRATED SEPARATION, AEROBIC TREATMENT AND SLUDGE DE-WATERING SYSTEM FOR PIG SLURR
200	77 4896	FILTRATION	DEWATERING A SWINE MANURE SLURRY BY EXPRESSION KEYWORDS: SEPARATION-TECHNIQUES SWINE-WA
100	77 4989	FILTRATION	STUDIES ON MICROBIOLOGICAL CONTROL OF LIQUID MANURE HANDLING KEYWORDS: LIQUID-WASTES WA
300	77 5034	FILTRATION	A METHOD OF MANURE DISPOSAL FOR A BEEF PACKING OPERATION-- FIRST INTERIM TECHNICAL REP
100	75 5200	FILTRATION	AEROBIC TREATMENT OF FARM WASTES KEYWORDS: AEROBIC-TREATMENT ANIMAL-WASTES SETTLEMENT F
300	77 5047	FINANCE	EPA SBA LOANS FOR WATER POLLUTION CONTROL KEYWORDS: WATER-POLLUTION ABATEMENT FINANCE SM
100	76 4827	FISH	EXPERIMENTAL STUDY OF NITROGEN EXCRETION OF BASS DICENTRARCHUS LABRAX DURING GROWTH. I
100	77 5121	FISH	POULTRY WASTES IN THE DIET OF ISRAELI CARP KEYWORDS: REFEEDING POULTRY-WASTES FISH PERF
100	76 4928	FISH-FARMING	ORGANIC AND INORGANIC NUTRIENT ENRICHMENT AND THE LIVING CONDITIONS OF CARP FRY IN FIRS
400	78 4931	FISH-FARMING	FARMING IN WASTE WATER MAY AID DEVELOPING NATIONS KEYWORDS: AQUACULTURE WASTEWATER-REUS
400	78 4973	FISH-FARMING	KAPLAN S BLUEPRINT FOR FEEDLOT UTOPIA-PART THREE KEYWORDS: LIQUID-WASTES WASTEWATER-TRE
100	78 5057	FISH-FARMING	EFFLUENTS FROM CATFISH PONDS DURING FISH HARVEST KEYWORDS: FISH-FARMING EFFLUENT-QUALIT
100	78 5309	FISH-FARMING	UTILIZATION OF SWINE MANURE IN A POLYCULTURE OF ASIAN AND NORTH AMERICAN FISHES KEYWORD
400	78 5312	FISH-FARMING	AGRICULTURAL WASTES IN FISH FARMING KEYWORDS: SWINE-WASTES CATTLE-WASTES POULTRY-WASTES
200	76 4725	FISH-KILLS	WATER POLLUTION BY LIVESTOCK EFFLUENTS KEYWORDS: WATER-POLLUTION FISH-KILLS LIVESTOCK-W
500	77 5123	FISH-KILLS	POLLUTION CONTROL FOR AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES ANIMAL-WASTES WASTE-TRE
100	4997	FISH-PONDS	MOVEMENT OF NITRATES AND OTHER DISSOLVED SALTS FROM A FISHPOND INTO LAKE KINNERET KEYWO
100	74 4703	FISH-PRODUCTION	AERATION, WATER QUALITY, AND CATFISH PRODUCTION KEYWORDS. FISH-PRODUCTION AERATION WATE

300 78 5037	FISH-WASTES	METHODS OF FECAL COLLECTION AND NUTRIENT LEACHING IN DIGESTIBILITY STUDIES KEYWORDS: FI
100 73 4801	FLIES	INFLUENCE OF AVAILABLE POULTRY MANURE BREEDING HABITAT ON EMERGENCE DENSITY OF SYNANTHR
300 78 4976	FLIES	THE POTENTIAL OF BROILER LITTER AS FUEL KEYWORDS: POULTRY-WASTES FUEL INCINERATION HEAT
300 70 5086	FLIES	WORLDWIDE SURVEY AND COMPARISON OF ADULT PREDATOR AND SCAVENGER INSECT POPULATIONS ASSO
100 78 4958	FLOCCULANTS	HARVESTING ALGAE FROM LAGOON EFFLUENT KEYWORDS: LAGOONS WASTE-TREATMENT FLOCCULANTS BY-
300 77 4969	FLOORING	FLOOR MATERIALS FOR SHEEP HOUSING KEYWORDS: SLOTTED-FLOORS SHEEP CONFINEMENT-PENS FLOOR
100 77 4991	FLOORS	EFFECT OF SLATTED AND DEEP LITTER FLOORS ON THE PRODUCTIVE PERFORMANCE AND ENERGY UTIL
300 75 5002	FLOORS	SELECTING A SWINE WASTE MANAGEMENT SYSTEM KEYWORDS: SWINE-WASTES MANAGEMENT FLOORS DESI
300 78 5131	FLOORS	A MANUAL ON EVALUATION AND ECONOMIC ANALYSIS OF LIVESTOCK WASTE MANAGEMENT SYSTEMS KE
100 78 5136	FLOORS	DRYING CHARACTERISTICS OF BROILER WASTE ON A HEATED CONCRETE SLAB KEYWORDS: DEHYDRATION
400 77 5058	FLOW-CHARTS	CONTROL OF NONPOINT WATER POLLUTION FROM AGRICULTURE: SOME CONCEPTS KEYWORDS: NONPOINT
300 78 4952	FLUIDIZED-BED-REAC	CONVERSION OF CATTLE FEEDLOT MANURE TO ETHYLENE AND AMMONIA SYNTHESIS GAS KEYWORDS: FEE
300 77 5034	FLUID-BED-INCINERA	A METHOD OF MANURE DISPOSAL FOR A BEEF PACKING OPERATION-- FIRST INTERIM TECHNICAL REP
700 75 4812	FLUID-BED-REACTOR	UTILIZATION AND DISPOSAL OF RESIDUE FROM THE PARTIAL OXIDATION OF CATTLE MANURE KEYWORD
300 76 4690	FLUSHING	GUTTER FLUSHING SYSTEMS FOR SWINE BUILDINGS KEYWORDS: FLUSHING SWINE-WASTES DESIGN LAGO
200 76 4749	FLUSHING	THE APPLICATION OF FLUSHING MANURE-HANDLING SYSTEMS TO POULTRY BUILDINGS KEYWORDS: POUL
200 74 4758	FLUSHING	HANDLING HOUSED BEEF CATTLE FEEDLOT MANURE KEYWORDS: DESIGN FEEDLOTS CATTLE WASTE-MANAG
200 77 4770	FLUSHING	DAIRY LAGOON EFFECTS ON GROUNDWATER QUALITY KEYWORDS: DAIRY-WASTES HOLDING-PONDS LAGOON
200 77 4809	FLUSHING	WASTEWATER REUSE LAGOON SYSTEMS FOR SWINE KEYWORDS: SWINE-WASTES LAGOONS FLUSHING WASTE
400 77 4831	FLUSHING	FLUSH GUTTER SYSTEMS-CUT COSTS, IMPROVE ANIMAL ENVIRONMENT KEYWORDS: CONFINEMENT-PENS
400 78 4840	FLUSHING	FEEDLOT SELLS MANURE KEYWORDS: WASTE-MANAGEMENT FEEDLOTS CATTLE LIQUID-WASTES FLUSHING
400 78 4846	FLUSHING	FLUSH SYSTEM CLEANS SWINE PENS KEYWORDS: SWINE-WASTES CONFINEMENT-PENS FLUSHING DESIGN
400 78 4899	FLUSHING	LOW-LABOR FLUSH SYSTEM CLEANS MILKING AREAS IN MINUTES KEYWORDS: LIQUID-WASTES DAIRY-WA
400 78 4977	FLUSHING	QUESTIONS AND ANSWERS ABOUT MANURE FLUSHING SYSTEMS FOR SWINE BUILDINGS KEYWORDS: SWINE
300 5010	FLUSHING	SCALE MODEL OF AN UNDERSLAT FLUSHING SYSTEM KEYWORDS: MODEL-STUDIES FLUSHING DESIGN SLO
400 78 5012	*FLUSHING*	*NON-STOP FLUSHING KEEPS BARN CLEAN KEYWORDS: CONFINEMENT-PENS CATTLE FLUSHING LAGOONS I*
100 77 5014	FLUSHING	FLUSHING PIGGERY WASTES KEYWORDS: FLUSHING SWINE-WASTES DESIGN EFFLUENT
300 77 5049	FLUSHING	REFEEDING WASTES TO DAIRY CATTLE KEYWORDS: DAIRY-WASTES SEPARATION TECHNIQUES DEHYDRATI
100 78 5056	FLUSHING	FLUSHING SLAT WASTE HANDLING SYSTEM KEYWORDS: SWINE-WASTES LIQUID-WASTES FLUSHING DESIG
200 78 5104	FLUSHING	HIGH VOLUME FLUSH DEVICES FOR ANIMAL WASTE MANAGEMENT KEYWORDS: FLUSHING DESIGN WATER-U
200 78 5109	FLUSHING	EARTHEN PITS FOR MANURE AND RECYCLED FLUSH-WATER STORAGE KEYWORDS: MANURE-PITS WASTE-ST
100 78 5148	FLUSHING	EARTHEN PITS FOR MANURE AND RECYCLED FLUSH-WATER STORAGE KEYWORDS: WASTE-STORAGE EARTHE
400 78 5163	FLUSHING	MOVE HOGS INDOORS-NEXT STEP IN HOG CONFINEMENT KEYWORDS: SWINE MANAGEMENT DESIGN ECONOM
400 78 5211	FLUSHING	HOLDING POND AND FLUSH GUTTERS KEYWORDS: CATTLE-WASTES FLUSHING WASTE-STORAGE RECYCLING
400 78 5223	FLUSHING	MANAGING MANURE ECONOMICS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT ECONOMICS SLATTED-FLO
100 77 5258	FLUSHING	INVESTIGATIONS IN THE U K INTO METHODS OF ODOUR CONTROL FOR FARMS KEYWORDS: ODOR-CONTR
500 77 5300	FLUSHING	FEEDLOT WASTE MANAGEMENT IN BULGARIA KEYWORDS: FEEDLOTS SWINE-WASTES DAIRY-INDUSTRY POL
100 78 5308	FLUSHING	DISTRIBUTION OF ENTEROBACTERIACEAE IN RECYCLED MANURE BEDDING ON CALIFORNIA DAIRIES KEY
300 5010	FLUSH-VOLUME	SCALE MODEL OF AN UNDERSLAT FLUSHING SYSTEM KEYWORDS: MODEL-STUDIES FLUSHING DESIGN SLO
400 78 4845	FLY-CONTROL	LEAVE PAD OF MANURE FOR NATURAL PREDATORS KEYWORDS: FLY-CONTROL PREDATORS MANURE-PAD PO
400 78 4871	FLY-CONTROL	KEEPING FLIES OUT OF THE HEN HOUSE KEYWORDS: FLY-CONTROL POULTRY-HOUSES WASTE-REMOVAL M
100 77 4949	FLY-CONTROL	RESIDUE CONTENT OF BEEF FEEDLOT MANURE AFTER FEEDING DIETHYLSTILBESTROL, CHLORTETRACYCL
200 76 5000	FLY-CONTROL	IN-HOUSE MANURE DRYING IN THE DEEP-PIT HIGH-RISE SYSTEM KEYWORDS: DEHYDRATION DEEP-PI
100 77 5033	FLY-CONTROL	MECHANICAL ROTAVATION OF POULTRY MANURE AS A METHOD OF FLY CONTROL KEYWORDS: FLY-CONTR
100 78 5041	FLY-CONTROL	USE OF THIOCARBAMIDE TO CONTROL HOUSE FLIES IN CAGED LAYER HOUSES KEYWORDS: FLY-CONTRO
100 78 5043	FLY-CONTROL	THIOCARBAMIDE AS AN INSECTICIDE WHEN APPLIED TO CAGE LAYING HEN FECES KEYWORDS: FLY-CON
100 77 5064	FLY-CONTROL	EFFICACY OF METHOPRENE (ALTOSID® IGR), AGAINST THE HORN FLY WHEN FED TO CATTLE IN MINER
300 78 5153	FLY-CONTROL	INTRODUCING DUNG BEETLES AS AN AID IN MANURE DISPOSAL AND FLY CONTROL KEYWORDS: FLY-CON
100 77 5180	FLY-CONTROL	PARASITES OF HAEMATOBIA IRRITANS AND OTHER FLIES BREEDING IN BOVINE FECES IN NORTHEAST
200 70 5191	FLY-CONTROL	AIR DRYING POULTRY MANURE KEYWORDS: DEHYDRATION POULTRY-WASTES FLY-CONTROL ODOR-CONTROL
300 78 5218	FLY-CONTROL	DOMESTIC FLY PROBLEMS IN DEEP PIT POULTRY HOUSES KEYWORDS: FLY-CONTROL DEEP-PITS POULTR
400 78 5219	FLY-CONTROL	FEATHERS ON MANURE CAN INCREASE FLY PROBLEM KEYWORDS: FLY-CONTROL POULTRY-WASTES FEATHE
100 78 5051	FLY-LARVAE	AN ATTEMPT TO MECHANIZE NUTRIENT RECOVERY FROM ANIMAL EXCRETA KEYWORDS: POULTRY-WASTES
400 77 4847	FOOD-PROCESSING-WA	YOU MAY FIND PROFITS IN WASTE FEEDS KEYWORDS: FEEDS FOOD-PROCESSING-WASTES BREWERY-WAST
500 77 4903	FOOD-PROCESSING-WA	RECYCLING ELEMENTS IN WASTES THROUGH SOIL-PLANT SYSTEMS KEYWORDS: LAND-APPLICATION MUNI
200 77 4763	FOOD-WASTES	MODELING TECHNIQUES AND COMPUTER SIMULATION OF AGRICULTURAL WASTE TREATMENT PROCESSES K
400 77 4838	FORAGES	FEEDLOT MANURE, SUPERPHOSPHATE FERTILIZING STUDIED KEYWORDS: LAND-APPLICATION FERTILIZE
100 77 5118	FORAGES	THE EFFECTS OF CATTLE SLURRY AND INORGANIC FERTILISER NITROGEN ON THE YIELD AND MINERAL
400 78 4669	FORESTRY-WASTES	CROP, LIVESTOCK RESIDUES: A FUTURE SOURCE OF FUEL KEYWORDS: AGRICULTURAL-WASTES FOREST
100 77 5138	FORESTRY-WASTES	AGRICULTURAL AND FORESTRY WASTES AS AN ENERGY RESOURCE KEYWORDS: AGRICULTURAL-WASTES FO
200 76 4715	FORESTS	ANIMAL ORGANIC MANURES IN DUTCH FORESTRY-APPLICATION AND RESTRICTIONS KEYWORDS: LIQUID-
700 74 4704	FOREST-LAND-RUNOFF	AGRICULTURAL AND FOREST LAND RUNOFF IN UPPER SOUTH RIVER NEAR WAYNESBORO, VIRGINIA KEYW
500 77 4904	FOREST-MANAGEMENT	SPECIAL OPPORTUNITIES AND PROBLEMS IN USING FOREST SOILS FOR ORGANIC WASTE APPLICATION
500 77 4901	FOREST-WASTES	PROPERTIES OF AGRICULTURAL AND MUNICIPAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WASTE
100 78 4878	FORMALDEHYDE	ANIMAL PERFORMANCE AND MICROBIAL ADAPTATION OF RUMINANTS FED FORMALDEHYDE TREATED POULT
500 77 5275	FORMALDEHYDE	HEALTH EFFECTS FROM WASTE UTILIZATION KEYWORDS: PUBLIC-HEALTH ANIMAL-HEALTH REFEEDING L
200 77 4959	FORMALIN	A GRAPHICAL ANALYSIS OF LIVESTOCK PRODUCTION AND WASTE-MANAGEMENT SYSTEMS KEYWORDS: SYS
100 73 4689	FOULING	A TECHNIQUE FOR THE STUDY OF FOULING BY GRAZING CATTLE KEYWORDS: CATTLE DEFOLIATION TRE
100 78 5095	FRACTIONATION	FRACTIONATION OF NITROGEN ISOTOPES BY ANIMALS: A FURTHER COMPLICATION TO THE USE OF VA
200 78 5101	FRACTIONATION	ANAEROBIC FERMENTATION OF MANURE INTO SINGLE CELL PROTEIN KEYWORDS: REFEEDING FEEDLOT-W
100 74 5262	FRACTIONATION	PHOSPHORUS IN ORGANIC MANURES-I. FRACTIONATION OF DIFFERENT FORMS OF PHOSPHORUS KEYWORD
200 78 5103	FRICTION-LOSS	CONTOUR FURROW IRRIGATION WITH LIQUID MANURE USING MICROTUBING FOR FLOW CONTROL KEYWOR
400 78 4669	FUELS	CROP, LIVESTOCK RESIDUES: A FUTURE SOURCE OF FUEL KEYWORDS: AGRICULTURAL-WASTES FOREST
700 75 4812	FUELS	UTILIZATION AND DISPOSAL OF RESIDUE FROM THE PARTIAL OXIDATION OF CATTLE MANURE KEYWORD
400 78 5161	FUELS	ANOTHER POSITIVE STEP IN RECYCLING KEYWORDS: SALT GROUNDWATER-POLLUTION DAIRY-WASTES DE
300 78 4976	FUEL	THE POTENTIAL OF BROILER LITTER AS FUEL KEYWORDS: POULTRY-WASTES FUEL INCINERATION HEAT
400 78 4680	FUNGICIDES	FUNGASTATIC FEED ADDITIVES IMPROVE LITTER RESULTS KEYWORDS: FEED-ADDITIVES FUNGICIDES L
300 78 5183	FUNGI	SPECIFIC COMPOSITION OF REPRESENTATIVE FEEDLOT WASTES: A CHEMICAL AND MICROBIAL PROFILE
100 77 5306	FUNGI	MYCOFLORA OF A TURKEY CONFINEMENT BROODER HOUSE KEYWORDS: POULTRY AIR-POLLUTION LITTERS
200 71 4762	GASES	SAFETY HAZARDS ASSOCIATED WITH LIVESTOCK WASTE KEYWORDS: FEEDLOTS ACCIDENTS MANAGEMENT
200 74 4781	GASES	SWINE BUILDING AIR CONTAMINATE CONTROL WITH PIT VENTILATION KEYWORDS: SWINE-WASTES GASE
400 70 4909	GASES	LIQUID MANURE CAN RELEASE DEADLY GASES KEYWORDS: LIQUID-WASTES GASES TOXICITY SAFETY
400 78 5011	GASES	TOXIC GASES KILL WORKER KEYWORDS: AIR-POLLUTION PUBLIC-HEALTH CONFINEMENT-PENS CATTLE-H
300 78 5025	GASES	CONTROL OF ANIMAL PRODUCTION ODORS--THE STATE-OF-THE-ART KEYWORDS: AIR-POLLUTION ODOR-C
300 77 5035	GASES	SOURCE ASSESSMENT--BEEF CATTLE FEEDLOTS KEYWORDS: CATTLE DUSTS GASES AMMONIA THIOLS AIR
400 78 5212	GASES	WARNING-MANURE GASES ARE DANGEROUS KEYWORDS: GASES HYDROGEN-SULFIDE METHANE CARBON-DIOX
500 77 5265	GASES	ANIMAL WASTES KEYWORDS: FEEDLOTS DESIGN EFFLUENTS GASES ODOR ANIMAL-WASTES WASTE-STORAG
500 77 5287	GASES	ENERGY RECOVERY FROM ANIMAL WASTES-ANAEROBIC DIGESTION, PYROLYSIS, HYDROGENATION KEYWOR
100 77 5242	GASES-TRACE	A METHOD FOR SAMPLING AIR IN ANIMAL HOUSES TO ANALYSE TRACE GASES INCLUDING ODORANTS WI
300 76 4964	GAS-CHROMATOGRAPHY	DETECTING AND MEASURING MALODORS FROM ANIMAL WASTES KEYWORDS: ANIMAL-WASTES ODOR MEASUR
100 78 5015	GAS-CHROMATOGRAPHY	A REVIEW OF ANALYTICAL METHODS FOR DETECTING AND MEASURING MALODORS FROM ANIMAL WASTES
100 77 5240	GAS-CHROMATOGRAPHY	SAMPLING, CHARACTERISATION AND ANALYSIS OF MALODOURS KEYWORDS: ODOR SWINE-WASTES POULTR
100 77 5242	GAS-CHROMATOGRAPHY	A METHOD FOR SAMPLING AIR IN ANIMAL HOUSES TO ANALYSE TRACE GASES INCLUDING ODORANTS WI
100 77 5244	GAS-CHROMATOGRAPHY	SAMPLING AND ANALYSIS OF AIR IN PIG HOUSES KEYWORDS: ODOR SWINE-WASTES SPECTROPHOTOMETR
400 78 4669	GAS-PRODUCTION	CROP, LIVESTOCK RESIDUES: A FUTURE SOURCE OF FUEL KEYWORDS: AGRICULTURAL-WASTES FOREST
200 77 4767	GAS-PRODUCTION	COMMERCIAL SIZE ANAEROBIC DIGESTER PERFORMANCE WITH DAIRY MANURE KEYWORDS: DAIRY-WASTES
200 77 4807	GAS-PRODUCTION	BACTERIAL RESPONSE TO SALTS IN AN ANAEROBIC DAIRY LAGOON KEYWORDS: DAIRY-WASTES LAGOONS
100 77 4855	GAS-PRODUCTION	AGRICULTURAL BIOMASS WASTES--UTILIZATION ROUTES KEYWORDS: AGRICULTURAL-WASTES RECYCLING
300 4916	GAS-PRODUCTION	METHANE PRODUCTION SYSTEMS FOR SWINE MANURE KEYWORDS: SWINE-WASTES CONFINEMENT-PENS ANA
200 77 4966	GAS-PRODUCTION	EFFECT OF SURFACE AERATION ON GASES EVOLVED BY A SWINE-WASTE ANAEROBIC LAGOON KEYWORDS:

300	76	5090	GAS-PRODUCTION BIOCONVERSION OF AGRICULTURAL WASTES FOR POLLUTION CONTROL AND ENERGY CONSERVATION KEY
200	78	5127	GAS-PRODUCTION ALTERNATE MANURE RECYCLING SYSTEMS FOR ENERGY RECOVERY KEYWORDS: RECYCLING GAS-PRODUCTI
300	78	5130	GAS-PRODUCTION ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUES INTO BIOGAS KEYWORDS: ANAEROBIC DIGESTE
300	78	5142	GAS-PRODUCTION THE FEASIBILITY OF METHANE PRODUCTION FROM DAIRY ANIMAL WASTES: THE FARMER'S PERSPECTI
100	78	5144	GAS-PRODUCTION CARBON NITROGEN RATIO AND ANAEROBIC DIGESTION OF SWINE WASTE KEYWORDS: ANAEROBIC DIGEST
300	78	5152	GAS-PRODUCTION METHANE PRODUCTION FROM LIVESTOCK WASTE KEYWORDS: RECYCLING LIVESTOCK-WASTES POULTRY-WA
200	78	5195	GAS-PRODUCTION BIOLOGICAL AND CHEMICAL FLUCTUATIONS DURING ANAEROBIC DIGESTION OF SWINE MANURE KEYWORD
200	76	5199	GAS-PRODUCTION *FERMENTATION FOR METHANE PRODUCTION KEYWORDS:* FERMENTATION METHANE GAS-PRODUCTION ANAER
200	77	4767	GAS-STORAGE COMMERCIAL SIZE ANAEROBIC DIGESTER PERFORMANCE WITH DAIRY MANURE KEYWORDS: DAIRY-WASTES
100	78	5216	GRAPHS A GRAPHICAL ANALYSIS OF LIVESTOCK PRODUCTION AND WASTE-MANAGEMENT SYSTEMS KEYWORDS: CAT
200	76	4709	GRASSLAND SLURRY UTILISATION ON THE DAIRY FARM KEYWORDS: DAIRY-WASTES SLURRIES LAND-APPLICATION G
200	76	4711	GRASSLAND EFFICIENT RECYCLING OF NUTRIENTS KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES SH
200	76	4714	GRASSLAND THE INFLUENCE OF ANIMAL MANURES ON THE GRAZING BEHAVIOR AND HERBAGE INTAKE OF CATTLE KE
200	76	4718	GRASSLAND THE EFFECT OF SOIL TYPE AND SEASON OF APPLICATION ON INFILTRATION AND RUNOFF OF NUTRIEN
200	76	4730	GRASSLAND A STUDY OF THE EFFECTS OF ANIMAL EFFLUENT UTILISATION FOR GRASSLAND PRODUCTION ON LEVEL
200	77	4764	GRASSLAND LONG-TERM FESCUE AND COASTAL BERMUDAGRASS CROP RESPONSE TO SWINE LAGOON EFFLUENT KEYWOR
200	77	4778	GRASSLAND ANAEROBIC BEEF SLURRY AS A *FERTILIZER FOR BERMUDA GRASS AND BAHIA GRASS KEYWORDS:* SLURR
400	77	4797	GRASSLAND THEY TRAP EVERY DROP OF RUNOFF KEYWORDS: FEEDLOT-RUNOFF WASTE-STORAGE-PONDS LAND-APPLIC
200	72	4818	GRASSLAND THE FATE OF ENTERIC BACTERIA DURING STORAGE AND DISPOSAL OF ANIMAL EXCRETA KEYWORDS: PA
400	78	4899	GRASSLAND LOW-LABOR FLUSH SYSTEM CLEANS MILKING AREAS IN MINUTES KEYWORDS: LIQUID-WASTES DAIRY-WA
700	76	4942	GRASSLAND THE EFFECT OF APPLICATION OF POULTRY MANURE WHICH WAS SUBJECTED TO DIFFERENT WASTE MANA
300	74	5006	GRASSLAND IS ALL THIS PHOSPHATE ON GRASSLAND REALLY NECESSARY KEYWORDS: FERTILIZERS PHOSPHATES GR
100	73	5085	GRASSLAND THE EFFECT OF APPLYING LARGE QUANTITIES OF SLURRY TO GRASSLAND KEYWORDS: LAND-APPLICATI
200	78	5227	GRASS-FILTERS BARNYARD SEDIMENT AND NUTRIENT REMOVAL BY GRASS FILTERS KEYWORDS: AGRICULTURAL-RUNOFF S
400	78	4939	GRASS-TETANY BROILER FERTILIZED FESCUE A MIXED BLESSING KEYWORDS: POULTRY-WASTES LAND-APPLICATION PA
700	76	4942	GRASS-TETANY THE EFFECT OF APPLICATION OF POULTRY MANURE WHICH WAS SUBJECTED *TO DIFFERENT WASTE MANA*
400	78	5134	GRASS-TETANY BROILER LITTER FOR FERTILIZER KEYWORDS: LAND-APPLICATION POULTRY-LITTER PASTURES ANIMAL
400	78	4832	GRAVITY-DRAIN-SYST GRAVITY DRAIN SYSTEMS FOR FARROWING AND NURSERY FACILITIES KEYWORDS: GRAVITY-DRAIN-SYS
400	77	4936	GRAVITY-DRAIN-SYST GRAVITY-DRAIN SYSTEM KEYWORDS: LIQUID-WASTES SWINE-WASTES ODOR AIR-POLLUTION GRAVITY-DR
100	70	4676	GRAZING FOULING OF PASTURES BY DUNG KEYWORDS: CATTLE-WASTES PASTURES WASTE-COMPOSITION DEGRADAT
100	73	4689	GRAZING A TECHNIQUE FOR THE STUDY OF FOULING BY GRAZING CATTLE KEYWORDS: CATTLE DEFOLIATION TRE
100	77	4691	GRAZING INJECTION OF DAIRY WASTE KEYWORDS: DAIRY-WASTES LAND-APPLICATION SOIL-INJECTION PASTURE
100	72	4696	GRAZING DISEASE HAZARD OF PATHOGENIC ORGANISMS IN FARM WASTE MATERIAL KEYWORDS: SLURRIES PATHOG
100	69	4697	GRAZING DAIRY WASTE DISPOSAL KEYWORDS: WASTE-DISPOSAL LAND-APPLICATION ECONOMICS SPRAY-IRRIGATI
200	76	4714	GRAZING THE INFLUENCE OF ANIMAL MANURES ON THE GRAZING BEHAVIOR AND HERBAGE INTAKE OF CATTLE KE
200	76	4730	GRAZING A STUDY OF THE EFFECTS OF ANIMAL EFFLUENT UTILISATION FOR GRASSLAND PRODUCTION ON LEVEL
100	76	5021	GRAZING TRICHOSTRONGYLE INFESTATIONS IN AUTUMN ON PASTURES GRAZED EXCLUSIVELY BY COWS OR BY CAL
200	78	5114	GRAZING OPTIMIZATION OF RUNOFF DETENTION FOR NONPOINT POLLUTION CONTROL KEYWORDS: NONPOINT-SOUR
100	78	5170	GRAZING AVAILABILITY TO GRAZING SHEEP OF GASTROINTESTINAL NEMATODE INFECTION ARISING FROM SUMM
500	77	5288	GRAZON UTILIZATION OF LIVESTOCK WASTES AS FEED AND OTHER DIETARY PRODUCTS KEYWORDS: REFEEDING
100	78	4879	GROSS-ENERGY LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF: I. INFLUENCE OF PRACTICAL EXTREMES IN DIET, W
200	76	4705	GROUNDWATER-POLLUT UTILIZATION OF MANURE BY LAND SPREADING KEYWORDS: LIVESTOCK-WASTES EFFLUENTS LAND-APPLI
200	76	4720	GROUNDWATER-POLLUT LEACHING OF NITRATE AND DENITRIFICATION IN A SANDY SOIL AS INFLUENCED BY MANURE APPLIC
200	76	4721	GROUNDWATER-POLLUT PHOSPHORUS COMPOUNDS IN PIG SLURRY AND THEIR RETENTION IN THE SOIL KEYWORDS: SWINE-WAST
200	74	4761	GROUNDWATER-POLLUT NITROGEN LEVELS UNDER A SWINE FEEDLOT IN SOUTH CAROLINA KEYWORDS: FEEDLOTS SWINE MANAGE
200	77	4770	GROUNDWATER-POLLUT DAIRY LAGOON EFFECTS ON GROUNDWATER QUALITY KEYWORDS: DAIRY-WASTES HOLDING-PONDS LAGOON
200	77	4794	GROUNDWATER-POLLUT ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS KEYWORDS: CATTLE MANAGEMENT PAST
700	76	4804	GROUNDWATER-POLLUT DIFFUSE AGRICULTURAL POLLUTION--THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS KEYWORDS:
300	73	4826	GROUNDWATER-POLLUT METHODS FOR IDENTIFYING AND EVALUATING THE NATURE AND EXTENT OF NON-POINT SOURCES OF PO
500	77	4905	GROUNDWATER-POLLUT LAND UTILIZATION AND DISPOSAL OF ORGANIC WASTES IN ARID REGIONS KEYWORDS: ANIMAL-WASTES
500	77	4907	GROUNDWATER-POLLUT FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS: MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP
300	77	4915	GROUNDWATER-POLLUT CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE KEYWORDS: LIQUID-WASTES DAIRY-WA
300	77	4937	GROUNDWATER-POLLUT ANIMAL WASTE MANAGEMENT AND OUR WATER QUALITY KEYWORDS: WATER-POLLUTION GROUNDWATER-POL
400	74	4990	GROUNDWATER-POLLUT ENGINEERS OUTLINE WASTE DESIGN FACTORS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT DESIGN S
100	75	5094	GROUNDWATER-POLLUT NATURAL SOIL NITRATE: THE CAUSE OF THE NITRATE CONTAMINATION OF GROUND WATER IN RUNNEL
500	77	5123	GROUNDWATER-POLLUT POLLUTION CONTROL FOR AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES ANIMAL-WASTES WASTE-TRE
400	78	5161	GROUNDWATER-POLLUT ANOTHER POSITIVE STEP IN RECYCLING KEYWORDS: SALT GROUNDWATER-POLLUTION DAIRY-WASTES DE
500	77	4907	GROUNDWATER-RECHAR FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS: MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP
400	78	4680	GV-11 FUNGASTATIC FEED ADDITIVES IMPROVE LITTER RESULTS KEYWORDS: FEED-ADDITIVES FUNGICIDES L
100	74	5087	GYPSUM EFFECT OF FARMYARD MANURE (FYM) ON THE YIELD, CHEMICAL COMPOSITION AND CALCIUM AVAILABI
400	78	4699	HARVESTING FEEDING FEEDLOT WASTE TO CATTLE KEYWORDS: REFEEDING FEEDLOT-WASTES CATTLE HARVESTING EN
400	78	5009	HAULING EARTHEN WASTE BASIN KEYWORDS: LIVESTOCK-WASTES WASTE-STORAGE HAULING PICKET-DAM DETENTI
100	77	4914	HEAD-LOSS EFFECTS OF RATION ROUGHAGE CONTENT ON VISCOSITY AND THEORETICAL HEAD LOSSES IN PIPE FLO
400	78	4823	HEATING MORE DEAR MOTHER A LETTER FROM JIM LAWRENCE KEYWORDS: HEATING PHYSICAL-TREATMENT BIOLOG
300	78	4976	HEATING THE POTENTIAL OF BROILER LITTER AS FUEL KEYWORDS: POULTRY-WASTES FUEL INCINERATION HEAT
100	75	4678	HEAVY-METALS NOTE ON SECONDARY AND MICRO-ELEMENT CONTENTS OF FERTILIZERS AND MANURES KEYWORDS: FERT
300	76	4870	HEAVY-METALS APPLICATION OF SEWAGE TO CROPLAND--APPRAISAL OF POTENTIAL HAZARDS OF THE HEAVY METALS T
500	77	4907	HEAVY-METALS FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP
300	77	4915	HEAVY-METALS CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE KEYWORDS: LIQUID-WASTES DAIRY-WA
300	78	5055	HEAVY-METALS SWINE LAGOON EFFLUENT ON A SOIL-PLANT ENVIRONMENT--AN *IMPACT ASSESSMENT KEYWORDS: SWINE*
200	76	5068	HEAVY-METALS PROCEEDINGS OF SYMPOSIUM ON THE CONVERSION OF POULTRY WASTE TO ENERGY, FEED, OR FERTILI
200	76	5071	HEAVY-METALS SIGNIFICANCE OF HEAVY METALS IN DPW FOR FEEDING KEYWORDS: REFEEDING POULTRY-WASTES-DRIE
200	78	5156	HEAVY-METALS NUTRIENTS AVAILABLE IN LIVESTOCK AND POULTRY MANURE RESIDUE AS REFLECTED BY MANAGEMENT
300	78	5175	HEAVY-METALS SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
100	77	5179	HEAVY-METALS SLUDGE DISPOSAL STRATEGY: PROCESSES AND COSTS KEYWORDS SEWAGE SLUDGE LAND-APPLICATION
300	78	5183	HEAVY-METALS SPECIFIC COMPOSITION OF REPRESENTATIVE FEEDLOT WASTES: A CHEMICAL AND MICROBIAL PROFILE
400	78	5220	HEAVY-METALS BACTERIA CONTENT SOLVES LAGOON PROBLEMS KEYWORDS: LAGOONS ANAEROBIC BACTERIA SALTS HEAV
200	76	5125	HEMICELLULASE AGRICULTURAL RESIDUES, INCLUDING FEEDLOT WASTES KEYWORDS: AGRICULTURAL-RESIDUES FEEDLOT
100	70	4874	HEMICELLULOSE *CHANGES IN BIOCHEMICAL CONSTITUENT OF SOME ORGANIC WASTE MATERIALS UNDER ANAEROBIC METH*
100	78	4954	HEMICELLULOSE CHEMICAL COMPOSITION OF FEEDLOT MANURE KEYWORDS: CATTLE-WASTES FEEDLOTS WASTE-COMPOSITI
100	75	4883	HERBAGE-REJECTION DIRECT INJECTION OF SLURRY INTO SOIL TO AVOID HERBAGE REJECTION KEYWORDS: CATTLE-WASTES
100	75	4698	HERBICIDES PERSISTENCE AND MOVEMENT OF SIMAZINE IN SOIL KEYWORDS: LAND-APPLICATION HERBICIDES ANIM
200	77	4770	HOLDING-PONDS DAIRY LAGOON EFFECTS ON GROUNDWATER QUALITY KEYWORDS: DAIRY-WASTES HOLDING-PONDS LAGOON
400	78	4829	HOLDING-PONDS RUNOFF CONTROL KEYWORDS: FEEDLOT-RUNOFF RUNOFF-CONTROL DESIGN DEBRIS-BASINS LOCATION HO
100	77	4864	HOLDING-PONDS FEEDLOT RUNOFF HOLDING PONDS--NUTRIENT LEVELS AND RELATED MANAGEMENT ASPECTS KEYWORDS:
400	78	4996	HOLDING-PONDS STUDY CONTROL OPTIONS FOR FEEDLOT RUNOFF SYSTEMS KEYWORDS: FEEDLOT-RUNOFF DEBRIS-BASINS
400	78	5208	HOLDING-PONDS RUNOFF CONTROL SYSTEMS FOR CATTLE FEEDLOTS KEYWORDS: FEEDLOT-RUNOFF CATTLE WASTE-STORAG
200	77	4872	*HOLDING-TANKS METHOD FOR INEXPENSIVE DISTRIBUTION OF LIQUID WASTE FROM DAIRY AND FEEDLOT KEYWORDS:* LI
100	77	4989	HOMOGENATION STUDIES ON MICROBIOLOGICAL CONTROL OF LIQUID MANURE HANDLING KEYWORDS: LIQUID-WASTES WA
100	78	4858	HORMONES HORMONAL ACTIVITY IN POULTRY EXCRETA PROCESSED FOR LIVESTOCK FEED KEYWORDS: POULTRY-WAS
500	77	5267	HORSES ANIMAL FEEDLOTS-DEVELOPMENT, TRENDS, PROBLEMS KEYWORDS: FEEDLOTS WASTE-MANAGEMENT CATTL
100	78	4971	HORSE-WASTES A STUDY ON THE INTERACTIONS OF ENZYMES WITH MANURES AND SLUDGES KEYWORDS: CATTLE-WASTES
100	77	5020	HORSE-WASTES STUDIES WITH HORSES COMPARING 4N-HCl INSOLUBLE ASH AS AN INDEX MATERIAL WITH TOTAL FECA
300	78	5194	HORSE-WASTES MANAGING HORSE MANURE FOR ENVIRONMENTAL PROTECTION KEYWORDS: WATER-POLLUTION AIR-POLLUT
200	74	4760	HOUSING A NEW APPROACH IN NON-SLATTED LIQUID WASTE SWINE HOUSING SYSTEMS KEYWORDS: SWINE-WASTES
300	77	4866	HOUSING ATMOSPHERIC AMMONIA AFFECTS SWINE HEALTH KEYWORDS AIR-POLLUTION SWINE HOUSING AMMONIA
300	78	4976	HOUSING THE POTENTIAL OF BROILER LITTER AS FUEL KEYWORDS: POULTRY-WASTES FUEL INCINERATION HEAT
400	74	4988	HOUSING PIGGERY UNDER-SLAT SCRAPER SYSTEM KEYWORDS. SWINE-WASTES CONFINEMENT HOUSING SLURRIES W
100	77	5242	HOUSING A METHOD FOR SAMPLING AIR IN ANIMAL HOUSES TO ANALYSE TRACE GASES INCLUDING ODORANTS HI
500	77	5278	HOUSING COLLECTION, STORAGE AND TRANSPORT OF CATTLE WASTES KEYWORDS: DAIRY-WASTES SLURRIES SOLI

200	74 4757	HUMIDITY	ENVIRONMENT AS A RESULT OF IN-HOUSE DRYING OF POULTRY EXCRETA KEYWORDS: POULTRY-WASTES
100	78 5053	HUMIDITY	AEROSOL CONCENTRATION IN A TURKEY BARN ENVIRONMENT KEYWORDS: AIR-POLLUTION BACTERIA TUR
100	78 5136	HUMIDITY	DRYING CHARACTERISTICS OF BROILER WASTE ON A HEATED CONCRETE SLAB KEYWORDS: DEHYDRATION
200	77 5237	HYDRAULIC-CONDUCTI	THE CONCENTRATION OF LIQUID MANURE AFFECTS ITS INFILTRATION INTO SOIL KEYWORDS: LIQUID-
500	77 5265	HYDROGENATION	ANIMAL WASTES KEYWORDS: FEEDLOTS DESIGN EFFLUENTS GASES ODOR ANIMAL-WASTES WASTE-STORAG
500	77 5287	HYDROGENATION	ENERGY RECOVERY FROM ANIMAL WASTES-ANAEROBIC DIGESTION, PYROLYSIS, HYDROGENATION KEYWOR
700	74 4908	HYDROGEN	CYCLONIC BURNER FOR PARTIAL COMBUSTION OF MANURE TO AMMONIA SYNTHESIS GAS KEYWORDS: OXI
100	78 5307	HYDROGEN-PEROXIDE	CHEMICAL TREATMENT FOR ODOR ABATEMENT MEASURED ORGANOLEPTICALLY IN LIQUID DAIRY MANURE
400	78 4671	HYDROGEN-SULFIDE	LIQUID MANURE GAS MAY POSE DANGER KEYWORDS: AIR-POLLUTION SAFETY LIQUID-WASTES HYDROGEN
400	78 4684	HYDROGEN-SULFIDE	PUTTING THE LID ON ODOR KEYWORDS: ODOR-CONTROL SWINE-WASTES CONFINEMENT-PENS HYDROGEN-S
200	74 4781	HYDROGEN-SULFIDE	SWINE BUILDING AIR CONTAMINATE CONTROL WITH PIT VENTILATION KEYWORDS: SWINE-WASTES GASE
400	78 4841	HYDROGEN-SULFIDE	ATMOSPHERIC AMMONIA AFFECTS SWINE HEALTH KEYWORDS: AIR-POLLUTION CONFINEMENT-PENS SWINE
400	77 4852	HYDROGEN-SULFIDE	MANURE MAKES THE ROUNDS KEYWORDS: FEEDLOT-WASTES ANAEROBIC DIGESTERS CARBON-DIOXIDE MET
300	77 4866	HYDROGEN-SULFIDE	ATMOSPHERIC AMMONIA AFFECTS SWINE HEALTH KEYWORDS: AIR-POLLUTION SWINE HOUSING AMMONIA
200	77 4966	HYDROGEN-SULFIDE	EFFECT OF SURFACE AERATION ON GASES EVOLVED BY A SWINE-WASTE ANAEROBIC LAGOON KEYWORDS:
400	78 5011	HYDROGEN-SULFIDE	TOXIC GASES KILL WORKER KEYWORDS: AIR-POLLUTION PUBLIC-HEALTH CONFINEMENT-PENS CATTLE-W
300	78 5139	HYDROGEN-SULFIDE	DEATH IN A FARM WORKER ASSOCIATED WITH TOXIC GASES FROM A LIQUID MANURE SYSTEM: WISCON
400	78 5206	HYDROGEN-SULFIDE	COLOR THESE LAGOONS PURPLE KEYWORDS: ODOR-CONTROL SWINE-WASTES PURPLE-SULFUR-BACTERIA
400	78 5212	HYDROGEN-SULFIDE	WARNING-MANURE GASES ARE DANGEROUS KEYWORDS: GASES HYDROGEN-SULFIDE METHANE CARBON-DIOX
500	77 5276	HYDROGEN-SULFIDE	NOXIOUS GASES AND ODOURS KEYWORDS: ODOR-CONTROL ANIMAL-HEALTH PUBLIC-HEALTH TOXICITY HY
100	77 4855	HYDROLYSIS	AGRICULTURAL BIOMASS WASTES--UTILIZATION ROUTES KEYWORDS: AGRICULTURAL-WASTES RECYCLING
500	77 5026	HYDROLYSIS	BIOLOGICAL RECLAMATION OF SOLID WASTES KEYWORDS: RECYCLING SOLID-WASTES MUNICIPAL-WASTE
200	78 5101	HYDROLYSIS	ANAEROBIC FERMENTATION OF MANURE INTO SINGLE CELL PROTEIN KEYWORDS: REFEEDING FEEDLOT-W
100	77 5181	HYDROLYSIS	THERMOPHILIC FERMENTATION OF PIG FAECES AND STRAW BY ACTINOMYCETES KEYWORDS: WASTE-TREA
100	75 4670	HYDROMETER	FIELD TEST FOR ESTIMATING DRY MATTER AND FERTILIZER VALUE OF SLURRY-- PRELIMINARY REPOR
200	76 5070	HYDROSEEDING	USING POULTRY MANURE FOR VEGETABLES AND HYDROSEEDING KEYWORDS: POULTRY-WASTES CHEMICAL-
200	76 4711	HYPOMAGNESAEMIA	EFFICIENT RECYCLING OF NUTRIENTS KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES SH
300	74 4702	ILLINOIS-LAW	ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS ALLEN BECKER, D B A BECKER'S CHICKEN-
300	73 4820	ILLINOIS-LAW	ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS PROCESSING AND BOOKS, INC. AN ILLINOI
300	72 4821	ILLINOIS-LAW	ENVIRONMENTAL PROTECTION AGENCY VS ROBERT R. DETERS-FABIAN J DETERS-MARCELLUS J DETERS
300	74 4822	ILLINOIS-LAW	ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS LESTER KIPLING, D B A KIPLING CHICKEN
100	77 5135	ILLUMINATION	CONTINUOUS CULTIVATION OF CHLORELLA EMERSONII ON PIG MANURE KEYWORDS: SWINE-WASTES WAST
400	77 4850	IMT-CORPORATION	MANURE DIGESTER BEING BUILT ON MINNESOTA FARM KEYWORDS: ANAEROBIC DIGESTERS RECYCLING P
200	76 4729	INCINERATION	POSSIBILITIES OF POULTRY DROPPINGS DECONTAMINATION AS RELATED TO FARM LEVEL MANAGEMENT
300	77 4751	INCINERATION	DISPOSAL OF FEEDLOT WASTES USING A TWO-STAGE PROCESS WITH NET ENERGY PRODUCTION KEYWORD
300	78 4940	INCINERATION	COST EFFICIENCIES OF LARGE-SCALE INTEGRATED DAIRY PRODUCTION AND WASTE MANAGEMENT SYSTE
300	78 4976	INCINERATION	THE POTENTIAL OF BROILER LITTER AS FUEL KEYWORDS: POULTRY-WASTES FUEL INCINERATION HEAT
400	78 4849	INC	STATE-BASED PLANT TURNING CATTLE MANURE INTO METHANE GAS KEYWORDS: CATTLE-WASTES RECYCL
400	78 4849	INC	STATE-BASED PLANT TURNING CATTLE MANURE INTO METHANE GAS KEYWORDS: CATTLE-WASTES RECYCL
600	4917	INC	THE CALORIFIC PROJECT I BACKGROUND AND DESIGN CRITERIA KEYWORDS: RECYCLING CATTLE-WA
100	77 4987	INDOLE	QUANTITATION OF INDOLE AND SKATOLE IN A HOUSED SWINE UNIT KEYWORDS: SWINE-WASTES CONFIN
700	74 4704	INDUSTRIAL-EFFLUEN	AGRICULTURAL AND FOREST LAND RUNOFF IN UPPER SOUTH RIVER NEAR WAYNESBORO, VIRGINIA KEYW
500	77 4901	INDUSTRIAL-WASTES	PROPERTIES OF AGRICULTURAL AND MUNICIPAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WASTE
500	77 4903	INDUSTRIAL-WASTES	RECYCLING ELEMENTS IN WASTES THROUGH SOIL-PLANT SYSTEMS KEYWORDS: LAND-APPLICATION MUNI
500	77 4904	INDUSTRIAL-WASTES	SPECIAL OPPORTUNITIES AND PROBLEMS IN USING FOREST SOILS FOR ORGANIC WASTE APPLICATION
500	77 4905	INDUSTRIAL-WASTES	LAND UTILIZATION AND DISPOSAL OF ORGANIC WASTES IN ARID REGIONS KEYWORDS: ANIMAL-WASTES
500	77 5026	INDUSTRIAL-WASTES	BIOLOGICAL RECLAMATION OF SOLID WASTES KEYWORDS: RECYCLING SOLID-WASTES MUNICIPAL-WASTE
300	77 5034	INDUSTRY	A METHOD OF MANURE DISPOSAL FOR A BEEF PACKING OPERATION-- FIRST INTERIM TECHNICAL REP
200	76 4717	INFILTRATION	RELATIONS BETWEEN PEDOLOGICAL ORGANISATION OF THE SOIL AND PIG SLURRY LANDSPREADINGS IN
200	76 4718	INFILTRATION	THE EFFECT OF SOIL TYPE AND SEASON OF APPLICATION ON INFILTRATION AND RUNOFF OF NUTRIEN
700	77 5182	INFILTRATION	SOME PHYSICAL, CHEMICAL, AND BIOLOGICAL EFFECTS OF HEAVY POULTRY MANURE APPLICATIONS ON
200	77 5237	INFILTRATION	THE CONCENTRATION OF LIQUID MANURE AFFECTS ITS INFILTRATION INTO SOIL KEYWORDS: LIQUID-
200	78 5103	INFILTRATION-RATE	CONTOUR FURROW IRRIGATION WITH LIQUID MANURE USING MICROTUBING FOR FLOW CONTROL KEYWOR
300	77 4915	INJECTION	CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE KEYWORDS: LIQUID-WASTES DAIRY-WA
100	75 4679	INSECTICIDES	NOTE ON DETOXICATION OF LINDANE BY FARMYARD MANURE KEYWORDS: INSECTICIDES LINDANE SOIL-
400	78 4871	INSECTICIDES	KEEPING FLIES OUT OF THE HEN HOUSE KEYWORDS: FLY-CONTROL POULTRY-HOUSES WASTE-REMOVAL M
100	77 4953	INSECTICIDES	SELECTIVE MORTALITY OF INSECTS IN MANURE FROM CATTLE FED RABON AND DIMILIN KEYWORDS: IN
100	78 4956	INSECTICIDES	RESPONSE OF COLIFORM POPULATIONS IN POULTRY WASTE DIGESTERS TO THREE INSECTICIDES KEYWO
100	77 5033	INSECTICIDES	MECHANICAL ROTAVATION OF POULTRY MANURE AS A METHOD OF FLY CONTROL KEYWORDS: FLY-CONTR
400	78 5221	INSECTICIDES	LESSER MEALWORM BEETLES INVADE MAINE RESIDENCES KEYWORDS: BEETLES POULTRY-WASTES INSECT
300	77 4915	INSECTS	CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE KEYWORDS: LIQUID-WASTES DAIRY-WA
100	76 5210	INSECTS	A REVIEW OF THE FOOD HABITS OF THE INSECT FAUNA INHABITING CATTLE DROPPINGS IN NORTH C
100	77 4953	INSECT-CONTROL	SELECTIVE MORTALITY OF INSECTS IN MANURE FROM CATTLE FED RABON AND DIMILIN KEYWORDS: IN
200	76 4730	IN-VITRO-RESISTANC	A STUDY OF THE EFFECTS OF ANIMAL EFFLUENT UTILISATION FOR GRASSLAND PRODUCTION ON LEVEL
500	77 5275	IONIZING-RADIATION	HEALTH EFFECTS FROM WASTE UTILIZATION KEYWORDS: PUBLIC-HEALTH ANIMAL-HEALTH REFEEDING L
200	78 5122	ION-DIFFUSION	NITROGEN AND PHOSPHORUS MOVEMENT FROM SURFACE APPLIED MANURE KEYWORDS: MODEL-STUDIES LE
100	77 4766	ION-EXCHANGE	THE APPLICATION OF NATURAL ZEOLITES IN ANIMAL SCIENCE AND AQUACULTURE KEYWORDS: ZEOLITE
400	78 4688	IOWA-LAW	TOUGHER RULES COMING FOR BUILDING LAGOONS KEYWORDS: LAGOONS DESIGN LEGAL-ASPECTS PERMIT
400	78 5003	IOWA-LAW	MANURE HANDLING EQUIPMENT EXEMPT FROM PROPERTY TAX KEYWORDS: IOWA-LAW LEGAL-ASPECTS POL
300	77 5149	IOWA-LAW	COMMON SCENTS: AN ANALYSIS OF THE LAW OF FEED LOT ODOR CONTROL KEYWORDS: ODOR-CONTROL
100	75 4678	IRON	NOTE ON SECONDARY AND MICRO-ELEMENT CONTENTS OF FERTILIZERS AND MANURES KEYWORDS: FERT
300	77 4982	IRON	PURPLE SULFUR BACTERIA IN LAGOONS IN THE MIDWEST KEYWORDS: SWINE-WASTES LAGOONS ODOR BA
200	78 5156	IRON	NUTRIENTS AVAILABLE IN LIVESTOCK AND POULTRY MANURE RESIDUE AS REFLECTED BY MANAGEMENT
300	78 4745	IRRIGATION	COSTS OF SELECTED WASTE-HANDLING SYSTEMS FOR DAIRY FARMS KEYWORDS: DAIRY-WASTES LEGAL-A
200	77 4806	IRRIGATION	A POLLUTANT AND NUTRIENT BUDGET FOR A SURFACE-AERATED DAIRY STORAGE LAGOON KEYWORDS: DA
200	77 4811	IRRIGATION	SIZING COMPONENTS ON OPEN FEEDLOT RUNOFF CONTROL SYSTEMS KEYWORDS: COMPUTER-MODELS FEED
400	78 4829	IRRIGATION	RUNOFF CONTROL KEYWORDS FEEDLOT-RUNOFF RUNOFF-CONTROL DESIGN DEBRIS-BASINS LOCATION HO
400	78 4840	IRRIGATION	FEEDLOT SELLS MANURE KEYWORDS: WASTE-MANAGEMENT FEEDLOTS CATTLE LIQUID-WASTES FLUSHING
400	77 4852	IRRIGATION	MANURE MAKES THE ROUNDS KEYWORDS. FEEDLOT-WASTES ANAEROBIC DIGESTERS CARBON-DIOXIDE MET
200	76 4869	IRRIGATION	UNIFORM SLURRY SPREADING WITH A CENTER PIVOT IRRIGATION SYSTEM KEYWORDS: SLURRIES LAND-
400	78 4899	IRRIGATION	LOW-LABOR FLUSH SYSTEM CLEANS MILKING AREAS IN MINUTES KEYWORDS: LIQUID-WASTES DAIRY-WA
100	78 4930	IRRIGATION	MODELING THE EFFECT OF MANAGEMENT POLICIES ON CATTLE FEEDLOT POLLUTION CONTROL COSTS KE
100	77 4946	IRRIGATION	MANURE MANAGEMENT IN AN IRRIGATED BASIN RELATIVE TO SALT LEACHATE TO GROUND WATER KEYWO
100	77 4950	IRRIGATION	MANURE EFFECTS ON WATER INTAKE AND RUNOFF QUALITY FROM IRRIGATED GRAIN SORGHUM PLOTS KE
400	78 4979	IRRIGATION	NOW LOOK WHAT THEY RE MAKING FROM MANURE KEYWORDS: DAIRY-WASTES RECYCLING IRRIGATION FE
400	78 4996	IRRIGATION	STUDY CONTROL OPTIONS FOR FEEDLOT RUNOFF SYSTEMS KEYWORDS: FEEDLOT-RUNOFF DEBRIS-BASINS
300	75 5002	IRRIGATION	SELECTING A SWINE WASTE MANAGEMENT SYSTEM KEYWORDS: SWINE-WASTES MANAGEMENT FLOORS DESI
400	78 5012	IRRIGATION	NON-STOP FLUSHING KEEPS BARN CLEAN KEYWORDS: CONFINEMENT-PENS CATTLE FLUSHING LAGOONS I
100	74 5027	IRRIGATION	EFFECT OF QUALITY OF IRRIGATION WATER, LEACHING LEVELS AND FARMYARD MANURE ON THE PERF
300	77 5049	IRRIGATION	REFEEDING WASTES TO DAIRY CATTLE KEYWORDS: DAIRY-WASTES SEPARATION TECHNIQUES DEHYDRATI
100	78 5052	IRRIGATION	QUALITY VARIATION OF STORED FEEDLOT RUNOFF KEYWORDS: FEEDLOT-WASTES WASTE-STORAGE FEEDL
300	78 5055	IRRIGATION	SWINE LAGOON EFFLUENT ON A SOIL-PLANT ENVIRONMENT--AN IMPACT ASSESSMENT KEYWORDS: SWINE
300	78 5063	IRRIGATION	ALTERNATE METHODS OF MANURE HANDLING KEYWORDS. WASTE-STORAGE DAIRY-WASTES FEEDLOT-RUNOF
400	77 5099	IRRIGATION	RESEARCH DAIRY STUDIES CONFINEMENT & WASTE REUSE KEYWORDS: DAIRY-WASTES SLURRIES SEPARA
200	78 5103	IRRIGATION	CONTOUR FURROW IRRIGATION WITH LIQUID MANURE USING MICROTUBING FOR FLOW CONTROL KEYWOR
300	77 5129	IRRIGATION	RECYCLING AGRICULTURE RUNOFF KEYWORDS: MODEL-STUDIES AGRICULTURAL-RUNOFF WASTE-STORAGE
100	65 5133	IRRIGATION	BETTER DISPOSAL OF FARM WASTES KEYWORDS: FARM-WASTES LAND-APPLICATION IRRIGATION EQUIPM
400	77 5141	IRRIGATION	THE DESIGN AND OPERATION OF SPRAY DISPOSAL SYSTEMS FOR DAIRY FARMS IN NEW ZEALAND KEYWO
300	78 5175	IRRIGATION	SEWAGE DISPOSAL ON AGRICULTURAL SOILS CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
300	78 5176	IRRIGATION	SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO

400	78	5189	IRRIGATION	FEEDLOT MANURE KEEPS HOME FIRES BURNING KEYWORDS: RECYCLING THERMONETICS METHANE REFEED
400	78	5222	IRRIGATION	WASTIGATION KEYWORDS: CATTLE-WASTES IRRIGATION WASTE-COMPOSITION LAND-APPLICATION ECONO
500	77	5290	IRRIGATION	LAND DISPOSAL OF FEEDLOT WASTES BY IRRIGATION IN CZECHOSLOVAKIA KEYWORDS: LAND-APPLICAT
500	77	4902	IRRIGATION-RETURN-	PROPERTIES OF WASTE WATERS KEYWORDS: WASTEWATER-MANAGEMENT WASTE-COMPOSITION BIOLOGICAL
700	74	4898	IRRIGATION-TAILWAT	CHARACTERISTICS OF RUNOFF FROM DISPOSAL OF CATTLE FEEDLOT WASTES ON LAND KEYWORDS: CATT
400	78	4935	KAPLAN	KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA KEYWORDS: KAPLAN FEEDLOTS RECYCLING REFEEDING MET
200	76	4739	KJELDAHL-NITROGEN	SAMPLING TECHNIQUES FOR LIQUID SWINE MANURE KEYWORDS: LIQUID-WASTES WASTE-STORAGE AERAT
200	77	4867	KJELDAHL-NITROGEN	THREE YEARS OF EVALUATING A MIDWEST ANAEROBIC DAIRY LAGOON KEYWORDS: DAIRY-WASTES ANAE
100	77	4691	LABOR	INJECTION OF DAIRY WASTE KEYWORDS: DAIRY-WASTES LAND-APPLICATION SOIL-INJECTION PASTURE
400	78	4816	LABOR	MANURE REMOVED WEEKLY FROM HIGH-RISE HOUSES KEYWORDS: POULTRY-WASTES MANURE-PITS CLEANI
200	77	4943	LABOR	DAIRY CHORE REDUCTION PROGRAM PROGRESS REPORT KEYWORDS: ANIMAL-WASTES MANAGEMENT DESIGN
200	78	5110	LABOR	WASTE HANDLING ALTERNATIVES FOR FARROWING UNITS KEYWORDS: SWINE-WASTES WASTE-STORAGE LI
500	77	5291	LABOR	COSTS OF LIQUID HANDLING AND TREATMENT OF LARGE SWINE FEEDLOT WASTES KEYWORDS: ECONOMIC
100	77	5062	LACTIC-ACIDS	FERMENTATION OF SWINE WASTE-CORN MIXTURES FOR ANIMAL FEED. PILOT-PLANT STUDIES KEYWORD
100	77	5061	LACTIC-ACID	CHARACTERISTICS OF AEROBIC, SOLID SUBSTRATE FERMENTATION OF SWINE WASTE-CORN MIXTURES K
300	78	5201	LACTIC-ACID	CHANGES IN CHARACTERISTICS OF DEEP STACKED BROILER LITTER WITH TIME KEYWORDS: POULTRY-L
300	78	5202	LACTIC-ACID	FERMENTATION AND DIGESTIBILITY OF BROILER LITTER ENSILED AT DIFFERENT MOISTURE LEVELS B
300	78	5204	LACTIC-ACID	ENSILING CHARACTERISTICS AND UTILIZATION BY SWINE OF ENSILED SWINE WASTE AND GROUND COR
400	78	4688	LAGOONS	TOUGHER RULES COMING FOR BUILDING LAGOONS KEYWORDS: LAGOONS DESIGN LEGAL-ASPECTS PERMIT
300	76	4690	LAGOONS	GUTTER FLUSHING SYSTEMS FOR SWINE BUILDINGS KEYWORDS: FLUSHING SWINE-WASTES DESIGN LAGO
400	78	4693	LAGOONS	LAGOONS-WHAT SIZE NEEDED FOR YOUR HERD KEYWORDS: DAIRY-WASTES LAGOONS ANAEROBIC DESIGN
200	76	4706	LAGOONS	AGRICULTURAL USE OF EFFLUENT FROM LIVESTOCKS-PROBLEMS AND PERSPECTIVES IN ITALY KEYWORD
200	76	4712	LAGOONS	THE AGRONOMIC UTILISATION OF PIG SLURRY-EFFECT ON FORAGE CROPS AND ON SOIL FERTILITY KE
300	78	4745	LAGOONS	COSTS OF SELECTED WASTE-HANDLING SYSTEMS FOR DAIRY FARMS KEYWORDS: DAIRY-WASTES LEGAL-A
200	77	4765	LAGOONS	MICROALGAE AS A MEANS OF RECYCLING ANIMAL WASTES KEYWORDS: RECYCLING WASTE-TREATMENT SW
200	77	4770	LAGOONS	DAIRY LAGOON EFFECTS ON GROUNDWATER QUALITY KEYWORDS: DAIRY-WASTES HOLDING-PONDS LAGOON
200	74	4787	LAGOONS	UNAERATED LAGOON RESPONSE TO LOADING INTENSITY AND FREQUENCY KEYWORDS: LAGOONS SWINE-WA
200	77	4794	LAGOONS	ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS KEYWORDS: CATTLE MANAGEMENT PAST
400	78	4796	LAGOONS	LET SWINE WASTES CUT YOUR FERTILIZER BILL KEYWORDS: SWINE-WASTES WASTE-STORAGE PITS LAG
200	77	4806	LAGOONS	A POLLUTANT AND NUTRIENT BUDGET FOR A SURFACE-AERATED DAIRY STORAGE LAGOON KEYWORDS: DA
200	77	4807	LAGOONS	BACTERIAL RESPONSE TO SALTS IN AN ANAEROBIC DAIRY LAGOON KEYWORDS: DAIRY-WASTES LAGOONS
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400	78	4840	LAGOONS	FEEDLOT SELLS MANURE KEYWORDS: WASTE-MANAGEMENT FEEDLOTS CATTLE LIQUID-WASTES FLUSHING
400	78	4846	LAGOONS	FLUSH SYSTEM CLEANS SWINE PENS KEYWORDS: SWINE-WASTES CONFINEMENT-PENS FLUSHING DESIGN
400	77	4852	LAGOONS	MANURE MAKES THE ROUNDS KEYWORDS: FEEDLOT-WASTES ANAEROBIC DIGESTERS CARBON-DIOXIDE MET
200	77	4867	LAGOONS	THREE YEARS OF EVALUATING A MIDWEST ANAEROBIC DAIRY LAGOON KEYWORDS: DAIRY-WASTES ANAE
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100	78	4958	LAGOONS	HARVESTING ALGAE FROM LAGOON EFFLUENT KEYWORDS LAGOONS WASTE-TREATMENT FLOCCULANTS BY-
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100 78 5307 LIQUID-WASTES CHEMICAL TREATMENT FOR ODOR ABATEMENT MEASURED ORGANOLEPTICALLY IN LIQUID DAIRY MANURE
100 77 4813 LISTERIA-MONOCYTOG LISTERIA-ENCEFALITIS IN COWS THROUGH LITTER FROM A BROILER-FARM KEYWORDS: ANIMAL-HEALTH
400 78 4680 LITTERS FUNGASTATIC FEED ADDITIVES IMPROVE LITTER RESULTS KEYWORDS: FEED-ADDITIVES FUNGICIDES L
100 77 5306 LITTERS MYCOFLORA OF A TURKEY CONFINEMENT BROODER HOUSE KEYWORDS: POULTRY AIR-POLLUTION LITTERS
400 77 4847 LIVESTOCK YOU MAY FIND PROFITS IN WASTE FEEDS KEYWORDS: FEEDS FOOD-PROCESSING-WASTES BREWERY-WAST
100 77 5255 LIVESTOCK ODOUR PROBLEMS AND ODOUR CONTROL IN INTENSIVE LIVESTOCK HUSBANDRY FARMS IN THE NETHERLA
100 75 4678 LIVESTOCK-WASTES NOTE ON SECONDARY AND MICRO-ELEMENT CONTENTS OF FERTILIZERS AND MANURES KEYWORDS: FERT
200 76 4705 LIVESTOCK-WASTES UTILIZATION OF MANURE BY LAND SPREADING KEYWORDS: LIVESTOCK-WASTES EFFLUENTS LAND-APPLI
200 76 4706 LIVESTOCK-WASTES AGRICULTURAL USE OF EFFLUENT FROM LIVESTOCKS-PROBLEMS AND PERSPECTIVES IN ITALY KEYWORD
200 76 4713 LIVESTOCK-WASTES THE YIELD EFFICIENT NITROGEN PORTION IN TREATED AND UNTREATED MANURE KEYWORDS: LIVESTOC
200 76 4725 LIVESTOCK-WASTES WATER POLLUTION BY LIVESTOCK EFFLUENTS KEYWORDS: WATER-POLLUTION FISH-KILLS LIVESTOCK-W
200 71 4762 LIVESTOCK-WASTES SAFETY HAZARDS ASSOCIATED WITH LIVESTOCK WASTE KEYWORDS: FEEDLOTS ACCIDENTS MANAGEMENT
400 78 4851 LIVESTOCK-WASTES MANAGE FEEDLOT WASTE TO CONTROL ODORS KEYWORDS: LIVESTOCK-WASTES FEEDLOTS ODOR-CONTROL
300 76 4859 LIVESTOCK-WASTES ENERGY RELATIONSHIPS FOR A 32-ACRE IOWA FARM--AN ATTEMPT TO INCREASE PRODUCTION OF GRAI
100 77 4864 LIVESTOCK-WASTES FEEDLOT RUNOFF HOLDING PONDS--NUTRIENT LEVELS AND RELATED MANAGEMENT ASPECTS KEYWORDS:
300 76 4873 LIVESTOCK-WASTES LIVESTOCK WASTE ODOR CONTROL KEYWORDS: LIVESTOCK-WASTES ODOR-CONTROL LOCATION ODOR-MEAS
100 77 4881 LIVESTOCK-WASTES WINTER-APPLIED MANURE--EFFECTS ON ANNUAL RUNOFF, EROSION, AND NUTRIENT MOVEMENT KEYWORD
300 77 4938 LIVESTOCK-WASTES DESIGN AND OPERATION OF LIVESTOCK WASTE LAGOONS KEYWORDS: LAGOONS LIVESTOCK-WASTES DESI
200 78 4947 LIVESTOCK-WASTES METHANE AND BIOMASS PRODUCTION SYSTEMS FOR BEEF CATTLE MANURE KEYWORDS: LIVESTOCK-WASTE
400 78 4975 LIVESTOCK-WASTES MANURE CONTAINMENT-SLURRY WITH THE CRUST ON TOP KEYWORDS: LIVESTOCK-WASTES SLURRIES WAS
400 77 5004 LIVESTOCK-WASTES A MARTINI IN YOUR TANK KEYWORDS: RECYCLING ORGANIC-WASTES LIVESTOCK-WASTES ETHYL-ALCOHO
400 78 5009 LIVESTOCK-WASTES EARTHEN WASTE BASIN KEYWORDS: LIVESTOCK-WASTES WASTE-STORAGE HAULING PICKET-DAM DETENTI

500	77	5026	LIVESTOCK-WASTES	BIOLOGICAL RECLAMATION OF SOLID WASTES KEYWORDS: RECYCLING SOLID-WASTES MUNICIPAL-WASTE
200	75	5083	LIVESTOCK-WASTES	NON-POINT SOURCES OF WATER POLLUTION KEYWORDS: WATER-POLLUTION NON-POINT-SOURCES AGRICU
400	78	5084	LIVESTOCK-WASTES	112 MILLION TONS OF MANURE PRODUCED IN 1974. USDA KEYWORDS: LIVESTOCK-WASTES POULTRY-W
300	70	5086	LIVESTOCK-WASTES	WORLDWIDE SURVEY AND COMPARISON OF ADULT PREDATOR AND SCAVENGER INSECT POPULATIONS ASSO
200	78	5102	LIVESTOCK-WASTES	ESTIMATED INVENTORY OF LIVESTOCK AND POULTRY MANURE RESOURCES IN THE UNITED STATES KEYW
300	78	5131	LIVESTOCK-WASTES	A MANUAL ON EVALUATION AND ECONOMIC ANALYSIS OF LIVESTOCK WASTE MANAGEMENT SYSTEMS KE
300	78	5152	LIVESTOCK-WASTES	METHANE PRODUCTION FROM LIVESTOCK WASTE KEYWORDS: RECYCLING LIVESTOCK-WASTES POULTRY-WA
200	78	5156	LIVESTOCK-WASTES	NUTRIENTS AVAILABLE IN LIVESTOCK AND POULTRY MANURE RESIDUE AS REFLECTED BY MANAGEMENT
300	78	5188	LIVESTOCK-WASTES	ESTIMATING U S LIVESTOCK AND POULTRY MANURE AND NUTRIENT PRODUCTION KEYWORDS: LIVESTOC
600	78	5196	LIVESTOCK-WASTES	METHANE FROM MANURE: FACT OR FANTASY KEYWORDS: METHANE ANAEROBIC-DIGESTION RECYCLING L
400	78	5234	LIVESTOCK-WASTES	BEAT EXPENSIVE SYSTEMS--SUN, WIND BEST FOR HANDLING WASTE KEYWORDS: DESIGN CONFINEMENT
500	77	5267	LIVESTOCK-WASTES	ANIMAL FEEDLOTS-DEVELOPMENT, TRENDS, PROBLEMS KEYWORDS: FEEDLOTS WASTE-MANAGEMENT CATTL
500	77	5282	LIVESTOCK-WASTES	DEHYDRATION SYSTEMS FOR FEEDLOT WASTES KEYWORDS: DEHYDRATION LIVESTOCK-WASTES DESIGN EC
500	77	5285	LIVESTOCK-WASTES	COMPOSTING OF FEEDLOT WASTES KEYWORDS: COMPOSTING FEEDLOTS LIVESTOCK-WASTES WINDROWS CO
400	78	4833	LIVESTOCK-WASTE	RECYCLING TAKES EXTRA MANAGEMENT KEYWORDS: LIVESTOCK-WASTE POULTRY-WASTES REFEEDING ANI
100	77	4892	LOADING	MECHANICAL MANURE HARVESTING FROM FEEDLOTS KEYWORDS: FEEDLOT-WASTES EQUIPMENT-MANURE-HA
400	78	4829	LOCATION	RUNOFF CONTROL KEYWORDS: FEEDLOT-RUNOFF RUNOFF-CONTROL DESIGN DEBRIS-BASINS LOCATION HO
400	78	4851	LOCATION	MANAGE FEEDLOT WASTE TO CONTROL ODORS KEYWORDS: LIVESTOCK-WASTES FEEDLOTS ODOR-CONTROL
300	76	4873	LOCATION	LIVESTOCK WASTE ODOR CONTROL KEYWORDS: LIVESTOCK-WASTES ODOR-CONTROL LOCATION ODOR-MEAS
300	76	4754	LOGGING	MICROBIOLOGY AND CHEMISTRY STUDIES OF WATER QUALITY FACTORS IN A WATERSHED USED FOR MUN
300	78	4745	LOUISIANA-LAW	COSTS OF SELECTED WASTE-HANDLING SYSTEMS FOR DAIRY FARMS KEYWORDS: DAIRY-WASTES LEGAL-A
100	78	5039	LYSINE	NUTRITIONAL QUALITY OF PROCESSED POULTRY WASTE FOR BROILERS KEYWORDS: POULTRY-WASTES-DR
100	77	5313	LYSINE	CATTLE MANURE AND FINAL MOLASSES SILAGE IN CHICKEN FATTENING:I. HIGH SUBSTITUTION LEVE
500	77	4907	MAGNESIUM	FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS: MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP
400	78	4981	MAGNESIUM	TOO MUCH MAGNESIUM MAKES WETTER DROPPINGS KEYWORDS: DIETS POULTRY FEED-ADDITIVES MAGNES
100	75	4986	MAGNESIUM	VARIATIONS BETWEEN FARMS IN N, P, K, MG AND DRY MATTER COMPOSTION OF CATTLE, PIG AND PO
100	77	5118	MAGNESIUM	THE EFFECTS OF CATTLE SLURRY AND INORGANIC FERTILISER NITROGEN ON THE YIELD AND MINERAL
200	78	5156	MAGNESIUM	NUTRIENTS AVAILABLE IN LIVESTOCK AND POULTRY MANURE RESIDUE AS REFLECTED BY MANAGEMENT
300	74	5213	MAGNESIUM	SOIL POLLUTION FROM FEEDLOTS IN GEORGIA KEYWORDS: FEEDLOTS CATTLE-WASTES SOIL-CONTAMINA
300	74	4702	MANAGEMENT	ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS. ALLEN BECKER, D B A BECKER'S CHICKEN-
200	76	4729	MANAGEMENT	POSSIBILITIES OF POULTRY DROPPINGS DECONTAMINATION AS RELATED TO FARM LEVEL MANAGEMENT
200	76	4755	MANAGEMENT	BEEF FEEDLOTS IN THE HUMID SOUTHEAST KEYWORDS: FEEDLOTS CATTLE MANAGEMENT DESIGN
200	74	4761	MANAGEMENT	NITROGEN LEVELS UNDER A SWINE FEEDLOT IN SOUTH CAROLINA KEYWORDS: FEEDLOTS SWINE MANAGE
200	71	4762	MANAGEMENT	SAFETY HAZARDS ASSOCIATED WITH LIVESTOCK WASTE KEYWORDS: FEEDLOTS ACCIDENTS MANAGEMENT
200	77	4771	MANAGEMENT	MODELING THE EFFECT OF MANAGEMENT POLICIES ON CATTLE FEEDLOT POLLUTION CONTROL COSTS KE
200	77	4774	MANAGEMENT	A MIXED INTEGER PROGRAMMING MODEL FOR CHOOSING AN OPTIMAL SWINE MANURE HANDLING SYSTEM
200	77	4776	MANAGEMENT	AGRICULTURAL WASTE MANAGEMENT IN NORTH CAROLINA KEYWORDS: AGRICULTURAL-WASTES MANAGEMEN
200	77	4794	MANAGEMENT	ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS KEYWORDS: CATTLE MANAGEMENT PAST
500	77	4900	MANAGEMENT	SOILS FOR MANAGEMENT OF ORGANIC WASTES AND WASTE WATERS KEYWORDS: ORGANIC-WASTES SOILS
300		4920	MANAGEMENT	FERTILIZER VALUE OF SWINE MANURE KEYWORDS: SWINE-WASTES FERTILIZERS WASTE-COMPOSITION W
300	77	4924	MANAGEMENT	POULTRY WASTE MANAGEMENT ALTERNATIVES-A DESIGN AND APPLICATION MANUAL KEYWORDS: POULTRY
300	77	4926	MANAGEMENT	ENVIRONMENTAL IMPLICATIONS OF TRENDS IN AGRICULTURE AND SILVICULTURE VOLUME I-TREND IDE
200	77	4943	MANAGEMENT	DAIRY CHORE REDUCTION PROGRAM PROGRESS REPORT KEYWORDS: ANIMAL-WASTES MANAGEMENT DESIGN
300	74	4960	MANAGEMENT	FEEDLOT POLLUTION CONTROL GUIDELINES KEYWORDS: FEEDLOTS TEXAS-LAW PERMITS LEGAL-ASPECTS
100	77	4991	MANAGEMENT	EFFECT OF SLATTED AND DEEP LITTER FLOORS ON THE PRODUCTIVE PERFORMANCE AND ENERGY UTIL
300	75	5002	MANAGEMENT	SELECTING A SWINE WASTE MANAGEMENT SYSTEM KEYWORDS: SWINE-WASTES MANAGEMENT FLOORS DESI
100	78	5053	MANAGEMENT	AEROSOL CONCENTRATION IN A TURKEY BARN ENVIRONMENT KEYWORDS: AIR-POLLUTION BACTERIA TUR
400	77	5058	MANAGEMENT	CONTROL OF NONPOINT WATER POLLUTION FROM AGRICULTURE: SOME CONCEPTS KEYWORDS: NONPOINT
200	78	5107	MANAGEMENT	BMP DEVELOPMENT FOR MANURE IN NEW YORK STATE KEYWORDS: NONPOINT-SOURCES LEGAL-ASPECTS M
400	78	5160	MANAGEMENT	MORE ON THREE-LEVEL BROILER BREEDER SYSTEM KEYWORDS: POULTRY MANAGEMENT DESIGN PERFORMA
400	78	5163	MANAGEMENT	MOVE HOGS INDOORS-NEXT STEP IN HOG CONFINEMENT KEYWORDS: SWINE MANAGEMENT DESIGN ECONOM
400	78	5215	MANAGEMENT	TWICE THE CATTLE AT HALF THE COST KEYWORDS: CATTLE-WASTES CONFINEMENT MANAGEMENT ECONOM
300	78	5229	MANAGEMENT	ANALYSIS OF STATE LAWS AND REGULATIONS IMPACTING ANIMAL WASTE MANAGEMENT KEYWORDS: LEGA
200	77	5310	MANAGEMENT	SCHEDULING SWINE PRODUCTION FACILITIES KEYWORDS: COMPUTER-MODELS MANAGEMENT SWINE
100	75	4678	MANGANESE	NOTE ON SECONDARY AND MICRO-ELEMENT CONTENTS OF FERTILIZERS AND MANURES KEYWORDS: FERT
200	78	5156	MANGANESE	NUTRIENTS AVAILABLE IN LIVESTOCK AND POULTRY MANURE RESIDUE AS REFLECTED BY MANAGEMENT
200	76	4726	MANURE-BANKS	TRANSPORT OF MANURE AND THE FUNCTION OF THE MANURE BANKS IN THE NETHERLANDS KEYWORDS:
500	77	5299	MANURE-BANKS	ANIMAL WASTE MANAGEMENT IN THE NETHERLANDS KEYWORDS: LEGAL-ASPECTS FEEDLOTS ODOR-CONTRO
200	76	4724	MANURE-HEAP	EXAMINATION OF SOIL SAMPLES TAKEN UNDER SILAGE MANURE HEAPS AND IN MANURED FIELDS KEYWO
400	78	4851	MANURE-PACK	MANAGE FEEDLOT WASTE TO CONTROL ODORS KEYWORDS: LIVESTOCK-WASTES FEEDLOTS ODOR-CONTROL
400	78	4845	MANURE-PAD	LEAVE PAD OF MANURE FOR NATURAL PREDATORS KEYWORDS: FLY-CONTROL PREDATORS MANURE-PAD PO
200	73	4782	MANURE-PITS	MECHANICAL AERATION OF A WASTE DISPOSAL PIT KEYWORDS: MANURE-PITS WASTE-STORAGE AERATIO
400	78	4816	MANURE-PITS	MANURE REMOVED WEEKLY FROM HIGH-RISE HOUSES KEYWORDS: POULTRY-WASTES MANURE-PITS CLEANI
200	78	5109	MANURE-PITS	EARTHEN PITS FOR MANURE AND RECYCLED FLUSH-WATER STORAGE KEYWORDS: MANURE-PITS WASTE-ST
100	78	5186	MANURE-PIT	MODEL STUDY OF FIVE TYPES OF MANURE PIT VENTILATION SYSTEMS KEYWORDS: VENTILATION SWINE
400	78	4845	MANURE-REMOVAL	LEAVE PAD OF MANURE FOR NATURAL PREDATORS KEYWORDS: FLY-CONTROL PREDATORS MANURE-PAD PO
100	78	5158	MANURE-TANKS	DESIGN OF LIQUID MANURE TANK ROOF SLABS KEYWORDS: LIQUID-WASTES MANURE-TANKS DESIGN ROO
200	71	4788	MAREKS-DISEASE	SALMONELLA AND OTHER MICROORGANISMS POSE A NEW PARAMETER TO DESIGNERS OF POULTRY HOUSES
200	76	5068	MARKETING	PROCEEDINGS OF SYMPOSIUM ON THE CONVERSION OF POULTRY WASTE TO ENERGY, FEED, OR FERTILI
200	76	5072	MARKETING	MARKETING OF CONVERTED POULTRY WASTE KEYWORDS: POULTRY-WASTES-DRIED MARKETING ECONOMICS
400	78	4836	MASKING-AGENTS	DEALING WITH ODORS KEYWORDS: ODOR-CONTROL MASKING-AGENTS ENZYMATIC-PRODUCTS CHEMICAL-TR
200	76	4733	MATHEMATICAL-MODEL	MATHEMATICAL MODELLING OF AMMONIUM OXIDATION IN EFFLUENTS KEYWORDS: MATHEMATICAL-MODELS
700	73	4884	MATHEMATICAL-MODEL	ANIMAL WASTE DISPOSAL LEGISLATION AND ITS IMPACT ON DAIRY FARMS IN TWO REGIONS DOMINATE
100	77	4934	MATHEMATICAL-MODEL	A DYNAMIC MODEL FOR SIMULATION OF ANIMAL WASTE DIGESTION KEYWORDS: MATHEMATICAL-MODELS
200	76	4740	MEASUREMENT	METHODS OF ANALYSIS FOR MANURES-COMPARISON BETWEEN COUNTRIES OF THE EEC, 2ND APPROXIMAT
300	76	4964	MEASUREMENT	DETECTING AND MEASURING MALODORS FROM ANIMAL WASTES KEYWORDS: ANIMAL-WASTES ODOR MEASUR
100	57	4980	MEASUREMENT	PROCEDURE FOR MEASURING ODOR CONCENTRATION IN AIR AND GASES KEYWORDS: ODOR MEASUREMENT
100	77	5243	MEASUREMENT	CHARACTERIZATION OF MALODOURS DURING ANAEROBIC STORAGE OF PIG WASTES KEYWORDS: WASTE-ST
300	77	5034	MEAT-PACKING	A METHOD OF MANURE DISPOSAL FOR A BEEF PACKING OPERATION: FIRST INTERIM TECHNICAL REP
100	77	4746	MEAT-PACKING-WASTE	BACTERIOLOGICAL INVESTIGATION OF ALBERTA MEAT-PACKING PLANT WASTES WITH EMPHASIS ON SAL
200	76	4743	MEAT-QUALITY	MICROBIOLOGICAL ANALYSIS OF ANIMAL MANURES WITH PARTICULAR REFERENCE TO THE ISOLATION
100	78	4890	MEAT-QUALITY	UTILISATION OF DRIED POULTRY MANURE BY GROWING CHICKENS FED ON A PRACTICAL DIET KEYWORD
300	77	4913	MEAT-QUALITY	WASTE AS A FEED EXTENDER KEYWORDS: REFEEDING DIGESTIBILTIY CATTLE PERFORMANCE WASTE-REC
200	76	4918	MEAT-QUALITY	FEEDING POULTRY WASTE TO RUMINANTS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE PROT
100	77	5033	MECHANICAL-ROTAVAT	MECHANICAL ROTAVATION OF POULTRY MANURE AS A METHOD OF FLY CONTROL KEYWORDS: FLY-CONTR
400	78	4684	MERCAPTANS	PUTTING THE LID ON ODOR KEYWORDS: ODOR-CONTROL SWINE-WASTES CONFINEMENT-PENS HYDROGEN-S
100	72	4802	MESOPHILIC	STUDIES ON LIVESTOCK EXCRETA DISPOSAL BY METHANE FERMENTATION. I. BASIC EXPERIMENT ON CO
100	72	4803	MESOPHILIC	STUDIES ON LIVESTOCK EXCRETA DISPOSAL BY METHANE FERMENTATION. II. OPTIMUM LOAD AND COMPA
400	78	4671	METHANE	LIQUID MANURE GAS MAY POSE DANGER KEYWORDS: AIR-POLLUTION SAFETY LIQUID-WASTES HYDROGEN
400	78	4675	METHANE	MONTANA RESEARCHER SEES METHANE PRODUCTION PROFITABLE IN FUTURE KEYWORDS: AGRICULTURAL-
400	78	4695	METHANE	METHANE DIGESTERS KEYWORDS: METHANE RECYCLING DIGESTERS DESIGN ECONOMICS
200	76	4732	METHANE	INVENTIONS AND INNOVATIONS TO REDUCE POLLUTION OF WATER RESOURCES KEYWORDS: WATER-POLLU
200	77	4767	METHANE	COMMERCIAL SIZE ANAEROBIC DIGESTER PERFORMANCE WITH DAIRY MANURE KEYWORDS: DAIRY-WASTES
200	77	4769	METHANE	PERFORMANCE OF A LARGE SIZE ANAEROBIC DIGESTER FOR POULTRY MANURE KEYWORDS: ANAEROBIC D
200	77	4773	METHANE	SOME MECHANICAL ASPECTS OF ANAEROBIC DIGESTION OF BEEF MANURE KEYWORDS: ANAEROBIC-DIGES
200	77	4779	METHANE	FIBER WALL REACTOR DIGESTION OF DAIRY CATTLE MANURE KEYWORDS: DAIRY-WASTES ANAEROBIC-TR
200	74	4781	METHANE	SWINE BUILDING AIR CONTAMINATE CONTROL WITH PIT VENTILATION KEYWORDS: SWINE-WASTES GASE
200	75	4784	METHANE	UTILIZATION OF METHANE FOR FARM PRODUCTION ENERGY-DISCUSSION KEYWORDS: CATTLE-WASTES DA
700	76	4795	METHANE	ANAEROBIC DIGESTION OF SCREENED DAIRY CATTLE WASTE USING A FIBER WALL REACTOR KEYWORDS:
300	77	4800	METHANE	METHANE ON THE MOVE--A DISCUSSION OF SMALL ANAEROBIC DIGESTERS KEYWORDS: METHANE ANAERO

100	72	4803	METHANE	STUDIES ON LIVESTOCK EXCRETA DISPOSAL BY METHANE FERMENTATION: II. OPTIMUM LOAD AND COMPA
700	75	4812	METHANE	UTILIZATION AND DISPOSAL OF RESIDUE FROM THE PARTIAL OXIDATION OF CATTLE MANURE KEYWORD
400	77	4817	METHANE	POULTRY MANURE MAKES DEBUT AS ENERGY SOURCE KEYWORDS: POULTRY-WASTES ANIMAL-WASTES FERM
400	78	4823	METHANE	MORE DEAR MOTHER A LETTER FROM JIM LAWRENCE KEYWORDS: HEATING PHYSICAL-TREATMENT BIOLOG
300	76	4824	METHANE	ENERGY POTENTIAL THROUGH BIO-CONVERSION OF AGRICULTURAL WASTES KEYWORDS: AGRICULTURAL-W
400	78	4830	METHANE	INNOVATIONS ARE SEEN IN 1980S CATTLE FEEDING KEYWORDS: CATTLE FEED-ADDITIVES STIMULANTS
100	78	4842	METHANE	COMPARATIVE VALUE OF ENSILED CATTLE WASTE FOR LAMBS AND GROWING-FINISHING CATTLE KEYWOR
400	78	4849	METHANE	STATE-BASED PLANT TURNING CATTLE MANURE INTO METHANE GAS KEYWORDS: CATTLE-WASTES RECYCL
400	77	4850	METHANE	MANURE DIGESTER BEING BUILT ON MINNESOTA FARM KEYWORDS: ANAEROBIC DIGESTERS RECYCLING P
400	77	4852	METHANE	MANURE MAKES THE ROUNDS KEYWORDS: FEEDLOT-WASTES ANAEROBIC DIGESTERS CARBON-DIOXIDE MET
300	76	4859	METHANE	ENERGY RELATIONSHIPS FOR A 32-ACRE IOWA FARM--AN ATTEMPT TO INCREASE PRODUCTION OF GRAI
300		4916	METHANE	METHANE PRODUCTION SYSTEMS FOR SWINE MANURE KEYWORDS: SWINE-WASTES CONFINEMENT-PENS ANA
600		4917	METHANE	THE CALORIFIC PROJECT: I. BACKGROUND AND DESIGN CRITERIA KEYWORDS: RECYCLING CATTLE-WA
400	78	4935	METHANE	KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA KEYWORDS: KAPLAN FEEDLOTS RECYCLING REFEEDING MET
300	78	4944	METHANE	BIOGAS PRODUCTION FROM POULTRY MANURE KEYWORDS: POULTRY-WASTES RECYCLING ANAEROBIC DIGE
200	78	4947	METHANE	METHANE AND BIOMASS PRODUCTION SYSTEMS FOR BEEF CATTLE MANURE KEYWORDS: LIVESTOCK-WASTE
500	76	4965	METHANE	THE LAMAR BIO-CONVERSION PLANT DESIGN KEYWORDS: BIO-CONVERSION ANAEROBIC-DIGESTION CATT
400	78	4972	METHANE	KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA-PART TWO KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLI
200	76	5005	METHANE	EXPERIENCES IN BUILDING AND OPERATING A FIELD SCALE ANAEROBIC DIGESTER KEYWORDS: ANAERO
300	76	5090	METHANE	BIOCONVERSION OF AGRICULTURAL WASTES FOR POLLUTION CONTROL AND ENERGY CONSERVATION KEY
200	76	5097	METHANE	ANAEROBIC PROCESSES INCLUDING METHANE FROM FARM WASTES KEYWORDS: ANAEROBIC-DIGESTION FA
200	78	5111	METHANE	METHANE PRODUCTION FROM ANAEROBIC FERMENTATION OF BEEF MANURE KEYWORDS: CATTLE-WASTES R
300	78	5130	METHANE	ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUES INTO BIOGAS KEYWORDS: ANAEROBIC DIGESTE
300	78	5142	METHANE	THE FEASIBILITY OF METHANE PRODUCTION FROM DAIRY ANIMAL WASTES: THE FARMER'S PERSPECTI
100	78	5144	METHANE	CARBON NITROGEN RATIO AND ANAEROBIC DIGESTION OF SWINE WASTE KEYWORDS: ANAEROBIC DIGEST
300	78	5152	METHANE	METHANE PRODUCTION FROM LIVESTOCK WASTE KEYWORDS: RECYCLING LIVESTOCK-WASTES POULTRY-WA
400	78	5189	METHANE	FEEDLOT MANURE KEEPS HOME FIRES BURNING KEYWORDS: RECYCLING THERMONETICS METHANE REFEED
400	78	5190	METHANE	METHANE FROM WASTE KEYWORDS: METHANE RECYCLING REFEEDING ECONOMICS
400	73	5192	METHANE	AN ALGAL REGENERATIVE SYSTEM FOR SINGLE-FAMILY FARMS AND VILLAGES KEYWORDS: RECYCLING A
600	78	5196	METHANE	METHANE FROM MANURE: FACT OR FANTASY KEYWORDS: METHANE ANAEROBIC-DIGESTION RECYCLING L
200	76	5199	METHANE	FERMENTATION FOR METHANE PRODUCTION KEYWORDS: FERMENTATION METHANE GAS-PRODUCTION ANAER
300	77	5205	METHANE	RESEARCH IN ANIMAL WASTE MANAGEMENT KEYWORDS: SWINE-WASTES DIGESTERS METHANE AGITATION
400	78	5212	METHANE	WARNING-MANURE GASES ARE DANGEROUS KEYWORDS: GASES HYDROGEN-SULFIDE METHANE CARBON-DIOX
400	78	5224	METHANE	SMALL FARM ENERGY PROJECT KEYWORDS: RECYCLING BIOGAS METHANE REFEEDING ANAEROBIC DIGEST
300	77	5226	METHANE	METHANE GENERATION FROM HUMAN, ANIMAL, AND AGRICULTURAL WASTES KEYWORDS: RECYCLING METH
500	77	5287	METHANE	ENERGY RECOVERY FROM ANIMAL WASTES-ANAEROBIC DIGESTION, PYROLYSIS, HYDROGENATION KEYWOR
400	78	5302	METHANE	BIOCONVERSION NO PANACEA AS DISPOSAL ALTERNATIVE KEYWORDS: BIOGAS METHANE ECONOMICS REC
400	78	5305	METHANE	COLORADO BIOGAS PLANT WINS ACEC TOP PRIZE KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING BI
100	77	5313	METHIONINE	CATTLE MANURE AND FINAL MOLASSES SILAGE IN CHICKEN FATTENING: I. HIGH SUBSTITUTION LEVE
100	77	5064	METHOPRENE	EFFICACY OF METHOPRENE ALTOSID[5]IGR,, AGAINST THE HORN FLY WHEN FED TO CATTLE IN MINER
100	70	4874	METHOXYL	CHANGES IN BIOCHEMICAL CONSTITUENT OF SOME ORGANIC WASTE MATERIALS UNDER ANAEROBIC METH
100	78	4878	MICROBIAL-ADAPTATI	ANIMAL PERFORMANCE AND MICROBIAL ADAPTATION OF RUMINANTS FED FORMALDEHYDE TREATED POULT
200	78	5117	MICROCOCCUS-DENITR	DENITRIFICATION: I. USE OF 15N FOR EVALUATION OF THE HYPOTHETICAL EXCRETION OF MOLECULA
100	77	5022	MICROFLORA	RECOVERY AND REACTIONS OF AMPROLIUM FROM POULTRY MANURE ADDED TO SOIL KEYWORDS: POULTRY
400	77	5177	MICRONUTRIENTS	MANURE IS AN INCREASINGLY ECONOMICAL FERTILIZER SOURCE KEYWORDS: ANIMAL-WASTES LAND-APP
200	74	4759	MICROORGANISMS	MECHANIZED COMPOSTING SYSTEM EVALUATION KEYWORDS: COMPOSTING MICROORGANISMS DAIRY-WASTE
200	77	4786	MICROORGANISMS	NONPOINT POLLUTION CONTROL FOR WINTERING RANGE CATTLE KEYWORDS: CATTLE WATER-POLLUTION
300	77	4923	MICROORGANISMS	POULTRY EXCRETA DEHYDRATION AND UTILIZATION-SYSTEM DEVELOPMENT AND DEMONSTRATION KEYWOR
100	77	4989	MICROORGANISMS	STUDIES ON MICROBIOLOGICAL CONTROL OF LIQUID MANURE HANDLING KEYWORDS: LIQUID-WASTES WA
100	78	5044	MICROORGANISMS	MICROFLORA OF AIR SAMPLES FROM POULTRY HOUSES KEYWORDS: POULTRY-HOUSES AIR-POLLUTION MI
300	77	5169	MICROORGANISMS	EFFECTS OF FEEDLOT RUNOFF ON FREE-LIVING AQUATIC CILIATED PROTOZOA KEYWORDS: FEEDLOT-RU
300	78	5183	MICROORGANISMS	SPECIFIC COMPOSITION OF REPRESENTATIVE FEEDLOT WASTES: A CHEMICAL AND MICROBIAL PROFILE
500	76	5225	MICROORGANISMS	THE UPGRADING OF AGRICULTURAL WASTES BY THERMOPHILIC FUNGI KEYWORDS: WASTE-TREATMENT T
200	78	5103	MICROTUBING	CONTOUR FURROW IRRIGATION WITH LIQUID MANURE USING MICROTUBING FOR FLOW CONTROL KEYWOR
400	78	4682	MILK-PRODUCTION	POULTRY WASTES PROVIDE NITROGEN SOURCE KEYWORDS: REFEEDING POULTRY-WASTES DAIRY-CATTLE
400	78	4941	MILK-PRODUCTION	DRIED POULTRY MANURE BENEFITS DAIRY COWS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTL
400	78	5217	MILK-PRODUCTION	OPW PROVIDES NITROGEN FOR COWS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE PERFORMA
700	73	4922	MINERALIZATION	SOIL AS AN ANIMAL WASTES DISPOSAL SYSTEM KEYWORDS: CATTLE-WASTES DAIRY-WASTES LAND-APPL
700	77	5198	MINERALIZATION	RECOVERY OF 15-N LABELED FERTILIZER AND PLANT GROWTH IN MANURE AND SLUDGE-AMENDED SOIL
200	76	4918	MINERALS	FEEDING POULTRY WASTE TO RUMINANTS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE PROT
300	73	4826	MINING	METHODS FOR IDENTIFYING AND EVALUATING THE NATURE AND EXTENT OF NON-POINT SOURCES OF PO
100	77	4893	MIXING	THE EFFECT OF MIXING ON AN ANAEROBIC LAGOON KEYWORDS: SWINE-WASTES WASTE-TREATMENT LAGO
300	77	4800	MOBILE-UNITS	METHANE ON THE MOVE--A DISCUSSION OF SMALL ANAEROBIC DIGESTERS KEYWORDS: METHANE ANAERO
300	77	4683	MODELS	PRELIMINARY IDENTIFICATION OF LITERATURE MODELS AND DATA FOR EVALUATING RURAL NONPOINT
200	76	4733	MODEL-STUDIES	MATHEMATICAL MODELLING OF AMMONIUM OXIDATION IN EFFLUENTS KEYWORDS: MATHEMATICAL-MODELS
200	76	4734	MODEL-STUDIES	TWO LEVELS OF MODELLING THE UTILISATION OF ANIMAL MANURES KEYWORDS: MODEL-STUDIES WASTE
200	76	4736	MODEL-STUDIES	WASTE MANAGEMENTS SYSTEMS IN ANIMAL HUSBANDRY-APPLICATION OF FARM MODEL STUDIES AND SYS
200	76	4738	MODEL-STUDIES	SOME ASPECTS OF THE PROBLEM OF MODELLING THE UTILISATION OF ANIMAL MANURES BY LAND SPRE
200	74	4748	MODEL-STUDIES	A MATHEMATICAL DRYING MODEL FOR MANURE BASED ON THE CONCEPT OF A RECEDING EVAPORATIVE I
200	77	4763	MODEL-STUDIES	MODELING TECHNIQUES AND COMPUTER SIMULATION OF AGRICULTURAL WASTE TREATMENT PROCESSES K
200	77	4772	MODEL-STUDIES	CONCEPTUAL MODELLING OF NONPOINT SOURCE POLLUTION FROM LAND AREAS RECEIVING ANIMAL WAST
200	77	4808	MODEL-STUDIES	PREDICTION OF EFFECTS OF LAGOON DESIGN VARIABLES-NITROGEN CONSERVATION OR REMOVAL KEYWO
200	77	4810	MODEL-STUDIES	NITRATE PRODUCTION AND CONTROL IN AN OXIDATION DITCH KEYWORDS: SWINE-WASTES OXIDATION-D
300	73	4826	MODEL-STUDIES	METHODS FOR IDENTIFYING AND EVALUATING THE NATURE AND EXTENT OF NON-POINT SOURCES OF PO
100	77	4868	MODEL-STUDIES	THE PHOSPHORUS CYCLE IN PIG SLURRY MEASURED FROM 32PO4 DISTRIBUTION RATES KEYWORDS: SWI
700	74	4882	MODEL-STUDIES	A COMPUTER SIMULATION OF BIOLOGICAL TREATMENT, STORAGE, AND LAND DISPOSAL OF SWINE WAST
700	73	4884	MODEL-STUDIES	ANIMAL WASTE DISPOSAL LEGISLATION AND ITS IMPACT ON DAIRY FARMS IN TWO REGIONS DOMINATE
300	76	4925	MODEL-STUDIES	MODELING PESTICIDES AND NUTRIENTS ON AGRICULTURAL LANDS KEYWORDS: AGRICULTURAL-RUNOFF M
300	77	4927	MODEL-STUDIES	AGRICULTURE RUNOFF MANAGEMENT (ARM) MODEL - VERSION II REFINEMENT AND TESTING KEYWORDS:
100	77	4934	MODEL-STUDIES	A DYNAMIC MODEL FOR SIMULATION OF ANIMAL WASTE DIGESTION KEYWORDS: MATHEMATICAL-MODELS
300	78	4940	MODEL-STUDIES	COST EFFICIENCIES OF LARGE-SCALE INTEGRATED DAIRY PRODUCTION AND WASTE MANAGEMENT SYSTE
200	78	4947	MODEL-STUDIES	METHANE AND BIOMASS PRODUCTION SYSTEMS FOR BEEF CATTLE MANURE KEYWORDS: LIVESTOCK-WASTE
300		5010	MODEL-STUDIES	SCALE MODEL OF AN UNDERSLAT FLUSHING SYSTEM KEYWORDS: MODEL-STUDIES FLUSHING DESIGN SLO
100	77	5028	MODEL-STUDIES	INTERNALIZATION IN A STOCHASTIC POLLUTION MODEL KEYWORDS: MODEL-STUDIES FEEDLOT-RUNOFF
100	77	5093	MODEL-STUDIES	MODEL TO EVALUATE FEEDLOT RUNOFF CONTROL SYSTEMS KEYWORDS: MODEL-STUDIES FEEDLOT-RUNOFF
200	78	5105	MODEL-STUDIES	MODELING NITROGEN MOVEMENT IN AGRICULTURAL WATERSHEDS KEYWORDS: MODEL-STUDIES WATERSHED
200	78	5114	MODEL-STUDIES	OPTIMIZATION OF RUNOFF DETENTION FOR NONPOINT POLLUTION CONTROL KEYWORDS: NONPOINT-SOUR
200	78	5122	MODEL-STUDIES	NITROGEN AND PHOSPHORUS MOVEMENT FROM SURFACE APPLIED MANURE KEYWORDS: MODEL-STUDIES LE
300	77	5129	MODEL-STUDIES	RECYCLING AGRICULTURE RUNOFF KEYWORDS: MODEL-STUDIES AGRICULTURAL-RUNOFF WASTE-STORAGE
600	75	5150	MODEL-STUDIES	FEEDLOT RUNOFF CONTROL FROM POINT NON-POINT SOURCES KEYWORDS: LEGAL-ASPECTS NPDES AGRIC
100	77	5259	MODEL-STUDIES	DISPERSION OF ODORS IN THE NEIGHBOURHOOD OF PIG HOUSES KEYWORDS: ODOR SWINE CONFINEMENT
100	77	5260	MODEL-STUDIES	THE DUTCH RESEARCH PROGRAM ON ODOR CONTROL KEYWORDS: ODOR-CONTROL MODEL-STUDIES
500	77	5271	MODEL-STUDIES	MANAGEMENT OF THE LIVING ENVIRONMENT KEYWORDS: POLLUTION FEEDLOTS LEGAL-ASPECTS MODEL-S
100	76	5232	MOISTURE	EFFECT OF AMENDMENTS TO SAND TO INCREASE THE MOISTURE LEVEL FOR THE GROWTH OF BAJRA PE
200	74	4759	MOISTURE-CONTENT	MECHANIZED COMPOSTING SYSTEM EVALUATION KEYWORDS: COMPOSTING MICROORGANISMS DAIRY-WASTE
700	76	4805	MOISTURE-CONTENT	DESIGN AND DEVELOPMENT OF A SEPARATOR FOR BOVINE MANURE KEYWORDS: SEPARATION-TECHNIQUES
400	78	4837	MOISTURE-CONTENT	FERTILIZER VALUE OF TURKEY WASTE KEYWORDS: POULTRY-WASTES SOLID-WASTES TURKEYS LIQUID-W
400	78	4871	MOISTURE-CONTENT	KEEPING FLIES OUT OF THE HEN HOUSE KEYWORDS: FLY-CONTROL POULTRY-HOUSES WASTE-REMOVAL M
100	78	4877	MOISTURE-CONTENT	FERMENTATION AND UTILIZATION OF BROILER LITTER ENSILED AT DIFFERENT MOISTURE LEVELS KEY
400	77	4887	MOISTURE-CONTENT	COMPOSTING AS A MANURE MANAGEMENT SYSTEM KEYWORDS: FARM-WASTES COMPOSTING ODOR-CONTROL

300	77 4923	MOISTURE-CONTENT	POULTRY EXCRETA DEHYDRATION AND UTILIZATION-SYSTEM DEVELOPMENT AND DEMONSTRATION KEYWOR
400	78 4981	MOISTURE-CONTENT	TOO MUCH MAGNESIUM MAKES WETTER DROPPINGS KEYWORDS: DIETS POULTRY FEED-ADDITIVES MAGNES
100	77 5033	MOISTURE-CONTENT	MECHANICAL ROTAVATION OF POULTRY MANURE AS A METHOD OF FLY CONTROL KEYWORDS: FLY-CONTR
100	78 5038	MOISTURE-CONTENT	*COMPARISON OF PROBE HAY MOISTURE DETECTOR AND CONVENTIONAL METHOD FOR DETERMINING* POUL
100	75 5120	MOISTURE-CONTENT	EFFECT OF THE APPLICATION OF COW SLURRY TO GRASSLAND ON NITRATE LEVELS IN SOIL AND SOIL
200	70 5191	MOISTURE-CONTENT	AIR DRYING POULTRY MANURE KEYWORDS: DEHYDRATION POULTRY-WASTES FLY-CONTROL ODOR-CONTROL
300	78 5202	MOISTURE-CONTENT	FERMENTATION AND DIGESTIBILITY OF BROILER LITTER ENSILED AT DIFFERENT MOISTURE LEVELS B
100	76 5304	MOISTURE-CONTENT	EFFECT OF DIETARY SODIUM AND POTASSIUM EXCESS ON WATER CONSUMPTION, URINE EXCRETION AND
200	77 5311	MOISTURE-CONTENT	SUMMER UTILIZATION OF SOLAR ENERGY FOR DRYING POULTRY EXCRETA KEYWORDS: DEHYDRATION POU
200	77 4811	MOISTURE-DEFICIT	SIZING COMPONENTS ON OPEN FEEDLOT RUNOFF CONTROL SYSTEMS KEYWORDS: COMPUTER-MODELS FEED
300	76 4873	MOISTURE-REDUCTION	LIVESTOCK WASTE ODOR CONTROL KEYWORDS: LIVESTOCK-WASTES ODOR-CONTROL LOCATION ODOR-MEAS
100	78 4880	MOLASSES	LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF. II. PRESERVATION AND ACCEPTABILITY OF WET EXC
400	78 4680	MOLDS	FUNGASTATIC FEED ADDITIVES IMPROVE LITTER RESULTS KEYWORDS: FEED-ADDITIVES FUNGICIDES L
100	77 5032	MOLDS	LITTER REUSE EFFECTS ON SELECTED TURKEY PRODUCTION AND PROCESSING PARAMETERS KEYWORDS:
100	78 5044	MOLDS	MICROFLORA OF AIR SAMPLES FROM POULTRY HOUSES KEYWORDS: POULTRY-HOUSES AIR-POLLUTION MI
100	75 4678	MOLYBDENUM	NOTE ON SECONDARY AND MICRO-ELEMENT CONTENTS OF FERTILIZERS AND MANURES KEYWORDS: FERT
400	78 5059	MOUNDS	WELL BUILT MOUNDS MANAGE THEMSELVES KEYWORDS: FEEDLOTS MOUNDS CONFINEMENT-PENS DESIGN S
100	77 4753	MULCHES	A REVIEW OF MULCHES TO CONTROL WIND EROSION KEYWORDS: WIND-EROSION MULCHES CROP-RESIDUE
500	77 4901	MUNICIPAL-REFUSE	PROPERTIES OF AGRICULTURAL AND MUNICIPAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WASTE
500	77 4903	MUNICIPAL-WASTES	RECYCLING ELEMENTS IN WASTES THROUGH SOIL-PLANT SYSTEMS KEYWORDS: LAND-APPLICATION MUNI
500	77 4904	MUNICIPAL-WASTES	SPECIAL OPPORTUNITIES AND PROBLEMS IN USING FOREST SOILS FOR ORGANIC WASTE APPLICATION
500	77 4905	MUNICIPAL-WASTES	LAND UTILIZATION AND DISPOSAL OF ORGANIC WASTES IN ARID REGIONS KEYWORDS: ANIMAL-WASTES
500	77 4906	MUNICIPAL-WASTES	PATHOGEN CONSIDERATIONS FOR LAND APPLICATION OF HUMAN AND DOMESTIC ANIMAL WASTES KEYWOR
500	77 4907	MUNICIPAL-WASTES	FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS: MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP
500	77 5026	MUNICIPAL-WASTES	BIOLOGICAL RECLAMATION OF SOLID WASTES KEYWORDS: RECYCLING SOLID-WASTES MUNICIPAL-WASTE
500	77 4902	MUNICIPAL-WASTEWAT	PROPERTIES OF WASTE WATERS KEYWORDS: WASTEWATER-MANAGEMENT WASTE-COMPOSITION BIOLOGICAL
300	76 4754	MUNICIPAL-WATERSHE	MICROBIOLOGY AND CHEMISTRY STUDIES OF WATER QUALITY FACTORS IN A WATERSHED USED FOR MUN
100	77 5306	MYCOFLORA	MYCOFLORA OF A TURKEY CONFINEMENT BROODER HOUSE KEYWORDS: POULTRY AIR-POLLUTION LITTERS
300	77 5149	NEBRASKA-LAW	COMMON SCENTS: AN ANALYSIS OF THE LAW OF FEED LOT ODOR CONTROL KEYWORDS: ODOR-CONTROL
400	78 5134	NECROSIS	BROILER LITTER FOR FERTILIZER KEYWORDS: LAND-APPLICATION POULTRY-LITTER PASTURES ANIMAL
400	78 4939	NEMATODES	BROILER FERTILIZED FESCUE A MIXED BLESSING KEYWORDS: POULTRY-WASTES LAND-APPLICATION PA
100	78 5170	NEMATODES	AVAILABILITY TO GRAZING SHEEP OF GASTROINTESTINAL NEMATODE INFECTION ARISING FROM SUMM
100	78 4879	NEUTRAL-DETERGENT-	LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF: I. INFLUENCE OF PRACTICAL EXTREMES IN DIET, W
100	78 4954	NEUTRAL-DETERGENT-	CHEMICAL COMPOSITION OF FEEDLOT MANURE KEYWORDS: CATTLE-WASTES FEEDLOTS WASTE-COMPOSITI
200	77 4770	NITRATES	DAIRY LAGOON EFFECTS ON GROUNDWATER QUALITY KEYWORDS: DAIRY-WASTES HOLDING-PONDS LAGOON
200	77 4794	NITRATES	ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS KEYWORDS: CATTLE MANAGEMENT PAST
700	76 4804	NITRATES	DIFFUSE AGRICULTURAL POLLUTION--THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS KEYWORDS:
200	77 4810	*NITRATES*	*NITRATE PRODUCTION AND CONTROL IN AN OXIDATION DITCH KEYWORDS: SWINE-WASTES OXIDATION-D*
100	77 4862	NITRATES	LAND DISPOSAL OF BROILER LITTER--CHANGES IN CONCENTRATION OF CHLORIDE, NITRATE NITROGEN
700	76 4921	NITRATES	EFFECT OF BEEF CATTLE MANURE ON SOIL PROPERTIES AND CROP GROWTH KEYWORDS: CATTLE-WASTES
100	77 4950	NITRATES	MANURE EFFECTS ON WATER INTAKE AND RUNOFF QUALITY FROM IRRIGATED GRAIN SORGHUM PLOTS KE
100	4997	NITRATES	MOVEMENT OF NITRATES AND OTHER DISSOLVED SALTS FROM A FISHPOND INTO LAKE KINNERET KEYWO
100	77 5008	NITRATES	RECYCLING OXIDATION DITCH MIXED LIQUOR TO LAYING HENS KEYWORDS: REFEEDING OXIDATION-DIT
100	78 5057	NITRATES	EFFLUENTS FROM CATFISH PONDS DURING FISH HARVEST KEYWORDS: FISH-FARMING EFFLUENT-QUALIT
100	75 5094	NITRATES	NATURAL SOIL NITRATE: THE CAUSE OF THE NITRATE CONTAMINATION OF GROUND WATER IN RUNNEL
200	78 5106	NITRATES	WINTER AND SPRING RUNOFF FROM MANURE APPLICATION PLOTS KEYWORDS: LAND-APPLICATION AGRIC
100	75 5120	NITRATES	EFFECT OF THE APPLICATION OF COW SLURRY TO GRASSLAND ON NITRATE LEVELS IN SOIL AND SOIL
100	78 5173	NITRATES	CROP RESPONSE AND QUALITY OF SOIL LEACHATE AS AFFECTED BY LAND APPLICATION OF BEEF CATT
400	78 5134	NITRATE	BROILER LITTER FOR FERTILIZER KEYWORDS: LAND-APPLICATION POULTRY-LITTER PASTURES ANIMAL
100	78 5171	NITRATE	EFFECTS OF LIQUID SWINE WASTE APPLICATIONS ON CORN YIELD AND SOIL CHEMICAL COMPOSITION
200	76 4733	NITRIFICATION	MATHEMATICAL MODELLING OF AMMONIUM OXIDATION IN EFFLUENTS KEYWORDS: MATHEMATICAL-MODELS
700	73 4922	NITRIFICATION	SOIL AS AN ANIMAL WASTES DISPOSAL SYSTEM KEYWORDS: CATTLE-WASTES DAIRY-WASTES LAND-APPL
100	78 4955	NITRIFICATION	NITRIFICATION AND DENITRIFICATION IN CATTLE MANURE-AMENDED SOIL KEYWORDS: LAND-APPLICA
100	75 4670	NITROGEN	FIELD TEST FOR ESTIMATING DRY MATTER AND FERTILIZER VALUE OF SLURRY-- PRELIMINARY REPOR
100	72 4673	NITROGEN	THE CATTLE DUNG PATCH: 2.EFFECT OF A DUNG PATCH ON THE CHEMICAL STATUS OF THE SOIL, AN
400	78 4681	NITROGEN	POULTRY MANURE FERTILIZER VALUE CUTS FARM COSTS KEYWORDS: POULTRY-WASTES LAND-APPLICATI
200	71 4687	NITROGEN	STORAGE OF BEEF CATTLE WASTES UNDER AEROBIC AND ANAEROBIC CONDITIONS KEYWORDS: CATTLE-W
200	76 4710	NITROGEN	EFFECT OF RATE OF APPLICATION OF ORGANIC AND INORGANIC NITROGEN ON CROP PRODUCTION AND
200	76 4715	NITROGEN	ANIMAL ORGANIC MANURES IN DUTCH FORESTRY-APPLICATION AND RESTRICTIONS KEYWORDS: LIQUID-
200	76 4719	NITROGEN	SOIL, WATER, PLANT RELATIONSHIP AS INFLUENCED BY INTENSIVE USE OF EFFLUENTS FROM LIVES
200	74 4761	NITROGEN	*NITROGEN LEVELS UNDER A SWINE FEEDLOT IN SOUTH CAROLINA* KEYWORDS: FEEDLOTS SWINE MANAGE
200	77 4767	NITROGEN	COMMERCIAL SIZE ANAEROBIC DIGESTER PERFORMANCE WITH DAIRY MANURE KEYWORDS: DAIRY-WASTES
200	77 4769	NITROGEN	PERFORMANCE OF A LARGE SIZE ANAEROBIC DIGESTER FOR POULTRY MANURE KEYWORDS: ANAEROBIC D
200	77 4773	NITROGEN	SOME MECHANICAL ASPECTS OF ANAEROBIC DIGESTION OF BEEF MANURE KEYWORDS: ANAEROBIC-DIGES
200	77 4808	NITROGEN	PREDICTION OF EFFECTS OF LAGOON DESIGN VARIABLES-NITROGEN CONSERVATION OR REMOVAL KEYWO
200	77 4809	NITROGEN	WASTEWATER REUSE LAGOON SYSTEMS FOR SWINE KEYWORDS: SWINE-WASTES LAGOONS FLUSHING WASTE
100	73 4819	NITROGEN	EFFECT OF FARMYARD MANURE ON THE YIELD AND CHEMICAL COMPOSITION OF THE WHEAT CROP KEYWO
100	76 4827	NITROGEN	EXPERIMENTAL STUDY OF NITROGEN EXCRETION OF BASS DICENTRARCHUS LABRAX DURING GROWTH. I
400	78 4837	NITROGEN	FERTILIZER VALUE OF TURKEY WASTE KEYWORDS: POULTRY-WASTES SOLID-WASTES TURKEYS LIQUID-W
400	78 4840	NITROGEN	FEEDLOT SELLS MANURE KEYWORDS: WASTE-MANAGEMENT FEEDLOTS CATTLE LIQUID-WASTES FLUSHING
100	77 4860	NITROGEN	EFFECTS OF SOIL, COVER CROP, AND NUTRIENT SOURCE ON MOVEMENT OF SOIL, WATER, AND NITROG
100	77 4864	NITROGEN	FEEDLOT RUNOFF HOLDING PONDS--NUTRIENT LEVELS AND RELATED MANAGEMENT ASPECTS KEYWORDS
300	77 4865	NITROGEN	CHEMICAL ANALYSIS AND FERTILIZER VALUE OF TURKEY MANURE KEYWORDS: POULTRY-WASTES WASTE-
100	78 4879	NITROGEN	LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF: I. INFLUENCE OF PRACTICAL EXTREMES IN DIET, W
400	77 4887	NITROGEN	COMPOSTING AS A MANURE MANAGEMENT SYSTEM KEYWORDS: FARM-WASTES COMPOSTING ODOR-CONTROL
100	76 4891	NITROGEN	AN INTEGRATED SEPARATION, AEROBIC TREATMENT AND SLUDGE DE-WATERING SYSTEM FOR PIG SLURR
700	74 4898	NITROGEN	CHARACTERISTICS OF RUNOFF FROM DISPOSAL OF CATTLE FEEDLOT WASTES ON LAND KEYWORDS: CATT
500	77 4901	NITROGEN	PROPERTIES OF AGRICULTURAL AND MUNICIPAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WASTE
300	76 4925	NITROGEN	MODELING PESTICIDES AND NUTRIENTS ON AGRICULTURAL LANDS KEYWORDS: AGRICULTURAL-RUNOFF M
100	77 4934	NITROGEN	A DYNAMIC MODEL FOR SIMULATION OF ANIMAL WASTE DIGESTION KEYWORDS: MATHEMATICAL-MODELS
300	77 4937	NITROGEN	ANIMAL WASTE MANAGEMENT AND OUR WATER QUALITY KEYWORDS: WATER-POLLUTION GROUNDWATER-POL
400	78 4941	NITROGEN	DRIED POULTRY MANURE BENEFITS DAIRY COWS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTL
700	76 4942	NITROGEN	THE EFFECT OF APPLICATION OF POULTRY MANURE WHICH WAS SUBJECTED TO DIFFERENT WASTE MANA
100	77 4945	NITROGEN	EFFECTS ON SOLID AND LIQUID BEEF MANURE AND LIQUID HOG MANURE ON SOIL CHARACTERISTICS A
200	78 4947	NITROGEN	METHANE AND BIOMASS PRODUCTION SYSTEMS FOR BEEF CATTLE MANURE KEYWORDS: LIVESTOCK-WASTE
100	78 4954	NITROGEN	CHEMICAL COMPOSITION OF FEEDLOT MANURE KEYWORDS: CATTLE-WASTES FEEDLOTS WASTE-COMPOSITI
300	76 4964	NITROGEN	DETECTING AND MEASURING MALODORS FROM ANIMAL WASTES KEYWORDS: ANIMAL-WASTES ODOR MEASUR
400	78 4983	NITROGEN	TURKEY MANURE AS FERTILIZER KEYWORDS: TURKEYS POULTRY-WASTES FERTILIZERS PHOSPHORUS POT
400	77 4985	NITROGEN	INJECTING LIQUID MANURE REDUCES NITROGEN LOSS KEYWORDS: LIQUID-WASTES LAND-APPLICATION
100	75 4986	NITROGEN	VARIATIONS BETWEEN FARMS IN N, P, K, MG AND DRY MATTER COMPOSITION OF CATTLE, PIG AND PO
200	77 5019	NITROGEN	HANDLING OF MANURE FROM DIFFERENT ANIMALS AND MANAGEMENT SYSTEMS KEYWORDS: WASTE-MANAGE
100	77 5020	NITROGEN	STUDIES WITH HORSES COMPARING 4N-HCl INSOLUBLE ASH AS AN INDEX MATERIAL WITH TOTAL FECA
300	78 5023	NITROGEN	ULTIMATE DISPOSAL OF BEEF FEEDLOT WASTES ONTO LAND KEYWORDS: FEEDLOTS CATTLE-WASTES LAN
100	76 5036	NITROGEN	ASKOV 1984--FERTILIZERS AND MANURE ON SANDY AND LOAMY SOILS KEYWORDS: ANIMAL-WASTES FER
100	78 5052	NITROGEN	QUALITY VARIATION OF STORED FEEDLOT RUNOFF KEYWORDS: FEEDLOT-WASTES WASTE-STORAGE FEEDL
400	78 5084	NITROGEN	112 MILLION TONS OF MANURE PRODUCED IN 1974: USDA KEYWORDS: LIVESTOCK-WASTES POULTRY-W
200	78 5100	NITROGEN	RECYCLING SWINE WASTE IN A GROWING-FINISHING RATION KEYWORDS: REFEEDING SWINE-WASTES SW
200	78 5102	NITROGEN	ESTIMATED INVENTORY OF LIVESTOCK AND POULTRY MANURE RESOURCES IN THE UNITED STATES KEYW
200	78 5113	NITROGEN	METHODOLOGIES AND PRELIMINARY RESULTS FOR EVALUATING SWINE DRYLOT RUNOFF IMPACT ON COA
100	77 5118	NITROGEN	THE EFFECTS OF CATTLE SLURRY AND INORGANIC FERTILISER NITROGEN ON THE YIELD AND MINERAL

200	78	5122	NITROGEN NITROGEN AND PHOSPHORUS MOVEMENT FROM SURFACE APPLIED MANURE KEYWORDS: MODEL-STUDIES LE
400	78	5126	NITROGEN FEED AND FERTILIZER VALUE OF BROILER LITTER VARIES KEYWORDS: POULTRY-LITTER RECYCLING W
200	78	5128	NITROGEN DEVELOPING A LIVESTOCK WASTE MANAGEMENT PLAN KEYWORDS: WASTE-MANAGEMENT LAND-APPLICATIO
100	76	5140	NITROGEN EFFECT OF VARIOUS SOURCES OF NITROGEN AND ADDED ORGANIC MATTER ON NODULATION AND NITROG
100	78	5144	NITROGEN CARBON NITROGEN RATIO AND ANAEROBIC DIGESTION OF SWINE WASTE KEYWORDS: ANAEROBIC DIGEST
100	78	5148	NITROGEN EARTHEN PITS FOR MANURE AND RECYCLED FLUSH-WATER STORAGE KEYWORDS: WASTE-STORAGE EARTHE
100	78	5171	NITROGEN EFFECTS OF LIQUID SWINE WASTE APPLICATIONS ON CORN YIELD AND SOIL CHEMICAL COMPOSITION
300	78	5175	NITROGEN SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
400	77	5177	NITROGEN MANURE IS AN INCREASINGLY ECONOMICAL FERTILIZER SOURCE KEYWORDS: ANIMAL-WASTES LAND-APP
100	78	5178	NITROGEN NONPOINT SOURCES- STATE-OF-THE-ART OVERVIEW KEYWORDS: NONPOINT-SOURCES WATER-POLLUTION
700	77	5182	NITROGEN SOME PHYSICAL, CHEMICAL, AND BIOLOGICAL EFFECTS OF HEAVY POULTRY MANURE APPLICATIONS ON
400	78	5185	NITROGEN POULTRY MANURE AS FEED KEYWORDS: REFEEDING POULTRY-WASTES SWINE PERFORMANCE NITROGEN TO
300	78	5188	NITROGEN ESTIMATING U.S. LIVESTOCK AND POULTRY MANURE AND NUTRIENT PRODUCTION KEYWORDS: LIVESTOC
300	78	5194	NITROGEN MANAGING HORSE MANURE FOR ENVIRONMENTAL PROTECTION KEYWORDS: WATER-POLLUTION AIR-POLLUT
400	78	5207	NITROGEN YOU CAN PUT LIQUID MANURE ON YOUR ALFALFA KEYWORDS: LIQUID-WASTES DAIRY-WASTES LAND-APP
300	74	5213	NITROGEN SOIL POLLUTION FROM FEEDLOTS IN GEORGIA KEYWORDS: FEEDLOTS CATTLE-WASTES SOIL-CONTAMINA
200	78	5227	NITROGEN BARNYARD SEDIMENT AND NUTRIENT REMOVAL BY GRASS FILTERS KEYWORDS: AGRICULTURAL-RUNOFF S
300	78	5231	NITROGEN WATER QUALITY RENOVATION OF ANIMAL WASTE LAGOONS UTILIZING AQUATIC PLANTS KEYWORDS: LA
100	77	5243	NITROGEN CHARACTERIZATION OF MALODOURS DURING ANAEROBIC STORAGE OF PIG WASTES KEYWORDS: WASTE-ST
100	77	5246	NITROGEN ODOUR CONTROL OF LIQUID SWINE MANURE BY AERATION KEYWORDS: WASTE-STORAGE SWINE-WASTES A
400	78	5263	NITROGEN DPE NITROGEN SOURCE FOR GROWING LAMBS KEYWORDS: POULTRY-WASTES-DRIED POULTRY-LITTER NIT
100	78	5264	NITROGEN WET POULTRY WASTE MAKES BETTER FEED KEYWORDS: POULTRY-WASTES REFEEDING SHEEP NITROGEN D
500	77	5286	NITROGEN NUTRIENT CONTROL APPLICABLE TO ANIMAL WASTES KEYWORDS: BIOLOGICAL-TREATMENT LAND-APPLIC
500	77	5289	NITROGEN UTILIZATION OF ANIMAL WASTES FOR CROP PRODUCTION KEYWORDS: LIQUID-WASTES FERTILIZERS LA
100	77	5303	NITROGEN ANAEROBIC DIGESTION OF PIGGERY WASTE: 1. THE INFLUENCE OF DETENTION TIME AND MANURE CON
100	78	4876	NITROGEN-BALANCE EFFECTS OF LIQUID FRACTION PRESSED FROM DAIRY CATTLE EXCRETA (LE) IN LAMB DIETS KEYWORD
100	77	4856	NITROGEN-COMPOUNDS RUNOFF FROM FEEDLOTS AND MANURE STORAGES IN SOUTHERN ONTARIO KEYWORDS: FEEDLOT-RUNOFF W
500	77	5123	NITROGEN-CONTROL POLLUTION CONTROL FOR AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES ANIMAL-WASTES WASTE-TRE
100	76	5029	NITROGEN-FIXATION EFFECT OF ORGANIC AMENDMENTS ON THE NODULATION AND NITROGEN FIXATION BY SOYBEAN KEYWORD
100	76	5140	NITROGEN-FIXATION EFFECT OF VARIOUS SOURCES OF NITROGEN AND ADDED ORGANIC MATTER ON NODULATION AND NITROG
100	78	5095	NITROGEN-ISOTOPES FRACTIONATION OF NITROGEN ISOTOPES BY ANIMALS: A FURTHER COMPLICATION TO THE USE OF VA
100	78	4880	NITROGEN-LOSSES LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF: II. PRESERVATION AND ACCEPTABILITY OF WET EXC
400	78	4975	NITROGEN-LOSS MANURE CONTAINMENT-SLURRY WITH THE CRUST ON TOP KEYWORDS. LIVESTOCK-WASTES SLURRIES WAS
200	78	5105	NITROGEN-MOVEMENT MODELING NITROGEN MOVEMENT IN AGRICULTURAL WATERSHEDS KEYWORDS: MODEL-STUDIES WATERSHED
200	76	4738	NITROGEN-TRANSFORM SOME ASPECTS OF THE PROBLEM OF MODELLING THE UTILISATION OF ANIMAL MANURES BY LAND SPRE
200	76	4744	NITROGEN-TRANSFORM THE NITROGEN BALANCE SHEET KEYWORDS: NITROGEN-TRANSFORMATIONS ORGANIC-WASTES SOIL-CHEMI
200	77	4772	NITROGEN-TRANSFORM CONCEPTUAL MODELLING OF NONPOINT SOURCE POLLUTION FROM LAND AREAS RECEIVING ANIMAL WAST
100	76	5119	NITROGEN-TRANSFORM EFFECT OF THE APPLICATION OF COW SLURRY TO GRASSLAND ON THE COMPOSITION OF THE SOIL ATM
100	77	4815	NITROGEN-UTILIZATI NITROGEN UTILIZATION BY LAMBS FED WHEAT STRAW ALONE OR WITH SUPPLEMENTS CONTAINING DRIE
100	78	4877	NITROGEN-UTILIZATI FERMENTATION AND UTILIZATION OF BROILER LITTER ENSILED AT DIFFERENT MOISTURE LEVELS KEY
200	78	5117	NITROUS-OXIDE DENITRIFICATION: I. USE OF 15N FOR EVALUATION OF THE HYPOTHETICAL EXCRETION OF MOLECULA
100	76	5029	NODULATION EFFECT OF ORGANIC AMENDMENTS ON THE NODULATION AND NITROGEN FIXATION BY SOYBEAN KEYWORD
100	76	5140	NODULATION EFFECT OF VARIOUS SOURCES OF NITROGEN AND ADDED ORGANIC MATTER ON NODULATION AND NITROG
300	77	4927	NONPOINT-POLLUTION AGRICULTURE RUNOFF MANAGEMENT ARM MODEL - VERSION II REFINEMENT AND TESTING KEYWORDS
300	77	4683	NONPOINT-SOURCES PRELIMINARY IDENTIFICATION OF LITERATURE MODELS AND DATA FOR EVALUATING RURAL NONPOINT
300	74	4700	NONPOINT-SOURCES QUANTIFICATION OF POLLUTANTS IN AGRICULTURAL RUNOFF KEYWORDS: AGRICULTURAL-RUNOFF EROSI
200	77	4772	NONPOINT-SOURCES CONCEPTUAL MODELLING OF NONPOINT SOURCE POLLUTION FROM LAND AREAS RECEIVING ANIMAL WAST
200	77	4786	NONPOINT-SOURCES NONPOINT POLLUTION CONTROL FOR WINTERING RANGE CATTLE KEYWORDS: CATTLE WATER-POLLUTION
300	78	4951	NONPOINT-SOURCES ENVIRONMENTAL IMPACT RESULTING FROM UNCONFINED ANIMAL PRODUCTION KEYWORDS: ENVIRONMENTA
400	77	5058	NONPOINT-SOURCES CONTROL OF NONPOINT WATER POLLUTION FROM AGRICULTURE: SOME CONCEPTS KEYWORDS NONPOINT
200	78	5107	NONPOINT-SOURCES BMP DEVELOPMENT FOR MANURE IN NEW YORK STATE KEYWORDS: NONPOINT-SOURCES LEGAL-ASPECTS M
200	78	5114	NONPOINT-SOURCES OPTIMIZATION OF RUNOFF DETENTION FOR NONPOINT POLLUTION CONTROL KEYWORDS: NONPOINT-SOUR
200	78	5155	NONPOINT-SOURCES MISSOURI S SHOW-ME APPROACH TO 208 INVOLVEMENT KEYWORDS: LEGAL-ASPECTS WATER-POLLUTION
100	78	5178	NONPOINT-SOURCES NONPOINT SOURCES: STATE-OF-THE-ART OVERVIEW KEYWORDS NONPOINT-SOURCES WATER-POLLUTION
300	73	4826	NON-POINT-SOURCES METHODS FOR IDENTIFYING AND EVALUATING THE NATURE AND EXTENT OF NON-POINT SOURCES OF PO
300	77	4937	NON-POINT-SOURCES ANIMAL WASTE MANAGEMENT AND OUR WATER QUALITY KEYWORDS: WATER-POLLUTION GROUNDWATER-POL
200	75	5083	NON-POINT-SOURCES NON-POINT SOURCES OF WATER POLLUTION KEYWORDS: WATER-POLLUTION NON-POINT-SOURCES AGRICU
600	75	5150	NON-POINT-SOURCES FEEDLOT RUNOFF CONTROL FROM POINT NON-POINT SOURCES KEYWORDS: LEGAL-ASPECTS NPDES AGRIC
100	76	5013	NPDES ANIMAL FEEDING FACTORIES AND THE ENVIRONMENT-A SUMMARY OF FEEDLOT POLLUTION, FEDERAL CO
600	75	5150	NPDES FEEDLOT RUNOFF CONTROL FROM POINT NON-POINT SOURCES KEYWORDS: LEGAL-ASPECTS NPDES AGRIC
400	78	4685	NUISANCE-LAWSUITS THE POLITICS OF ODOR KEYWORDS ODOR LEGAL-ASPECTS NUISANCE-LAWSUITS
300	74	4702	NUISANCE-LAWSUITS ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS. ALLEN BECKER, D B A BECKER'S CHICKEN-
300	76	4825	NUISANCE-LAWSUITS RECENT TRENDS IN ODOR NUISANCE LAWSUITS KEYWORDS: ODOR NUISANCE-LAWSUITS LEGAL-ASPECTS
100	76	5013	NUISANCE-LAWSUITS ANIMAL FEEDING FACTORIES AND THE ENVIRONMENT-A SUMMARY OF FEEDLOT POLLUTION, FEDERAL CO
300	78	5229	NUISANCE-LAWSUITS ANALYSIS OF STATE LAWS AND REGULATIONS IMPACTING ANIMAL WASTE MANAGEMENT KEYWORDS: LEGA
300	73	4820	NUISANCE-LAWSUIT ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS PROCESSING AND BOOKS, INC AN ILLINOI
300	72	4821	NUISANCE-LAWSUIT ENVIRONMENTAL PROTECTION AGENCY VS ROBERT R. DETERS-FABIAN J DETERS-MARCELLUS J DETERS
300	74	4822	NUISANCE-LAWSUIT ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS LESTER KIPLING, D B A KIPLING CHICKEN
400	78	5162	NUISANCE-LAWSUIT ODOR COMPLAINTS MUST BE VALID KEYWORDS: ODOR NUISANCE-LAWSUIT
300	77	5149	NUISANCE-LAW COMMON SCENTS- AN ANALYSIS OF THE LAW OF FEED LOT ODOR CONTROL KEYWORDS: ODOR-CONTROL
300	74	4700	NUTRIENTS QUANTIFICATION OF POLLUTANTS IN AGRICULTURAL RUNOFF KEYWORDS: AGRICULTURAL-RUNOFF EROSI
400	77	4790	NUTRIENTS THE VALUE OF DRIED POULTRY WASTE AS A FEEDSTUFF IN BROILER DIETS KEYWORDS: REFEEDING P
500	77	4901	NUTRIENTS PROPERTIES OF AGRICULTURAL AND MUNICIPAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WASTE
500	77	4903	NUTRIENTS RECYCLING ELEMENTS IN WASTES THROUGH SOIL-PLANT SYSTEMS KEYWORDS: LAND-APPLICATION MUNI
300	77	4915	NUTRIENTS CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE KEYWORDS: LIQUID-WASTES DAIRY-WA
300	77	4927	NUTRIENTS AGRICULTURE RUNOFF MANAGEMENT ARM MODEL - VERSION II REFINEMENT AND TESTING KEYWORDS:
400	74	4990	NUTRIENTS ENGINEERS OUTLINE WASTE DESIGN FACTORS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT DESIGN S
300	73	5024	NUTRIENTS INTENSIVE FARMING AND POLLUTION KEYWORDS: ANIMAL-WASTES LAND-APPLICATION FERTILIZERS NU
300	78	5037	NUTRIENTS METHODS OF FECAL COLLECTION AND NUTRIENT LEACHING IN DIGESTIBILITY STUDIES KEYWORDS: FI
300	78	5231	NUTRIENTS WATER QUALITY RENOVATION OF ANIMAL WASTE LAGOONS UTILIZING AQUATIC PLANTS KEYWORDS: LA
100	77	4864	NUTRIENT-LOSSES FEEDLOT RUNOFF HOLDING PONDS--NUTRIENT LEVELS AND RELATED MANAGEMENT ASPECTS KEYWORDS:
200	78	5122	NUTRIENT-LOSSES NITROGEN AND PHOSPHORUS MOVEMENT FROM SURFACE APPLIED MANURE KEYWORDS: MODEL-STUDIES LE
100	77	4881	NUTRIENT-MOVEMENT WINTER-APPLIED MANURE--EFFECTS ON ANNUAL RUNOFF, EROSION, AND NUTRIENT MOVEMENT KEYWORD
400	78	4685	ODOR THE POLITICS OF ODOR KEYWORDS: ODOR LEGAL-ASPECTS NUISANCE-LAWSUITS
400	78	4693	ODOR LAGOONS-WHAT SIZE NEEDED FOR YOUR HERD KEYWORDS: DAIRY-WASTES LAGOONS ANAEROBIC DESIGN
300	75	4701	ODOR ENVIRONMENTAL PROTECTION REQUIREMENTS FOR SWINE OPERATIONS KEYWORDS: SWINE FEEDLOTS AI
300	74	4702	ODOR ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS. ALLEN BECKER, D B A BECKER S CHICKEN-
200	76	4731	ODOR THE EFFECTS OF SEPARATING SLURRY ON ITS STORAGE, HANDLING AND SPREADING ON LAND KEYWORD
200	76	4736	ODOR WASTE MANAGEMENTS SYSTEMS IN ANIMAL HUSBANDRY-APPLICATION OF FARM MODEL STUDIES AND SYS
200	77	4775	ODOR SIMPLIFIED DESIGN OF RIGID PLASTIC DUCTS FOR UNIFORM AIR REMOVAL FROM LIQUID MANURE PIT
200	73	4782	ODOR MECHANICAL AERATION OF A WASTE DISPOSAL PIT KEYWORDS MANURE-PITS WASTE-STORAGE AERATIO
200	73	4783	ODOR SWINE HOUSING AND WASTE DISPOSAL RESEARCH AND DEVELOPMENTS KEYWORDS: SWINE-WASTES WAST
200	76	4792	ODOR HOW AIR POLLUTION REGULATIONS AFFECT AGRICULTURAL OPERATIONS KEYWORDS: AIR-POLLUTION LE
700	76	4805	ODOR DESIGN AND DEVELOPMENT OF A SEPARATOR FOR BOVINE MANURE KEYWORDS SEPARATION-TECHNIQUES
200	77	4806	ODOR A POLLUTANT AND NUTRIENT BUDGET FOR A SURFACE-AERATED DAIRY STORAGE LAGOON KEYWORDS: DA
300	76	4814	ODOR ODOR REGULATION BY NUISANCE LAWS KEYWORDS: LEGAL-ASPECTS ODOR FEEDLOTS ZONING SITE-SELE
300	73	4820	ODOR ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS PROCESSING AND BOOKS, INC AN ILLINOI
300	72	4821	ODOR ENVIRONMENTAL PROTECTION AGENCY VS ROBERT R DETERS-FABIAN J DETERS-MARCELLUS J DETERS
300	74	4822	ODOR ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS LESTER KIPLING, D B A KIPLING CHICKEN
300	76	4825	ODOR RECENT TRENDS IN ODOR NUISANCE LAWSUITS KEYWORDS: ODOR NUISANCE-LAWSUITS LEGAL-ASPECTS

100	77	4853	ODOR THE EFFECT OF ANAEROBIC DIGESTION UPON SWINE MANURE ODORS KEYWORDS: SWINE-WASTES ODOR A
100	76	4891	ODOR AN INTEGRATED SEPARATION, AEROBIC TREATMENT AND SLUDGE DE-WATERING SYSTEM FOR PIG SLURR
100	77	4893	ODOR THE EFFECT OF MIXING ON AN ANAEROBIC LAGOON KEYWORDS: SWINE-WASTES WASTE-TREATMENT LAGO
500	77	4901	ODOR PROPERTIES OF AGRICULTURAL AND MUNICIPAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WASTE
500	77	4907	ODOR FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS: MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP
300	77	4915	ODOR CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE KEYWORDS: LIQUID-WASTES DAIRY-WA
400	77	4936	ODOR GRAVITY-DRAIN SYSTEM KEYWORDS: LIQUID-WASTES SWINE-WASTES ODOR *AIR-POLLUTION GRAVITY-DR*
300	76	4964	ODOR DETECTING AND MEASURING MALODORS FROM ANIMAL WASTES KEYWORDS: ANIMAL-WASTES ODOR MEASUR
200	77	4966	ODOR EFFECT OF SURFACE AERATION ON GASES EVOLVED BY A SWINE-WASTE ANAEROBIC LAGOON KEYWORDS:
400	78	4974	ODOR EUROPEAN COMPOSTING METHODS-TREATMENT AND USE OF FARM YARD MANURE AND SLURRY KEYWORDS:
300	78	4976	ODOR THE POTENTIAL OF BROILER LITTER AS FUEL KEYWORDS: POULTRY-WASTES FUEL INCINERATION HEAT
400	78	4977	ODOR QUESTIONS AND ANSWERS ABOUT MANURE FLUSHING SYSTEMS FOR SWINE BUILDINGS KEYWORDS: SWINE
100	57	4980	ODOR PROCEDURE FOR MEASURING ODOR CONCENTRATION IN AIR AND GASES KEYWORDS: ODOR MEASUREMENT
300	77	4982	ODOR PURPLE SULFUR BACTERIA IN LAGOONS IN THE MIDWEST KEYWORDS: SWINE-WASTES LAGOONS ODOR BA
400	74	4990	ODOR ENGINEERS OUTLINE WASTE DESIGN FACTORS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT DESIGN S
100	76	5013	ODOR ANIMAL FEEDING FACTORIES AND THE ENVIRONMENT-A SUMMARY OF FEEDLOT POLLUTION, FEDERAL CO
100	77	5033	ODOR MECHANICAL ROTAVATION OF POULTRY MANURE AS A METHOD OF FLY CONTROL KEYWORDS: FLY-CONTR
200	78	5110	ODOR WASTE HANDLING ALTERNATIVES FOR FARROWING UNITS KEYWORDS: SWINE-WASTES WASTE-STORAGE LI
400	78	5162	ODOR ODOR COMPLAINTS MUST BE VALID KEYWORDS: ODOR NUISANCE-LAWSUIT
400	78	5164	ODOR OPEN LAGOONS MAY DISAPPEAR KEYWORDS: ODOR LEGAL-ASPECTS LAGOONS DESIGN
100	73	5167	ODOR PRINCIPLES OF TREATMENT OF ANIMAL SLURRIES KEYWORDS: SLURRIES WASTE-TREATMENT AEROBIC A
100	78	5186	ODOR MODEL STUDY OF FIVE TYPES OF MANURE PIT VENTILATION SYSTEMS KEYWORDS: VENTILATION SWINE
400	78	5223	ODOR MANAGING MANURE ECONOMICS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT ECONOMICS SLATTED-FLO
500	76	5225	ODOR THE UPGRADING OF AGRICULTURAL WASTES BY THERMOPHILIC FUNGI KEYWORDS: WASTE-TREATMENT T
400	78	5228	ODOR AUSTRALIANS UTILIZE FARM WASTE TO PRODUCE EDIBLE PROTEIN PRODUCTS KEYWORDS: SWINE-WASTE
100	77	5240	ODOR SAMPLING, CHARACTERISATION AND ANALYSIS OF MALODOURS KEYWORDS: ODOR SWINE-WASTES POULTR
100	77	5242	ODOR A METHOD FOR SAMPLING AIR IN ANIMAL HOUSES TO ANALYSE TRACE GASES INCLUDING ODORANTS WI
100	77	5243	ODOR CHARACTERIZATION OF MALODOURS DURING ANAEROBIC STORAGE OF PIG WASTES KEYWORDS: WASTE-ST
100	77	5244	ODOR SAMPLING AND ANALYSIS OF AIR IN PIG HOUSES KEYWORDS: ODOR SWINE-WASTES SPECTROPHOTOMETR
100	77	5245	ODOR ODOURS ARISING FROM THE LAND-SPREADING OF PIG SLURRY KEYWORDS: LAND-APPLICATION SWINE-W
100	77	5256	ODOR FRENCH REGULATIONS CONCERNING ODORS KEYWORDS: ODOR LEGAL-ASPECTS
100	77	5259	ODOR DISPERSION OF ODORS IN THE NEIGHBOURHOOD OF PIG HOUSES KEYWORDS: ODOR SWINE CONFINEMENT
500	77	5265	ODOR ANIMAL WASTES KEYWORDS: FEEDLOTS DESIGN EFFLUENTS GASES ODOR ANIMAL-WASTES WASTE-STORAG
500	77	5274	ODOR MANAGEMENT OF HYGIENIC PROBLEMS IN LARGE ANIMAL FEEDLOTS KEYWORDS: EPIDEMIOLOGY ANIMAL-
400	78	4677	ODOR-CONTROL SWINE ODOR NOT LOWERED MUCH BY CONTROL PRODUCTS KEYWORDS: SWINE-WASTES LIQUID-WASTES OD
400	78	4684	ODOR-CONTROL PUTTING THE LID ON ODOR KEYWORDS: ODOR-CONTROL SWINE-WASTES CONFINEMENT-PENS HYDROGEN-S
400	78	4686	ODOR-CONTROL REDUCING SUMMERTIME ODORS FROM POULTRY HOUSES KEYWORDS: ODOR-CONTROL POULTRY-WASTES
200	77	4765	ODOR-CONTROL MICROALGAE AS A MEANS OF RECYCLING ANIMAL WASTES KEYWORDS: RECYCLING WASTE-TREATMENT SW
100	77	4766	ODOR-CONTROL THE APPLICATION OF NATURAL ZEOLITES IN ANIMAL SCIENCE AND AQUACULTURE KEYWORDS: ZEOLITE
300	74	4822	ODOR-CONTROL ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS LESTER KIPLING, D B A KIPLING CHICKEN
400	78	4828	ODOR-CONTROL WHICH WASTE SYSTEM IS BEST KEYWORDS: WASTE-MANAGEMENT DESIGN CONFINEMENT-PENS LIQUID-WA
400	78	4836	ODOR-CONTROL DEALING WITH ODORS KEYWORDS: ODOR-CONTROL MASKING-AGENTS ENZYMATIC-PRODUCTS CHEMICAL-TR
400	78	4851	ODOR-CONTROL MANAGE FEEDLOT WASTE TO CONTROL ODORS KEYWORDS: LIVESTOCK-WASTES FEEDLOTS ODOR-CONTROL
300	76	4873	ODOR-CONTROL LIVESTOCK WASTE ODOR CONTROL KEYWORDS: LIVESTOCK-WASTES ODOR-CONTROL LOCATION ODOR-MEAS
400	77	4875	ODOR-CONTROL FEEDLOT ODORS KEYWORDS: ODOR-INTENSITY ODOR-MEASUREMENT ODOR-CONTROL WASTE-MANAGEMENT C
400	77	4887	ODOR-CONTROL COMPOSTING AS A MANURE MANAGEMENT SYSTEM KEYWORDS: FARM-WASTES COMPOSTING ODOR-CONTROL ,
300	77	4924	ODOR-CONTROL POULTRY WASTE MANAGEMENT ALTERNATIVES-A DESIGN AND APPLICATION MANUAL KEYWORDS: POULTRY
200	77	4959	ODOR-CONTROL A GRAPHICAL ANALYSIS OF LIVESTOCK PRODUCTION AND WASTE-MANAGEMENT SYSTEMS KEYWORDS: SYS
400	77	4985	ODOR-CONTROL INJECTING LIQUID MANURE REDUCES NITROGEN LOSS KEYWORDS: LIQUID-WASTES LAND-APPLICATION
200	76	5000	ODOR-CONTROL IN-HOUSE MANURE DRYING IN THE DEEP-PIT HIGH-RISE SYSTEM KEYWORDS: DEHYDRATION DEEP-PI
300	75	5002	ODOR-CONTROL SELECTING A SWINE WASTE MANAGEMENT SYSTEM KEYWORDS: SWINE-WASTES MANAGEMENT FLOORS DESI
300	78	5025	ODOR-CONTROL CONTROL OF ANIMAL PRODUCTION ODORS--THE STATE-OF-THE-ART KEYWORDS: AIR-POLLUTION ODOR-C
100	78	5046	ODOR-CONTROL ORGANOLEPTIC EVALUATION OF POULTRY EXCRETA FROM HENS CONSUMING FEED TREATED WITH AN ODO
100	77	5062	ODOR-CONTROL FERMENTATION OF SWINE WASTE-CORN MIXTURES FOR ANIMAL FEED: PILOT-PLANT STUDIES KEYWORD
400	78	5067	ODOR-CONTROL CATTLEMEN INFLUENCE ODOR CONTROL RULES KEYWORDS: AIR-POLLUTION SULFATES ODOR-CONTROL LE
300	78	5131	ODOR-CONTROL A MANUAL ON: EVALUATION AND ECONOMIC ANALYSIS OF LIVESTOCK WASTE MANAGEMENT SYSTEMS KE
300	77	5149	ODOR-CONTROL COMMON SCENTS: AN ANALYSIS OF THE LAW OF FEED LOT ODOR CONTROL KEYWORDS: ODOR-CONTROL
200	70	5191	ODOR-CONTROL AIR DRYING POULTRY MANURE KEYWORDS: DEHYDRATION POULTRY-WASTES FLY-CONTROL ODOR-CONTROL
300	78	5194	ODOR-CONTROL MANAGING HORSE MANURE FOR ENVIRONMENTAL PROTECTION KEYWORDS: WATER-POLLUTION AIR-POLLUT
500	77	5197	ODOR-CONTROL PARTICULATE AND ODOR CONTROL IN THE ORGANIC FERTILIZER INDUSTRY: A CASE HISTORY KEYWOR
400	78	5206	ODOR-CONTROL COLOR THESE LAGOONS PURPLE KEYWORDS: ODOR-CONTROL SWINE-WASTES PURPLE-SULFUR-BACTERIA
400	78	5211	ODOR-CONTROL HOLDING POND AND FLUSH GUTTERS KEYWORDS: CATTLE-WASTES FLUSHING WASTE-STORAGE RECYCLING
100	77	5241	ODOR-CONTROL CHARACTERIZATION OF ODORS AND OTHER VOLATILE EMISSIONS KEYWORDS: ODOR-CONTROL VOLATILE-
100	77	5246	ODOR-CONTROL ODOUR CONTROL OF LIQUID SWINE MANURE BY AERATION KEYWORDS: WASTE-STORAGE SWINE-WASTES A
100	77	5247	ODOR-CONTROL A FRENCH EXPERIMENT IN PIG SLURRY DEODORIZATION KEYWORDS: ODOR-CONTROL SWINE-WASTES SLURR
100	77	5248	ODOR-CONTROL VEAL-CALF MANURE DEODORIZATION BY SURFACE AERATION KEYWORDS: ODOR-CONTROL CATTLE-WASTES
100	77	5249	ODOR-CONTROL TECHNIQUES AND COSTS RELATING TO ODOUR CONTROL KEYWORDS: ODOR-CONTROL SLURRIES CHEMICAL
100	77	5250	ODOR-CONTROL ODOUR CONTROL WITH BIOLOGICAL AIR WASHERS KEYWORDS: ODOR-CONTROL AIR-SCRUBBING DESIGN
100	77	5251	ODOR-CONTROL ODOUR REMOVAL FROM THE EXHAUST AIR OF ANIMAL SHELTERS KEYWORDS: ODOR-CONTROL CONFINEMEN
100	77	5252	ODOR-CONTROL DEODORIZATION BY MEANS OF OZONE KEYWORDS: ODOR-CONTROL OZONE SWINE-WASTES ANIMAL-HEALTH
100	77	5254	ODOR-CONTROL U K PROBLEMS AND LEGISLATION RELATING TO ODOUR CONTROL KEYWORDS: ODOR-CONTROL LEGAL-AS
100	77	5255	ODOR-CONTROL ODOUR PROBLEMS AND ODOUR CONTROL IN INTENSIVE LIVESTOCK HUSBANDRY FARMS IN THE NETHERLA
100	77	5258	ODOR-CONTROL INVESTIGATIONS IN THE U.K. INTO METHODS OF ODOUR CONTROL FOR FARMS KEYWORDS: ODOR-CONTR
100	77	5260	ODOR-CONTROL THE DUTCH RESEARCH PROGRAM ON ODOR CONTROL KEYWORDS: ODOR-CONTROL MODEL-STUDIES
500	77	5276	ODOR-CONTROL NOXIOUS GASES AND ODOURS KEYWORDS: ODOR-CONTROL ANIMAL-HEALTH PUBLIC-HEALTH TOXICITY HY
500	77	5286	ODOR-CONTROL NUTRIENT CONTROL APPLICABLE TO ANIMAL WASTES KEYWORDS: BIOLOGICAL-TREATMENT LAND-APPLIC
500	77	5299	ODOR-CONTROL ANIMAL WASTE MANAGEMENT IN THE NETHERLANDS KEYWORDS: LEGAL-ASPECTS FEEDLOTS ODOR-CONTRO
100	77	5303	ODOR-CONTROL ANAEROBIC DIGESTION OF PIGGERY WASTE: 1. THE INFLUENCE OF DETENTION TIME AND MANURE CON
100	78	5307	ODOR-CONTROL CHEMICAL TREATMENT FOR ODOR ABATEMENT MEASURED ORGANOLEPTICALLY IN LIQUID DAIRY MANURE
400	77	4875	ODOR-INTENSITY FEEDLOT ODORS KEYWORDS: ODOR-INTENSITY ODOR-MEASUREMENT ODOR-CONTROL WASTE-MANAGEMENT C
300	76	4873	ODOR-MEASUREMENT LIVESTOCK WASTE ODOR CONTROL KEYWORDS: LIVESTOCK-WASTES ODOR-CONTROL LOCATION ODOR-MEAS
400	77	4875	ODOR-MEASUREMENT FEEDLOT ODORS KEYWORDS: ODOR-INTENSITY ODOR-MEASUREMENT ODOR-CONTROL WASTE-MANAGEMENT C
100	77	4987	ODOR-MEASUREMENT QUANTITATION OF INDOLE AND SKATOLE IN A HOUSED SWINE UNIT KEYWORDS: SWINE-WASTES CONFIN
100	78	5015	ODOR-MEASUREMENT A REVIEW OF ANALYTICAL METHODS FOR DETECTING AND MEASURING MALODORS FROM ANIMAL WASTES
300	78	5025	ODOR-MEASUREMENT CONTROL OF ANIMAL PRODUCTION ODORS--THE STATE-OF-THE-ART KEYWORDS: AIR-POLLUTION ODOR-C
100	77	5239	ODOR-MEASUREMENT MEASUREMENT OF ODOUR INTENSITY IN FARMING SITUATIONS KEYWORDS: ODOR-MEASUREMENT CHEMICA
100	78	5307	ODOR-MEASUREMENT CHEMICAL TREATMENT FOR ODOR ABATEMENT MEASURED ORGANOLEPTICALLY IN LIQUID DAIRY MANURE
400	78	4669	OIL CROP, LIVESTOCK RESIDUES- A FUTURE SOURCE OF FUEL KEYWORDS: AGRICULTURAL-WASTES FOREST
100	76	5013	OKLAHOMA-LAW ANIMAL FEEDING FACTORIES AND THE ENVIRONMENT-A SUMMARY OF FEEDLOT POLLUTION, FEDERAL CO
100	76	4995	ONTHOPHAGUS-GAZELL EFFECTS OF RESIDUES OF CERTAIN ANTHELMINTICS IN BOVINE MANURE ON ONTHOPHAGUS GAZELLA, A
200	76	5005	OPERATION EXPERIENCES IN BUILDING AND OPERATING A FIELD SCALE ANAEROBIC DIGESTER KEYWORDS: ANAERO
100	78	5173	ORGANIC-CARBON CROP RESPONSE AND QUALITY OF SOIL LEACHATE AS AFFECTED BY LAND APPLICATION OF BEEF CATT
400	78	4998	ORGANIC-FARMING NOBODY LAUGHED ABOUT ORGANIC FARMING AFTER SEEING THE HAUGHLEY EXPERIMENT KEYWORDS: O
100	77	4862	ORGANIC-MATTER LAND DISPOSAL OF BROILER LITTER--CHANGES IN CONCENTRATION OF CHLORIDE, NITRATE NITROGEN
200	76	4744	ORGANIC-WASTES THE NITROGEN BALANCE SHEET KEYWORDS: NITROGEN-TRANSFORMATIONS ORGANIC-WASTES SOIL-CHEMI
400	77	4789	ORGANIC-WASTES RED WIGGLERS-TURN WORMS TO PROTEIN SUPPLEMENT-RESEARCHERS KEYWORDS FEEDS RECYCLING WOR
100	70	4874	ORGANIC-WASTES CHANGES IN BIOCHEMICAL CONSTITUENT OF SOME ORGANIC WASTE MATERIALS UNDER ANAEROBIC METH
100	78	4876	ORGANIC-WASTES EFFECTS OF LIQUID FRACTION PRESSED FROM DAIRY CATTLE EXCRETA LE IN LAMB DIETS KEYWORD
500	77	4900	ORGANIC-WASTES SOILS FOR MANAGEMENT OF ORGANIC WASTES AND WASTE WATERS KEYWORDS: ORGANIC-WASTES SOILS
100	76	4928	ORGANIC-WASTES ORGANIC AND INORGANIC NUTRIENT ENRICHMENT AND THE LIVING CONDITIONS OF CARP FRY IN FIRS

300	78 4952	ORGANIC-WASTES	CONVERSION OF CATTLE FEEDLOT MANURE TO ETHYLENE AND AMMONIA SYNTHESIS GAS KEYWORDS: FEE
400	77 4984	ORGANIC-WASTES	SPECIALIZED EQUIPMENT FOR COMPOSTING MANURE KEYWORDS: EQUIPMENT-COMPOSTING COMPOSTING O
400	77 5004	ORGANIC-WASTES	A MARTINI IN YOUR TANK KEYWORDS: RECYCLING ORGANIC-WASTES LIVESTOCK-WASTES ETHYL-ALCOHO
100	76 5029	ORGANIC-WASTES	EFFECT OF ORGANIC AMENDMENTS ON THE NODULATION AND NITROGEN FIXATION BY SOYBEAN KEYWORD
400	78 5187	ORGANIC-WASTES	USES OF ORGANIC RESIDUES AT NEBRASKA EXPERIMENT STATIONS KEYWORDS: ORGANIC-WASTES LAND-
200	76 5199	ORGANIC-WASTES	FERMENTATION FOR METHANE PRODUCTION KEYWORDS: FERMENTATION METHANE GAS-PRODUCTION ANAER
300	77 5226	ORGANIC-WASTES	METHANE GENERATION FROM HUMAN, ANIMAL, AND AGRICULTURAL WASTES KEYWORDS: RECYCLING METH
100	75 5235	ORGANIC-WASTES	RELATIVE AVAILABILITY OF PHOSPHORUS FROM SOME ORGANIC MANURES AND PHOSPHATIC FERTILIZER
100	74 5262	ORGANIC-WASTES	PHOSPHORUS IN ORGANIC MANURES: I. FRACTIONATION OF DIFFERENT FORMS OF PHOSPHORUS KEYWORD
100	78 5015	ORGANOLEPTIC-PROPE	A REVIEW OF ANALYTICAL METHODS FOR DETECTING AND MEASURING MALODORS FROM ANIMAL WASTES
200	77 4961	OVERLAND-FLOW	VEGETATIVE FILTER TREATMENT OF FEEDLOT RUNOFF KEYWORDS: VEGETATIVE-FILTER-SYSTEMS FEEDL
400	76 4999	OVERLAND-FLOW	VEGETATIVE FILTER SYSTEM CLEANS FEEDLOT RUNOFF KEYWORDS: FEEDLOT-RUNOFF WASTE-TREATMENT
300	77 4751	OXIDATION	DISPOSAL OF FEEDLOT WASTES USING A TWO-STAGE PROCESS WITH NET ENERGY PRODUCTION KEYWORD
700	75 4812	OXIDATION	UTILIZATION AND DISPOSAL OF RESIDUE FROM THE PARTIAL OXIDATION OF CATTLE MANURE KEYWORD
700	74 4908	OXIDATION	CYCLONIC BURNER FOR PARTIAL COMBUSTION OF MANURE TO AMMONIA SYNTHESIS GAS KEYWORDS: OXI
300	78 4952	OXIDATION	CONVERSION OF CATTLE FEEDLOT MANURE TO ETHYLENE AND AMMONIA SYNTHESIS GAS KEYWORDS: FEE
200	73 4783	OXIDATION-DITCH	SWINE HOUSING AND WASTE DISPOSAL RESEARCH AND DEVELOPMENTS KEYWORDS: SWINE-WASTES WAST
200	77 4810	OXIDATION-DITCH	NITRATE PRODUCTION AND CONTROL IN AN OXIDATION DITCH KEYWORDS: SWINE-WASTES OXIDATION-D
700	74 4885	OXIDATION-DITCH	A NUTRITIONAL EVALUATION OF RECYCLED SWINE WASTE KEYWORDS: REFEEDING SWINE-WASTES SWINE
300	77 4924	OXIDATION-DITCH	POULTRY WASTE MANAGEMENT ALTERNATIVES-A DESIGN AND APPLICATION MANUAL KEYWORDS: POULTRY
400	74 4990	OXIDATION-DITCH	ENGINEERS OUTLINE WASTE DESIGN FACTORS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT DESIGN S
400	72 4992	OXIDATION-DITCH	IOWA BEEF TESTS SHOW PROFIT FOR FEEDING DITCH EFFLUENT KEYWORDS: OXIDATION-DITCH EFFLUE
100	77 5008	OXIDATION-DITCH	RECYCLING OXIDATION DITCH MIXED LIQUOR TO LAYING HENS KEYWORDS: REFEEDING OXIDATION-DIT
400	78 5223	OXIDATION-DITCH	MANAGING MANURE ECONOMICS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT ECONOMICS SLATTED-FLO
500	77 5286	OXIDATION-DITCH	NUTRIENT CONTROL APPLICABLE TO ANIMAL WASTES KEYWORDS: BIOLOGICAL-TREATMENT LAND-APPLIC
500	77 5288	OXIDATION-DITCH	UTILIZATION OF LIVESTOCK WASTES AS FEED AND OTHER DIETARY PRODUCTS KEYWORDS: REFEEDING
100	65 5133	OXIDATION-PONDS	BETTER DISPOSAL OF FARM WASTES KEYWORDS: FARM-WASTES LAND-APPLICATION IRRIGATION EQUIPM
500	77 5294	OXIDATION-PONDS	SWINE FEEDLOT WASTEWATER TREATMENT IN ROMANIA KEYWORDS: SWINE-WASTES FEEDLOTS WASTEWATE
200	76 5005	OXIDATION-REDUCTIO	EXPERIENCES IN BUILDING AND OPERATING A FIELD SCALE ANAEROBIC DIGESTER KEYWORDS: ANAERO
200	76 4706	OXIDATION-TANKS	AGRICULTURAL USE OF EFFLUENT FROM LIVESTOCKS-PROBLEMS AND PERSPECTIVES IN ITALY KEYWORD
100	76 4928	OXYGEN-CONTENT	ORGANIC AND INORGANIC NUTRIENT ENRICHMENT AND THE LIVING CONDITIONS OF CARP FRY IN FIRS
200	76 4733	OXYGEN-PARTIAL-PRE	MATHEMATICAL MODELLING OF AMMONIUM OXIDATION IN EFFLUENTS KEYWORDS: MATHEMATICAL-MODELS
500	77 5123	OXYGEN-TRANSFER	POLLUTION CONTROL FOR AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES ANIMAL-WASTES WASTE-TRE
500	77 5275	OZONATION	HEALTH EFFECTS FROM WASTE UTILIZATION KEYWORDS: PUBLIC-HEALTH ANIMAL-HEALTH REFEEDING L
100	77 5252	OZONE	DEODORIZATION BY MEANS OF OZONE KEYWORDS: ODOR-CONTROL OZONE SWINE-WASTES ANIMAL-HEALTH
400	72 4992	PAB	IOWA BEEF TESTS SHOW PROFIT FOR FEEDING DITCH EFFLUENT KEYWORDS: OXIDATION-DITCH EFFLUE
200	77 4959	PALATABILITY	A GRAPHICAL ANALYSIS OF LIVESTOCK PRODUCTION AND WASTE-MANAGEMENT SYSTEMS KEYWORDS: SYS
100	78 5307	PARAFORMALDEHYDE	CHEMICAL TREATMENT FOR ODOR ABATEMENT MEASURED ORGANOLEPTICALLY IN LIQUID DAIRY MANURE
200	76 4728	PARASITES	AN APPROACH TO THE PROBLEM OF SLURRY AS A POSSIBLE SOURCE OF PASTURE CONTAMINATION WITH
100	76 4995	PARASITES	EFFECTS OF RESIDUES OF CERTAIN ANTHELMINTICS IN BOVINE MANURE ON ONTHOPHAGUS GAZELLA, A
300	78 5176	PARASITES	SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
100	77 5180	PARASITES	PARASITES OF HAEMATOBIA IRRITANS AND OTHER FLIES BREEDING IN BOVINE FECES IN NORTHEAST
400	78 5134	PARASITISM	BROILER LITTER FOR FERTILIZER KEYWORDS: LAND-APPLICATION POULTRY-LITTER PASTURES ANIMAL
300	77 5035	PARTICULATES	SOURCE ASSESSMENT--BEEF CATTLE FEEDLOTS KEYWORDS: CATTLE DUSTS GASES AMMONIA THIOLS AIR
300	78 5188	PASTURELAND	ESTIMATING U.S. LIVESTOCK AND POULTRY MANURE AND NUTRIENT PRODUCTION KEYWORDS: LIVESTOC
100	72 4673	PASTURES	THE CATTLE DUNG PATCH: 2. EFFECT OF A DUNG PATCH ON THE CHEMICAL STATUS OF THE SOIL, AN
100	70 4676	PASTURES	FOULING OF PASTURES BY DUNG KEYWORDS: CATTLE-WASTES PASTURES WASTE-COMPOSITION DEGRADAT
100	73 4689	PASTURES	A TECHNIQUE FOR THE STUDY OF FOULING BY GRAZING CATTLE KEYWORDS: CATTLE DEFOLIATION TRE
100	77 4691	PASTURES	INJECTION OF DAIRY WASTE KEYWORDS: DAIRY-WASTES LAND-APPLICATION SOIL-INJECTION PASTURE
100	72 4696	PASTURES	DISEASE HAZARD OF PATHOGENIC ORGANISMS IN FARM WASTE MATERIAL KEYWORDS: SLURRIES PATHOG
100	69 4697	PASTURES	DAIRY WASTE DISPOSAL KEYWORDS: WASTE-DISPOSAL LAND-APPLICATION ECONOMICS SPRAY-IRRIGATI
200	76 4728	PASTURES	AN APPROACH TO THE PROBLEM OF SLURRY AS A POSSIBLE SOURCE OF PASTURE CONTAMINATION WITH
200	77 4786	PASTURES	NONPOINT POLLUTION CONTROL FOR WINTERING RANGE CATTLE KEYWORDS: CATTLE WATER-POLLUTION
300	77 4926	PASTURES	ENVIRONMENTAL IMPLICATIONS OF TRENDS IN AGRICULTURE AND SILVICULTURE VOLUME I, TREND IDE
300	77 4937	PASTURES	ANIMAL WASTE MANAGEMENT AND OUR WATER QUALITY KEYWORDS: WATER-POLLUTION GROUNDWATER-POL
100	76 5021	PASTURES	TRICHOSTRONGYLE INFESTATIONS IN AUTUMN ON PASTURES GRAZED EXCLUSIVELY BY COWS OR BY CAL
400	78 5134	PASTURES	BROILER LITTER FOR FERTILIZER KEYWORDS: LAND-APPLICATION POULTRY-LITTER PASTURES ANIMAL
100	78 5170	PASTURES	AVAILABILITY TO GRAZING SHEEP OF GASTROINTESTINAL NEMATODE INFECTION ARISING FROM SUMM
300	78 5176	PASTURES	SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
100	78 5178	PASTURES	NONPOINT SOURCES: STATE-OF-THE-ART OVERVIEW KEYWORDS: NONPOINT-SOURCES WATER-POLLUTION
100	77 5179	PASTURES	SLUDGE DISPOSAL STRATEGY: PROCESSES AND COSTS KEYWORDS: SEWAGE SLUDGE LAND-APPLICATION
100	76 5210	PASTURES	A REVIEW OF THE FOOD HABITS OF THE INSECT FAUNA INHABITING CATTLE DROPPINGS IN NORTH C
200	77 4794	PASTURE	ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS KEYWORDS: CATTLE MANAGEMENT PAST
400	78 4939	PASTURE	BROILER FERTILIZED FESCUE A MIXED BLESSING KEYWORDS: POULTRY-WASTES LAND-APPLICATION PA
300	78 4951	PASTURE	ENVIRONMENTAL IMPACT RESULTING FROM UNCONFINED ANIMAL PRODUCTION KEYWORDS: ENVIRONMENTA
300	77 4683	PATHOGENIC-BACTERI	PRELIMINARY IDENTIFICATION OF LITERATURE MODELS AND DATA FOR EVALUATING RURAL NONPOINT
100	72 4696	PATHOGENIC-BACTERI	DISEASE HAZARD OF PATHOGENIC ORGANISMS IN FARM WASTE MATERIAL KEYWORDS: SLURRIES PATHOG
100	69 4697	PATHOGENIC-BACTERI	DAIRY WASTE DISPOSAL KEYWORDS: WASTE-DISPOSAL LAND-APPLICATION ECONOMICS SPRAY-IRRIGATI
200	76 4729	PATHOGENIC-BACTERI	POSSIBILITIES OF POULTRY DROPPINGS DECONTAMINATION AS RELATED TO FARM LEVEL MANAGEMENT
200	76 4730	PATHOGENIC-BACTERI	A STUDY OF THE EFFECTS OF ANIMAL EFFLUENT UTILISATION FOR GRASSLAND PRODUCTION ON LEVEL
200	76 4731	PATHOGENIC-BACTERI	THE EFFECTS OF SEPARATING SLURRY ON ITS STORAGE, HANDLING AND SPREADING ON LAND KEYWORD
200	76 4743	PATHOGENIC-BACTERI	MICROBIOLOGICAL ANALYSIS OF ANIMAL MANURES WITH PARTICULAR REFERENCE TO THE ISOLATION
200	72 4818	PATHOGENIC-BACTERI	THE FATE OF ENTERIC BACTERIA DURING STORAGE AND DISPOSAL OF ANIMAL EXCRETA KEYWORDS: PA
500	77 4906	PATHOGENIC-BACTERI	PATHOGEN CONSIDERATIONS FOR LAND APPLICATION OF HUMAN AND DOMESTIC ANIMAL WASTES KEYWOR
500	77 4907	PATHOGENIC-BACTERI	FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS: MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP
200	77 4959	PATHOGENIC-BACTERI	A GRAPHICAL ANALYSIS OF LIVESTOCK PRODUCTION AND WASTE-MANAGEMENT SYSTEMS KEYWORDS: SYS
100	78 5054	PATHOGENIC-BACTERI	FATE OF PATHOGENS IN SOILS RECEIVING ANIMAL WASTES--A REVIEW KEYWORDS: ANIMAL-WASTES LA
100	77 5179	PATHOGENIC-BACTERI	SLUDGE DISPOSAL STRATEGY: PROCESSES AND COSTS KEYWORDS: SEWAGE SLUDGE LAND-APPLICATION
400	78 5187	PAUNCH-MANURE	USES OF ORGANIC RESIDUES AT NEBRASKA EXPERIMENT STATIONS KEYWORDS: ORGANIC-WASTES LAND-
300	77 5034	PAUNCH-MANURE-DISP	A METHOD OF MANURE DISPOSAL FOR A BEEF PACKING OPERATION-- FIRST INTERIM TECHNICAL REP
200	76 4717	PEDOLOGY	RELATIONS BETWEEN PEDOLOGICAL ORGANISATION OF THE SOIL AND PIG SLURRY LANDSPREADINGS IN
100	70 4874	PENTOSANS	CHANGES IN BIOCHEMICAL CONSTITUENT OF SOME ORGANIC WASTE MATERIALS UNDER ANAEROBIC METH
400	78 4674	PERFORMANCE	ARIZONA RECYCLING TRIAL ENDS SUCCESSFULLY KEYWORDS: REFEEDING CORRAL-INDUSTRIES CATTLE-
100	70 4676	PERFORMANCE	FOULING OF PASTURES BY DUNG KEYWORDS: CATTLE-WASTES PASTURES WASTE-COMPOSITION DEGRADAT
400	78 4680	PERFORMANCE	FUNGASTATIC FEED ADDITIVES IMPROVE LITTER RESULTS KEYWORDS: FEED-ADDITIVES FUNGICIDES L
200	76 4714	PERFORMANCE	THE INFLUENCE OF ANIMAL MANURES ON THE GRAZING BEHAVIOR AND HERBAGE INTAKE OF CATTLE KE
200	77 4778	PERFORMANCE	ANAEROBIC BEEF SLURRY AS A FERTILIZER FOR BERMUDA GRASS AND BAHIA GRASS KEYWORDS: SLURR
400	77 4790	PERFORMANCE	THE VALUE OF DRIED-POULTRY WASTE AS A FEEDSTUFF IN BROILER DIETS KEYWORDS: REFEEDING P
400	78 4834	PERFORMANCE	BROILER LITTER IMPROVED GAIN DURING WINTER, STUDY SAYS KEYWORDS: POULTRY-LITTER REFEEDI
400	78 4839	PERFORMANCE	MISSISSIPPI APPROVES SALE OF POULTRY WASTE FEED KEYWORDS: POULTRY-WASTES-DRIED REFEEDIN
400	78 4841	PERFORMANCE	ATMOSPHERIC AMMONIA AFFECTS SWINE HEALTH KEYWORDS: AIR-POLLUTION CONFINEMENT-PENS SWINE
100	72 4844	PERFORMANCE	UTILIZATION OF COW-MANURE, HATCHERY-WASTE AND PARTLY DRIED MOLASSES IN POULTRY FEEDS K
400	77 4847	PERFORMANCE	YOU MAY FIND PROFITS IN WASTE FEEDS KEYWORDS: FEEDS FOOD-PROCESSING-WASTES BREWERY-WAST
400	77 4861	PERFORMANCE	THE BEST OF FOUR BARNS KEYWORDS: CONFINEMENT-PENS DESIGN CATTLE PERFORMANCE LAND-APPLIC
300	77 4866	PERFORMANCE	ATMOSPHERIC AMMONIA AFFECTS SWINE HEALTH KEYWORDS: AIR-POLLUTION SWINE HOUSING AMMONIA
100	78 4876	PERFORMANCE	EFFECTS OF LIQUID FRACTION PRESSED FROM DAIRY CATTLE EXCRETA (LE) IN LAMB DIETS KEYWORD
100	78 4878	PERFORMANCE	ANIMAL PERFORMANCE AND MICROBIAL ADAPTATION OF RUMINANTS FED FORMALDEHYDE TREATED POULT
700	74 4885	PERFORMANCE	A NUTRITIONAL EVALUATION OF RECYCLED SWINE WASTE KEYWORDS REFEEDING SWINE-WASTES SWINE
700	77 4888	PERFORMANCE	COMPOSITION AND DIGESTIBILITY OF UNTREATED AND SODIUM HYDROXIDE TREATED FECAL WASTE FRO
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100 78 4890 PERFORMANCE UTILISATION OF DRIED POULTRY MANURE BY GROWING CHICKENS FED ON A PRACTICAL DIET KEYWORD
100 77 4895 PERFORMANCE NUTRITIONAL EVALUATION WITH RATS OF ALGAE CHLORELLA GROWN ON SWINE MANURE KEYWORDS: LI
100 78 4911 PERFORMANCE EFFECTS OF RUMEN CONTENTS OR FRACTIONS THEREOF ON PERFORMANCE OF BROILERS KEYWORDS: RUM
100 78 4912 PERFORMANCE INFLUENCE OF B-GLUCANASE ON FEEDING VALUE OF BARLEY FOR POULTRY AND MOISTURE CONTENT OF
300 77 4913 PERFORMANCE WASTE AS A FEED EXTENDER KEYWORDS: REFEEDING DIGESTIBILITIY CATTLE PERFORMANCE WASTE-REC
200 76 4918 PERFORMANCE FEEDING POULTRY WASTE TO RUMINANTS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE PROT
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100 75 4932 PERFORMANCE UTILISATION OF RATIONS CONTAINING POULTRY MANURE AS A PROTEIN KEYWORDS: SHEEP REFEEDING
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100 75 4963 PERFORMANCE THE USE OF DRIED POULTRY WASTES AS FEEDINGSTUFFS KEYWORDS: POULTRY-WASTES-DRIED REFEEDI
100 76 4968 PERFORMANCE LAYERS IMPROVE WITH DPW KEYWORDS: REFEEDING POULTRY POULTRY-WASTES-DRIED PERFORMANCE EG
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400 72 4992 PERFORMANCE IOWA BEEF TESTS SHOW PROFIT FOR FEEDING DITCH EFFLUENT KEYWORDS: OXIDATION-DITCH EFFLUE
400 78 5001 PERFORMANCE SCRAPING AWAY WASTE KEYWORDS: CATTLE-WASTES FEEDLOTS DESIGN SCRAPING STORAGE-PIT LAND-A
200 76 5005 PERFORMANCE EXPERIENCES IN BUILDING AND OPERATING A FIELD SCALE ANAEROBIC DIGESTER KEYWORDS: ANAERO
100 77 5007 PERFORMANCE RETENTION AND EXCRETION OF POLYCHLORINATED BIPHENYL RESIDUES BY LAYING HENS KEYWORDS: P
100 77 5008 PERFORMANCE RECYCLING OXIDATION DITCH MIXED LIQUOR TO LAYING HENS KEYWORDS: REFEEDING OXIDATION-DIT
100 76 5030 PERFORMANCE GROWTH PERFORMANCE OF BROILERS FED VARIOUS POULTRY WASTES KEYWORDS: REFEEDING POULTRY-W
100 78 5039 PERFORMANCE NUTRITIONAL QUALITY OF PROCESSED POULTRY WASTE FOR BROILERS KEYWORDS: POULTRY-WASTES-DR
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100 78 5042 PERFORMANCE EFFECT OF FEEDING RAW AND COOKED SOYBEANS AND KIDNEY BEANS AND DRIED POULTRY WASTE IN
100 78 5045 PERFORMANCE EFFECT OF ATMOSPHERIC AMMONIA AND STRESS ON BROILER MALES KEYWORDS: AIR-POLLUTION AMMON
300 77 5048 PERFORMANCE MANURE REFEEDING TO BEEF CATTLE KEYWORDS: CATTLE-WASTES REFEEDING CATTLE PERFORMANCE
100 77 5062 PERFORMANCE FERMENTATION OF SWINE WASTE-CORN MIXTURES FOR ANIMAL FEED: PILOT-PLANT STUDIES KEYWORD
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200 78 5100 PERFORMANCE RECYCLING SWINE WASTE IN A GROWING-FINISHING RATION KEYWORDS: REFEEDING SWINE-WASTES SW
100 77 5121 PERFORMANCE POULTRY WASTES IN THE DIET OF ISRAELI CARP KEYWORDS: REFEEDING POULTRY-WASTES FISH PERF
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400 78 5168 PERFORMANCE RECYCLED SWINE WASTE FED IN GROWING-FINISHING DIET KEYWORDS: SWINE-WASTES REFEEDING SWI
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400 78 5185 PERFORMANCE POULTRY MANURE AS FEED KEYWORDS: REFEEDING POULTRY-WASTES SWINE PERFORMANCE NITROGEN TO
300 78 5202 PERFORMANCE FERMENTATION AND DIGESTIBILITY OF BROILER LITTER ENSILED AT DIFFERENT MOISTURE LEVELS B
300 78 5203 PERFORMANCE ENSILED CORN FORAGE AND BROILER LITTER FOR FINISHING HEIFERS KEYWORDS: SILAGES ENSILING
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100 78 5233 PERFORMANCE COMBINED EFFECTS OF SCREENED MANURE SOLIDS AND CRUDE FIBER IN RATIONS OF LACTATING COW
100 77 5252 PERFORMANCE DEODORIZATION BY MEANS OF OZONE KEYWORDS: ODOR-CONTROL OZONE SWINE-WASTES ANIMAL-HEALTH
100 77 5261 PERFORMANCE A NOTE ON THE FERMENTATIVE CHANGES OF DIETS PREPARED WEEKLY WITH MANURE SILAGE AND FINA
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100 77 5313 PERFORMANCE CATTLE MANURE AND FINAL MOLASSES SILAGE IN CHICKEN FATTENING; I. HIGH SUBSTITUTION LEVE
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300 75 4701 PERMITS ENVIRONMENTAL PROTECTION REQUIREMENTS FOR SWINE OPERATIONS KEYWORDS: SWINE FEEDLOTS AI
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400 78 5207 PHOSPHORUS YOU CAN PUT LIQUID MANURE ON YOUR ALFALFA KEYWORDS: LIQUID-WASTES DAIRY-WASTES LAND-APP
300 74 5213 PHOSPHORUS SOIL POLLUTION FROM FEEDLOTS IN GEORGIA KEYWORDS: FEEDLOTS CATTLE-WASTES SOIL-CONTAMINA
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200 76 4721 PHOSPHORUS-COMPOUN PHOSPHORUS COMPOUNDS IN PIG SLURRY AND THEIR RETENTION IN THE SOIL KEYWORDS: SWINE-WAST
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200 76 4742 PHYSICAL-PROPERTIE HARMONISATION OF METHODS FOR SAMPLING AND FOR CHEMICAL AND PHYSICAL ANALYSIS KEYWORDS:
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400 78 4823 PHYSICAL-TREATMENT MORE DEAR MOTHER A LETTER FROM JIM LAWRENCE KEYWORDS: HEATING PHYSICAL-TREATMENT BIOLOG
100 77 5016 PHYSICAL-TREATMENT PROTEIN PRODUCTION FROM FEEDLOT WASTE KEYWORDS: FEEDLOTS CATTLE-WASTES REFEEDING SUBSTR
400 77 5050 PHYSICAL-TREATMENT IT'S NO BULL' COLORADO TOWN TO CONVERT COW MANURE TO NATURAL GAS KEYWORDS: CATTLE-WASTES
100 77 5249 PHYSICAL-TREATMENT TECHNIQUES AND COSTS RELATING TO ODOUR CONTROL KEYWORDS: ODOR-CONTROL SLURRIES CHEMICAL
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700 76 4942 PH THE EFFECT OF APPLICATION OF POULTRY MANURE WHICH WAS SUBJECTED TO DIFFERENT WASTE MANA
300 78 5201 PH CHANGES IN CHARACTERISTICS OF DEEP STACKED BROILER LITTER WITH TIME KEYWORDS: POULTRY-L
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400 78 5220 PH BACTERIA CONTENT SOLVES LAGOON PROBLEMS KEYWORDS: LAGOONS ANAEROBIC BACTERIA SALTS HEAV
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400 78 5009 PICKET-DAM EARTHEN WASTE BASIN KEYWORDS: LIVESTOCK-WASTES WASTE-STORAGE HAULING PICKET-DAM DETENTI
100 77 4914 PIPE-FLOW EFFECTS OF RATION ROUGHAGE CONTENT ON VISCOSITY AND THEORETICAL HEAD LOSSES IN PIPE FLO
400 78 4796 PITS LET SWINE WASTES CUT YOUR FERTILIZER BILL KEYWORDS: SWINE-WASTES WASTE-STORAGE PITS LAG
200 78 5128 PLANNING DEVELOPING A LIVESTOCK WASTE MANAGEMENT PLAN KEYWORDS: WASTE-MANAGEMENT LAND-APPLICATIO
200 78 5108 PLANT DUST REDUCTION IN THE BIRD RECEIVING AREA OF A POULTRY PROCESSING PLANT KEYWORDS: AIR-P
500 77 4905 PLANT-WASTES LAND UTILIZATION AND DISPOSAL OF ORGANIC WASTES IN ARID REGIONS KEYWORDS. ANIMAL-WASTES
300 77 4969 PLASTIC FLOOR MATERIALS FOR SHEEP HOUSING KEYWORDS: SLOTTED-FLOORS SHEEP CONFINEMENT-PENS FLOOR
400 78 4835 PLASTIC-LINERS MORE ON WASTE HANDLING KEYWORDS: WASTE-MANAGEMENT DESIGN CONCRETE-TRENCHES PLASTIC-LINE
200 77 4758 PLOWING TIME-MOTION ANALYSIS OF FEEDLOT MANURE COLLECTION SYSTEMS KEYWORDS: WASTE-COLLECTION TI
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500 77 5272 POINT-SOURCES EFFLUENT REGULATIONS FOR ANIMAL FEEDLOTS IN THE USA KEYWORDS: WATER-POLLUTION POINT-SOU
300 73 4826 POLLUTANTS METHODS FOR IDENTIFYING AND EVALUATING THE NATURE AND EXTENT OF NON-POINT SOURCES OF PO
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300 76 4925 POLLUTANT-PATHWAYS MODELING PESTICIDES AND NUTRIENTS ON AGRICULTURAL LANDS KEYWORDS AGRICULTURAL-RUNOFF M
100 75 5094 POLLUTANT-SOURCES NATURAL SOIL NITRATE: THE CAUSE OF THE NITRATE CONTAMINATION OF GROUND WATER IN RUNNEL
200 76 4735 POLLUTION THE SOCIO ECONOMIC ASPECTS OF LAND SPREADING OF MANURES VERSUS OTHER USES A SYSTEM AP
200 71 4747 POLLUTION POLLUTION LEGISLATION IN CANADA AFFECTING THE LIVESTOCK INDUSTRY KEYWORDS: WASTE-DISPOS
700 75 4812 POLLUTION UTILIZATION AND DISPOSAL OF RESIDUE FROM THE PARTIAL OXIDATION OF CATTLE MANURE KEYWORD
500 77 4900 POLLUTION SOILS FOR MANAGEMENT OF ORGANIC WASTES AND WASTE WATERS KEYWORDS: ORGANIC-WASTES SOILS
200 78 5115 POLLUTION SURFACE APPLICATION AND INJECTION OF LIQUID DAIRY MANURE KEYWORDS: DAIRY-WASTES LIQUID-
500 77 5266 POLLUTION AGRICULTURE IN CZECHOSLOVAKIA KEYWORDS: CONFINEMENT ANIMAL-WASTES WASTE-DISPOSAL POLLUT
500 77 5271 POLLUTION MANAGEMENT OF THE LIVING ENVIRONMENT KEYWORDS: POLLUTION FEEDLOTS LEGAL-ASPECTS MODEL-S
500 77 5300 POLLUTION FEEDLOT WASTE MANAGEMENT IN BULGARIA KEYWORDS: FEEDLOTS SWINE-WASTES DAIRY-INDUSTRY POL
400 78 5003 POLLUTION-CONTROL MANURE HANDLING EQUIPMENT EXEMPT FROM PROPERTY TAX KEYWORDS: IOWA-LAW LEGAL-ASPECTS POL
300 77 5098 POLLUTION-CONTROL EPA SBA WATER POLLUTION ABATEMENT LOANS FOR AGRIBUSINESS KEYWORDS: POLLUTION-CONTROL WA
100 77 5007 POLYCHLORINATED-BI RETENTION AND EXCRETION OF POLYCHLORINATED BIPHENYL RESIDUES BY LAYING HENS KEYWORDS: P
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100 76 4928 PONDS ORGANIC AND INORGANIC NUTRIENT ENRICHMENT AND THE LIVING CONDITIONS OF CARP FRY IN FIRS
500 77 5123 PONDS POLLUTION CONTROL FOR AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES ANIMAL-WASTES WASTE-TRE
200 76 4785 POROUS-CEILING-CON VENTILATION OF TIE-STALL DAIRY BARNS IN ONTARIO KEYWORDS: VENTILATION DAIRY-INDUSTRY PO
400 77 4798 POTASH TOP YIELDS FROM ANIMAL WASTE KEYWORDS: DAIRY-WASTES SEWAGE-SLUDGE FERTILIZERS LAND-APPL
100 72 4673 POTASSIUM THE CATTLE DUNG PATCH: 2. EFFECT OF A DUNG PATCH ON THE CHEMICAL STATUS OF THE SOIL, AN
400 78 4681 POTASSIUM POULTRY MANURE FERTILIZER VALUE CUTS FARM COSTS KEYWORDS: POULTRY-WASTES LAND-APPLICATI
200 71 4687 POTASSIUM STORAGE OF BEEF CATTLE WASTES UNDER AEROBIC AND ANAEROBIC CONDITIONS KEYWORDS: CATTLE-W
200 76 4711 POTASSIUM EFFICIENT RECYCLING OF NUTRIENTS KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES SH
200 76 4719 POTASSIUM SOIL, WATER, PLANT RELATIONSHIP AS INFLUENCED BY INTENSIVE USE OF EFFLUENTS FROM LIVES
100 73 4819 POTASSIUM EFFECT OF FARMYARD MANURE ON THE YIELD AND CHEMICAL COMPOSITION OF THE WHEAT CROP KEYWO
400 78 4837 POTASSIUM FERTILIZER VALUE OF TURKEY WASTE KEYWORDS: POULTRY-WASTES SOLID-WASTES TURKEYS LIQUID-W
400 78 4840 POTASSIUM FEEDLOT SELLS MANURE KEYWORDS: WASTE-MANAGEMENT FEEDLOTS CATTLE LIQUID-WASTES FLUSHING
100 77 4860 POTASSIUM EFFECTS OF SOIL, COVER CROP, AND NUTRIENT SOURCE ON MOVEMENT OF SOIL, WATER, AND NITROG
100 77 4864 POTASSIUM FEEDLOT RUNOFF HOLDING PONDS--NUTRIENT LEVELS AND RELATED MANAGEMENT ASPECTS KEYWORDS
300 77 4865 POTASSIUM CHEMICAL ANALYSIS AND FERTILIZER VALUE OF TURKEY MANURE KEYWORDS: POULTRY-WASTES WASTE-
100 76 4891 POTASSIUM AN INTEGRATED SEPARATION, AEROBIC TREATMENT AND SLUDGE DE-WATERING SYSTEM FOR PIG SLURR
500 77 4907 POTASSIUM FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS: MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP
700 76 4921 POTASSIUM EFFECT OF BEEF CATTLE MANURE ON SOIL PROPERTIES AND CROP GROWTH KEYWORDS: CATTLE-WASTES
400 78 4983 POTASSIUM TURKEY MANURE AS FERTILIZER KEYWORDS: TURKEYS POULTRY-WASTES FERTILIZERS PHOSPHORUS POT
100 75 4986 POTASSIUM VARIATIONS BETWEEN FARMS IN N, P, K, MG AND DRY MATTER COMPOSITION OF CATTLE, PIG AND PO
100 76 5036 POTASSIUM ASKOV 1984--FERTILIZERS AND MANURE ON SANDY AND LOAMY SOILS KEYWORDS: ANIMAL-WASTES FER
100 75 5081 POTASSIUM EFFECT OF LONG TERM APPLICATION OF P, K AND FARMYARD MANURE ON THE ZINC CONTENT OF SOIL
400 78 5084 POTASSIUM 112 MILLION TONS OF MANURE PRODUCED IN 1974: USDA KEYWORDS: LIVESTOCK-WASTES POULTRY-W
100 73 5085 POTASSIUM THE EFFECT OF APPLYING LARGE QUANTITIES OF SLURRY TO GRASSLAND KEYWORDS: LAND-APPLICATI
200 78 5102 POTASSIUM ESTIMATED INVENTORY OF LIVESTOCK AND POULTRY MANURE RESOURCES IN THE UNITED STATES KEYW
100 77 5118 POTASSIUM THE EFFECTS OF CATTLE SLURRY AND INORGANIC FERTILISER NITROGEN ON THE YIELD AND MINERAL
200 78 5156 POTASSIUM NUTRIENTS AVAILABLE IN LIVESTOCK AND POULTRY MANURE RESIDUE AS REFLECTED BY MANAGEMENT
100 78 5171 POTASSIUM EFFECTS OF LIQUID SWINE WASTE APPLICATIONS ON CORN YIELD AND SOIL CHEMICAL COMPOSITION
400 77 5177 POTASSIUM MANURE IS AN INCREASINGLY ECONOMICAL FERTILIZER SOURCE KEYWORDS: ANIMAL-WASTES LAND-APP
100 78 5178 POTASSIUM NONPOINT SOURCES: STATE-OF-THE-ART OVERVIEW KEYWORDS: NONPOINT-SOURCES WATER-POLLUTION
300 78 5188 POTASSIUM ESTIMATING U.S. LIVESTOCK AND POULTRY MANURE AND NUTRIENT PRODUCTION KEYWORDS. LIVESTOC
300 78 5194 POTASSIUM MANAGING HORSE MANURE FOR ENVIRONMENTAL PROTECTION KEYWORDS: WATER-POLLUTION AIR-POLLUT
400 78 5207 POTASSIUM YOU CAN PUT LIQUID MANURE ON YOUR ALFALFA KEYWORDS: LIQUID-WASTES DAIRY-WASTES LAND-APP

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300	78	5231	POTASSIUM	WATER QUALITY RENOVATION OF ANIMAL WASTE LAGOONS UTILIZING AQUATIC PLANTS KEYWORDS: LA
500	77	5290	POTASSIUM	LAND DISPOSAL OF FEEDLOT WASTES BY IRRIGATION IN CZECHOSLOVAKIA KEYWORDS: LAND-APPLICAT
100	76	5304	POTASSIUM	EFFECT OF DIETARY SODIUM AND POTASSIUM EXCESS ON WATER CONSUMPTION, URINE EXCRETION AND
400	78	5305	POTASSIUM	COLORADO BIOGAS PLANT WINS ACEC TOP PRIZE KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING BI
100	78	5039	POTASSIUM-HYDROSID	NUTRITIONAL QUALITY OF PROCESSED POULTRY WASTE FOR BROILERS KEYWORDS: POULTRY-WASTES-DR
100	78	5307	POTASSIUM-PERMANGA	CHEMICAL TREATMENT FOR ODOR ABATEMENT MEASURED ORGANOLEPTICALLY IN LIQUID DAIRY MANURE
400	78	4680	POULTRY	FUNGASTATIC FEED ADDITIVES IMPROVE LITTER RESULTS KEYWORDS: FEED-ADDITIVES FUNGICIDES L
400	77	4790	POULTRY	THE VALUE OF DRIED POULTRY WASTE AS A FEEDSTUFF IN BROILER DIETS KEYWORDS: REFEEDING P
100	72	4844	POULTRY	UTILIZATION OF COW-MANURE, HATCHERY-WASTE AND PARTLY DRIED MOLASSES IN POULTRY FEEDS K
100	78	4879	POULTRY	LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF I. INFLUENCE OF PRACTICAL EXTREMES IN DIET, W
100	78	4889	POULTRY	REPLACEMENT OF GROUNDNUT CAKE BY DRIED POULTRY MANURE IN THE DIETS OF LAYING HENS ,KEYW
100	78	4890	POULTRY	UTILISATION OF DRIED POULTRY MANURE BY GROWING CHICKENS FED ON A PRACTICAL DIET KEYWORD
100	78	4911	POULTRY	EFFECTS OF RUMEN CONTENTS OR FRACTIONS THEREOF ON PERFORMANCE OF BROILERS KEYWORDS: RUM
200	73	4919	POULTRY	SOME ENERGY AND PROTEIN SOURCES OF THE FUTURE KEYWORDS: FEEDS POULTRY PERFORMANCE
300	77	4923	POULTRY	POULTRY EXCRETA DEHYDRATION AND UTILIZATION-SYSTEM DEVELOPMENT AND DEMONSTRATION KEYWOR
100	76	4968	POULTRY	LAYERS IMPROVE WITH DPW KEYWORDS: REFEEDING POULTRY POULTRY-WASTES-DRIED PERFORMANCE EG
400	78	4981	POULTRY	TOO MUCH MAGNESIUM MAKES WETTER DROPPINGS KEYWORDS: DIETS POULTRY FEED-ADDITIVES MAGNES
100	77	5007	POULTRY	RETENTION AND EXCRETION OF POLYCHLORINATED BIPHENYL RESIDUES BY LAYING HENS KEYWORDS: P
100	77	5008	POULTRY	RECYCLING OXIDATION DITCH MIXED LIQUOR TO LAYING HENS KEYWORDS: REFEEDING OXIDATION-DIT
100	78	5040	POULTRY	NUTRITIONAL EVALUATION OF A SINGLE CELL PROTEIN FROM POULTRY MANURE KEYWORDS: REFEEDING
100	78	5042	POULTRY	EFFECT OF FEEDING RAW AND COOKED SOYBEANS AND KIDNEY BEANS AND DRIED POULTRY WASTE IN
100	78	5045	POULTRY	EFFECT OF ATMOSPHERIC AMMONIA AND STRESS ON BROILER MALES KEYWORDS: AIR-POLLUTION AMMON
100	77	5062	POULTRY	FERMENTATION OF SWINE WASTE-CORN MIXTURES FOR ANIMAL FEED: PILOT-PLANT STUDIES KEYWORD
400	78	5066	POULTRY	BROILER LITTER REMOVED, COMPOSTED, AND USED AGAIN KEYWORDS: POULTRY-LITTER COMPOSTING P
400	78	5160	POULTRY	MORE ON THREE-LEVEL BROILER BREEDER SYSTEM KEYWORDS: POULTRY MANAGEMENT DESIGN PERFORMA
100	77	5255	POULTRY	ODOUR PROBLEMS AND ODOUR CONTROL IN INTENSIVE LIVESTOCK HUSBANDRY FARMS IN THE NETHERLA
100	77	5261	POULTRY	A NOTE ON THE FERMENTATIVE CHANGES OF DIETS PREPARED WEEKLY WITH MANURE SILAGE AND FINA
500	77	5267	POULTRY	ANIMAL FEEDLOTS-DEVELOPMENT, TRENDS, PROBLEMS KEYWORDS FEEDLOTS WASTE-MANAGEMENT CATTL
500	77	5270	POULTRY	LAYOUT AND DESIGN OF ANIMAL FEEDLOT STRUCTURES AND EQUIPMENT KEYWORDS: FEEDLOTS DESIGN
100	76	5304	POULTRY	EFFECT OF DIETARY SODIUM AND POTASSIUM EXCESS ON WATER CONSUMPTION, URINE EXCRETION AND
100	77	5306	POULTRY	MYCOFLORA OF A TURKEY CONFINEMENT BROODER HOUSE KEYWORDS: POULTRY AIR-POLLUTION LITTERS
100	77	5313	POULTRY	CATTLE MANURE AND FINAL MOLASSES SILAGE IN CHICKEN FATTENING I. HIGH SUBSTITUTION LEVE
200	71	4788	POULTRY-HOUSES	SALMONELLA AND OTHER MICROORGANISMS POSE A NEW PARAMETER TO DESIGNERS OF POULTRY HOUSES
400	78	4871	POULTRY-HOUSES	KEEPING FLIES OUT OF THE HEN HOUSE KEYWORDS: FLY-CONTROL POULTRY-HOUSES WASTE-REMOVAL M
100	78	5044	POULTRY-HOUSES	MICROFLORA OF AIR SAMPLES FROM POULTRY HOUSES KEYWORDS: POULTRY-HOUSES AIR-POLLUTION MI
400	77	4791	POULTRY-LITTER	RECYCLED POULTRY WASTES OFFER MORE POTENTIAL TO COW-CALF OPERATORS KEYWORDS: REFEEDING
400	78	4834	POULTRY-LITTER	BROILER LITTER IMPROVED GAIN DURING WINTER, STUDY SAYS KEYWORDS: POULTRY-LITTER REFEEDI
400	77	4847	POULTRY-LITTER	YOU MAY FIND PROFITS IN WASTE FEEDS KEYWORDS: FEEDS FOOD-PROCESSING-WASTES BREWERY-WAST
100	77	4862	POULTRY-LITTER	LAND DISPOSAL OF BROILER LITTER--CHANGES IN CONCENTRATION OF CHLORIDE, NITRATE NITROGEN
100	78	4877	POULTRY-LITTER	FERMENTATION AND UTILIZATION OF BROILER LITTER ENSILED AT DIFFERENT MOISTURE LEVELS KEY
100	77	5031	POULTRY-LITTER	BARK BROILER LITTER AS A POTENTIAL FEEDSTUFF FOR RUMINANTS KEYWORDS: POULTRY-LITTER RE
100	77	5032	POULTRY-LITTER	LITTER REUSE EFFECTS ON SELECTED TURKEY PRODUCTION AND PROCESSING PARAMETERS KEYWORDS:
100	78	5043	POULTRY-LITTER	THIOCARBAMIDE AS AN INSECTICIDE WHEN APPLIED TO CAGE LAYING HEN FECES KEYWORDS: FLY-CON
100	78	5053	POULTRY-LITTER	AEROSOL CONCENTRATION IN A TURKEY BARN ENVIRONMENT KEYWORDS: AIR-POLLUTION BACTERIA TUR
400	78	5066	POULTRY-LITTER	BROILER LITTER REMOVED, COMPOSTED, AND USED AGAIN KEYWORDS: POULTRY-LITTER COMPOSTING P
100	78	5124	POULTRY-LITTER	BROILER GROWERS WITH CATTLE CAN MAKE BEST USE OF LITTER KEYWORDS: POULTRY-LITTER RECYCL
400	78	5126	POULTRY-LITTER	FEED AND FERTILIZER VALUE OF BROILER LITTER VARIES KEYWORDS: POULTRY-LITTER RECYCLING W
400	78	5132	POULTRY-LITTER	GRASS A BY-PRODUCT OF POULTRY KEYWORDS: POULTRY-LITTER LAND-DISPOSAL FERTILIZERS FESCUE
400	78	5134	POULTRY-LITTER	BROILER LITTER FOR FERTILIZER KEYWORDS: LAND-APPLICATION POULTRY-LITTER PASTURES ANIMAL
400	78	5166	POULTRY-LITTER	PREPARING BROILER HOUSE WHEN USING OLD LITTER KEYWORDS: POULTRY-LITTER RECYCLING ANIMAL
300	78	5201	POULTRY-LITTER	CHANGES IN CHARACTERISTICS OF DEEP STACKED BROILER LITTER WITH TIME KEYWORDS: POULTRY-L
300	78	5202	POULTRY-LITTER	FERMENTATION AND DIGESTIBILITY OF BROILER LITTER ENSILED AT DIFFERENT MOISTURE LEVELS B
300	78	5203	POULTRY-LITTER	ENSILED CORN FORAGE AND BROILER LITTER FOR FINISHING HEIFERS KEYWORDS: SILAGES ENSILING
400	78	5263	POULTRY-LITTER	DPE NITROGEN SOURCE FOR GROWING LAMBS KEYWORDS: POULTRY-WASTES-DRIED POULTRY-LITTER NIT
100	78	5039	POULTRY-METABOLIZA	NUTRITIONAL QUALITY OF PROCESSED POULTRY WASTE FOR BROILERS KEYWORDS: POULTRY-WASTES-DR
200	78	5108	POULTRY-PROCESSING	DUST REDUCTION IN THE BIRD RECEIVING AREA OF A POULTRY PROCESSING PLANT KEYWORDS: AIR-P
100	75	4678	POULTRY-WASTES	NOTE ON SECONDARY AND MICRO-ELEMENT CONTENTS OF FERTILIZERS AND MANURES KEYWORDS: FERT
400	78	4681	POULTRY-WASTES	POULTRY MANURE FERTILIZER VALUE CUTS FARM COSTS KEYWORDS: POULTRY-WASTES LAND-APPLICATI
400	78	4682	POULTRY-WASTES	POULTRY WASTES PROVIDE NITROGEN SOURCE KEYWORDS: REFEEDING POULTRY-WASTES DAIRY-CATTLE
400	78	4686	POULTRY-WASTES	REDUCING SUMMERTIME ODORS FROM POULTRY HOUSES KEYWORDS: ODOR-CONTROL POULTRY-WASTES
300	74	4702	POULTRY-WASTES	ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS ALLEN BECKER, D B A BECKER S CHICKEN-
200	76	4710	POULTRY-WASTES	EFFECT OF RATE OF APPLICATION OF ORGANIC AND INORGANIC NITROGEN ON CROP PRODUCTION AND
200	76	4711	POULTRY-WASTES	EFFICIENT RECYCLING OF NUTRIENTS KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES SH
200	76	4714	POULTRY-WASTES	THE INFLUENCE OF ANIMAL MANURES ON THE GRAZING BEHAVIOR AND HERBAGE INTAKE OF CATTLE KE
200	76	4715	POULTRY-WASTES	ANIMAL ORGANIC MANURES IN DUTCH FORESTRY-APPLICATION AND RESTRICTIONS KEYWORDS: LIQUID-
200	76	4720	POULTRY-WASTES	LEACHING OF NITRATE AND DENITRIFICATION IN A SANDY SOIL AS INFLUENCED BY MANURE APPLIC
200	76	4729	POULTRY-WASTES	POSSIBILITIES OF POULTRY DROPPINGS DECONTAMINATION AS RELATED TO FARM LEVEL MANAGEMENT
200	74	4748	POULTRY-WASTES	A MATHEMATICAL DRYING MODEL FOR MANURE BASED ON THE CONCEPT OF A RECEDING EVAPORATIVE I
200	76	4749	POULTRY-WASTES	THE APPLICATION OF FLUSHING MANURE-HANDLING SYSTEMS TO POULTRY BUILDINGS KEYWORDS: POUL
200	74	4757	POULTRY-WASTES	ENVIRONMENT AS A RESULT OF IN-HOUSE DRYING OF POULTRY EXCRETA KEYWORDS: POULTRY-WASTES
200	77	4763	POULTRY-WASTES	MODELING TECHNIQUES AND COMPUTER SIMULATION OF AGRICULTURAL WASTE TREATMENT PROCESSES K
200	77	4769	POULTRY-WASTES	PERFORMANCE OF A LARGE SIZE ANAEROBIC DIGESTER FOR POULTRY MANURE KEYWORDS: ANAEROBIC D
200	77	4772	POULTRY-WASTES	CONCEPTUAL MODELLING OF NONPOINT SOURCE POLLUTION FROM LAND AREAS RECEIVING ANIMAL WAST
200	73	4783	POULTRY-WASTES	SWINE HOUSING AND WASTE DISPOSAL RESEARCH AND DEVELOPMENTS KEYWORDS: SWINE-WASTES WAST
400	77	4791	POULTRY-WASTES	RECYCLED POULTRY WASTES OFFER MORE POTENTIAL TO COW-CALF OPERATORS KEYWORDS: REFEEDING
100	73	4801	POULTRY-WASTES	INFLUENCE OF AVAILABLE POULTRY MANURE BREEDING HABITAT ON EMERGENCE DENSITY OF SYNANTHR
100	77	4813	POULTRY-WASTES	LISTERIA-ENCEFALITIS IN COWS THROUGH LITTER FROM A BROILER-FARM KEYWORDS: ANIMAL-HEALTH
400	78	4816	POULTRY-WASTES	MANURE REMOVED WEEKLY FROM HIGH-RISE HOUSES KEYWORDS: POULTRY-WASTES MANURE-PITS CLEANI
400	77	4817	POULTRY-WASTES	POULTRY MANURE MAKES DEBUT AS ENERGY SOURCE KEYWORDS: POULTRY-WASTES ANIMAL-WASTES FERM
300	73	4820	POULTRY-WASTES	ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS PROCESSING AND BOOKS, INC AN ILLINOI
300	74	4822	POULTRY-WASTES	ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS LESTER KIPLING, D B A KIPLING CHICKEN
400	78	4833	POULTRY-WASTES	RECYCLING TAKES EXTRA MANAGEMENT KEYWORDS: LIVESTOCK-WASTE POULTRY-WASTES REFEEDING ANI
400	78	4837	POULTRY-WASTES	FERTILIZER VALUE OF TURKEY WASTE KEYWORDS: POULTRY-WASTES SOLID-WASTES TURKEYS LIQUID-W
100	76	4843	POULTRY-WASTES	ANAEROBIC FERMENTATION OF POULTRY MANURE KEYWORDS: ANAEROBIC-DIGESTION POULTRY-WASTES V
400	78	4845	POULTRY-WASTES	LEAVE PAD OF MANURE FOR NATURAL PREDATORS KEYWORDS: FLY-CONTROL PREDATORS MANURE-PAD PO
400	77	4850	POULTRY-WASTES	MANURE DIGESTER BEING BUILT ON MINNESOTA FARM KEYWORDS: ANAEROBIC DIGESTERS RECYCLING P
100	78	4858	POULTRY-WASTES	HORMONAL ACTIVITY IN POULTRY EXCRETA PROCESSED FOR LIVESTOCK FEED KEYWORDS: POULTRY-WAS
300	77	4865	POULTRY-WASTES	CHEMICAL ANALYSIS AND FERTILIZER VALUE OF TURKEY MANURE KEYWORDS: POULTRY-WASTES WASTE-
100	78	4878	POULTRY-WASTES	ANIMAL PERFORMANCE AND MICROBIAL ADAPTATION OF RUMINANTS FED FORMALDEHYDE TREATED POULT
100	78	4879	POULTRY-WASTES	LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF I. INFLUENCE OF PRACTICAL EXTREMES IN DIET, W
100	78	4880	POULTRY-WASTES	LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF II. PRESERVATION AND ACCEPTABILITY OF WET EXC
100	78	4912	POULTRY-WASTES	INFLUENCE OF B-GLUCANASE ON FEEDING VALUE OF BARLEY FOR POULTRY AND MOISTURE CONTENT OF
300	77	4923	POULTRY-WASTES	POULTRY EXCRETA DEHYDRATION AND UTILIZATION-SYSTEM DEVELOPMENT AND DEMONSTRATION KEYWOR
300	77	4924	POULTRY-WASTES	POULTRY WASTE MANAGEMENT ALTERNATIVES-A DESIGN AND APPLICATION MANUAL KEYWORDS: POULTRY
400	78	4939	POULTRY-WASTES	BROILER FERTILIZED FESCUE A MIXED BLESSING KEYWORDS: POULTRY-WASTES LAND-APPLICATION PA
700	76	4942	POULTRY-WASTES	THE EFFECT OF APPLICATION OF POULTRY MANURE WHICH WAS SUBJECTED TO DIFFERENT WASTE MANA
300	78	4944	POULTRY-WASTES	BIOGAS PRODUCTION FROM POULTRY MANURE KEYWORDS: POULTRY-WASTES RECYCLING ANAEROBIC DIGE
100	75	4948	POULTRY-WASTES	VOLUNTARY INTAKE AND NUTRITIVE VALUE OF SILAGE MADE OF POULTRY DROPPINGS AND GREEN MAIZ
100	78	4956	POULTRY-WASTES	RESPONSE OF COLIFORM POPULATIONS IN POULTRY WASTE DIGESTERS TO THREE INSECTICIDES KEYWO

200 76 4962	POULTRY-WASTES	FEEDING POULTRY WASTE TO RUMINANTS KEYWORDS: POULTRY-WASTES REFEEDING RUMINANTS POULTRY
300 78 4976	POULTRY-WASTES	THE POTENTIAL OF BROILER LITTER AS FUEL KEYWORDS: POULTRY-WASTES FUEL INCINERATION HEAT
400 78 4983	POULTRY-WASTES	TURKEY MANURE AS FERTILIZER KEYWORDS: TURKEYS POULTRY-WASTES FERTILIZERS PHOSPHORUS POT
100 75 4986	POULTRY-WASTES	VARIATIONS BETWEEN FARMS IN N, P, K, MG AND DRY MATTER COMPOSITION OF CATTLE, PIG AND PO
200 76 5000	POULTRY-WASTES	IN-HOUSE MANURE DRYING IN THE DEEP-PIT HIGH-RISE SYSTEM KEYWORDS: DEHYDRATION DEEP-PI
100 77 5007	POULTRY-WASTES	RETENTION AND EXCRETION OF POLYCHLORINATED BIPHENYL RESIDUES BY LAYING HENS KEYWORDS: P
100 77 5022	POULTRY-WASTES	RECOVERY AND REACTIONS OF AMPROLIUM FROM POULTRY MANURE ADDED TO SOIL KEYWORDS: POULTRY
100 77 5033	POULTRY-WASTES	MECHANICAL ROTAVATION OF POULTRY MANURE AS A METHOD OF FLY CONTROL KEYWORDS: FLY-CONTR
100 78 5038	POULTRY-WASTES	COMPARISON OF PROBE HAY MOISTURE DETECTOR AND CONVENTIONAL METHOD FOR DETERMINING POUL
100 78 5040	POULTRY-WASTES	NUTRITIONAL EVALUATION OF A SINGLE CELL PROTEIN FROM POULTRY MANURE KEYWORDS: REFEEDING
100 78 5041	POULTRY-WASTES	USE OF THIOCARBAMIDE TO CONTROL HOUSE FLIES IN CAGED LAYER HOUSES KEYWORDS: FLY-CONTRO
100 78 5046	POULTRY-WASTES	ORGANOLEPTIC EVALUATION OF POULTRY EXCRETA FROM HENS CONSUMING FEED TREATED WITH AN ODO
100 78 5051	POULTRY-WASTES	AN ATTEMPT TO MECHANIZE NUTRIENT RECOVERY FROM ANIMAL EXCRETA KEYWORDS: POULTRY-WASTES
200 76 5068	POULTRY-WASTES	PROCEEDINGS OF SYMPOSIUM ON THE CONVERSION OF POULTRY WASTE TO ENERGY, FEED, OR FERTILI
200 76 5069	POULTRY-WASTES	ENSILING POULTRY LITTER AND SUBSEQUENT FEEDING KEYWORDS: POULTRY-WASTES ENSILING REFEED
200 76 5070	POULTRY-WASTES	USING POULTRY MANURE FOR VEGETABLES AND HYDROSEEDING KEYWORDS: POULTRY-WASTES CHEMICAL-
200 75 5083	POULTRY-WASTES	NON-POINT SOURCES OF WATER POLLUTION KEYWORDS: WATER-POLLUTION NON-POINT-SOURCES AGRICU
400 78 5084	POULTRY-WASTES	112 MILLION TONS OF MANURE PRODUCED IN 1974: USDA KEYWORDS: LIVESTOCK-WASTES POULTRY-W
300 70 5086	POULTRY-WASTES	WORLDWIDE SURVEY AND COMPARISON OF ADULT PREDATOR AND SCAVENGER INSECT POPULATIONS ASSO
200 78 5102	POULTRY-WASTES	ESTIMATED INVENTORY OF LIVESTOCK AND POULTRY MANURE RESOURCES IN THE UNITED STATES KEYW
100 77 5121	POULTRY-WASTES	POULTRY WASTES IN THE DIET OF ISRAELI CARP KEYWORDS: REFEEDING POULTRY-WASTES FISH PERF
300 78 5131	POULTRY-WASTES	A MANUAL ON- EVALUATION AND ECONOMIC ANALYSIS OF LIVESTOCK WASTE MANAGEMENT SYSTEMS KE
100 78 5136	POULTRY-WASTES	DRYING CHARACTERISTICS OF BROILER WASTE ON A HEATED CONCRETE SLAB KEYWORDS: DEHYDRATION
100 78 5145	POULTRY-WASTES	CONVECTIVE HEAT TRANSFER COEFFICIENT FOR POULTRY EXCRETA KEYWORDS: POULTRY-WASTES DEHYD
300 78 5152	POULTRY-WASTES	METHANE PRODUCTION FROM LIVESTOCK WASTE KEYWORDS: RECYCLING LIVESTOCK-WASTES POULTRY-WA
200 78 5156	POULTRY-WASTES	NUTRIENTS AVAILABLE IN LIVESTOCK AND POULTRY MANURE RESIDUE AS REFLECTED BY MANAGEMENT
700 77 5182	POULTRY-WASTES	SOME PHYSICAL, CHEMICAL, AND BIOLOGICAL EFFECTS OF HEAVY POULTRY MANURE APPLICATIONS ON
100 73 5184	POULTRY-WASTES	EQUIPMENT AND METHODS FOR THE SOLID LIQUID SEPARATION OF SLURRIES KEYWORDS: SLURRIES SE
400 78 5185	POULTRY-WASTES	POULTRY MANURE AS FEED KEYWORDS: REFEEDING POULTRY-WASTES SWINE PERFORMANCE NITROGEN TO
300 78 5188	POULTRY-WASTES	ESTIMATING U S LIVESTOCK AND POULTRY MANURE AND NUTRIENT PRODUCTION KEYWORDS: LIVESTOC
200 70 5191	POULTRY-WASTES	AIR DRYING POULTRY MANURE KEYWORDS: DEHYDRATION POULTRY-WASTES FLY-CONTROL ODOR-CONTROL
600 78 5196	POULTRY-WASTES	METHANE FROM MANURE: FACT OR FANTASY KEYWORDS: METHANE ANAEROBIC-DIGESTION RECYCLING L
300 78 5218	POULTRY-WASTES	DOMESTIC FLY PROBLEMS IN DEEP PIT POULTRY HOUSES KEYWORDS: FLY-CONTROL DEEP-PITS POULTR
400 78 5219	POULTRY-WASTES	FEATHERS ON MANURE CAN INCREASE FLY PROBLEM KEYWORDS: FLY-CONTROL POULTRY-WASTES FEATHE
400 78 5221	POULTRY-WASTES	LESSER MEALWORM BEETLES INVADE MAINE RESIDENCES KEYWORDS: BEETLES POULTRY-WASTES INSECT
100 77 5240	POULTRY-WASTES	SAMPLING, CHARACTERISATION AND ANALYSIS OF MALODOURS KEYWORDS: ODOR SWINE-WASTES POULTR
100 78 5264	POULTRY-WASTES	WET POULTRY WASTE MAKES BETTER FEED KEYWORDS: POULTRY-WASTES REFEEDING SHEEP NITROGEN D
500 77 5267	POULTRY-WASTES	ANIMAL FEEDLOTS-DEVELOPMENT, TRENDS, PROBLEMS KEYWORDS: FEEDLOTS WASTE-MANAGEMENT CATTL
500 77 5280	POULTRY-WASTES	COLLECTION, STORAGE AND TRANSPORT OF POULTRY WASTES KEYWORDS: POULTRY-WASTES WASTE-REMO
500 77 5292	POULTRY-WASTES	COST OF ANIMAL WASTE MANAGEMENT KEYWORDS: WASTE-MANAGEMENT ECONOMICS WATER-POLLUTION CA
500 77 5298	POULTRY-WASTES	ANIMAL WASTE MANAGEMENT IN GREECE KEYWORDS: FEEDLOTS POULTRY-WASTES SWINE-WASTES LIQUID
100 76 5304	POULTRY-WASTES	EFFECT OF DIETARY SODIUM AND POTASSIUM EXCESS ON WATER CONSUMPTION, URINE EXCRETION AND
200 77 5311	POULTRY-WASTES	SUMMER UTILIZATION OF SOLAR ENERGY FOR DRYING POULTRY EXCRETA KEYWORDS: DEHYDRATION POU
400 78 5312	POULTRY-WASTES	AGRICULTURAL WASTES IN FISH FARMING KEYWORDS: SWINE-WASTES CATTLE-WASTES POULTRY-WASTES
400 77 4790	POULTRY-WASTES-DRI	THE VALUE OF DRIED POULTRY WASTE AS A FEEDSTUFF IN BROILER DIETS KEYWORDS: REFEEDING P
100 77 4815	POULTRY-WASTES-DRI	NITROGEN UTILIZATION BY LAMBS FED WHEAT STRAW ALONE OR WITH SUPPLEMENTS CONTAINING DRIE
400 78 4839	POULTRY-WASTES-DRI	MISSISSIPPI APPROVES SALE OF POULTRY WASTE FEED KEYWORDS: POULTRY-WASTES-DRIED REFEEDIN
100 78 4857	POULTRY-WASTES-DRI	A COMPARISON OF DROP-PLATE AND POUR-PLATE METHODS FOR BACTERIAL POPULATION COUNTS OF PO
700 74 4885	POULTRY-WASTES-DRI	A NUTRITIONAL EVALUATION OF RECYCLED SWINE WASTE KEYWORDS: REFEEDING SWINE-WASTES SWINE
400 78 4886	POULTRY-WASTES-DRI	PRORICH CASHES IN ON FEED MARKET WITH DPW KEYWORDS: POULTRY-WASTES-DRIED REFEEDING PRORI
100 78 4889	POULTRY-WASTES-DRI	REPLACEMENT OF GROUNDNUT CAKE BY DRIED POULTRY MANURE IN THE DIETS OF LAYING HENS ,KEYW
100 78 4890	POULTRY-WASTES-DRI	UTILISATION OF DRIED POULTRY MANURE BY GROWING CHICKENS FED ON A PRACTICAL DIET KEYWORD
200 76 4918	POULTRY-WASTES-DRI	FEEDING POULTRY WASTE TO RUMINANTS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE PROT
100 75 4932	POULTRY-WASTES-DRI	UTILISATION OF RATIONS CONTAINING POULTRY MANURE AS A PROTEIN KEYWORDS: SHEEP REFEEDING
400 78 4941	POULTRY-WASTES-DRI	DRIED POULTRY MANURE BENEFITS DAIRY COWS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTL
200 76 4962	POULTRY-WASTES-DRI	FEEDING POULTRY WASTE TO RUMINANTS KEYWORDS: POULTRY-WASTES REFEEDING RUMINANTS POULTRY
100 75 4963	POULTRY-WASTES-DRI	THE USE OF DRIED POULTRY WASTES AS FEEDINGSTUFFS KEYWORDS: POULTRY-WASTES-DRIED REFEEDI
100 76 4968	POULTRY-WASTES-DRI	LAYERS IMPROVE WITH DPW KEYWORDS: REFEEDING POULTRY POULTRY-WASTES-DRIED PERFORMANCE EG
100 76 5030	POULTRY-WASTES-DRI	GROWTH PERFORMANCE OF BROILERS FED VARIOUS POULTRY WASTES KEYWORDS: REFEEDING POULTRY-W
100 78 5039	POULTRY-WASTES-DRI	NUTRITIONAL QUALITY OF PROCESSED POULTRY WASTE FOR BROILERS KEYWORDS: POULTRY-WASTES-DR
100 78 5042	POULTRY-WASTES-DRI	EFFECT OF FEEDING RAW AND COOKED SOYBEANS AND KIDNEY BEANS AND DRIED POULTRY WASTE IN
200 76 5071	POULTRY-WASTES-DRI	SIGNIFICANCE OF HEAVY METALS IN DPW FOR FEEDING KEYWORDS: REFEEDING POULTRY-WASTES-DRIE
200 76 5072	POULTRY-WASTES-DRI	MARKETING OF CONVERTED POULTRY WASTE KEYWORDS: POULTRY-WASTES-DRIED MARKETING ECONOMICS
200 76 5074	POULTRY-WASTES-DRI	POULTRY MANURE FED TO LAMBS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED SHEEP CRUDE-PROTEI
200 76 5075	POULTRY-WASTES-DRI	MARKETING MANURE KEYWORDS: POULTRY-WASTES-DRIED DEHYDRATION FERTILIZERS WASTE-STORAGE L
100 77 5096	POULTRY-WASTES-DRI	DRIED POULTRY MANURE AS A SOURCE OF PHOSPHORUS FOR SHEEP KEYWORDS: REFEEDING POULTRY-WA
200 78 5122	POULTRY-WASTES-DRI	NITROGEN AND PHOSPHORUS MOVEMENT FROM SURFACE APPLIED MANURE KEYWORDS: MODEL-STUDIES LE
400 78 5217	POULTRY-WASTES-DRI	DPW PROVIDES NITROGEN FOR COWS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE PERFORMA
400 78 5263	POULTRY-WASTES-DRI	DPE NITROGEN SOURCE FOR GROWING LAMBS KEYWORDS: POULTRY-WASTES-DRIED POULTRY-LITTER NIT
400 78 4845	PREDATORS	LEAVE PAD OF MANURE FOR NATURAL PREDATORS KEYWORDS: FLY-CONTROL PREDATORS MANURE-PAD PO
300 70 5086	PREDATORS	WORLDWIDE SURVEY AND COMPARISON OF ADULT PREDATOR AND SCAVENGER INSECT POPULATIONS ASSO
100 76 5210	PREDATORS	A REVIEW OF THE FOOD HABITS OF THE INSECT FAUNA INHABITING CATTLE DROPPINGS IN NORTH C
300 78 5218	PREDATORS	DOMESTIC FLY PROBLEMS IN DEEP PIT POULTRY HOUSES KEYWORDS: FLY-CONTROL DEEP-PITS POULTR
100 78 4880	PRESERVATIVES	LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF II. PRESERVATION AND ACCEPTABILITY OF WET EXC
400 78 4979	PRESSBOARD	NOW LOOK WHAT THEY'RE MAKING FROM MANURE KEYWORDS: DAIRY-WASTES RECYCLING IRRIGATION FE
400 78 5003	PROPERTY-TAX-EXEMP	MANURE HANDLING EQUIPMENT EXEMPT FROM PROPERTY TAX KEYWORDS: IOWA-LAW LEGAL-ASPECTS POL
100 78 4880	PROPIONIC-ACID	LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF II. PRESERVATION AND ACCEPTABILITY OF WET EXC
400 78 4886	PRORICH-FEEDS	PRORICH CASHES IN ON FEED MARKET WITH DPW KEYWORDS: POULTRY-WASTES-DRIED REFEEDING PRORI
100 77 4895	PROTEINS	NUTRITIONAL EVALUATION WITH RATS OF ALGAE CHLORELLA GROWN ON SWINE MANURE KEYWORDS LI
100 77 5016	PROTEINS	PROTEIN PRODUCTION FROM FEEDLOT WASTE KEYWORDS: FEEDLOTS CATTLE-WASTES REFEEDING SUBSTR
300 78 5201	PROTEINS	CHANGES IN CHARACTERISTICS OF DEEP STACKED BROILER LITTER WITH TIME KEYWORDS: POULTRY-L
400 78 5228	PROTEINS	AUSTRALIANS UTILIZE FARM WASTE TO PRODUCE EDIBLE PROTEIN PRODUCTS KEYWORDS: SWINE-WASTE
400 77 4789	PROTEIN	RED WIGGLERS-TURN WORMS TO PROTEIN SUPPLEMENT-RESEARCHERS KEYWORDS: FEEDS RECYCLING WOR
400 78 4886	PROTEIN	PRORICH CASHES IN ON FEED MARKET WITH DPW KEYWORDS: POULTRY-WASTES-DRIED REFEEDING PRORI
200 76 4918	PROTEIN	FEEDING POULTRY WASTE TO RUMINANTS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE PROT
300 78 5231	PROTEIN	WATER QUALITY RENOVATION OF ANIMAL WASTE LAGOONS UTILIZING AQUATIC PLANTS KEYWORDS: LA
500 77 5268	PROTEIN	WORLD DEMAND FOR ANIMAL PRODUCTS FOR HUMAN FOOD, 1970-2000 KEYWORDS: ANIMAL-PRODUCTION
400 78 4830	PROTEIN-SOURCES	INNOVATIONS ARE SEEN IN 1980S CATTLE FEEDING KEYWORDS: CATTLE FEED-ADDITIVES STIMULANTS
400 78 4839	PROTEIN-SUPPLEMENT	MISSISSIPPI APPROVES SALE OF POULTRY WASTE FEED KEYWORDS: POULTRY-WASTES-DRIED REFEEDIN
400 78 4692	PUBLIC-HEALTH	LET THEM EAT WASTE KEYWORDS: REFEEDING SWINE-WASTES SWINE ANIMAL-HEALTH LEGAL-ASPECTS D
200 76 4727	PUBLIC-HEALTH	VETERINARY-HYGIENIC ASPECTS OF LANDSPREADING AND TRANSPORT OF MANURE KEYWORDS: SOLID-W
200 76 4730	PUBLIC-HEALTH	A STUDY OF THE EFFECTS OF ANIMAL EFFLUENT UTILISATION FOR GRASSLAND PRODUCTION ON LEVEL
200 76 4743	PUBLIC-HEALTH	MICROBIOLOGICAL ANALYSIS OF ANIMAL MANURES WITH PARTICULAR REFERENCE TO THE ISOLATION
100 77 4746	PUBLIC-HEALTH	BACTERIOLOGICAL INVESTIGATION OF ALBERTA MEAT-PACKING PLANT WASTES WITH EMPHASIS ON SAL
300 76 4754	PUBLIC-HEALTH	MICROBIOLOGY AND CHEMISTRY STUDIES OF WATER QUALITY FACTORS IN A WATERSHED USED FOR MUN
200 71 4762	PUBLIC-HEALTH	SAFETY HAZARDS ASSOCIATED WITH LIVESTOCK WASTE KEYWORDS: FEEDLOTS ACCIDENTS MANAGEMENT
200 71 4788	PUBLIC-HEALTH	SALMONELLA AND OTHER MICROORGANISMS POSE A NEW PARAMETER TO DESIGNERS OF POULTRY HOUSES
400 78 4833	PUBLIC-HEALTH	RECYCLING TAKES EXTRA MANAGEMENT KEYWORDS: LIVESTOCK-WASTE POULTRY-WASTES REFEEDING ANI
500 77 4906	PUBLIC-HEALTH	PATHOGEN CONSIDERATIONS FOR LAND APPLICATION OF HUMAN AND DOMESTIC ANIMAL WASTES KEYWOR
500 77 4907	PUBLIC-HEALTH	FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS: MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP

400	78 4910	PUBLIC-HEALTH	SULFA RESIDUES IN SWINE STILL A PROBLEM KEYWORDS: SWINE-SULFA RESIDUES WITHDRAWAL-PERIO
200	76 4918	PUBLIC-HEALTH	FEEDING POULTRY WASTE TO RUMINANTS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE PROT
400	78 4931	PUBLIC-HEALTH	FARMING IN WASTE WATER MAY AID DEVELOPING NATIONS KEYWORDS: AQUACULTURE WASTEWATER-REUS
100	77 4989	PUBLIC-HEALTH	STUDIES ON MICROBIOLOGICAL CONTROL OF LIQUID MANURE HANDLING KEYWORDS: LIQUID-WASTES WA
400	78 5011	PUBLIC-HEALTH	TOXIC GASES KILL WORKER KEYWORDS: AIR-POLLUTION PUBLIC-HEALTH CONFINEMENT-PENS CATTLE-W
100	78 5053	PUBLIC-HEALTH	AEROSOL CONCENTRATION IN A TURKEY BARN ENVIRONMENT KEYWORDS: AIR-POLLUTION BACTERIA TUR
100	78 5054	PUBLIC-HEALTH	FATE OF PATHOGENS IN SOILS RECEIVING ANIMAL WASTES--A REVIEW KEYWORDS: ANIMAL-WASTES LA
300	78 5079	PUBLIC-HEALTH	FEEDING ANIMAL WASTE KEYWORDS: REFEEDING SAFETY ANIMAL-HEALTH PUBLIC-HEALTH COPPER-TOXI
300	78 5139	PUBLIC-HEALTH	DEATH IN A FARM WORKER ASSOCIATED WITH TOXIC GASES FROM A LIQUID MANURE SYSTEM - WISCON
100	73 5167	PUBLIC-HEALTH	PRINCIPLES OF TREATMENT OF ANIMAL SLURRIES KEYWORDS: SLURRIES WASTE-TREATMENT AEROBIC A
300	78 5176	PUBLIC-HEALTH	SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
500	76 5225	PUBLIC-HEALTH	THE UPGRADING OF AGRICULTURAL WASTES BY THERMOPHILIC FUNGI KEYWORDS: WASTE-TREATMENT T
300	77 5226	PUBLIC-HEALTH	METHANE GENERATION FROM HUMAN, ANIMAL, AND AGRICULTURAL WASTES KEYWORDS: RECYCLING METH
500	77 5273	PUBLIC-HEALTH	IMPACT OF INTENSIVE ANIMAL PRODUCTION ON HUMAN ECOLOGY KEYWORDS: FEEDLOTS EPIDEMIOLOGY
500	77 5274	PUBLIC-HEALTH	MANAGEMENT OF HYGIENIC PROBLEMS IN LARGE ANIMAL FEEDLOTS KEYWORDS: EPIDEMIOLOGY ANIMAL-
500	77 5275	PUBLIC-HEALTH	HEALTH EFFECTS FROM WASTE UTILIZATION KEYWORDS: PUBLIC-HEALTH ANIMAL-HEALTH REFEEDING L
500	77 5276	PUBLIC-HEALTH	NOXIOUS GASES AND ODOURS KEYWORDS: ODOR-CONTROL ANIMAL-HEALTH PUBLIC-HEALTH TOXICITY HY
500	77 5288	PUBLIC-HEALTH	UTILIZATION OF LIVESTOCK WASTES AS FEED AND OTHER DIETARY PRODUCTS KEYWORDS: REFEEDING
100	77 4892	PULVERIZING	MECHANICAL MANURE HARVESTING FROM FEEDLOTS KEYWORDS: FEEDLOT-WASTES EQUIPMENT-MANURE-HA
100	69 4697	PUMPING	DAIRY WASTE DISPOSAL KEYWORDS: WASTE-DISPOSAL LAND-APPLICATION ECONOMICS SPRAY-IRRIGATI
100	77 4893	PUMPS	THE EFFECT OF MIXING ON AN ANAEROBIC LAGOON KEYWORDS: SWINE-WASTES WASTE-TREATMENT LAGO
400	78 5206	PURPLE-SULFUR-BACT	COLOR THESE LAGOONS PURPLE KEYWORDS: ODOR-CONTROL SWINE-WASTES PURPLE-SULFUR-BACTERIA
400	78 4669	PYROLYSIS	CROP, LIVESTOCK RESIDUES: A FUTURE SOURCE OF FUEL KEYWORDS: AGRICULTURAL-WASTES FOREST
100	77 4855	PYROLYSIS	AGRICULTURAL BIOMASS WASTES--UTILIZATION ROUTES KEYWORDS: AGRICULTURAL-WASTES RECYCLING
200	78 5127	PYROLYSIS	ALTERNATE MANURE RECYCLING SYSTEMS FOR ENERGY RECOVERY KEYWORDS: RECYCLING GAS-PRODUCTI
500	77 5265	PYROLYSIS	ANIMAL WASTES KEYWORDS: FEEDLOTS DESIGN EFFLUENTS GASES ODOR ANIMAL-WASTES WASTE-STORAG
500	77 5287	PYROLYSIS	ENERGY RECOVERY FROM ANIMAL WASTES-ANAEROBIC DIGESTION, PYROLYSIS, HYDROGENATION KEYWOR
100	78 5040	QUAIL	NUTRITIONAL EVALUATION OF A SINGLE CELL PROTEIN FROM POULTRY MANURE KEYWORDS: REFEEDING
300	74 4700	RAINFALL	QUANTIFICATION OF POLLUTANTS IN AGRICULTURAL RUNOFF KEYWORDS: AGRICULTURAL-RUNOFF EROSI
100	77 4860	RAINFALL-RUNOFF-RE	EFFECTS OF SOIL, COVER CROP, AND NUTRIENT SOURCE ON MOVEMENT OF SOIL, WATER, AND NITROG
200	77 4786	RANGELAND	NONPOINT POLLUTION CONTROL FOR WINTERING RANGE CATTLE KEYWORDS: CATTLE WATER-POLLUTION
300	77 4926	RANGELAND	ENVIRONMENTAL IMPLICATIONS OF TRENDS IN AGRICULTURE AND SILVICULTURE VOLUME 1. TREND IDE
300	78 4951	RANGELAND	ENVIRONMENTAL IMPACT RESULTING FROM UNCONFINED ANIMAL PRODUCTION KEYWORDS: ENVIRONMENTA
100	78 5178	RANGELAND	NONPOINT SOURCES: STATE-OF-THE-ART OVERVIEW KEYWORDS: NONPOINT-SOURCES WATER-POLLUTION
100	76 5210	RANGELAND	A REVIEW OF THE FOOD HABITS OF THE INSECT FAUNA INHABITING CATTLE DROPPINGS IN NORTH C
100	77 4914	RATIONS	EFFECTS OF RATION ROUGHAGE CONTENT ON VISCOSITY AND THEORETICAL HEAD LOSSES IN PIPE FLO
100	77 4895	RATS	NUTRITIONAL EVALUATION WITH RATS OF ALGAE CHLORELLA GROWN ON SWINE MANURE KEYWORDS: LI
200	76 5070	RECLAMATION	USING POULTRY MANURE FOR VEGETABLES AND HYDROSEEDING KEYWORDS POULTRY-WASTES CHEMICAL-
200	76 5125	RECLAMATION	AGRICULTURAL RESIDUES, INCLUDING FEEDLOT WASTES KEYWORDS: AGRICULTURAL-RESIDUES FEEDLOT
500	77 5301	RECLAMATION	FEEDLOT WASTE MANAGEMENT IN CZECHOSLOVAKIA KEYWORDS: FEEDLOTS LIQUID-WASTES LAND-APPLIC
500	77 4904	RECREATIONAL-AREA-	SPECIAL OPPORTUNITIES AND PROBLEMS IN USING FOREST SOILS FOR ORGANIC WASTE APPLICATION
700	76 4668	RECYCLING	CELLULOLYSIS IN FEEDLOT WASTE KEYWORDS: FEEDLOT-WASTES CHEMICAL-TREATMENT PHYSICAL-TREA
400	78 4669	RECYCLING	CROP, LIVESTOCK RESIDUES: A FUTURE SOURCE OF FUEL KEYWORDS: AGRICULTURAL-WASTES FOREST
400	78 4675	RECYCLING	MONTANA RESEARCHER SEES METHANE PRODUCTION PROFITABLE IN FUTURE KEYWORDS: AGRICULTURAL-
400	78 4695	RECYCLING	METHANE DIGESTERS KEYWORDS: METHANE RECYCLING DIGESTERS DESIGN ECONOMICS
200	76 4732	RECYCLING	INVENTIONS AND INNOVATIONS TO REDUCE POLLUTION OF WATER RESOURCES KEYWORDS: WATER-POLLU
200	76 4735	RECYCLING	THE SOCIO ECONOMIC ASPECTS OF LAND SPREADING OF MANURES VERSUS OTHER USES: A SYSTEM AP
200	74 4758	RECYCLING	HANDLING HOUSED BEEF CATTLE FEEDLOT MANURE KEYWORDS: DESIGN FEEDLOTS CATTLE WASTE-MANAG
200	77 4765	RECYCLING	MICROALGAE AS A MEANS OF RECYCLING ANIMAL WASTES KEYWORDS: RECYCLING WASTE-TREATMENT SW
200	77 4767	RECYCLING	COMMERCIAL SIZE ANAEROBIC DIGESTER PERFORMANCE WITH DAIRY MANURE KEYWORDS: DAIRY-WASTES
200	77 4769	RECYCLING	PERFORMANCE OF A LARGE SIZE ANAEROBIC DIGESTER FOR POULTRY MANURE KEYWORDS: ANAEROBIC D
200	77 4773	RECYCLING	SOME MECHANICAL ASPECTS OF ANAEROBIC DIGESTION OF BEEF MANURE KEYWORDS: ANAEROBIC-DIGES
200	77 4779	RECYCLING	FIBER WALL REACTOR DIGESTION OF DAIRY CATTLE MANURE KEYWORDS: DAIRY-WASTES ANAEROBIC-TR
200	75 4784	RECYCLING	UTILIZATION OF METHANE FOR FARM PRODUCTION ENERGY-DISCUSSION KEYWORDS: CATTLE-WASTES DA
400	77 4789	RECYCLING	RED WIGGLERS-TURN WORMS TO PROTEIN SUPPLEMENT-RESEARCHERS KEYWORDS: FEEDS RECYCLING WOR
700	76 4795	RECYCLING	ANAEROBIC DIGESTION OF SCREENED DAIRY CATTLE WASTE USING A FIBER WALL REACTOR KEYWORDS
700	75 4812	RECYCLING	UTILIZATION AND DISPOSAL OF RESIDUE FROM THE PARTIAL OXIDATION OF CATTLE MANURE KEYWORD
400	77 4817	RECYCLING	POULTRY MANURE MAKES DEBUT AS ENERGY SOURCE KEYWORDS: POULTRY-WASTES ANIMAL-WASTES FERM
400	78 4823	RECYCLING	MORE DEAR MOTHER A LETTER FROM JIM LAWRENCE KEYWORDS: HEATING PHYSICAL-TREATMENT BIOLOG
300	76 4824	RECYCLING	ENERGY POTENTIAL THROUGH BIO-CONVERSION OF AGRICULTURAL WASTES KEYWORDS: AGRICULTURAL-W
400	78 4846	RECYCLING	FLUSH SYSTEM CLEANS SWINE PENS KEYWORDS: SWINE-WASTES CONFINEMENT-PENS FLUSHING DESIGN
400	78 4848	RECYCLING	LIQUID COW MANURE GOES TO MARKET KEYWORDS: DAIRY-WASTES LIQUID-WASTES WASTE-TREATMENT U
400	78 4849	RECYCLING	STATE-BASED PLANT TURNING CATTLE MANURE INTO METHANE GAS KEYWORDS: CATTLE-WASTES RECYCL
400	77 4850	RECYCLING	MANURE DIGESTER BEING BUILT ON MINNESOTA FARM KEYWORDS: ANAEROBIC DIGESTERS RECYCLING P
100	77 4855	RECYCLING	AGRICULTURAL BIOMASS WASTES--UTILIZATION ROUTES KEYWORDS: AGRICULTURAL-WASTES RECYCLING
300	76 4859	RECYCLING	ENERGY RELATIONSHIPS FOR A 32-ACRE IOWA FARM--AN ATTEMPT TO INCREASE PRODUCTION OF GRAI
500	77 4907	RECYCLING	FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS: MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP
600	4917	RECYCLING	THE CALORIFIC PROJECT I. BACKGROUND AND DESIGN CRITERIA KEYWORDS RECYCLING CATTLE-WA
400	78 4935	RECYCLING	KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA KEYWORDS: KAPLAN FEEDLOTS RECYCLING REFEEDING MET
300	78 4944	RECYCLING	BIOGAS PRODUCTION FROM POULTRY MANURE KEYWORDS: POULTRY-WASTES RECYCLING ANAEROBIC DIGE
200	78 4947	RECYCLING	METHANE AND BIOMASS PRODUCTION SYSTEMS FOR BEEF CATTLE MANURE KEYWORDS: LIVESTOCK-WASTE
300	78 4952	RECYCLING	CONVERSION OF CATTLE FEEDLOT MANURE TO ETHYLENE AND AMMONIA SYNTHESIS GAS KEYWORDS: FEE
500	76 4965	RECYCLING	THE LAMAR BIO-CONVERSION PLANT DESIGN KEYWORDS: BIO-CONVERSION ANAEROBIC-DIGESTION CATT
400	78 4972	RECYCLING	KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA-PART TWO KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLI
400	78 4979	RECYCLING	NOW LOOK WHAT THEY'RE MAKING FROM MANURE KEYWORDS: DAIRY-WASTES RECYCLING IRRIGATION FE
400	77 5004	RECYCLING	A MARTINI IN YOUR TANK KEYWORDS: RECYCLING ORGANIC-WASTES LIVESTOCK-WASTES ETHYL-ALCOHO
500	77 5026	RECYCLING	BIOLOGICAL RECLAMATION OF SOLID WASTES KEYWORDS: RECYCLING SOLID-WASTES MUNICIPAL-WASTE
100	77 5032	RECYCLING	LITTER REUSE EFFECTS ON SELECTED TURKEY PRODUCTION AND PROCESSING PARAMETERS KEYWORDS:
400	77 5050	RECYCLING	IT'S NO BULL! COLORADO TOWN TO CONVERT COW MANURE TO NATURAL GAS KEYWORDS: CATTLE-WASTES
300	78 5065	RECYCLING	ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUE: POTENTIAL FOR IMPROVEMENT AND IMPLEME
200	76 5068	RECYCLING	PROCEEDINGS OF SYMPOSIUM ON THE CONVERSION OF POULTRY WASTE TO ENERGY, FEED, OR FERTILI
200	76 5072	RECYCLING	MARKETING OF CONVERTED POULTRY WASTE KEYWORDS: POULTRY-WASTES-DRIED MARKETING ECONOMICS
300	76 5090	RECYCLING	BIOCONVERSION OF AGRICULTURAL WASTES FOR POLLUTION CONTROL AND ENERGY CONSERVATION KEY
400	77 5099	RECYCLING	RESEARCH DAIRY STUDIES CONFINEMENT & WASTE REUSE KEYWORDS: DAIRY-WASTES SLURRIES SEPARA
200	78 5102	RECYCLING	ESTIMATED INVENTORY OF LIVESTOCK AND POULTRY MANURE RESOURCES IN THE UNITED STATES KEYW
200	78 5109	RECYCLING	EARTHEN PITS FOR MANURE AND RECYCLED FLUSH-WATER STORAGE KEYWORDS: MANURE-PITS WASTE-ST
200	78 5111	RECYCLING	METHANE PRODUCTION FROM ANAEROBIC FERMENTATION OF BEEF MANURE KEYWORDS. CATTLE-WASTES R
500	77 5123	RECYCLING	POLLUTION CONTROL FOR AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES ANIMAL-WASTES WASTE-TRE
100	78 5124	RECYCLING	BROILER GROWERS WITH CATTLE CAN MAKE BEST USE OF LITTER KEYWORDS: POULTRY-LITTER RECYCL
400	78 5126	RECYCLING	FEED AND FERTILIZER VALUE OF BROILER LITTER VARIES KEYWORDS: POULTRY-LITTER RECYCLING W
200	78 5127	RECYCLING	ALTERNATE MANURE RECYCLING SYSTEMS FOR ENERGY RECOVERY KEYWORDS: RECYCLING GAS-PRODUCTI
300	78 5130	RECYCLING	ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUES INTO BIOGAS KEYWORDS. ANAEROBIC DIGESTE
100	77 5138	RECYCLING	AGRICULTURAL AND FORESTRY WASTES AS AN ENERGY RESOURCE KEYWORDS: AGRICULTURAL-WASTES FO
300	78 5142	RECYCLING	THE FEASIBILITY OF METHANE PRODUCTION FROM DAIRY ANIMAL WASTES: THE FARMER S PERSPECTI
100	78 5148	RECYCLING	EARTHEN PITS FOR MANURE AND RECYCLED FLUSH-WATER STORAGE KEYWORDS: WASTE-STORAGE EARTHE
300	78 5152	RECYCLING	METHANE PRODUCTION FROM LIVESTOCK WASTE KEYWORDS: RECYCLING LIVESTOCK-WASTES POULTRY-WA
400	78 5166	RECYCLING	PREPARING BROILER HOUSE WHEN USING OLD LITTER KEYWORDS: POULTRY-LITTER RECYCLING ANIMAL
100	73 5184	RECYCLING	EQUIPMENT AND METHODS FOR THE SOLID LIQUID SEPARATION OF SLURRIES KEYWORDS: SLURRIES SE
400	78 5189	RECYCLING	FEEDLOT MANURE KEEPS HOME FIRES BURNING KEYWORDS: RECYCLING THERMOMETICS METHANE REFEED
400	78 5190	RECYCLING	METHANE FROM WASTE KEYWORDS: METHANE RECYCLING REFEEDING ECONOMICS

400	73 5192	RECYCLING	AN ALGAL REGENERATIVE SYSTEM FOR SINGLE-FAMILY FARMS AND VILLAGES KEYWORDS: RECYCLING A
600	78 5196	RECYCLING	METHANE FROM MANURE: FACT OR FANTASY KEYWORDS: METHANE ANAEROBIC-DIGESTION RECYCLING L
500	77 5197	RECYCLING	PARTICULATE AND ODOR CONTROL IN THE ORGANIC FERTILIZER INDUSTRY: A CASE HISTORY KEYWOR
400	78 5211	RECYCLING	HOLDING POND AND FLUSH GUTTERS KEYWORDS: CATTLE-WASTES FLUSHING WASTE-STORAGE RECYCLING
400	78 5224	RECYCLING	SMALL FARM ENERGY PROJECT KEYWORDS: RECYCLING BIOGAS METHANE REFEEDING ANAEROBIC DIGEST
300	77 5226	RECYCLING	METHANE GENERATION FROM HUMAN, ANIMAL, AND AGRICULTURAL WASTES KEYWORDS: RECYCLING METH
500	77 5265	RECYCLING	ANIMAL WASTES KEYWORDS: FEEDLOTS DESIGN EFFLUENTS GASES ODOR ANIMAL-WASTES WASTE-STORAG
500	77 5285	RECYCLING	COMPOSTING OF FEEDLOT WASTES KEYWORDS: COMPOSTING FEEDLOTS LIVESTOCK-WASTES WINDROWS CO
500	77 5287	RECYCLING	ENERGY RECOVERY FROM ANIMAL WASTES-ANAEROBIC DIGESTION, PYROLYSIS, HYDROGENATION KEYWOR
500	77 5296	RECYCLING	FEEDLOT WASTE MANAGEMENT IN HUNGARY KEYWORDS: WATER-POLLUTION LEGAL-ASPECTS FEEDLOTS SW
500	77 5297	RECYCLING	FEEDLOT WASTE MANAGEMENT IN THE SOVIET UNION KEYWORDS: FEEDLOTS WASTE-MANAGEMENT FERTIL
500	77 5301	RECYCLING	FEEDLOT WASTE MANAGEMENT IN CZECHOSLOVAKIA KEYWORDS: FEEDLOTS LIQUID-WASTES LAND-APPLIC
400	78 5302	RECYCLING	BIOCONVERSION NO PANACEA AS DISPOSAL ALTERNATIVE KEYWORDS: BIOGAS METHANE ECONOMICS REC
400	78 5305	RECYCLING	COLORADO BIOGAS PLANT WINS ACEC TOP PRIZE KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING BI
100	78 5308	RECYCLING	DISTRIBUTION OF ENTEROBACTERIACEAE IN RECYCLED MANURE BEDDING ON CALIFORNIA DAIRIES KEY
400	78 5312	RECYCLING	AGRICULTURAL WASTES IN FISH FARMING KEYWORDS: SWINE-WASTES CATTLE-WASTES POULTRY-WASTES
400	78 4674	REFEEDING	ARIZONA RECYCLING TRIAL ENDS SUCCESSFULLY KEYWORDS: REFEEDING CORRAL-INDUSTRIES CATTLE-
400	78 4680	REFEEDING	FUNGASTATIC FEED ADDITIVES IMPROVE LITTER RESULTS KEYWORDS: FEED-ADDITIVES FUNGICIDES L
400	78 4682	REFEEDING	POULTRY WASTES PROVIDE NITROGEN SOURCE KEYWORDS: REFEEDING POULTRY-WASTES DAIRY-CATTLE
400	78 4692	REFEEDING	LET THEM EAT WASTE KEYWORDS: REFEEDING SWINE-WASTES SWINE ANIMAL-HEALTH LEGAL-ASPECTS D
400	78 4699	REFEEDING	FEEDING FEEDLOT WASTE TO CATTLE KEYWORDS: REFEEDING FEEDLOT-WASTES CATTLE HARVESTING EN
200	77 4765	REFEEDING	MICROALGAE AS A MEANS OF RECYCLING ANIMAL WASTES KEYWORDS: RECYCLING WASTE-TREATMENT SW
400	77 4790	REFEEDING	THE VALUE OF DRIED POULTRY WASTE AS A FEEDSTUFF IN BROILER DIETS KEYWORDS: REFEEDING P
400	77 4791	REFEEDING	RECYCLED POULTRY WASTES OFFER MORE POTENTIAL TO COW-CALF OPERATORS KEYWORDS: REFEEDING
400	77 4793	REFEEDING	ANIMAL WASTE FEEDING GUIDES SET FOR STATES KEYWORDS: REFEEDING ANIMAL-WASTES-PROCESSED
700	76 4805	REFEEDING	DESIGN AND DEVELOPMENT OF A SEPARATOR FOR BOVINE MANURE KEYWORDS: SEPARATION-TECHNIQUES
100	77 4815	REFEEDING	NITROGEN UTILIZATION BY LAMBS FED WHEAT STRAW ALONE OR WITH SUPPLEMENTS CONTAINING DRIE
400	78 4833	REFEEDING	RECYCLING TAKES EXTRA MANAGEMENT KEYWORDS: LIVESTOCK-WASTE POULTRY-WASTES REFEEDING ANI
400	78 4834	REFEEDING	BROILER LITTER IMPROVED GAIN DURING WINTER, STUDY SAYS KEYWORDS: POULTRY-LITTER REFEEDI
400	78 4839	REFEEDING	MISSISSIPPI APPROVES SALE OF POULTRY WASTE FEED KEYWORDS: POULTRY-WASTES-DRIED REFEEDIN
100	78 4842	REFEEDING	COMPARATIVE VALUE OF ENSILED CATTLE WASTE FOR LAMBS AND GROWING-FINISHING CATTLE KEYWOR
100	72 4844	REFEEDING	UTILIZATION OF COW-MANURE, HATCHERY-WASTE AND PARTLY DRIED MOLASSES IN POULTRY FEEDS K
400	77 4847	REFEEDING	YOU MAY FIND PROFITS IN WASTE FEEDS KEYWORDS: FEEDS FOOD-PROCESSING-WASTES BREWERY-WAST
400	78 4849	REFEEDING	STATE-BASED PLANT TURNING CATTLE MANURE INTO METHANE GAS KEYWORDS: CATTLE-WASTES RECYCL
100	78 4858	REFEEDING	HORMONAL ACTIVITY IN POULTRY EXCRETA PROCESSED FOR LIVESTOCK FEED KEYWORDS: POULTRY-WAS
300	76 4859	REFEEDING	ENERGY RELATIONSHIPS FOR A 32-ACRE IOWA FARM--AN ATTEMPT TO INCREASE PRODUCTION OF GRAI
100	78 4876	REFEEDING	EFFECTS OF LIQUID FRACTION PRESSED FROM DAIRY CATTLE EXCRETA (LE) IN LAMB DIETS KEYWORD
100	78 4877	REFEEDING	FERMENTATION AND UTILIZATION OF BROILER LITTER ENSILED AT DIFFERENT MOISTURE LEVELS KEY
100	78 4878	REFEEDING	ANIMAL PERFORMANCE AND MICROBIAL ADAPTATION OF RUMINANTS FED FORMALDEHYDE TREATED POULT
100	78 4879	REFEEDING	LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF I. INFLUENCE OF PRACTICAL EXTREMES IN DIET, W
100	78 4880	REFEEDING	LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF II. PRESERVATION AND ACCEPTABILITY OF WET EXC
700	74 4885	REFEEDING	A NUTRITIONAL EVALUATION OF RECYCLED SWINE WASTE KEYWORDS: REFEEDING SWINE-WASTES SWINE
400	78 4886	REFEEDING	PRORICH CASHES IN ON FEED MARKET WITH DPW KEYWORDS: POULTRY-WASTES-DRIED REFEEDING PRORI
700	77 4888	REFEEDING	COMPOSITION AND DIGESTIBILITY OF UNTREATED AND SODIUM HYDROXIDE TREATED FECAL WASTE FRO
100	78 4889	REFEEDING	REPLACEMENT OF GROUNDNUT CAKE BY DRIED POULTRY MANURE IN THE DIETS OF LAYING HENS ,KEYW
100	78 4890	REFEEDING	UTILISATION OF DRIED POULTRY MANURE BY GROWING CHICKENS FED ON A PRACTICAL DIET KEYWORD
500	77 4907	REFEEDING	FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS: MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP
100	78 4911	REFEEDING	EFFECTS OF RUMEN CONTENTS OR FRACTIONS THEREOF ON PERFORMANCE OF BROILERS KEYWORDS: RUM
300	77 4913	REFEEDING	WASTE AS A FEED EXTENDER KEYWORDS: REFEEDING DIGESTIBILTIY CATTLE PERFORMANCE WASTE-REC
200	76 4918	REFEEDING	FEEDING POULTRY WASTE TO RUMINANTS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE PROT
300	77 4923	REFEEDING	POULTRY EXCRETA DEHYDRATION AND UTILIZATION-SYSTEM DEVELOPMENT AND DEMONSTRATION KEYWOR
300	77 4924	REFEEDING	POULTRY WASTE MANAGEMENT ALTERNATIVES-A DESIGN AND APPLICATION MANUAL KEYWORDS: POULTRY
100	75 4932	REFEEDING	UTILISATION OF RATIONS CONTAINING POULTRY MANURE AS A PROTEIN KEYWORDS: SHEEP REFEEDING
400	77 4933	REFEEDING	PROCESS MANURE FOR REFEEDING KEYWORDS: REFEEDING ANIMAL-WASTES ENSILING CHEMICAL-TREATM
400	78 4935	REFEEDING	KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA KEYWORDS: KAPLAN FEEDLOTS RECYCLING REFEEDING MET
300	78 4940	REFEEDING	COST EFFICIENCIES OF LARGE-SCALE INTEGRATED DAIRY PRODUCTION AND WASTE MANAGEMENT SYSTE
400	78 4941	REFEEDING	DRIED POULTRY MANURE BENEFITS DAIRY COWS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTL
200	78 4947	REFEEDING	METHANE AND BIOMASS PRODUCTION SYSTEMS FOR BEEF CATTLE MANURE KEYWORDS: LIVESTOCK-WASTE
100	75 4948	REFEEDING	VOLUNTARY INTAKE AND NUTRITIVE VALUE OF SILAGE MADE OF POULTRY DROPPINGS AND GREEN MAIZ
200	76 4962	REFEEDING	FEEDING POULTRY WASTE TO RUMINANTS KEYWORDS: POULTRY-WASTES REFEEDING RUMINANTS POULTRY
100	75 4963	REFEEDING	THE USE OF DRIED POULTRY WASTES AS FEEDINGSTUFFS KEYWORDS: POULTRY-WASTES-DRIED REFEEDI
500	76 4965	REFEEDING	THE LAMAR BIO-CONVERSION PLANT DESIGN KEYWORDS: BIO-CONVERSION ANAEROBIC-DIGESTION CATT
100	76 4968	REFEEDING	LAYERS IMPROVE WITH DPW KEYWORDS: REFEEDING POULTRY POULTRY-WASTES-DRIED PERFORMANCE EG
400	72 4992	REFEEDING	IOWA BEEF TESTS SHOW PROFIT FOR FEEDING DITCH EFFLUENT KEYWORDS: OXIDATION-DITCH EFFLUE
100	77 5008	REFEEDING	RECYCLING OXIDATION DITCH MIXED LIQUOR TO LAYING HENS KEYWORDS: REFEEDING OXIDATION-DIT
100	77 5016	REFEEDING	PROTEIN PRODUCTION FROM FEEDLOT WASTE KEYWORDS: FEEDLOTS CATTLE-WASTES REFEEDING SUBSTR
100	76 5030	REFEEDING	GROWTH PERFORMANCE OF BROILERS FED VARIOUS POULTRY WASTES KEYWORDS: REFEEDING POULTRY-W
100	77 5031	REFEEDING	BARK BROILER LITTER AS A PUTENTIAL FEEDSTUFF FOR RUMINANTS KEYWORDS: POULTRY-LITTER RE
100	78 5039	REFEEDING	NUTRITIONAL QUALITY OF PROCESSED POULTRY WASTE FOR BROILERS KEYWORDS: POULTRY-WASTES-DR
100	78 5040	REFEEDING	NUTRITIONAL EVALUATION OF A SINGLE CELL PROTEIN FROM POULTRY MANURE KEYWORDS: REFEEDING
100	78 5042	REFEEDING	EFFECT OF FEEDING RAW AND COOKED SOYBEANS AND KIDNEY BEANS AND DRIED POULTRY WASTE IN
300	77 5048	REFEEDING	MANURE REFEEDING TO BEEF CATTLE KEYWORDS: CATTLE-WASTES REFEEDING CATTLE PERFORMANCE
300	77 5049	REFEEDING	REFEEDING WASTES TO DAIRY CATTLE KEYWORDS: DAIRY-WASTES SEPARATION TECHNIQUES DEHYDRATI
100	78 5051	REFEEDING	AN ATTEMPT TO MECHANIZE NUTRIENT RECOVERY FROM ANIMAL EXCRETA KEYWORDS: POULTRY-WASTES
100	77 5061	REFEEDING	CHARACTERISTICS OF AEROBIC, SOLID SUBSTRATE FERMENTATION OF SWINE WASTE-CORN MIXTURES K
100	77 5062	REFEEDING	FERMENTATION OF SWINE WASTE-CORN MIXTURES FOR ANIMAL FEED: PILOT-PLANT STUDIES KEYWORD
200	76 5068	REFEEDING	PROCEEDINGS OF SYMPOSIUM ON THE CONVERSION OF POULTRY WASTE TO ENERGY, FEED, OR FERTILI
200	76 5069	REFEEDING	ENSILING POULTRY LITTER AND SUBSEQUENT FEEDING KEYWORDS: POULTRY-WASTES ENSILING REFEED
200	76 5071	REFEEDING	SIGNIFICANCE OF HEAVY METALS IN DPW FOR FEEDING KEYWORDS: REFEEDING POULTRY-WASTES-DRIE
200	76 5074	REFEEDING	POULTRY MANURE FED TO LAMBS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED SHEEP CRUDE-PROTEI
300	78 5079	REFEEDING	FEEDING ANIMAL WASTE KEYWORDS: REFEEDING SAFETY ANIMAL-HEALTH PUBLIC-HEALTH COPPER-TOXI
100	77 5096	REFEEDING	DRIED POULTRY MANURE AS A SOURCE OF PHOSPHORUS FOR SHEEP KEYWORDS: REFEEDING POULTRY-WA
200	78 5100	REFEEDING	RECYCLING SWINE WASTE IN A GROWING-FINISHING RATION KEYWORDS: REFEEDING SWINE-WASTES SW
200	78 5101	REFEEDING	ANAEROBIC FERMENTATION OF MANURE INTO SINGLE CELL PROTEIN KEYWORDS: REFEEDING FEEDLOT-W
100	77 5121	REFEEDING	POULTRY WASTES IN THE DIET OF ISRAELI CARP KEYWORDS: REFEEDING POULTRY-WASTES FISH PERF
100	78 5124	REFEEDING	BROILER GROWERS WITH CATTLE CAN MAKE BEST USE OF LITTER KEYWORDS: POULTRY-LITTER RECYCL
400	78 5126	REFEEDING	FEED AND FERTILIZER VALUE OF BROILER LITTER VARIES KEYWORDS: POULTRY-LITTER RECYCLING W
400	78 5143	REFEEDING	FEEDING CATTLE WASTE MAKES SENSE: CANADIANS KEYWORDS: REFEEDING CATTLE-WASTES PERFORMA
400	78 5146	REFEEDING	CATTLE FURNISH CHEAP SWINE FEED KEYWORDS: REFEEDING CATTLE-WASTES SWINE ECONOMICS
400	78 5147	REFEEDING	CATTLE MILKED WELL AND GAINED ON RATIONS CONTAINING MANURE KEYWORDS: REFEEDING CATTLE-
300	78 5152	REFEEDING	METHANE PRODUCTION FROM LIVESTOCK WASTE KEYWORDS: RECYCLING LIVESTOCK-WASTES POULTRY-WA
400	78 5161	REFEEDING	ANOTHER POSITIVE STEP IN RECYCLING KEYWORDS: SALT GROUNDWATER-POLLUTION DAIRY-WASTES OE
400	78 5168	REFEEDING	RECYCLED SWINE WASTE FED IN GROWING-FINISHING DIET KEYWORDS: SWINE-WASTES REFEEDING SWI
300	78 5172	REFEEDING	SWINE WASTES AS A NUTRIENT SOURCE IN GROWING-FINISHING SWINE RATIONS KEYWORDS: SWINE-WA
100	77 5181	REFEEDING	THERMOPHILIC FERMENTATION OF PIG FAECES AND STRAW BY ACTINOMYCETES KEYWORDS: WASTE-TREA
400	78 5185	REFEEDING	POULTRY MANURE AS FEED KEYWORDS: REFEEDING POULTRY-WASTES SWINE PERFORMANCE NITROGEN TO
400	78 5189	REFEEDING	FEEDLOT MANURE KEEPS HOME FIRES BURNING KEYWORDS: RECYCLING THERMONETICS METHANE REFEED
400	78 5190	REFEEDING	METHANE FROM WASTE KEYWORDS: METHANE RECYCLING REFEEDING ECONOMICS
300	78 5202	REFEEDING	FERMENTATION AND DIGESTIBILITY OF BROILER LITTER ENSILED AT DIFFERENT MOISTURE LEVELS B
300	78 5203	REFEEDING	ENSILED CORN FORAGE AND BROILER LITTER FOR FINISHING HEIFERS KEYWORDS: SILAGES ENSILING

300	78	5204	REFEEDING ENSILING CHARACTERISTICS AND UTILIZATION BY SWINE OF ENSILED SWINE WASTE AND GROUND COR
400	78	5217	REFEEDING DPW PROVIDES NITROGEN FOR COWS KEYWORDS: REFEEDING POULTRY-WASTES-DRIED CATTLE PERFORMA
400	78	5224	REFEEDING SMALL FARM ENERGY PROJECT KEYWORDS: RECYCLING BIOGAS METHANE REFEEDING ANAEROBIC DIGEST
500	76	5225	REFEEDING THE UPGRADING OF AGRICULTURAL WASTES BY THERMOPHILIC FUNGI KEYWORDS: WASTE-TREATMENT T
400	78	5228	REFEEDING AUSTRALIANS UTILIZE FARM WASTE TO PRODUCE EDIBLE PROTEIN PRODUCTS KEYWORDS: SWINE-WASTE
300	78	5229	REFEEDING ANALYSIS OF STATE LAWS AND REGULATIONS IMPACTING ANIMAL WASTE MANAGEMENT KEYWORDS: LEGA
100	78	5233	REFEEDING COMBINED EFFECTS OF SCREENED MANURE SOLIDS AND CRUDE FIBER IN RATIONS OF LACTATING COW
100	77	5261	REFEEDING A NOTE ON THE FERMENTATIVE CHANGES OF DIETS PREPARED WEEKLY WITH MANURE SILAGE AND FINA
100	78	5264	REFEEDING WET POULTRY WASTE MAKES BETTER FEED KEYWORDS: POULTRY-WASTES REFEEDING SHEEP NITROGEN D
500	77	5265	REFEEDING ANIMAL WASTES KEYWORDS: FEEDLOTS DESIGN EFFLUENTS GASES ODOR ANIMAL-WASTES WASTE-STORAG
500	77	5275	REFEEDING HEALTH EFFECTS FROM WASTE UTILIZATION KEYWORDS: PUBLIC-HEALTH ANIMAL-HEALTH REFEEDING L
500	77	5288	REFEEDING UTILIZATION OF LIVESTOCK WASTES AS FEED AND OTHER DIETARY PRODUCTS KEYWORDS: REFEEDING
500	77	5297	REFEEDING FEEDLOT WASTE MANAGEMENT IN THE SOVIET UNION KEYWORDS: FEEDLOTS WASTE-MANAGEMENT FERTIL
500	77	5301	REFEEDING FEEDLOT WASTE MANAGEMENT IN CZECHOSLOVAKIA KEYWORDS: FEEDLOTS LIQUID-WASTES LAND-APPLIC
400	78	5305	REFEEDING COLORADO BIOGAS PLANT WINS ACEC TOP PRIZE KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING BI
100	78	5309	REFEEDING UTILIZATION OF SWINE MANURE IN A POLYCULTURE OF ASIAN AND NORTH AMERICAN FISHES KEYWORD
100	77	5313	REFEEDING CATTLE MANURE AND FINAL MOLASSES SILAGE IN CHICKEN FATTENING I. HIGH SUBSTITUTION LEVE
400	78	4910	RESIDUES SULFA RESIDUES IN SWINE STILL A PROBLEM KEYWORDS: SWINE-SULFA RESIDUES WITHDRAWAL-PERIO
100	77	4949	RESIDUES RESIDUE CONTENT OF BEEF FEEDLOT MANURE *AFTER FEEDING DIETHYLSTILBESTROL, CHLORTETRACYCL*
100	77	5007	RESIDUES RETENTION AND EXCRETION OF POLYCHLORINATED BIPHENYL RESIDUES BY LAYING HENS KEYWORDS: P
100	77	5022	RESPIRATION RECOVERY AND REACTIONS OF AMPROLIUM FROM POULTRY MANURE ADDED TO SOIL KEYWORDS: POULTRY
200	77	4773	RETENTION-TIME SOME MECHANICAL ASPECTS OF ANAEROBIC DIGESTION OF BEEF MANURE KEYWORDS: ANAEROBIC-DIGES
100	77	5137	ROCKPHOSPHATE EFFECT OF SULPHUR AND FYM APPLICATION ON THE EFFICIENCY OF ROCK PHOSPHATE FOR WHEAT KE
100	77	4949	RONNEL RESIDUE CONTENT OF BEEF FEEDLOT MANURE AFTER FEEDING DIETHYLSTILBESTROL, CHLORTETRACYCL
100	78	5158	ROOFS DESIGN OF LIQUID MANURE TANK ROOF SLABS KEYWORDS: LIQUID-WASTES MANURE-TANKS DESIGN ROO
100	78	4929	ROTATING-FLIGHTED- A ROTATING FLIGHTED CYLINDER FOR BIOLOGICAL WASTE TREATMENT KEYWORDS: ROTATING-FLIGHTED
700	77	4888	ROUGHAGE COMPOSITION AND DIGESTIBILITY OF UNTREATED AND SODIUM HYDROXIDE TREATED FECAL WASTE FRO
100	77	4914	ROUGHAGE-CONTENT EFFECTS OF RATION ROUGHAGE CONTENT ON VISCOSITY AND THEORETICAL HEAD LOSSES IN PIPE FLO
100	78	4911	RUMEN-CONTENTS EFFECTS OF RUMEN CONTENTS OR FRACTIONS THEREOF ON PERFORMANCE OF BROILERS KEYWORDS: RUM
100	77	4993	RUMEN-LIQUOR BIOGASIFICATION USING NAOH TREATED PIG FAECES KEYWORDS: LIQUID-WASTES SWINE-WASTES CHEM
200	76	4962	RUMINANTS FEEDING POULTRY WASTE TO RUMINANTS KEYWORDS: POULTRY-WASTES REFEEDING RUMINANTS POULTRY
100	75	4963	RUMINANTS *THE USE OF DRIED POULTRY WASTES AS FEEDINGSTUFFS* KEYWORDS: POULTRY-WASTES-DRIED REFEEDI
100	77	5031	RUMINANTS BARK BROILER LITTER AS A POTENTIAL FEEDSTUFF FOR RUMINANTS KEYWORDS: POULTRY-LITTER RE
400	77	4672	RUNOFF-CONTROL CONTROL RUNOFF FROM OPEN LIVESTOCK FEEDLOTS KEYWORDS: AGRICULTURAL-RUNOFF RUNOFF-CONTRO
200	77	4771	RUNOFF-CONTROL MODELING-THE EFFECT OF MANAGEMENT POLICIES ON CATTLE FEEDLOT POLLUTION CONTROL COSTS KE
200	77	4811	RUNOFF-CONTROL SIZING COMPONENTS ON OPEN FEEDLOT RUNOFF CONTROL SYSTEMS KEYWORDS: COMPUTER-MODELS FEED
400	78	4829	RUNOFF-CONTROL RUNOFF CONTROL KEYWORDS: FEEDLOT-RUNOFF RUNOFF-CONTROL DESIGN DEBRIS-BASINS LOCATION HO
100	78	4930	RUNOFF-CONTROL MODELING THE EFFECT OF MANAGEMENT POLICIES ON CATTLE FEEDLOT POLLUTION CONTROL COSTS KE
200	78	5114	RUNOFF-CONTROL OPTIMIZATION OF RUNOFF DETENTION FOR NONPOINT POLLUTION CONTROL KEYWORDS: NONPOINT-SOUR
600	75	5150	RUNOFF-CONTROL FEEDLOT RUNOFF CONTROL FROM POINT NON-POINT SOURCES KEYWORDS: LEGAL-ASPECTS NPDES AGRIC
400	78	5092	RURAL-CLEAN-WATER- FEDERAL FUNDS AVAILABLE TO SOLVE WATER POLLUTION KEYWORDS: WATER-POLLUTION LEGAL-ASPECT
400	78	4671	SAFETY LIQUID MANURE GAS MAY POSE DANGER KEYWORDS: AIR-POLLUTION SAFETY LIQUID-WASTES HYDROGEN
200	71	4762	SAFETY SAFETY HAZARDS ASSOCIATED WITH LIVESTOCK WASTE KEYWORDS: FEEDLOTS ACCIDENTS MANAGEMENT
400	78	4909	SAFETY LIQUID MANURE CAN RELEASE DEADLY GASES KEYWORDS: LIQUID-WASTES GASES TOXICITY SAFETY
400	78	5011	SAFETY TOXIC GASES KILL WORKER KEYWORDS: AIR-POLLUTION PUBLIC-HEALTH CONFINEMENT-PENS CATTLE>W
300	78	5079	SAFETY FEEDING ANIMAL WASTE KEYWORDS: REFEEDING SAFETY ANIMAL-HEALTH PUBLIC-HEALTH COPPER-TOXI
300	78	5139	SAFETY DEATH IN A FARM WORKER ASSOCIATED WITH TOXIC GASES FROM A LIQUID MANURE SYSTEM - WISCON
400	78	5212	SAFETY WARNING-MANURE GASES ARE DANGEROUS KEYWORDS: GASES HYDROGEN-SULFIDE METHANE CARBON-DIOX
500	77	5288	SAFETY UTILIZATION OF LIVESTOCK WASTES AS FEED AND OTHER DIETARY PRODUCTS KEYWORDS: REFEEDING
200	76	4722	SALINITY HEAVY APPLICATION OF LIQUID MANURE ON SOIL-EFFECT ON SOIL SALINITY KEYWORDS: LIQUID-WAS
700	76	4921	SALINITY EFFECT OF BEEF CATTLE MANURE ON SOIL PROPERTIES AND CROP GROWTH KEYWORDS: CATTLE-WASTES
100	78	5052	SALINITY QUALITY VARIATION OF STORED FEEDLOT RUNOFF KEYWORDS: FEEDLOT-WASTES WASTE-STORAGE FEEDL
400	78	5209	SALINITY SALT BUILDUP CAUSES LAGOON FAILURE KEYWORDS: LAGOONS DAIRY-WASTES ANAEROBIC ELECTRICAL-
100	76	5232	SALINITY EFFECT OF AMENDMENTS TO SAND TO INCREASE THE MOISTURE LEVEL FOR THE GROWTH OF BAJRA PE
100	72	4696	SALMONELLA DISEASE HAZARD OF PATHOGENIC ORGANISMS IN FARM WASTE MATERIAL KEYWORDS: SLURRIES PATHOG
200	76	4730	SALMONELLA A STUDY OF THE EFFECTS OF ANIMAL EFFLUENT UTILISATION FOR GRASSLAND PRODUCTION ON LEVEL
200	76	4743	SALMONELLA MICROBIOLOGICAL ANALYSIS OF ANIMAL MANURES WITH PARTICULAR REFERENCE TO THE ISOLATION
100	77	4746	SALMONELLA BACTERIOLOGICAL INVESTIGATION OF ALBERTA MEAT-PACKING PLANT WASTES WITH EMPHASIS ON SAL
100	72	4799	SALMONELLA STUDIES ON THE SURVIVAL OF SALMONELLA TYPHIMURIUM AND SALMONELLA BOVIS-MORBIFICANS ON S
200	72	4818	SALMONELLA THE FATE OF ENTERIC BACTERIA DURING STORAGE AND DISPOSAL OF ANIMAL EXCRETA KEYWORDS: PA
300	78	5176	SALMONELLA SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
300	78	5183	SALMONELLA SPECIFIC COMPOSITION OF REPRESENTATIVE FEEDLOT WASTES: A CHEMICAL AND MICROBIAL PROFILE
300	78	5201	SALMONELLA CHANGES IN CHARACTERISTICS OF DEEP STACKED BROILER LITTER WITH TIME KEYWORDS: POULTRY-L
200	71	4788	SALMONELLOSIS SALMONELLA AND OTHER MICROORGANISMS POSE A NEW PARAMETER TO DESIGNERS OF POULTRY HOUSES
200	77	4807	SALTS BACTERIAL RESPONSE TO SALTS IN AN ANAEROBIC DAIRY LAGOON KEYWORDS: DAIRY-WASTES LAGOONS
200	77	4809	SALTS WASTEWATER REUSE LAGOON SYSTEMS FOR SWINE KEYWORDS: SWINE-WASTES LAGOONS FLUSHING WASTE
500	77	4907	SALTS FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS: MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP
300	77	4915	SALTS CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE KEYWORDS: LIQUID-WASTES DAIRY-WA
300	77	4937	SALTS ANIMAL WASTE MANAGEMENT AND OUR WATER QUALITY KEYWORDS: WATER-POLLUTION GROUNDWATER-POL
100	78	5171	SALTS EFFECTS OF LIQUID SWINE WASTE APPLICATIONS ON CORN YIELD AND SOIL CHEMICAL COMPOSITION
700	77	5182	SALTS SOME PHYSICAL, CHEMICAL, AND BIOLOGICAL EFFECTS OF HEAVY POULTRY MANURE APPLICATIONS ON
300	77	5205	SALTS *RESEARCH IN ANIMAL WASTE MANAGEMENT KEYWORDS: SWINE-WASTES DIGESTERS METHANE AGITATION*
400	78	5220	SALTS BACTERIA CONTENT SOLVES LAGOON PROBLEMS KEYWORDS: LAGOONS ANAEROBIC BACTERIA SALTS HEAV
400	78	5161	SALT ANOTHER POSITIVE STEP IN RECYCLING KEYWORDS: SALT GROUNDWATER-POLLUTION DAIRY-WASTES DE
400	78	5207	SALT-BURN YOU CAN PUT LIQUID MANURE ON YOUR ALFALFA KEYWORDS: LIQUID-WASTES DAIRY-WASTES LAND-APP
200	77	4867	SAMPLING THREE YEARS OF EVALUATING A MIDWEST ANAEROBIC DAIRY LAGOON KEYWORDS: DAIRY-WASTES ANAE
200	78	5113	SAMPLING-METHODS METHODOLOGIES AND PRELIMINARY RESULTS FOR EVALUATING SWINE DRYLOT RUNOFF IMPACT ON COA
200	76	4741	SAMPLING-TECHNIQUE PROPOSITIONS ON THE HARMONISATION OF CHEMICAL METHODS OF SOILS ANALYSIS IN THE EEC COMM
200	76	4742	SAMPLING-TECHNIQUE HARMONISATION OF METHODS FOR SAMPLING AND FOR CHEMICAL AND PHYSICAL ANALYSIS KEYWORDS:
200	76	4719	SATURATION-EXTRACT SOIL, WATER, PLANT RELATIONSHIP AS INFLUENCED BY INTENSIVE USE OF EFFLUENTS FROM LIVES
400	74	4988	SCRAPING PIGGERY UNDER-SLAT SCRAPER SYSTEM KEYWORDS: SWINE-WASTES CONFINEMENT HOUSING SLURRIES W
400	78	5001	SCRAPING SCRAPING AWAY WASTE KEYWORDS: CATTLE-WASTES FEEDLOTS DESIGN SCRAPING STORAGE-PIT LAND-A
300	77	5034	SCREENING A METHOD OF MANURE DISPOSAL FOR A BEEF PACKING OPERATION-- FIRST INTERIM TECHNICAL REP
400	78	5147	SCREENING CATTLE MILKED WELL AND GAINED ON RATIONS CONTAINING MANURE KEYWORDS: REFEEDING CATTLE-
300	77	5205	SCREENING RESEARCH IN ANIMAL WASTE MANAGEMENT KEYWORDS: SWINE-WASTES DIGESTERS METHANE AGITATION
500	77	5281	SCREENS SOLIDS SEPARATION AND DEWATERING KEYWORDS: SEPARATION-TECHNIQUES CENTRIFUGAL-SEPARATORS
200	74	5017	SCREEN-SEPARATORS MECHANICAL LIQUID-SOLID SEPARATION OF BEEF, DAIRY AND SWINE WASTE SLURRIES KEYWORDS: SE
100	78	4876	SCREW-PRESS EFFECTS OF LIQUID FRACTION PRESSED FROM DAIRY CATTLE EXCRETA (LE) IN LAMB DIETS KEYWORD
500	77	5197	SCRUBBING PARTICULATE AND ODOR CONTROL IN THE ORGANIC FERTILIZER INDUSTRY: A CASE HISTORY KEYWOR
200	77	5237	SEALING THE CONCENTRATION OF LIQUID MANURE AFFECTS ITS INFILTRATION INTO SOIL KEYWORDS: LIQUID-
400	73	5192	SEDIMENTATION AN ALGAL REGENERATIVE SYSTEM FOR SINGLE-FAMILY FARMS AND VILLAGES KEYWORDS: RECYCLING A
300	77	5205	SEDIMENTATION RESEARCH IN ANIMAL WASTE MANAGEMENT KEYWORDS: SWINE-WASTES DIGESTERS METHANE AGITATION
500	77	5281	SEDIMENTATION SOLIDS SEPARATION AND DEWATERING KEYWORDS: SEPARATION-TECHNIQUES CENTRIFUGAL-SEPARATORS
300	74	4700	SEDIMENTS QUANTIFICATION OF POLLUTANTS IN AGRICULTURAL RUNOFF KEYWORDS: AGRICULTURAL-RUNOFF EROSI
700	76	4804	SEDIMENTS DIFFUSE AGRICULTURAL POLLUTION--THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS KEYWORDS
300	77	4683	SEDIMENT PRELIMINARY IDENTIFICATION OF LITERATURE MODELS AND DATA FOR EVALUATING RURAL NONPOINT
300	77	4927	SEDIMENT AGRICULTURE RUNOFF MANAGEMENT (ARM) MODEL: VERSION II REFINEMENT AND TESTING KEYWORDS
100	78	5178	SEDIMENT NONPOINT SOURCES: STATE-OF-THE-ART OVERVIEW KEYWORDS: NONPOINT-SOURCES WATER-POLLUTION
200	78	5227	SEDIMENT BARNYARD SEDIMENT AND NUTRIENT REMOVAL BY GRASS FILTERS KEYWORDS: AGRICULTURAL-RUNOFF S
100	76	4863	SEEDLING-EMERGENCE REDUCTION OF CRUST IMPEDANCE TO SIMULATED SEEDLING EMERGENCE BY THE ADDITION OF MANURE

100	4997	SEEPAGE	MOVEMENT OF NITRATES AND OTHER DISSOLVED SALTS FROM A FISHPOND INTO LAKE KINNERET KEYWO
100 78	5057	SEINING	EFFLUENTS FROM CATFISH PONDS DURING FISH HARVEST KEYWORDS; FISH-FARMING EFFLUENT-QUALIT
200 77	4794	SEMI-CONFINEMENT	ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS KEYWORDS: CATTLE MANAGEMENT PAST
300 77	5049	SEPARATION	REFEEDING WASTES TO DAIRY CATTLE KEYWORDS; DAIRY-WASTES SEPARATION TECHNIQUES DEHYDRATI
200 76	4711	SEPARATION-TECHNIQ	EFFICIENT RECYCLING OF NUTRIENTS KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES SH
200 76	4712	SEPARATION-TECHNIQ	THE AGRONOMIC UTILISATION OF PIG SLURRY-EFFECT ON FORAGE CROPS AND ON SOIL FERTILITY KE
200 76	4731	SEPARATION-TECHNIQ	THE EFFECTS OF SEPARATING SLURRY ON ITS STORAGE, HANDLING AND SPREADING ON LAND KEYWORD
200 74	4758	SEPARATION-TECHNIQ	HANDLING HOUSED BEEF CATTLE FEEDLOT MANURE KEYWORDS: DESIGN FEEDLOTS CATTLE WASTE-MANAG
200 77	4779	SEPARATION-TECHNIQ	FIBER WALL REACTOR DIGESTION OF DAIRY CATTLE MANURE KEYWORDS: DAIRY-WASTES ANAEROBIC-TR
700 76	4805	SEPARATION-TECHNIQ	DESIGN AND DEVELOPMENT OF A SEPARATOR FOR BOVINE MANURE KEYWORDS: SEPARATION-TECHNIQUES
100 78	4876	SEPARATION-TECHNIQ	EFFECTS OF LIQUID FRACTION PRESSED FROM DAIRY CATTLE EXCRETA (LE) IN LAMB DIETS KEYWORD
100 76	4891	SEPARATION-TECHNIQ	AN INTEGRATED SEPARATION, AEROBIC TREATMENT AND SLUDGE DE-WATERING SYSTEM FOR PIG SLURR
200 77	4896	SEPARATION-TECHNIQ	DEWATERING A SWINE MANURE SLURRY BY EXPRESSION KEYWORDS: SEPARATION-TECHNIQUES SWINE-WA
100 78	4911	SEPARATION-TECHNIQ	EFFECTS OF RUMEN CONTENTS OR FRACTIONS THEREOF ON PERFORMANCE OF BROILERS KEYWORDS: RUM
600	4917	SEPARATION-TECHNIQ	THE CALORIFIC PROJECT I. BACKGROUND AND DESIGN CRITERIA KEYWORDS: RECYCLING CATTLE-WA
100 78	4929	SEPARATION-TECHNIQ	A ROTATING FLIGHTED CYLINDER FOR BIOLOGICAL WASTE TREATMENT KEYWORDS: ROTATING-FLIGHTED
200 74	5017	SEPARATION-TECHNIQ	MECHANICAL LIQUID-SOLID SEPARATION OF BEEF, DAIRY AND SWINE WASTE SLURRIES KEYWORDS: SE
300 77	5088	SEPARATION-TECHNIQ	FARM WASTE MANAGEMENT -- PIGS- 1. BIOLOGICAL FILTRATION TOWER -- TERRINGTON EHF REPORT
400 77	5099	SEPARATION-TECHNIQ	RESEARCH DAIRY STUDIES CONFINEMENT & WASTE REUSE KEYWORDS: DAIRY-WASTES SLURRIES SEPARA
100 73	5184	SEPARATION-TECHNIQ	EQUIPMENT AND METHODS FOR THE SOLID LIQUID SEPARATION OF SLURRIES KEYWORDS: SLURRIES SE
100 77	5247	SEPARATION-TECHNIQ	FRENCH EXPERIMENT IN PIG SLURRY DEODORIZATION KEYWORDS: ODOR-CONTROL SWINE-WASTES SLURR
100 77	5258	SEPARATION-TECHNIQ	INVESTIGATIONS IN THE U.K. INTO METHODS OF ODOUR CONTROL FOR FARMS KEYWORDS: ODOR-CONTR
500 77	5265	SEPARATION-TECHNIQ	ANIMAL WASTES KEYWORDS: FEEDLOTS DESIGN EFFLUENTS GASES ODOR ANIMAL-WASTES WASTE-STORAG
500 77	5281	SEPARATION-TECHNIQ	SOLIDS SEPARATION AND DEWATERING KEYWORDS: SEPARATION-TECHNIQUES CENTRIFUGAL-SEPARATORS
100 78	5308	SEPARATION-TECHNIQ	DISTRIBUTION OF ENTEROBACTERIACEAE IN RECYCLED MANURE BEDDING ON CALIFORNIA DAIRIES KEY
400 76	4999	SERPENTINE-TERRACE	VEGETATIVE FILTER SYSTEM CLEANS FEEDLOT RUNOFF KEYWORDS: FEEDLOT-RUNOFF WASTE-TREATMENT
400 78	5091	SERPENTINE-WATERWA	SERPENTINE SYSTEM IS THE SOLUTION KEYWORDS: SERPENTINE-WATERWAY FEEDLOT-RUNOFF WASTE-TR
100 78	5057	SETTLEABLE-SOLIDS	EFFLUENTS FROM CATFISH PONDS DURING FISH HARVEST KEYWORDS: FISH-FARMING EFFLUENT-QUALIT
100 75	5200	SETTLEMENT	AEROBIC TREATMENT OF FARM WASTES KEYWORDS: AEROBIC-TREATMENT ANIMAL-WASTES SETTLEMENT F
100 65	5133	SETTLEMENT-BANKS	BETTER DISPOSAL OF FARM WASTES KEYWORDS: FARM-WASTES LAND-APPLICATION IRRIGATION EQUIPM
100 78	4958	SETTLING	HARVESTING ALGAE FROM LAGOON EFFLUENT KEYWORDS: LAGOONS WASTE-TREATMENT FLOCCULANTS BY-
200 77	4872	SETTLING-BASINS	METHOD FOR INEXPENSIVE DISTRIBUTION OF LIQUID WASTE FROM DAIRY AND FEEDLOT KEYWORDS: LI
300	4916	SETTLING-BASINS	METHANE PRODUCTION SYSTEMS FOR SWINE MANURE KEYWORDS: SWINE-WASTES CONFINEMENT-PENS ANA
500 77	5294	SETTLING-TANKS	SWINE FEEDLOT WASTEWATER TREATMENT IN ROMANIA KEYWORDS: SWINE-WASTES FEEDLOTS WASTEWATE
300 76	4754	SEWAGE	MICROBIOLOGY AND CHEMISTRY STUDIES OF WATER QUALITY FACTORS IN A WATERSHED USED FOR MUN
300 78	5175	SEWAGE	SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
300 78	5176	SEWAGE	SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
100 77	5179	SEWAGE	SLUDGE DISPOSAL STRATEGY; PROCESSES AND COSTS KEYWORDS: SEWAGE SLUDGE LAND-APPLICATION
400 78	5187	SEWAGE	USES OF ORGANIC RESIDUES AT NEBRASKA EXPERIMENT STATIONS KEYWORDS: ORGANIC-WASTES LAND-
700 77	5198	SEWAGE	RECOVERY OF 15-N LABELED FERTILIZER AND PLANT GROWTH IN MANURE AND SLUDGE-AMENDED SOIL
500 77	5284	SEWAGE	AEROBIC STABILIZATION OF PIG FEEDLOT WASTEWATERS IN CZECHOSLOVAKIA KEYWORDS: SWINE-WAST
400 77	4798	SEWAGE-SLUDGE	TOP YIELDS FROM ANIMAL WASTE KEYWORDS; DAIRY-WASTES SEWAGE-SLUDGE FERTILIZERS LAND-APPL
300 76	4870	SEWAGE-SLUDGE	APPLICATION OF SEWAGE TO CROPLAND--APPRAISAL OF POTENTIAL HAZARDS OF THE HEAVY METALS T
500 77	4901	SEWAGE-SLUDGE	PROPERTIES OF AGRICULTURAL AND MUNICIPAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WASTE
100 77	4815	SHEEP	NITROGEN UTILIZATION BY LAMBS FED WHEAT STRAW ALONE OR WITH SUPPLEMENTS CONTAINING DRIE
100 78	4842	SHEEP	COMPARATIVE VALUE OF ENSILED CATTLE WASTE FOR LAMBS AND GROWING-FINISHING CATTLE KEYWOR
100 78	4876	SHEEP	EFFECTS OF LIQUID FRACTION PRESSED FROM DAIRY CATTLE EXCRETA (LE) IN LAMB DIETS KEYWORD
100 78	4877	SHEEP	FERMENTATION AND UTILIZATION OF BROILER LITTER ENSILED AT DIFFERENT MOISTURE LEVELS KEY
100 78	4878	SHEEP	ANIMAL PERFORMANCE AND MICROBIAL ADAPTATION OF RUMINANTS FED FORMALDEHYDE TREATED POULT
100 78	4880	SHEEP	LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF II, PRESERVATION AND ACCEPTABILITY OF WET EXC
700 77	4888	SHEEP	COMPOSITION AND DIGESTIBILITY OF UNTREATED AND SODIUM HYDROXIDE TREATED FECAL WASTE FRO
100 75	4932	SHEEP	UTILISATION OF RATIONS CONTAINING POULTRY MANURE AS A PROTEIN KEYWORDS: SHEEP REFEEDING
200 78	4947	SHEEP	METHANE AND BIOMASS PRODUCTION SYSTEMS FOR BEEF CATTLE MANURE KEYWORDS: LIVESTOCK-WASTE
300 77	4969	SHEEP	FLOOR MATERIALS FOR SHEEP HOUSING KEYWORDS: SLOTTED-FLOORS SHEEP CONFINEMENT-PENS FLOOR
100 77	5062	SHEEP	FERMENTATION OF SWINE WASTE-CORN MIXTURES FOR ANIMAL FEED: PILOT-PLANT STUDIES KEYWORD
200 76	5074	SHEEP	POULTRY MANURE FED TO LAMBS KEYWORDS; REFEEDING POULTRY-WASTES-DRIED SHEEP CRUDE-PROTEI
100 77	5096	SHEEP	DRIED POULTRY MANURE AS A SOURCE OF PHOSPHORUS FOR SHEEP KEYWORDS: REFEEDING POULTRY-WA
100 78	5170	SHEEP	AVAILABILITY TO GRAZING SHEEP OF GASTROINTESTINAL NEMATODE INFECTION ARISING FROM SUMM
300 78	5202	SHEEP	FERMENTATION AND DIGESTIBILITY OF BROILER LITTER ENSILED AT DIFFERENT MOISTURE LEVELS B
400 78	5263	SHEEP	DPE NITROGEN SOURCE FOR GROWING LAMBS KEYWORDS; POULTRY-WASTES-DRIED POULTRY-LITTER NIT
100 78	5264	SHEEP	WET POULTRY WASTE MAKES BETTER FEED KEYWORDS: POULTRY-WASTES REFEEDING SHEEP NITROGEN D
500 77	5267	SHEEP	ANIMAL FEEDLOTS-DEVELOPMENT, TRENDS, PROBLEMS KEYWORDS: FEEDLOTS WASTE-MANAGEMENT CATTL
200 76	4711	SHEEP-WASTES	EFFICIENT RECYCLING OF NUTRIENTS KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES SH
200 76	4743	SHEEP-WASTES	MICROBIOLOGICAL ANALYSIS OF ANIMAL MANURES WITH PARTICULAR REFERENCE TO THE ISOLATION
100 72	4799	SHEEP-WASTES	STUDIES ON THE SURVIVAL OF SALMONELLA TYPHIMURIUM AND SALMONELLA BOVIS-MORBIFICANS ON S
100 78	4911	SHEEP-WASTES	EFFECTS OF RUMEN CONTENTS OR FRACTIONS THEREOF ON PERFORMANCE OF BROILERS KEYWORDS: RUM
300 78	4951	SHEEP-WASTES	ENVIRONMENTAL IMPACT RESULTING FROM UNCONFINED ANIMAL PRODUCTION KEYWORDS: ENVIRONMENTA
100 78	5170	SHEEP-WASTES	AVAILABILITY TO GRAZING SHEEP OF GASTROINTESTINAL NEMATODE INFECTION ARISING FROM SUMM
100 77	5028	SHELLFISH-HARVEST	INTERNALIZATION IN A STOCHASTIC POLLUTION MODEL KEYWORDS: MODEL-STUDIES FEEDLOT-RUNOFF
300 78	5201	SHIGELLA	CHANGES IN CHARACTERISTICS OF DEEP STACKED BROILER LITTER WITH TIME KEYWORDS: POULTRY-L
300 78	5203	SILAGES	ENSILED CORN FORAGE AND BROILER LITTER FOR FINISHING HEIFERS KEYWORDS: SILAGES ENSILING
100 77	5261	SILAGES	A NOTE ON THE FERMENTATIVE CHANGES OF DIETS PREPARED WEEKLY WITH MANURE SILAGE AND FINA
100 77	5313	SILAGES	CATTLE MANURE AND FINAL MOLASSES SILAGE IN CHICKEN FATTENING I. HIGH SUBSTITUTION LEVE
200 76	4732	SILAGE-EFFECT	INVENTIONS AND INNOVATIONS TO REDUCE POLLUTION OF WATER RESOURCES KEYWORDS: WATER-POLLU
300 73	4826	SILVICULTURE	METHODS FOR IDENTIFYING AND EVALUATING THE NATURE AND EXTENT OF NON-POINT SOURCES OF PO
300 77	4926	SILVICULTURE	ENVIRONMENTAL IMPLICATIONS OF TRENDS IN AGRICULTURE AND SILVICULTURE VOLUME I. TREND IDE
100 75	4698	SIMAZINE	PERSISTENCE AND MOVEMENT OF SIMAZINE IN SOIL KEYWORDS: LAND-APPLICATION HERBICIDES ANIM
500 77	5268	SINGLE-CELL-PROTEI	WORLD DEMAND FOR ANIMAL PRODUCTS FOR HUMAN FOOD, 1970-2000 KEYWORDS: ANIMAL-PRODUCTION
300 76	4814	SITE-SELECTION	ODOR REGULATION BY NUISANCE LAWS KEYWORDS: LEGAL-ASPECTS ODOR FEEDLOTS ZONING SITE-SELE
500 77	4900	SITE-SELECTION	SOILS FOR MANAGEMENT OF ORGANIC WASTES AND WASTE WATERS KEYWORDS: ORGANIC-WASTES SOILS
300 77	4915	SITE-SELECTION	CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE KEYWORDS: LIQUID-WASTES DAIRY-WA
500 77	5269	SITE-SELECTION	CRITERIA AND GUIDELINES FOR THE SELECTION OF ANIMAL FEEDLOT SITES KEYWORDS: FEEDLOTS SI
500 77	5276	SITE-SELECTION	NOXIOUS GASES AND ODOURS KEYWORDS: ODOR-CONTROL ANIMAL-HEALTH PUBLIC-HEALTH TOXICITY HY
400 78	4693	SIZE	LAGOONS-WHAT SIZE NEEDED FOR YOUR HERD KEYWORDS: DAIRY-WASTES LAGOONS ANAEROBIC DESIGN
100 77	4987	SKATOLE	QUANTITATION OF INDOLE AND SKATOLE IN A HOUSED SWINE UNIT KEYWORDS: SWINE-WASTES CONFIN
100 77	5244	SKATOLE	SAMPLING AND ANALYSIS OF AIR IN PIG HOUSES KEYWORDS: ODOR SWINE-WASTES SPECTROPHOTOMETR
400 74	4990	SLATTED-FLOORS	ENGINEERS OUTLINE WASTE DESIGN FACTORS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT DESIGN S
100 77	4991	SLATTED-FLOORS	EFFECT OF SLATTED AND DEEP LITTER FLOORS ON THE PRODUCTIVE PERFORMANCE AND ENERGY UTIL
200 76	5000	SLATTED-FLOORS	IN-HOUSE MANURE DRYING IN THE DEEP-PIT HIGH-RISE SYSTEM KEYWORDS: DEHYDRATION DEEP-PI
400 78	5223	SLATTED-FLOORS	MANAGING MANURE ECONOMICS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT ECONOMICS SLATTED-FLO
100 77	4860	SLOPES	EFFECTS OF SOIL, COVER CROP, AND NUTRIENT SOURCE ON MOVEMENT OF SOIL, WATER, AND NITROG
200 77	4872	SLOPES	METHOD FOR INEXPENSIVE DISTRIBUTION OF LIQUID WASTE FROM DAIRY AND FEEDLOT KEYWORDS: LI
300	5010	SLOPES	SCALE MODEL OF AN UNDERSLAT FLUSHING SYSTEM KEYWORDS: MODEL-STUDIES FLUSHING DESIGN SLO
400 78	5059	SLOPES	WELL BUILT MOUNDS MANAGE THEMSELVES KEYWORDS: FEEDLOTS MOUNDS CONFINEMENT-PENS DESIGN S
200 74	4781	SLOTTED-FLOORS	SWINE BUILDING AIR CONTAMINATE CONTROL WITH PIT VENTILATION KEYWORDS: SWINE-WASTES GASE
300 77	4969	SLOTTED-FLOORS	FLOOR MATERIALS FOR SHEEP HOUSING KEYWORDS: SLOTTED-FLOORS SHEEP CONFINEMENT-PENS FLOOR
200 76	5000	SLOTTED-FLOORS	IN-HOUSE MANURE DRYING IN THE DEEP-PIT HIGH-RISE SYSTEM KEYWORDS: DEHYDRATION DEEP-PI
100 78	4971	SLUDGES	A STUDY ON THE INTERACTIONS OF ENZYMES WITH MANURES AND SLUDGES KEYWORDS: CATTLE-WASTES
100 76	4891	SLUDGE	AN INTEGRATED SEPARATION, AEROBIC TREATMENT AND SLUDGE DE-WATERING SYSTEM FOR PIG SLURR
200 77	4957	SLUDGE	ANAEROBIC LAGOONING OF MANURES AND MILKING PARLOR WASTEWATER KEYWORDS: DAIRY-WASTES AER

100	77	5179	SLUDGE — SLUDGE DISPOSAL STRATEGY: PROCESSES AND COSTS KEYWORDS: SEWAGE SLUDGE LAND-APPLICATION
100	73	5184	SLUDGE — EQUIPMENT AND METHODS FOR THE SOLID LIQUID SEPARATION OF SLURRIES KEYWORDS: SLURRIES SE
700	77	5198	SLUDGE — RECOVERY OF 15-N LABELED FERTILIZER AND PLANT GROWTH IN MANURE AND SLUDGE-AMENDED SOIL
300	77	5226	SLUDGE — METHANE GENERATION FROM HUMAN, ANIMAL, AND AGRICULTURAL WASTES KEYWORDS: RECYCLING METH
100	75	4670	SLURRIES — FIELD TEST FOR ESTIMATING DRY MATTER AND FERTILIZER VALUE OF SLURRY-- PRELIMINARY REPOR
100	72	4696	SLURRIES — DISEASE HAZARD OF PATHOGENIC ORGANISMS IN FARM WASTE MATERIAL KEYWORDS: SLURRIES PATHOG
200	76	4706	SLURRIES — AGRICULTURAL USE OF EFFLUENT FROM LIVESTOCKS: PROBLEMS AND PERSPECTIVES IN ITALY KEYWORD
200	76	4708	SLURRIES — CONSEQUENCES OF SEMI-LIQUID PIG MANURE SPREADING KEYWORDS: SLURRIES SWINE-WASTES LAND-A
200	76	4709	SLURRIES — SLURRY UTILISATION ON THE DAIRY FARM KEYWORDS: DAIRY-WASTES SLURRIES LAND-APPLICATION G
200	76	4710	SLURRIES — EFFECT OF RATE OF APPLICATION OF ORGANIC AND INORGANIC NITROGEN ON CROP PRODUCTION AND
200	76	4711	SLURRIES — EFFICIENT RECYCLING OF NUTRIENTS KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES SH
200	76	4712	SLURRIES — THE AGRONOMIC UTILISATION OF PIG SLURRY: EFFECT ON FORAGE CROPS AND ON SOIL FERTILITY KE
200	76	4714	SLURRIES — THE INFLUENCE OF ANIMAL MANURES ON THE GRAZING BEHAVIOR AND HERBAGE INTAKE OF CATTLE KE
200	76	4717	SLURRIES — RELATIONS BETWEEN PEDOLOGICAL ORGANISATION OF THE SOIL AND PIG SLURRY LANDSPREADINGS IN
200	76	4718	SLURRIES — THE EFFECT OF SOIL TYPE AND SEASON OF APPLICATION ON INFILTRATION AND RUNOFF OF NUTRIEN
200	76	4721	SLURRIES — PHOSPHORUS COMPOUNDS IN PIG SLURRY AND THEIR RETENTION IN THE SOIL KEYWORDS: SWINE-WAST
200	76	4723	SLURRIES — ASPECTS OF CU ACCUMULATION IN SOIL FOLLOWING HOG MANURE APPLICATION: SOME PRELIMINARY RE
200	76	4726	SLURRIES — TRANSPORT OF MANURE AND THE FUNCTION OF THE MANURE BANKS IN THE NETHERLANDS KEYWORDS:
200	76	4727	SLURRIES — VETERINARY-HYGIENIC ASPECTS OF LANDSPREADING AND TRANSPORT OF MANURE KEYWORDS: SOLID-W
200	76	4728	SLURRIES — AN APPROACH TO THE PROBLEM OF SLURRY AS A POSSIBLE SOURCE OF PASTURE CONTAMINATION WITH
200	76	4731	SLURRIES — THE EFFECTS OF SEPARATING SLURRY ON ITS STORAGE, HANDLING AND SPREADING ON LAND KEYWORD
200	76	4732	SLURRIES — INVENTIONS AND INNOVATIONS TO REDUCE POLLUTION OF WATER RESOURCES KEYWORDS: WATER-POLLU
200	77	4777	SLURRIES — EXPERIENCES FROM OPERATING A FULL SIZE ANAEROBIC DIGESTER KEYWORDS: ANAEROBIC DIGESTERS
200	77	4778	SLURRIES — ANAEROBIC BEEF SLURRY AS A FERTILIZER FOR BERMUDA GRASS AND BAHIA GRASS KEYWORDS: SLURR
700	76	4805	SLURRIES — DESIGN AND DEVELOPMENT OF A SEPARATOR FOR BOVINE MANURE KEYWORDS: SEPARATION-TECHNIQUES
100	77	4868	SLURRIES — THE PHOSPHORUS CYCLE IN PIG SLURRY MEASURED FROM 32PO4 DISTRIBUTION RATES KEYWORDS: SWI
200	76	4869	SLURRIES — UNIFORM SLURRY SPREADING WITH A CENTER PIVOT IRRIGATION SYSTEM KEYWORDS: SLURRIES LAND-
100	75	4883	SLURRIES — DIRECT INJECTION OF SLURRY INTO SOIL TO AVOID HERBAGE REJECTION KEYWORDS: CATTLE-WASTES
200	77	4896	SLURRIES — DEWATERING A SWINE MANURE SLURRY BY EXPRESSION KEYWORDS: SEPARATION-TECHNIQUES SWINE-WA
100	77	4914	SLURRIES — EFFECTS OF RATION ROUGHAGE CONTENT ON VISCOSITY AND THEORETICAL HEAD LOSSES IN PIPE FLO
100	78	4929	SLURRIES — A ROTATING FLIGHTED CYLINDER FOR BIOLOGICAL WASTE TREATMENT KEYWORDS: ROTATING-FLIGHTED
400	78	4974	SLURRIES — EUROPEAN COMPOSTING METHODS: TREATMENT AND USE OF FARM YARD MANURE AND SLURRY KEYWORDS
400	78	4975	SLURRIES — MANURE CONTAINMENT-SLURRY WITH THE CRUST ON TOP KEYWORDS; LIVESTOCK-WASTES SLURRIES WAS
400	78	4978	SLURRIES — GEORGIA FARMERS CUT COSTS WITH CORNLAGE KEYWORDS: SWINE-WASTES CONFINEMENT-PENS SLURRIE
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100	76	5018	SLURRIES — COW SLURRY MANAGEMENT WITH PARTICULAR REFERENCE TO BRIDGETS KEYWORDS: CATTLE-WASTES SLU
100	78	5060	SLURRIES — DISSOLVED ORGANIC AND INORGANIC PHOSPHORUS COMPOUNDS IN PIG SLURRY: EFFECT OF DRYING K
200	76	5073	SLURRIES — PROGRESS REPORT FROM THE FIRST YEAR OF OPERATION OF THE PENN STATE ANAEROBIC DIGESTER K
100	73	5085	SLURRIES — THE EFFECT OF APPLYING LARGE QUANTITIES OF SLURRY TO GRASSLAND KEYWORDS: LAND-APPLICATI
400	77	5099	SLURRIES — RESEARCH DAIRY STUDIES CONFINEMENT & WASTE REUSE KEYWORDS; DAIRY-WASTES SLURRIES SEPARA
200	78	5116	SLURRIES — DEVELOPMENT OF A SLURRY SPINNER KEYWORDS: SLURRIES LAND-APPLICATION EQUIPMENT-IRRIGATIO
100	77	5118	SLURRIES — THE EFFECTS OF CATTLE SLURRY AND INORGANIC FERTILISER NITROGEN ON THE YIELD AND MINERAL
100	76	5119	SLURRIES — EFFECT OF THE APPLICATION OF COW SLURRY TO GRASSLAND ON THE COMPOSITION OF THE SOIL ATM
100	75	5120	SLURRIES — EFFECT OF THE APPLICATION OF COW SLURRY TO GRASSLAND ON NITRATE LEVELS IN SOIL AND SOIL
400	75	5157	SLURRIES — NEW SLURRY COMPOSTING PROCESS KEYWORDS: COMPOSTING SLURRIES EQUIPMENT-COMPOSTING CATTLE
100	73	5167	SLURRIES — PRINCIPLES OF TREATMENT OF ANIMAL SLURRIES KEYWORDS: SLURRIES WASTE-TREATMENT AEROBIC A
100	73	5184	SLURRIES — EQUIPMENT AND METHODS FOR THE SOLID LIQUID SEPARATION OF SLURRIES KEYWORDS: SLURRIES SE
100	77	5243	SLURRIES — CHARACTERIZATION OF MALODOURS DURING ANAEROBIC STORAGE OF PIG WASTES KEYWORDS: WASTE-ST
100	77	5243	SLURRIES — CHARACTERIZATION OF MALODOURS DURING ANAEROBIC STORAGE OF PIG WASTES KEYWORDS: WASTE-ST
100	77	5245	SLURRIES — ODOURS ARISING FROM THE LAND-SPREADING OF PIG SLURRY KEYWORDS: LAND-APPLICATION SWINE-W
100	77	5247	SLURRIES — FRENCH EXPERIMENT IN PIG SLURRY DEODORIZATION KEYWORDS: ODOR-CONTROL SWINE-WASTES SLURR
100	77	5248	SLURRIES — VEAL-CALF MANURE DEODORIZATION BY SURFACE AERATION KEYWORDS: ODOR-CONTROL CATTLE-WASTES
100	77	5249	SLURRIES — TECHNIQUES AND COSTS RELATING TO ODOUR CONTROL KEYWORDS: ODOR-CONTROL SLURRIES CHEMICAL
100	77	5258	SLURRIES — INVESTIGATIONS IN THE U.K. INTO METHODS OF ODOUR CONTROL FOR FARMS KEYWORDS: ODOR-CONTR
500	77	5276	SLURRIES — NOXIOUS GASES AND ODOURS KEYWORDS: ODOR-CONTROL ANIMAL-HEALTH PUBLIC-HEALTH TOXICITY HY
500	77	5278	SLURRIES — COLLECTION, STORAGE AND TRANSPORT OF CATTLE WASTES KEYWORDS: DAIRY-WASTES SLURRIES SOLI
500	77	5293	SLURRIES — LAND DISPOSAL OF ANIMAL WASTES IN THE GDR KEYWORDS: SLURRIES WASTE-DISPOSAL WASTE-COMPO
300	77	5047	SMALL-BUSINESS-ADM — EPA SBA LOANS FOR WATER POLLUTION CONTROL KEYWORDS: WATER-POLLUTION ABATEMENT FINANCE SM
300	74	4700	SNOWMELT — QUANTIFICATION OF POLLUTANTS IN AGRICULTURAL RUNOFF KEYWORDS: AGRICULTURAL-RUNOFF EROSI
500	77	4907	SODIUM — FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS: MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP
700	76	4921	SODIUM — EFFECT OF BEEF CATTLE MANURE ON SOIL PROPERTIES AND CROP GROWTH KEYWORDS: CATTLE-WASTES
300	78	5055	SODIUM — SWINE LAGOON EFFLUENT ON A SOIL-PLANT ENVIRONMENT--AN IMPACT ASSESSMENT KEYWORDS: SWINE
200	78	5156	SODIUM — NUTRIENTS AVAILABLE IN LIVESTOCK AND POULTRY MANURE RESIDUE AS REFLECTED BY MANAGEMENT
100	76	5304	SODIUM — EFFECT OF DIETARY SODIUM AND POTASSIUM EXCESS ON WATER CONSUMPTION, URINE EXCRETION AND
400	78	5305	SODIUM — COLORADO BIOGAS PLANT WINS ACEC TOP PRIZE KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING BI
700	76	4668	SODIUM-HYDROXIDE — CELLULOLYSIS IN FEEDLOT WASTE KEYWORDS: FEEDLOT-WASTES CHEMICAL-TREATMENT PHYSICAL-TREA
700	77	4888	SODIUM-HYDROXIDE — COMPOSITION AND DIGESTIBILITY OF UNTREATED AND SODIUM HYDROXIDE TREATED FECAL WASTE FRO
100	77	4993	SODIUM-HYDROXIDE — BIOGASIFICATION USING NAOH TREATED PIG FAECES KEYWORDS: LIQUID-WASTES SWINE-WASTES CHEM
200	76	4717	SOILS — RELATIONS BETWEEN PEDOLOGICAL ORGANISATION OF THE SOIL AND PIG SLURRY LANDSPREADINGS IN
200	76	4718	SOILS — THE EFFECT OF SOIL TYPE AND SEASON OF APPLICATION ON INFILTRATION AND RUNOFF OF NUTRIEN
200	77	4794	SOILS — ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS KEYWORDS: CATTLE MANAGEMENT PAST
700	73	4884	SOILS — ANIMAL WASTE DISPOSAL LEGISLATION AND ITS IMPACT ON DAIRY FARMS IN TWO REGIONS DOMINATE
500	77	4900	SOILS — SOILS FOR MANAGEMENT OF ORGANIC WASTES AND WASTE WATERS KEYWORDS: ORGANIC-WASTES SOILS
300	73	5024	SOILS — INTENSIVE FARMING AND POLLUTION KEYWORDS: ANIMAL-WASTES LAND-APPLICATION FERTILIZERS NU
100	76	5036	SOILS — ASKOV 1984--FERTILIZERS AND MANURE ON SANDY AND LOAMY SOILS KEYWORDS: ANIMAL-WASTES FER
200	76	4721	SOIL-ADSORPTION — PHOSPHORUS COMPOUNDS IN PIG SLURRY AND THEIR RETENTION IN THE SOIL KEYWORDS: SWINE-WAST
100	77	4970	SOIL-AGGREGATES — EFFECTS OF BEEF CATTLE MANURE ON WATER-STABILITY OF SOIL AGGREGATES KEYWORDS: CATTLE-WA
100	77	4766	SOIL-AMENDMENTS — THE APPLICATION OF NATURAL ZEOLITES IN ANIMAL SCIENCE AND AQUACULTURE KEYWORDS: ZEOLITE
400	78	4979	SOIL-AMENDMENTS — NOW LOOK WHAT THEY'RE MAKING FROM MANURE KEYWORDS: DAIRY-WASTES RECYCLING IRRIGATION FE
200	76	4741	SOIL-ANALYSIS — PROPOSITIONS ON THE HARMONISATION OF CHEMICAL METHODS OF SOILS ANALYSIS IN THE EEC COMM
200	76	4742	SOIL-ANALYSIS — HARMONISATION OF METHODS FOR SAMPLING AND FOR CHEMICAL AND PHYSICAL ANALYSIS KEYWORDS
100	77	5022	SOIL-BIOCHEMISTRY — RECOVERY AND REACTIONS OF AMPROLIUM FROM POULTRY MANURE ADDED TO SOIL KEYWORDS: POULTRY
100	75	4678	SOIL-CHEMICAL-PROP — NOTE ON SECONDARY AND MICRO-ELEMENT CONTENTS OF FERTILIZERS AND MANURES' KEYWORDS: FERT
200	76	4722	SOIL-CHEMICAL-PROP — HEAVY APPLICATION OF LIQUID MANURE ON SOIL-EFFECT ON SOIL SALINITY KEYWORDS: LIQUID-WAS
100	72	4673	SOIL-CHEMISTRY — THE CATTLE DUNG PATCH: 2. EFFECT OF A DUNG PATCH ON THE CHEMICAL STATUS OF THE SOIL, AN
100	75	4679	SOIL-CHEMISTRY — NOTE ON DETOXICATION OF LINDANE BY FARMYARD MANURE KEYWORDS: INSECTICIDES LINDANE SOIL-
200	76	4711	SOIL-CHEMISTRY — EFFICIENT RECYCLING OF NUTRIENTS KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES SH
200	76	4741	SOIL-CHEMISTRY — PROPOSITIONS ON THE HARMONISATION OF CHEMICAL METHODS OF SOILS ANALYSIS IN THE EEC COMM
200	76	4744	SOIL-CHEMISTRY — THE NITROGEN BALANCE SHEET KEYWORDS: NITROGEN-TRANSFORMATIONS ORGANIC-WASTES SOIL-CHEMI
200	77	4764	SOIL-CHEMISTRY — LONG-TERM FESCUE AND COASTAL BERMUDAGRASS CROP RESPONSE TO SWINE LAGOON EFFLUENT KEYWOR
100	77	4862	SOIL-CHEMISTRY — LAND DISPOSAL OF BROILER LITTER--CHANGES IN CONCENTRATION OF CHLORIDE, NITRATE NITROGEN
700	73	4922	SOIL-CHEMISTRY — SOIL AS AN ANIMAL WASTES DISPOSAL SYSTEM KEYWORDS: CATTLE-WASTES DAIRY-WASTES LAND-APPL
700	76	4942	SOIL-CHEMISTRY — THE EFFECT OF APPLICATION OF POULTRY MANURE WHICH WAS SUBJECTED TO DIFFERENT WASTE MANA
100	77	4945	SOIL-CHEMISTRY — EFFECTS ON SOLID AND LIQUID BEEF MANURE AND LIQUID HOG MANURE ON SOIL CHARACTERISTICS A
100	78	4955	SOIL-CHEMISTRY — NITRIFICATION AND DENITRIFICATION IN CATTLE MANURE-AMENDED SOIL KEYWORDS: LAND-APPLICA
300	78	5023	SOIL-CHEMISTRY — ULTIMATE DISPOSAL OF BEEF FEEDLOT WASTES ONTO LAND KEYWORDS: FEEDLOTS CATTLE-WASTES LAN
100	75	5081	SOIL-CHEMISTRY — EFFECT OF LONG TERM APPLICATION OF P, K AND FARMYARD MANURE ON THE ZINC CONTENT OF SOIL
100	77	5118	SOIL-CHEMISTRY — THE EFFECTS OF CATTLE SLURRY AND INORGANIC FERTILISER NITROGEN ON THE YIELD AND MINERAL
100	76	5119	SOIL-CHEMISTRY — EFFECT OF THE APPLICATION OF COW SLURRY TO GRASSLAND ON THE COMPOSITION OF THE SOIL ATM
100	75	5120	SOIL-CHEMISTRY — EFFECT OF THE APPLICATION OF COW SLURRY TO GRASSLAND ON NITRATE LEVELS IN SOIL AND SOIL

100	78 5171	SOIL-CHEMISTRY	EFFECTS OF LIQUID SWINE WASTE APPLICATIONS ON CORN YIELD AND SOIL CHEMICAL COMPOSITION
700	77 5198	SOIL-CHEMISTRY	RECOVERY OF 15-N LABELED FERTILIZER AND PLANT GROWTH IN MANURE AND SLUDGE-AMENDED SOIL
100	75 4698	SOIL-CONTAMINATION	PERSISTENCE AND MOVEMENT OF SIMAZINE IN SOIL KEYWORDS: LAND-APPLICATION HERBICIDES ANIM
200	76 4705	SOIL-CONTAMINATION	UTILIZATION OF MANURE BY LAND SPREADING KEYWORDS: LIVESTOCK-WASTES EFFLUENTS LAND-APPLI
200	76 4723	SOIL-CONTAMINATION	ASPECTS OF CU ACCUMULATION IN SOIL FOLLOWING HOG MANURE APPLICATION-SOME PRELIMINARY RE
200	76 4737	SOIL-CONTAMINATION	ELABORATION OF STATISTICS ON MANURE PRODUCTION KEYWORDS: FARM-WASTES LAND-APPLICATION E
200	74 4761	SOIL-CONTAMINATION	NITROGEN LEVELS UNDER A SWINE FEEDLOT IN SOUTH CAROLINA KEYWORDS: FEEDLOTS SWINE MANAGE
300	78 5055	SOIL-CONTAMINATION	SWINE LAGOON EFFLUENT ON A SOIL-PLANT ENVIRONMENT--AN IMPACT ASSESSMENT KEYWORDS: SWINE
300	78 5175	SOIL-CONTAMINATION	SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
300	74 5213	SOIL-CONTAMINATION	SOIL POLLUTION FROM FEEDLOTS IN GEORGIA KEYWORDS: FEEDLOTS CATTLE-WASTES SOIL-CONTAMINA
300	78 5229	SOIL-CONTAMINATION	ANALYSIS OF STATE LAWS AND REGULATIONS IMPACTING ANIMAL WASTE MANAGEMENT KEYWORDS: LEGA
500	77 5274	SOIL-CONTAMINATION	MANAGEMENT OF HYGIENIC PROBLEMS IN LARGE ANIMAL FEEDLOTS KEYWORDS: EPIDEMIOLOGY ANIMAL-
100	77 4970	SOIL-CORES	EFFECTS OF BEEF CATTLE MANURE ON WATER-STABILITY OF SOIL AGGREGATES KEYWORDS: CATTLE-WA
100	76 5119	SOIL-GAS	EFFECT OF THE APPLICATION OF COW SLURRY TO GRASSLAND ON THE COMPOSITION OF THE SOIL ATM
100	77 4691	SOIL-INJECTION	INJECTION OF DAIRY WASTE KEYWORDS: DAIRY-WASTES LAND-APPLICATION SOIL-INJECTION PASTURE
200	76 4709	SOIL-INJECTION	SLURRY UTILISATION ON THE DAIRY FARM KEYWORDS: DAIRY-WASTES SLURRIES LAND-APPLICATION G
200	76 4756	SOIL-INJECTION	DEVELOPMENT OF A LIQUID MANURE SPREADING AND INJECTION SYSTEM KEYWORDS: EQUIPMENT-LAND-
100	75 4883	SOIL-INJECTION	DIRECT INJECTION OF SLURRY INTO SOIL TO AVOID HERBAGE REJECTION KEYWORDS: CATTLE-WASTES
400	77 4985	SOIL-INJECTION	INJECTING LIQUID MANURE REDUCES NITROGEN LOSS KEYWORDS: LIQUID-WASTES LAND-APPLICATION
200	78 5115	SOIL-INJECTION	SURFACE APPLICATION AND INJECTION OF LIQUID DAIRY MANURE KEYWORDS: DAIRY-WASTES LIQUID-
500	77 5299	SOIL-INJECTION	ANIMAL WASTE MANAGEMENT IN THE NETHERLANDS KEYWORDS: LEGAL-ASPECTS FEEDLOTS ODOR-CONTRO
700	76 4921	SOIL-INVESTIGATION	EFFECT OF BEEF CATTLE MANURE ON SOIL PROPERTIES AND CROP GROWTH KEYWORDS: CATTLE-WASTES
200	76 4717	SOIL-MECHANICS	RELATIONS BETWEEN PEDOLOGICAL ORGANISATION OF THE SOIL AND PIG SLURRY LANDSPREADINGS IN
200	76 4720	SOIL-MECHANICS	LEACHING OF NITRATE AND DENITRIFICATION IN A SANDY SOIL AS INFLUENCED BY MANURE APPLIC
200	76 4723	SOIL-MECHANICS	ASPECTS OF CU ACCUMULATION IN SOIL FOLLOWING HOG MANURE APPLICATION-SOME PRELIMINARY RE
200	76 4733	SOIL-MECHANICS	MATHEMATICAL MODELLING OF AMMONIUM OXIDATION IN EFFLUENTS KEYWORDS: MATHEMATICAL-MODELS
200	74 4780	SOIL-MECHANICS	SOIL AND CROP CONSIDERATIONS FOR RECYCLING WASTES KEYWORDS: LAND-APPLICATION SOIL-PROPE
500	77 4903	SOIL-MECHANICS	RECYCLING ELEMENTS IN WASTES THROUGH SOIL-PLANT SYSTEMS KEYWORDS: LAND-APPLICATION MUNI
200	77 5237	SOIL-MECHANICS	THE CONCENTRATION OF LIQUID MANURE AFFECTS ITS INFILTRATION INTO SOIL KEYWORDS: LIQUID-
300	78 5176	SOIL-MICROBIOLOGY	SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
100	77 4860	SOIL-PERMEABILITY	EFFECTS OF SOIL, COVER CROP, AND NUTRIENT SOURCE ON MOVEMENT OF SOIL, WATER, AND NITROG
200	76 4721	SOIL-PROFILE	PHOSPHORUS COMPOUNDS IN PIG SLURRY AND THEIR RETENTION IN THE SOIL KEYWORDS: SWINE-WAST
100	75 5120	SOIL-PROFILE	EFFECT OF THE APPLICATION OF COW SLURRY TO GRASSLAND ON NITRATE LEVELS IN SOIL AND SOIL
200	76 4717	SOIL-PROPERTIES	RELATIONS BETWEEN PEDOLOGICAL ORGANISATION OF THE SOIL AND PIG SLURRY LANDSPREADINGS IN
200	74 4780	SOIL-PROPERTIES	SOIL AND CROP CONSIDERATIONS FOR RECYCLING WASTES KEYWORDS: LAND-APPLICATION SOIL-PROPE
400	77 4798	SOIL-PROPERTIES	TOP YIELDS FROM ANIMAL WASTE KEYWORDS: DAIRY-WASTES SEWAGE-SLUDGE FERTILIZERS LAND-APPL
100	76 4863	SOIL-PROPERTIES	REDUCTION OF CRUST IMPEDANCE TO SIMULATED SEEDLING EMERGENCE BY THE ADDITION OF MANURE
100	76 5082	SOIL-PROPERTIES	EFFECT OF CONTINUOUS USE OF CHEMICAL FERTILISERS AND MANURES ON SOIL PHYSICAL AND CHEMI
700	77 5182	SOIL-PROPERTIES	SOME PHYSICAL, CHEMICAL, AND BIOLOGICAL EFFECTS OF HEAVY POULTRY MANURE APPLICATIONS ON
200	76 4721	SOIL-RETENTION	PHOSPHORUS COMPOUNDS IN PIG SLURRY AND THEIR RETENTION IN THE SOIL KEYWORDS: SWINE-WAST
200	77 5237	SOIL-TYPES	THE CONCENTRATION OF LIQUID MANURE AFFECTS ITS INFILTRATION INTO SOIL KEYWORDS: LIQUID-
100	75 5120	SOIL-WATER	EFFECT OF THE APPLICATION OF COW SLURRY TO GRASSLAND ON NITRATE LEVELS IN SOIL AND SOIL
200	77 4794	SOIL-WATER-MOVEMEN	ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS KEYWORDS: CATTLE MANAGEMENT PAST
200	76 4719	SOIL-WATER-PLANT-R	SOIL, WATER, PLANT RELATIONSHIP AS INFLUENCED BY INTENSIVE USE OF EFFLUENTS FROM LIVES
200	76 4738	SOIL-WATER-PLANT-R	SOME ASPECTS OF THE PROBLEM OF MODELLING THE UTILISATION OF ANIMAL MANURES BY LAND SPRE
100	77 4860	SOIL-WATER-PLANT-R	EFFECTS OF SOIL, COVER CROP, AND NUTRIENT SOURCE ON MOVEMENT OF SOIL, WATER, AND NITROG
500	77 4900	SOIL-WATER-PLANT-R	SOILS FOR MANAGEMENT OF ORGANIC WASTES AND WASTE WATERS KEYWORDS: ORGANIC-WASTES SOILS
100	77 4950	SOIL-WATER-PLANT-R	MANURE EFFECTS ON WATER INTAKE AND RUNOFF QUALITY FROM IRRIGATED GRAIN SORGHUM PLOTS KE
300	78 5175	SOIL-WATER-PLANT-R	SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
700	77 5182	SOIL-WATER-PLANT-R	SOME PHYSICAL, CHEMICAL, AND BIOLOGICAL EFFECTS OF HEAVY POULTRY MANURE APPLICATIONS ON
200	77 5311	SOLAR-ENERGY	SUMMER UTILIZATION OF SOLAR ENERGY FOR DRYING POULTRY EXCRETA KEYWORDS: DEHYDRATION POU
200	71 4687	SOLIDS	STORAGE OF BEEF CATTLE WASTES UNDER AEROBIC AND ANAEROBIC CONDITIONS KEYWORDS: CATTLE-W
100	76 4891	SOLIDS	AN INTEGRATED SEPARATION, AEROBIC TREATMENT AND SLUDGE DE-WATERING SYSTEM FOR PIG SLURR
200	77 4896	SOLIDS	DEWATERING A SWINE MANURE SLURRY BY EXPRESSION KEYWORDS: SEPARATION-TECHNIQUES SWINE-WA
300	77 4937	SOLIDS	ANIMAL WASTE MANAGEMENT AND OUR WATER QUALITY KEYWORDS: WATER-POLLUTION GROUNDWATER-POL
100	78 5148	SOLIDS	EARTHEN PITS FOR MANURE AND RECYCLED FLUSH-WATER STORAGE KEYWORDS: WASTE-STORAGE EARTHE
200	78 5156	SOLIDS	NUTRIENTS AVAILABLE IN LIVESTOCK AND POULTRY MANURE RESIDUE AS REFLECTED BY MANAGEMENT
100	77 4853	SOLIDS-RETENTION-T	THE EFFECT OF ANAEROBIC DIGESTION UPON SWINE MANURE ODORS KEYWORDS: SWINE-WASTES ODOR A
200	76 4707	SOLID-WASTES	FARMYARD MANURE AND CROP PRODUCTION IN DENMARK KEYWORDS: SOLID-WASTES LIQUID-WASTES DEN
200	76 4727	SOLID-WASTES	VETERINARY-HYGIENIC ASPECTS OF LANDSPREADING AND TRANSPORT OF MANURE KEYWORDS: SOLID-W
200	76 4736	SOLID-WASTES	WASTE MANAGEMENTS SYSTEMS IN ANIMAL HUSBANDRY-APPLICATION OF FARM MODEL STUDIES AND SYS
400	78 4828	SOLID-WASTES	WHICH WASTE SYSTEM IS BEST KEYWORDS: WASTE-MANAGEMENT DESIGN CONFINEMENT-PENS LIQUID-WA
400	78 4837	SOLID-WASTES	FERTILIZER VALUE OF TURKEY WASTE KEYWORDS: POULTRY-WASTES SOLID-WASTES TURKEYS LIQUID-W
100	77 4854	SOLID-WASTES	DESIGN CONCEPTS AND CONSTRUCTION COSTS OF EIGHT DIFFERENT MANURE STORAGES KEYWORDS: DES
300	77 4865	SOLID-WASTES	CHEMICAL ANALYSIS AND FERTILIZER VALUE OF TURKEY MANURE KEYWORDS: POULTRY-WASTES WASTE-
500	77 4900	SOLID-WASTES	SOILS FOR MANAGEMENT OF ORGANIC WASTES AND WASTE WATERS KEYWORDS: ORGANIC-WASTES SOILS
100	77 4945	SOLID-WASTES	EFFECTS ON SOLID AND LIQUID BEEF MANURE AND LIQUID HOG MANURE ON SOIL CHARACTERISTICS A
100	77 4946	SOLID-WASTES	MANURE MANAGEMENT IN AN IRRIGATED BASIN RELATIVE TO SALT LEACHATE TO GROUND WATER KEYWO
200	77 5019	SOLID-WASTES	HANDLING OF MANURE FROM DIFFERENT ANIMALS AND MANAGEMENT SYSTEMS KEYWORDS: WASTE-MANAGE
500	77 5026	SOLID-WASTES	BIOLOGICAL RECLAMATION OF SOLID WASTES KEYWORDS: RECYCLING SOLID-WASTES MUNICIPAL-WASTE
500	77 5278	SOLID-WASTES	COLLECTION, STORAGE AND TRANSPORT OF CATTLE WASTES KEYWORDS: DAIRY-WASTES SLURRIES SOLI
100	78 5060	SOLUBILITY	DISSOLVED ORGANIC AND INORGANIC PHOSPHORUS COMPOUNDS IN PIG SLURRY: EFFECT OF DRYING K
400	78 4680	SORBIC-ACID	FUNGASTATIC FEED ADDITIVES IMPROVE LITTER RESULTS KEYWORDS: FEED-ADDITIVES FUNGICIDES L
100	75 4670	SPECIFIC-GRAVITY	FIELD TEST FOR ESTIMATING DRY MATTER AND FERTILIZER VALUE OF SLURRY-- PRELIMINARY REPOR
100	77 5244	SPECTROPHOTOMETRY	SAMPLING AND ANALYSIS OF AIR IN PIG HOUSES KEYWORDS: ODOR SWINE-WASTES SPECTROPHOTOMETR
200	74 4748	SPHERES	A MATHEMATICAL DRYING MODEL FOR MANURE BASED ON THE CONCEPT OF A RECEDING EVAPORATIVE I
100	69 4697	SPRAY-IRRIGATION	DAIRY WASTE DISPOSAL KEYWORDS: WASTE-DISPOSAL LAND-APPLICATION ECONOMICS SPRAY-IRRIGATI
400	77 4797	SPRINKLER-IRRIGATI	THEY TRAP EVERY DROP OF RUNOFF KEYWORDS: FEEDLOT-RUNOFF WASTE-STORAGE-PONDS LAND-APPLIC
200	77 5019	SPRINKLER-IRRIGATI	HANDLING OF MANURE FROM DIFFERENT ANIMALS AND MANAGEMENT SYSTEMS KEYWORDS: WASTE-MANAGE
300	78 5201	STACKING	CHANGES IN CHARACTERISTICS OF DEEP STACKED BROILER LITTER WITH TIME KEYWORDS: POULTRY-L
200	76 4740	STANDARDIZATION	METHODS OF ANALYSIS FOR MANURES-COMPARISON BETWEEN COUNTRIES OF THE EEC, 2ND APPROXIMAT
400	78 4830	STIMULANTS	INNOVATIONS ARE SEEN IN 1980S CATTLE FEEDING KEYWORDS: CATTLE FEED-ADDITIVES STIMULANTS
100	77 4949	STIROFOS	RESIDUE CONTENT OF BEEF FEEDLOT MANURE AFTER FEEDING DIETHYLSTILBESTROL, CHLORTETRACYCL
200	77 4794	STOCKING-RATES	ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS KEYWORDS: CATTLE MANAGEMENT PAST
300	77 5226	STORAGE	METHANE GENERATION FROM HUMAN, ANIMAL, AND AGRICULTURAL WASTES KEYWORDS: RECYCLING METH
200	74 4781	STORAGE-PITS	SWINE BUILDING AIR CONTAMINATE CONTROL WITH PIT VENTILATION KEYWORDS: SWINE-WASTES GASE
200	74 4760	STORAGE-PIT	A NEW APPROACH IN NON-SLATTED LIQUID WASTE SWINE HOUSING SYSTEMS KEYWORDS: SWINE-WASTES
400	78 5001	STORAGE-PIT	SCRAPING AWAY WASTE KEYWORDS: CATTLE-WASTES FEEDLOTS DESIGN SCRAPING STORAGE-PIT LAND-A
300	78 5183	STREPTOMYCETES	SPECIFIC COMPOSITION OF REPRESENTATIVE FEEDLOT WASTES: A CHEMICAL AND MICROBIAL PROFILE
700	76 4668	SUBSTRATES	CELLULOLYSIS IN FEEDLOT WASTE KEYWORDS: FEEDLOT-WASTES CHEMICAL-TREATMENT PHYSICAL-TREA
100	77 4895	SUBSTRATES	NUTRITIONAL EVALUATION WITH RATS OF ALGAE CHLORELLA GROWN ON SWINE MANURE KEYWORDS: LI
100	77 5016	SUBSTRATES	PROTEIN PRODUCTION FROM FEEDLOT WASTE KEYWORDS: FEEDLOTS CATTLE-WASTES REFEEDING SUBSTR
100	78 5051	SUBSTRATES	AN ATTEMPT TO MECHANIZE NUTRIENT RECOVERY FROM ANIMAL EXCRETA KEYWORDS: POULTRY-WASTES
500	77 5301	SUBSTRATES	FEEDLOT WASTE MANAGEMENT IN CZECHOSLOVAKIA KEYWORDS: FEEDLOTS LIQUID-WASTES LAND-APPLIC
400	78 5067	SULFATES	CATTLEMEN INFLUENCE ODOR CONTROL RULES KEYWORDS: AIR-POLLUTION SULFATES ODOR-CONTROL LE
300	77 5035	SULFIDES	SOURCE ASSESSMENT--BEEF CATTLE FEEDLOTS KEYWORDS: CATTLE DUSTS GASES AMMONIA THIOLS AIR
300	76 4964	SULFUR	DETECTING AND MEASURING MALODORS FROM ANIMAL WASTES KEYWORDS: ANIMAL-WASTES ODOR MEASUR
400	78 5126	SULFUR	FEED AND FERTILIZER VALUE OF BROILER LITTER VARIES KEYWORDS: POULTRY-LITTER RECYCLING W
100	77 5137	SULFUR	EFFECT OF SULPHUR AND FYM APPLICATION ON THE EFFICIENCY OF ROCK PHOSPHATE FOR WHEAT KE
100	77 5242	SULFUR	A METHOD FOR SAMPLING AIR IN ANIMAL HOUSES TO ANALYSE TRACE GASES INCLUDING ODORANTS WI

400 78 5234	SUNLIGHT	BEAT EXPENSIVE SYSTEMS--SUN, WIND BEST FOR HANDLING WASTE KEYWORDS: DESIGN CONFINEMENT
200 73 4782	SUSPENDED-SOLIDS	MECHANICAL AERATION OF A WASTE DISPOSAL PIT KEYWORDS: MANURE-PITS WASTE-STORAGE AERATIO
100 77 4856	SUSPENDED-SOLIDS	RUNOFF FROM FEEDLOTS AND MANURE STORAGES IN SOUTHERN ONTARIO KEYWORDS: FEEDLOT-RUNOFF W
200 78 4947	SUSPENDED-SOLIDS	METHANE AND BIOMASS PRODUCTION SYSTEMS FOR BEEF CATTLE MANURE KEYWORDS: LIVESTOCK-WASTE
100 75 5200	SUSPENDED-SOLIDS	AEROBIC TREATMENT OF FARM WASTES KEYWORDS: AEROBIC-TREATMENT ANIMAL-WASTES SETTLEMENT F
400 78 4692	SWINE	LET THEM EAT WASTE KEYWORDS: REFEEDING SWINE-WASTES SWINE ANIMAL-HEALTH LEGAL-ASPECTS D
300 75 4701	SWINE	ENVIRONMENTAL PROTECTION REQUIREMENTS FOR SWINE OPERATIONS KEYWORDS: SWINE FEEDLOTS AI
200 74 4761	SWINE	NITROGEN LEVELS UNDER A SWINE FEEDLOT IN SOUTH CAROLINA KEYWORDS: FEEDLOTS SWINE MANAGE
300 76 4825	SWINE	RECENT TRENDS IN ODOR NUISANCE LAWSUITS KEYWORDS: ODOR NUISANCE-LAWSUITS LEGAL-ASPECTS
400 78 4841	SWINE	ATMOSPHERIC AMMONIA AFFECTS SWINE HEALTH KEYWORDS: AIR-POLLUTION CONFINEMENT-PENS SWINE
300 77 4866	SWINE	ATMOSPHERIC AMMONIA AFFECTS SWINE HEALTH KEYWORDS: AIR-POLLUTION SWINE HOUSING AMMONIA
100 77 5062	SWINE	FERMENTATION OF SWINE WASTE-CORN MIXTURES FOR ANIMAL FEED: PILOT-PLANT STUDIES KEYWORD
200 78 5100	SWINE	RECYCLING SWINE WASTE IN A GROWING-FINISHING RATION KEYWORDS: REFEEDING SWINE-WASTES SW
400 78 5146	SWINE	CATTLE FURNISH CHEAP SWINE FEED KEYWORDS: REFEEDING CATTLE-WASTES SWINE ECONOMICS
400 78 5163	SWINE	MOVE HOGS INDOORS-NEXT STEP IN HOG CONFINEMENT KEYWORDS: SWINE MANAGEMENT DESIGN ECONOM
400 78 5168	SWINE	RECYCLED SWINE WASTE FED IN GROWING-FINISHING DIET KEYWORDS: SWINE-WASTES REFEEDING SWI
300 78 5172	SWINE	SWINE WASTES AS A NUTRIENT SOURCE IN GROWING-FINISHING SWINE RATIONS KEYWORDS: SWINE-WA
400 78 5174	SWINE	AMMONIA AFFECTS SWINE HEALTH KEYWORDS: AMMONIA SWINE ANIMAL-HEALTH AIR-POLLUTION
400 78 5185	SWINE	POULTRY MANURE AS FEED KEYWORDS: REFEEDING POULTRY-WASTES SWINE PERFORMANCE NITROGEN TO
300 78 5204	SWINE	ENSILING CHARACTERISTICS AND UTILIZATION BY SWINE OF ENSILED SWINE WASTE AND GROUND COR
100 77 5259	SWINE	DISPERSION OF ODORS IN THE NEIGHBOURHOOD OF PIG HOUSES KEYWORDS: ODOR SWINE CONFINEMENT
500 77 5267	SWINE	ANIMAL FEEDLOTS-DEVELOPMENT, TRENDS, PROBLEMS KEYWORDS: FEEDLOTS WASTE-MANAGEMENT CATTL
500 77 5270	SWINE	LAYOUT AND DESIGN OF ANIMAL FEEDLOT STRUCTURES AND EQUIPMENT KEYWORDS: FEEDLOTS DESIGN
200 77 5310	SWINE	SCHEDULING SWINE PRODUCTION FACILITIES KEYWORDS: COMPUTER-MODELS MANAGEMENT SWINE
400 78 4910	SWINE-SULFA	SULFA RESIDUES IN SWINE STILL A PROBLEM KEYWORDS: SWINE-SULFA RESIDUES WITHDRAWAL-PERID
100 75 4670	SWINE-WASTES	FIELD TEST FOR ESTIMATING DRY MATTER AND FERTILIZER VALUE OF SLURRY-- PRELIMINARY REPOR
400 78 4677	SWINE-WASTES	SWINE ODOR NOT LOWERED MUCH BY CONTROL PRODUCTS KEYWORDS: SWINE-WASTES LIQUID-WASTES OD
400 78 4684	SWINE-WASTES	PUTTING THE LID ON ODOR KEYWORDS: ODOR-CONTROL SWINE-WASTES CONFINEMENT-PENS HYDROGEN-S
300 76 4690	SWINE-WASTES	GUTTER FLUSHING SYSTEMS FOR SWINE BUILDINGS KEYWORDS: FLUSHING SWINE-WASTES DESIGN LAGO
400 78 4692	SWINE-WASTES	LET THEM EAT WASTE KEYWORDS: REFEEDING SWINE-WASTES SWINE ANIMAL-HEALTH LEGAL-ASPECTS D
200 76 4706	SWINE-WASTES	AGRICULTURAL USE OF EFFLUENT FROM LIVESTOCKS-PROBLEMS AND PERSPECTIVES IN ITALY KEYWORD
200 76 4708	SWINE-WASTES	CONSEQUENCES OF SEMI-LIQUID PIG MANURE SPREADING KEYWORDS: SLURRIES SWINE-WASTES LAND-A
200 76 4711	SWINE-WASTES	EFFICIENT RECYCLING OF NUTRIENTS KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES SH
200 76 4712	SWINE-WASTES	THE AGRONOMIC UTILISATION OF PIG SLURRY-EFFECT ON FORAGE CROPS AND ON SOIL FERTILITY KE
200 76 4714	SWINE-WASTES	THE INFLUENCE OF ANIMAL MANURES ON THE GRAZING BEHAVIOR AND HERBAGE INTAKE OF CATTLE KE
200 76 4715	SWINE-WASTES	ANIMAL ORGANIC MANURES IN DUTCH FORESTRY-APPLICATION AND RESTRICTIONS KEYWORDS: LIQUID-
200 76 4717	SWINE-WASTES	RELATIONS BETWEEN PEDOLOGICAL ORGANISATION OF THE SOIL AND PIG SLURRY LANDSPREADINGS IN
200 76 4718	SWINE-WASTES	THE EFFECT OF SOIL TYPE AND SEASON OF APPLICATION ON INFILTRATION AND RUNOFF OF NUTRIEN
200 76 4720	SWINE-WASTES	LEACHING OF NITRATE AND DENITRIFICATION IN A SANDY SOIL AS INFLUENCED BY MANURE APPLIC
200 76 4721	SWINE-WASTES	PHOSPHORUS COMPOUNDS IN PIG SLURRY AND THEIR RETENTION IN THE SOIL KEYWORDS: SWINE-WAST
200 76 4723	SWINE-WASTES	ASPECTS OF CU ACCUMULATION IN SOIL FOLLOWING HOG MANURE APPLICATION-SOME PRELIMINARY RE
200 76 4736	SWINE-WASTES	WASTE MANAGEMENTS SYSTEMS IN ANIMAL HUSBANDRY-APPLICATION OF FARM MODEL STUDIES AND SYS
200 74 4760	SWINE-WASTES	A NEW APPROACH IN NON-SLATTED LIQUID WASTE SWINE HOUSING SYSTEMS KEYWORDS: SWINE-WASTES
200 77 4763	SWINE-WASTES	MODELING TECHNIQUES AND COMPUTER SIMULATION OF AGRICULTURAL WASTE TREATMENT PROCESSES K
200 77 4764	SWINE-WASTES	LONG-TERM FESCUE AND COASTAL BERMUDAGRASS CROP RESPONSE TO SWINE LAGOON EFFLUENT KEYWOR
200 77 4765	SWINE-WASTES	MICROALGAE AS A MEANS OF RECYCLING ANIMAL WASTES KEYWORDS: RECYCLING WASTE-TREATMENT SW
200 77 4772	SWINE-WASTES	CONCEPTUAL MODELLING OF NONPOINT SOURCE POLLUTION FROM LAND AREAS RECEIVING ANIMAL WAST
200 77 4774	SWINE-WASTES	A MIXED INTEGER PROGRAMMING MODEL FOR CHOOSING AN OPTIMAL SWINE MANURE HANDLING SYSTEM
200 74 4781	SWINE-WASTES	SWINE BUILDING AIR CONTAMINATE CONTROL WITH PIT VENTILATION KEYWORDS: SWINE-WASTES GASE
200 73 4783	SWINE-WASTES	SWINE HOUSING AND WASTE DISPOSAL RESEARCH AND DEVELOPMENTS KEYWORDS: SWINE-WASTES WAST
200 74 4787	SWINE-WASTES	UNAERATED LAGOON RESPONSE TO LOADING INTENSITY AND FREQUENCY KEYWORDS: LAGOONS SWINE-WA
400 78 4796	SWINE-WASTES	LET SWINE WASTES CUT YOUR FERTILIZER BILL KEYWORDS: SWINE-WASTES WASTE-STORAGE PITS LAG
100 72 4802	SWINE-WASTES	STUDIES ON LIVESTOCK EXCRETA DISPOSAL BY METHANE. FERMENTATION I. BASIC EXPERIMENT ON CO
100 72 4803	SWINE-WASTES	STUDIES ON LIVESTOCK EXCRETA DISPUSAL BY METHANE. FERMENTATION II. OPTIMUM LOAD AND COMPA
200 77 4808	SWINE-WASTES	PREDICTION OF EFFECTS OF LAGOON DESIGN VARIABLES-NITROGEN CONSERVATION OR REMOVAL KEYWO
200 77 4809	SWINE-WASTES	WASTEWATER REUSE LAGOON SYSTEMS FOR SWINE KEYWORDS: SWINE-WASTES LAGOONS FLUSHING WASTE
200 77 4810	SWINE-WASTES	NITRATE PRODUCTION AND CONTROL IN AN OXIDATION DITCH KEYWORDS: SWINE-WASTES OXIDATION-D
400 77 4831	SWINE-WASTES	FLUSH GUTTER SYSTEMS-CUT COSTS, IMPROVE ANIMAL ENVIRONMENT KEYWORDS: CONFINEMENT-PENS
400 78 4832	SWINE-WASTES	GRAVITY DRAIN SYSTEMS FOR FARROWING AND NURSERY FACILITIES KEYWORDS: GRAVITY-DRAIN-SYS
400 78 4846	SWINE-WASTES	FLUSH SYSTEM CLEANS SWINE PENS KEYWORDS: SWINE-WASTES CONFINEMENT-PENS FLUSHING DESIGN
100 77 4853	SWINE-WASTES	THE EFFECT OF ANAEROBIC DIGESTION UPON SWINE MANURE ODORS KEYWORDS: SWINE-WASTES ODOR A
100 77 4868	SWINE-WASTES	THE PHOSPHORUS CYCLE IN PIG SLURRY MEASURED FROM 32PO4 DISTRIBUTION RATES KEYWORDS: SWI
700 74 4882	SWINE-WASTES	A COMPUTER SIMULATION OF BIOLOGICAL TREATMENT, STORAGE, AND LAND DISPOSAL OF SWINE WAST
700 74 4885	SWINE-WASTES	A NUTRITIONAL EVALUATION OF RECYCLED SWINE WASTE KEYWORDS: REFEEDING SWINE-WASTES SWINE
100 76 4891	SWINE-WASTES	AN INTEGRATED SEPARATION, AEROBIC TREATMENT AND SLUDGE DE-WATERING SYSTEM FOR PIG SLURR
100 77 4893	SWINE-WASTES	THE EFFECT OF MIXING ON AN ANAEROBIC LAGOON KEYWORDS: SWINE-WASTES WASTE-TREATMENT LAGO
100 77 4895	SWINE-WASTES	NUTRITIONAL EVALUATION WITH RATS OF ALGAE CHLORELLA GROWN ON SWINE MANURE KEYWORDS: LI
200 77 4896	SWINE-WASTES	DEWATERING A SWINE MANURE SLURRY BY EXPRESSION KEYWORDS: SEPARATION-TECHNIQUES SWINE-WA
400 78 4897	SWINE-WASTES	MANURE CAN SLICE FERTILIZER NEEDS KEYWORDS: SWINE-WASTES FERTILIZERS LAND-APPLICATION W
400 78 4910	SWINE-WASTES	SULFA RESIDUES IN SWINE STILL A PROBLEM KEYWORDS: SWINE-SULFA RESIDUES WITHDRAWAL-PERIO
300 4916	SWINE-WASTES	METHANE PRODUCTION SYSTEMS FOR SWINE MANURE KEYWORDS: SWINE-WASTES CONFINEMENT-PENS ANA
300 4920	SWINE-WASTES	FERTILIZER VALUE OF SWINE MANURE KEYWORDS: SWINE-WASTES FERTILIZERS WASTE-COMPOSITION W
400 77 4936	SWINE-WASTES	GRAVITY-DRAIN SYSTEM KEYWORDS: LIQUID-WASTES SWINE-WASTES ODOR AIR-POLLUTION GRAVITY-DR
100 77 4945	SWINE-WASTES	EFFECTS ON SOLID AND LIQUID BEEF MANURE AND LIQUID HOG MANURE ON SOIL CHARACTERISTICS A
300 78 4951	SWINE-WASTES	ENVIRONMENTAL IMPACT RESULTING FROM UNCONFINED ANIMAL PRODUCTION KEYWORDS: ENVIRONMENTA
200 77 4961	SWINE-WASTES	VEGETATIVE FILTER TREATMENT OF FEEDLOT RUNOFF KEYWORDS: VEGETATIVE-FILTER-SYSTEMS FEEDL
200 77 4966	SWINE-WASTES	EFFECT OF SURFACE AERATION ON GASES EVOLVED BY A SWINE-WASTE ANAEROBIC LAGOON KEYWORDS:
400 78 4977	SWINE-WASTES	QUESTIONS AND ANSWERS ABOUT MANURE FLUSHING SYSTEMS FOR SWINE BUILDINGS KEYWORDS: SWINE
400 78 4978	SWINE-WASTES	GEORGIA FARMERS CUT COSTS WITH CORNLAGE KEYWORDS: SWINE-WASTES CONFINEMENT-PENS SLURRIE
300 77 4982	SWINE-WASTES	PURPLE SULFUR BACTERIA IN LAGOONS IN THE MIDWEST KEYWORDS: SWINE-WASTES LAGOONS ODOR BA
100 75 4986	SWINE-WASTES	VARIATIONS BETWEEN FARMS IN N, P, K, MG AND DRY MATTER COMPOSTION OF CATTLE, PIG AND PO
100 77 4987	SWINE-WASTES	QUANTITATION OF INDOLE AND SKATOLE IN A HOUSED SWINE UNIT KEYWORDS: SWINE-WASTES CONFIN
400 74 4988	SWINE-WASTES	PIGGERY UNDER-SLAT SCRAPER SYSTEM KEYWORDS. SWINE-WASTES CONFINEMENT HOUSING SLURRIES W
400 74 4990	SWINE-WASTES	ENGINEERS OUTLINE WASTE DESIGN FACTORS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT DESIGN S
100 77 4993	SWINE-WASTES	BIOGASIFICATION USING NAOH TREATED PIG FAECES KEYWORDS: LIQUID-WASTES SWINE-WASTES CHEM
300 75 5002	SWINE-WASTES	SELECTING A SWINE WASTE MANAGEMENT SYSTEM KEYWORDS. SWINE-WASTES MANAGEMENT FLOORS DESI
200 76 5005	SWINE-WASTES	EXPERIENCES IN BUILDING AND OPERATING A FIELD SCALE ANAEROBIC DIGESTER KEYWORDS: ANAERO
100 77 5014	SWINE-WASTES	FLUSHING PIGGERY WASTES KEYWORDS: FLUSHING SWINE-WASTES DESIGN EFFLUENT
200 74 5017	SWINE-WASTES	MECHANICAL LIQUID-SOLID SEPARATION OF BEEF, DAIRY AND SWINE WASTE SLURRIES KEYWORDS: SE
300 78 5055	SWINE-WASTES	SWINE LAGOON EFFLUENT ON A SOIL-PLANT ENVIRONMENT--AN IMPACT ASSESSMENT KEYWORDS: SWINE
100 78 5056	SWINE-WASTES	FLUSHING SLAT WASTE HANDLING SYSTEM KEYWORDS: SWINE-WASTES LIQUID-WASTES FLUSHING DESIG
100 78 5060	SWINE-WASTES	DISSOLVED ORGANIC AND INORGANIC PHOSPHORUS COMPOUNDS IN PIG SLURRY: EFFECT OF DRYING K
100 77 5061	SWINE-WASTES	CHARACTERISTICS OF AEROBIC, SOLID SUBSTRATE FERMENTATION OF SWINE WASTE-CORN MIXTURES K
100 77 5062	SWINE-WASTES	FERMENTATION OF SWINE WASTE-CORN MIXTURES FOR ANIMAL FEED: PILOT-PLANT STUDIES KEYWORD
100 73 5085	SWINE-WASTES	THE EFFECT OF APPLYING LARGE QUANTITIES OF SLURRY TO GRASSLAND KEYWORDS: LAND-APPLICATI
300 77 5088	SWINE-WASTES	FARM WASTE MANAGEMENT -- PIGS: 1. BIOLOGICAL FILTRATION TOWER -- TERRINGTON EHF REPORT
100 74 5089	SWINE-WASTES	THE EFFECTIVENESS OF LIQUID MANURE OF CATTLE AND PIGS WITH PLOUGHED-IN STRAW IN THE CR
200 78 5100	SWINE-WASTES	RECYCLING SWINE WASTE IN A GROWING-FINISHING RATION KEYWORDS: REFEEDING SWINE-WASTES SW
200 78 5110	SWINE-WASTES	WASTE HANDLING ALTERNATIVES FOR FARROWING UNITS KEYWORDS: SWINE-WASTES WASTE-STORAGE LI
200 78 5113	SWINE-WASTES	METHODOLOGIES AND PRELIMINARY RESULTS FOR EVALUATING SWINE DRYLOT RUNOFF IMPACT ON COA

100 77 5135	SWINE-WASTES		CONTINUOUS CULTIVATION OF CHLORELLA EMERSONII ON PIG MANURE KEYWORDS: SWINE-WASTES WAST
100 78 5144	SWINE-WASTES		CARBON NITROGEN RATIO AND ANAEROBIC DIGESTION OF SWINE WASTE KEYWORDS: ANAEROBIC DIGEST
400 75 5157	SWINE-WASTES		NEW SLURRY COMPOSTING PROCESS KEYWORDS: COMPOSTING SLURRIES EQUIPMENT-COMPOSTING CATTLE
100 78 5159	SWINE-WASTES		EFFECT OF DISSOLVED OXYGEN CONCENTRATION ON THE AEROBIC STABILIZATION OF SWINE WASTE KE
400 78 5168	SWINE-WASTES		RECYCLED SWINE WASTE FED IN GROWING-FINISHING DIET KEYWORDS: SWINE-WASTES REFEEDING SWI
100 78 5171	SWINE-WASTES		EFFECTS OF LIQUID SWINE WASTE APPLICATIONS ON CORN YIELD AND SOIL CHEMICAL COMPOSITION
300 78 5172	SWINE-WASTES		SWINE WASTES AS A NUTRIENT SOURCE IN GROWING-FINISHING SWINE RATIONS KEYWORDS: SWINE-WA
100 77 5181	SWINE-WASTES		THERMOPHILIC FERMENTATION OF PIG FAECES AND STRAW BY ACTINOMYCETES KEYWORDS: WASTE-TREA
300 78 5183	SWINE-WASTES		SPECIFIC COMPOSITION OF REPRESENTATIVE FEEDLOT WASTES: A CHEMICAL AND MICROBIAL PROFILE
100 73 5184	SWINE-WASTES		EQUIPMENT AND METHODS FOR THE SOLID LIQUID SEPARATION OF SLURRIES KEYWORDS: SLURRIES SE
100 78 5186	SWINE-WASTES		MODEL STUDY OF FIVE TYPES OF MANURE PIT VENTILATION SYSTEMS KEYWORDS: VENTILATION SWINE
200 78 5195	SWINE-WASTES		BIOLOGICAL AND CHEMICAL FLUCTUATIONS DURING ANAEROBIC DIGESTION OF SWINE MANURE KEYWORD
300 78 5204	SWINE-WASTES		ENSILING CHARACTERISTICS AND UTILIZATION BY SWINE OF ENSILED SWINE WASTE AND GROUND COR
300 77 5205	SWINE-WASTES		RESEARCH IN ANIMAL WASTE MANAGEMENT KEYWORDS: SWINE-WASTES DIGESTERS METHANE AGITATION
400 78 5206	SWINE-WASTES		COLOR THESE LAGOONS PURPLE KEYWORDS: ODOR-CONTROL SWINE-WASTES PURPLE-SULFUR-BACTERIA
400 78 5223	SWINE-WASTES		MANAGING MANURE ECONOMICS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT ECONOMICS SLATTED-FLO
500 76 5225	SWINE-WASTES		THE UPGRADING OF AGRICULTURAL WASTES BY THERMOPHILIC FUNGI KEYWORDS: WASTE-TREATMENT T
400 78 5228	SWINE-WASTES		AUSTRALIANS UTILIZE FARM WASTE TO PRODUCE EDIBLE PROTEIN PRODUCTS KEYWORDS: SWINE-WASTE
200 78 5230	SWINE-WASTES		A CONTROL SYSTEM FOR AN AUTOMATED ANAEROBIC DIGESTER KEYWORDS: ANAEROBIC DIGESTERS SWIN
100 77 5240	SWINE-WASTES		SAMPLING, CHARACTERISATION AND ANALYSIS OF MALODOURS KEYWORDS: ODOR SWINE-WASTES POULTR
100 77 5242	SWINE-WASTES		A METHOD FOR SAMPLING AIR IN ANIMAL HOUSES TO ANALYSE TRACE GASES INCLUDING ODORANTS WI
100 77 5243	SWINE-WASTES		CHARACTERIZATION OF MALODOURS DURING ANAEROBIC STORAGE OF PIG WASTES KEYWORDS: WASTE-ST
100 77 5244	SWINE-WASTES		SAMPLING AND ANALYSIS OF AIR IN PIG HOUSES KEYWORDS: ODOR SWINE-WASTES SPECTROPHOTOMETR
100 77 5245	SWINE-WASTES		ODOURS ARISING FROM THE LAND-SPREADING OF PIG SLURRY KEYWORDS: LAND-APPLICATION SWINE-W
100 77 5246	SWINE-WASTES		ODOUR CONTROL OF LIQUID SWINE MANURE BY AERATION KEYWORDS: WASTE-STORAGE SWINE-WASTES A
100 77 5247	SWINE-WASTES		FRENCH EXPERIMENT IN PIG SLURRY DEODORIZATION KEYWORDS: ODOR-CONTROL SWINE-WASTES SLURR
100 77 5252	SWINE-WASTES		DEODORIZATION BY MEANS OF OZONE KEYWORDS: ODOR-CONTROL OZONE SWINE-WASTES ANIMAL-HEALTH
500 77 5279	SWINE-WASTES		COLLECTION, STORAGE AND TRANSPORT OF SWINE WASTES KEYWORDS: SWINE-WASTES WASTE-REMOVAL
500 77 5284	SWINE-WASTES		AEROBIC STABILIZATION OF PIG FEEDLOT WASTEWATERS IN CZECHOSLOVAKIA KEYWORDS: SWINE-WAST
500 77 5291	SWINE-WASTES		COSTS OF LIQUID HANDLING AND TREATMENT OF LARGE SWINE FEEDLOT WASTES KEYWORDS: ECONOMIC
500 77 5292	SWINE-WASTES		COST OF ANIMAL WASTE MANAGEMENT KEYWORDS WASTE-MANAGEMENT ECONOMICS WATER-POLLUTION CA
500 77 5294	SWINE-WASTES		SWINE FEEDLOT WASTEWATER TREATMENT IN ROMANIA KEYWORDS: SWINE-WASTES FEEDLOTS WASTEWATE
500 77 5295	SWINE-WASTES		FEEDLOT WASTE MANAGEMENT IN UPPER SILESIA, POLAND KEYWORDS: SWINE-WASTES LIQUID-WASTES
500 77 5296	SWINE-WASTES		FEEDLOT WASTE MANAGEMENT IN HUNGARY KEYWORDS: WATER-POLLUTION LEGAL-ASPECTS FEEDLOTS SW
500 77 5298	SWINE-WASTES		ANIMAL WASTE MANAGEMENT IN GREECE KEYWORDS: FEEDLOTS POULTRY-WASTES SWINE-WASTES LIQUID
500 77 5300	SWINE-WASTES		FEEDLOT WASTE MANAGEMENT IN BULGARIA KEYWORDS: FEEDLOTS SWINE-WASTES DAIRY-INDUSTRY POL
100 77 5303	SWINE-WASTES		ANAEROBIC DIGESTION OF PIGGERY WASTE. 1. THE INFLUENCE OF DETENTION TIME AND MANURE CON
100 78 5309	SWINE-WASTES		UTILIZATION OF SWINE MANURE IN A POLYCULTURE OF ASIAN AND NORTH AMERICAN FISHES KEYWORD
400 78 5312	SWINE-WASTES		AGRICULTURAL WASTES IN FISH FARMING KEYWORDS: SWINE-WASTES CATTLE-WASTES POULTRY-WASTES
700 74 4885	SWINE-WASTES-DRIED		A NUTRITIONAL EVALUATION OF RECYCLED SWINE WASTE KEYWORDS: REFEEDING SWINE-WASTES SWINE
200 76 4736	SYSTEMS-ANALYSIS		WASTE MANAGEMENTS SYSTEMS IN ANIMAL HUSBANDRY-APPLICATION OF FARM MODEL STUDIES AND SYS
200 77 4959	SYSTEM-ANALYSIS		A GRAPHICAL ANALYSIS OF LIVESTOCK PRODUCTION AND WASTE-MANAGEMENT SYSTEMS KEYWORDS: SYS
500 77 5290	TANK-WAGONS		LAND DISPOSAL OF FEEDLOT WASTES BY IRRIGATION IN CZECHOSLOVAKIA KEYWORDS: LAND-APPLICAT
300 77 5049	TECHNIQUES		REFEEDING WASTES TO DAIRY CATTLE KEYWORDS: DAIRY-WASTES SEPARATION TECHNIQUES DEHYDRATI
200 74 4748	TEMPERATURES		A MATHEMATICAL DRYING MODEL FOR MANURE BASED ON THE CONCEPT OF A RECEDING EVAPORATIVE I
200 76 4733	TEMPERATURE		MATHEMATICAL MODELLING OF AMMONIUM OXIDATION IN EFFLUENTS KEYWORDS: MATHEMATICAL-MODELS
200 74 4757	TEMPERATURE		ENVIRONMENT AS A RESULT OF IN-HOUSE DRYING OF POULTRY EXCRETA KEYWORDS: POULTRY-WASTES
200 74 4759	TEMPERATURE		MECHANIZED COMPOSTING SYSTEM EVALUATION KEYWORDS. COMPOSTING MICROORGANISMS DAIRY-WASTE
200 77 4773	TEMPERATURE		SOME MECHANICAL ASPECTS OF ANAEROBIC DIGESTION OF BEEF MANURE KEYWORDS: ANAEROBIC-DIGES
100 77 4853	TEMPERATURE		THE EFFECT OF ANAEROBIC DIGESTION UPON SWINE MANURE ODORS KEYWORDS: SWINE-WASTES ODOR A
100 78 4858	TEMPERATURE		HORMONAL ACTIVITY IN POULTRY EXCRETA PROCESSED FOR LIVESTOCK FEED KEYWORDS: POULTRY-WAS
200 77 4867	TEMPERATURE		THREE YEARS OF EVALUATING A MIDWEST ANAEROBIC DAIRY LAGOON KEYWORDS: DAIRY-WASTES ANAE
400 77 4887	TEMPERATURE		COMPOSTING AS A MANURE MANAGEMENT SYSTEM KEYWORDS: FARM-WASTES COMPOSTING ODOR-CONTROL
100 77 4893	TEMPERATURE		THE EFFECT OF MIXING ON AN ANAEROBIC LAGOON KEYWORDS: SWINE-WASTES WASTE-TREATMENT LAGO
700 74 4908	TEMPERATURE		CYCLONIC BURNER FOR PARTIAL COMBUSTION OF MANURE TO AMMONIA SYNTHESIS GAS KEYWORDS: OXI
100 77 4934	TEMPERATURE		A DYNAMIC MODEL FOR SIMULATION OF ANIMAL WASTE DIGESTION KEYWORDS: MATHEMATICAL-MODELS
200 77 4966	TEMPERATURE		EFFECT OF SURFACE AERATION ON GASES EVOLVED BY A SWINE-WASTE ANAEROBIC LAGOON KEYWORDS
400 78 4974	TEMPERATURE		EUROPEAN COMPOSTING METHODS-TREATMENT AND USE OF FARM YARD MANURE AND SLURRY KEYWORDS
100 78 5060	TEMPERATURE		DISSOLVED ORGANIC AND INORGANIC PHOSPHORUS COMPOUNDS IN PIG SLURRY: EFFECT OF DRYING K
300 78 5065	TEMPERATURE		ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUE: POTENTIAL FOR IMPROVEMENT AND IMPLEME
100 78 5136	TEMPERATURE		DRYING CHARACTERISTICS OF BROILER WASTE ON A HEATED CONCRETE SLAB KEYWORDS: DEHYDRATION
200 76 5199	TEMPERATURE		FERMENTATION FOR METHANE PRODUCTION KEYWORDS' FERMENTATION METHANE GAS-PRODUCTION ANAER
300 78 5201	TEMPERATURE		CHANGES IN CHARACTERISTICS OF DEEP STACKED BROILER LITTER WITH TIME KEYWORDS: POULTRY-L
200 77 5237	TEMPERATURE		THE CONCENTRATION OF LIQUID MANURE AFFECTS ITS INFILTRATION INTO SOIL KEYWORDS: LIQUID-
100 77 5242	TEMPERATURE-GRADIE		A METHOD FOR SAMPLING AIR IN ANIMAL HOUSES TO ANALYSE TRACE GASES INCLUDING ODORANTS WI
300 75 4701	TEXAS-LAW		ENVIRONMENTAL PROTECTION REQUIREMENTS FOR SWINE OPERATIONS KEYWORDS. SWINE FEEDLOTS AI
300 74 4960	TEXAS-LAW		FEEDLOT POLLUTION CONTROL GUIDELINES KEYWORDS. FEEDLOTS TEXAS-LAW PERMITS LEGAL-ASPECTS
400 78 4849	THERMONETICS		STATE-BASED PLANT TURNING CATTLE MANURE INTO METHANE GAS KEYWORDS: CATTLE-WASTES RECYCL
600 4917	THERMONETICS		THE CALORIFIC PROJECT. I. BACKGROUND AND DESIGN CRITERIA KEYWORDS. RECYCLING CATTLE-WA
400 78 5189	THERMONETICS		FEEDLOT MANURE KEEPS HOME FIRES BURNING KEYWORDS: RECYCLING THERMONETICS METHANE REFEED
300 78 5152	THERMONETICS-INC		METHANE PRODUCTION FROM LIVESTOCK WASTE KEYWORDS: RECYCLING LIVESTOCK-WASTES POULTRY-WA
100 72 4802	THERMOPHILIC		STUDIES ON LIVESTOCK EXCRETA DISPOSAL BY METHANE FERMENTATION. I BASIC EXPERIMENT ON CO
100 72 4803	THERMOPHILIC		STUDIES ON LIVESTOCK EXCRETA DISPOSAL BY METHANE FERMENTATION. II. OPTIMUM LOAD AND COMPA
100 77 5181	THERMOPHILIC		THERMOPHILIC FERMENTATION OF PIG FAECES AND STRAW BY ACTINOMYCETES KEYWORDS: WASTE-TREA
500 76 5225	THERMOPHILIC		THE UPGRADING OF AGRICULTURAL WASTES BY THERMOPHILIC FUNGI KEYWORDS: WASTE-TREATMENT T
100 77 5247	THERMOPHILIC		FRENCH EXPERIMENT IN PIG SLURRY DEODORIZATION KEYWORDS: ODOR-CONTROL SWINE-WASTES SLURR
500 77 5284	THERMOPHILIC		AEROBIC STABILIZATION OF PIG FEEDLOT WASTEWATERS IN CZECHOSLOVAKIA KEYWORDS: SWINE-WAST
100 78 5041	THIOCARBAMIDE		USE OF THIOCARBAMIDE TO CONTROL HOUSE FLIES IN CAGED LAYER HOUSES KEYWORDS: FLY-CONTRO
100 78 5043	THIOCARBAMIDE		THIOCARBAMIDE AS AN INSECTICIDE WHEN APPLIED TO CAGE LAYING HEN FECES KEYWORDS: FLY-CON
300 77 5035	THIOLS		SOURCE ASSESSMENT--BEEF CATTLE FEEDLOTS KEYWORDS: CATTLE DUSTS GASES AMMONIA THIOLS AIR
100 77 5239	THRESHOLD-DILUTION		MEASUREMENT OF ODOUR INTENSITY IN FARMING SITUATIONS KEYWORDS: ODOR-MEASUREMENT CHEMICA
400 78 4973	TILAPIA		KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA-PART THREE KEYWORDS: LIQUID-WASTES WASTEWATER-TRE
200 77 4768	TIME-MOTION-ANALYS		TIME-MOTION ANALYSIS OF FEEDLOT MANURE COLLECTION SYSTEMS KEYWORDS: WASTE-COLLECTION TI
200 78 5106	TOTAL-KJELDAHL-NIT		WINTER AND SPRING RUNOFF FROM MANURE APPLICATION PLOTS KEYWORDS: LAND-APPLICATION AGRIC
100 77 4862	TOTAL-NITROGEN		LAND DISPOSAL OF BROILER LITTER--CHANGES IN CONCENTRATION OF CHLORIDE, NITRATE NITROGEN
200 77 4767	TOTAL-SOLIDS		COMMERCIAL SIZE ANAEROBIC DIGESTER PERFORMANCE WITH DAIRY MANURE KEYWORDS: DAIRY-WASTES
200 77 4769	TOTAL-SOLIDS		PERFORMANCE OF A LARGE SIZE ANAEROBIC DIGESTER FOR POULTRY MANURE KEYWORDS: ANAEROBIC D
100 77 4856	TOTAL-SOLIDS		RUNOFF FROM FEEDLOTS AND MANURE STORAGES IN SOUTHERN ONTARIO KEYWORDS FEEDLOT-RUNOFF W
200 77 4867	TOTAL-SOLIDS		THREE YEARS OF EVALUATING A MIDWEST ANAEROBIC DAIRY LAGOON KEYWORDS: DAIRY-WASTES ANAE
200 78 4947	TOTAL-SOLIDS		METHANE AND BIOMASS PRODUCTION SYSTEMS FOR BEEF CATTLE MANURE KEYWORDS: LIVESTOCK-WASTE
300 77 4982	TOTAL-SOLIDS		PURPLE SULFUR BACTERIA IN LAGOONS IN THE MIDWEST KEYWORDS: SWINE-WASTES LAGOONS ODOR BA
200 78 5227	TOTAL-SOLIDS		BARNYARD SEDIMENT AND NUTRIENT REMOVAL BY GRASS FILTERS KEYWORDS: AGRICULTURAL-RUNOFF S
100 77 5303	TOTAL-SOLIDS		ANAEROBIC DIGESTION OF PIGGERY WASTE 1. THE INFLUENCE OF DETENTION TIME AND MANURE CON
100 75 4679	TOXICITY		NOTE ON DETOXICATION OF LINDANE BY FARMYARD MANURE KEYWORDS: INSECTICIDES LINDANE SOIL-
200 71 4762	TOXICITY		SAFETY HAZARDS ASSOCIATED WITH LIVESTOCK WASTE KEYWORDS: FEEDLOTS ACCIDENTS MANAGEMENT
200 77 4807	TOXICITY		BACTERIAL RESPONSE TO SALTS IN AN ANAEROBIC DAIRY LAGOON KEYWORDS: DAIRY-WASTES LAGOONS
100 76 4827	TOXICITY		EXPERIMENTAL STUDY OF NITROGEN EXCRETION OF BASS DICENTRARCHUS LABRAX DURING GROWTH 1
300 76 4870	TOXICITY		APPLICATION OF SEWAGE TO CROPLAND--APPRAISAL OF POTENTIAL HAZARDS OF THE HEAVY METALS T
400 78 4909	TOXICITY		LIQUID MANURE CAN RELEASE DEADLY GASES KEYWORDS: LIQUID-WASTES GASES TOXICITY SAFETY
100 77 4993	TOXICITY		BIOGASIFICATION USING NAOH TREATED PIG FAECES KEYWORDS: LIQUID-WASTES SWINE-WASTES CHEM

400	78 5011	TOXICITY	TOXIC GASES KILL WORKER KEYWORDS: AIR-POLLUTION PUBLIC-HEALTH CONFINEMENT-PENS CATTLE-W
200	76 5071	TOXICITY	SIGNIFICANCE OF HEAVY METALS IN DPW FOR FEEDING KEYWORDS: REFEEDING POULTRY-WASTES-DRIE
300	78 5139	TOXICITY	DEATH IN A FARM WORKER ASSOCIATED WITH TOXIC GASES FROM A LIQUID MANURE SYSTEM - WISCON
400	78 5185	TOXICITY	POULTRY MANURE AS FEED KEYWORDS: REFEEDING POULTRY-WASTES SWINE PERFORMANCE NITROGEN TO
500	77 5276	TOXICITY	NOXIOUS GASES AND ODOURS KEYWORDS: ODOR-CONTROL ANIMAL-HEALTH PUBLIC-HEALTH TOXICITY HY
300	78 5055	*TOXIC-MINERALS*	*SWINE LAGOON EFFLUENT ON A SOIL-PLANT ENVIRONMENT--AN IMPACT ASSESSMENT KEYWORDS: SWINE*
200	78 5156	TOXIC-MINERALS	NUTRIENTS AVAILABLE IN LIVESTOCK AND POULTRY MANURE RESIDUE AS REFLECTED BY MANAGEMENT
100	75 4678	TRACE-ELEMENTS	NOTE ON SECONDARY AND MICRO-ELEMENT CONTENTS OF FERTILIZERS AND MANURES KEYWORDS: FERT
200	78 5156	TRACE-ELEMENTS	NUTRIENTS AVAILABLE IN LIVESTOCK AND POULTRY MANURE RESIDUE AS REFLECTED BY MANAGEMENT
300	78 5183	TRACE-ELEMENTS	SPECIFIC COMPOSITION OF REPRESENTATIVE FEEDLOT WASTES: A CHEMICAL AND MICROBIAL PROFILE
400	78 5236	TRACE-ELEMENTS	MANURE SPREADING BUILDS SOIL AND PROFITS KEYWORDS: ANIMAL-WASTES ECONOMICS FERTILIZERS
500	77 4907	TRACE-MINERALS	FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS: MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP
700	76 4942	TRACE-MINERALS	THE EFFECT OF APPLICATION OF POULTRY MANURE WHICH WAS SUBJECTED TO DIFFERENT WASTE MANA
100	77 4945	TRACE-MINERALS	EFFECTS ON SOLID AND LIQUID BEEF MANURE AND LIQUID HOG MANURE ON SOIL CHARACTERISTICS A
100	77 4946	TRACE-MINERALS	MANURE MANAGEMENT IN AN IRRIGATED BASIN RELATIVE TO SALT LEACHATE TO GROUND WATER KEYWO
300	78 5023	TRACE-MINERALS	ULTIMATE DISPOSAL OF BEEF FEEDLOT WASTES ONTO LAND KEYWORDS: FEEDLOTS CATTLE-WASTES LAN
100	77 5118	TRACE-MINERALS	THE EFFECTS OF CATTLE SLURRY AND INORGANIC FERTILISER NITROGEN ON THE YIELD AND MINERAL
400	78 5126	TRACE-MINERALS	FEED AND FERTILIZER VALUE OF BROILER LITTER VARIES KEYWORDS: POULTRY-LITTER RECYCLING W
300	78 5188	TRACE-MINERALS	ESTIMATING U S LIVESTOCK AND POULTRY MANURE AND NUTRIENT PRODUCTION KEYWORDS: LIVESTOC
500	77 4900	TRANSPORTATION	SOILS FOR MANAGEMENT OF ORGANIC WASTES AND WASTE WATERS KEYWORDS: ORGANIC-WASTES SOILS
100	77 4892	TRANSPORTING	MECHANICAL MANURE HARVESTING FROM FEEDLOTS KEYWORDS: FEEDLOT-WASTES EQUIPMENT-MANURE-HA
100	77 5179	TRANSPORT	SLUDGE DISPOSAL STRATEGY: PROCESSES AND COSTS KEYWORDS: SEWAGE SLUDGE LAND-APPLICATION
100	73 4689	TREADING	A TECHNIQUE FOR THE STUDY OF FOULING BY GRAZING CATTLE KEYWORDS: CATTLE DEFOLIATION TRE
400	77 5004	TRICHODERMA-VIRIDE	A MARTINI IN YOUR TANK KEYWORDS: RECYCLING ORGANIC-WASTES LIVESTOCK-WASTES ETHYL-ALCOHO
100	77 5016	TRICHODERMA-VIRIDE	PROTEIN PRODUCTION FROM FEEDLOT WASTE KEYWORDS. FEEDLOTS CATTLE-WASTES REFEEDING SUBSTR
100	76 5021	TRICHOSTRONGYLE-IN	TRICHOSTRONGYLE INFESTATIONS IN AUTUMN ON PASTURES GRAZED EXCLUSIVELY BY COWS OR BY CAL
300	72 4821	TURBIDITY	ENVIRONMENTAL PROTECTION AGENCY VS ROBERT R DETERS-FABIAN J DETERS-MARCELLUS J DETERS
400	78 4837	TURKEYS	FERTILIZER VALUE OF TURKEY WASTE KEYWORDS: POULTRY-WASTES SOLID-WASTES TURKEYS LIQUID-W
300	77 4865	TURKEYS	CHEMICAL ANALYSIS AND FERTILIZER VALUE OF TURKEY MANURE KEYWORDS: POULTRY-WASTES WASTE-
400	78 4983	TURKEYS	TURKEY MANURE AS FERTILIZER KEYWORDS: TURKEYS POULTRY-WASTES FERTILIZERS PHOSPHORUS POT
100	77 4991	TURKEYS	EFFECT OF SLATTED AND DEEP LITTER FLOORS ON THE PRODUCTIVE PERFORMANCE AND ENERGY UTIL
100	77 5032	TURKEYS	LITTER REUSE EFFECTS ON SELECTED TURKEY PRODUCTION AND PROCESSING PARAMETERS KEYWORDS·
100	78 5053	TURKEYS	AEROSOL CONCENTRATION IN A TURKEY BARN ENVIRONMENT KEYWORDS: *AIR-POLLUTION BACTERIA TUR*
100	77 4892	UNLOADING	MECHANICAL MANURE HARVESTING FROM FEEDLOTS KEYWORDS: FEEDLOT-WASTES EQUIPMENT-MANURE-HA
100	76 4827	UREA	EXPERIMENTAL STUDY OF NITROGEN EXCRETION OF BASS DICENTRARCHUS LABRAX DURING GROWTH I
100	78 4878	URIC-ACID	ANIMAL PERFORMANCE AND MICROBIAL ADAPTATION OF RUMINANTS FED FORMALDEHYDE TREATED POULT
100	78 5136	VAPOR-DIFFUSION-CO	DRYING CHARACTERISTICS OF BROILER WASTE ON A HEATED CONCRETE SLAB KEYWORDS: DEHYDRATION
200	71 4788	VECTORS	SALMONELLA AND OTHER MICROORGANISMS POSE A NEW PARAMETER TO DESIGNERS OF POULTRY HOUSES
400	77 4672	VEGETATIVE-FILTERS	CONTROL RUNOFF FROM OPEN LIVESTOCK FEEDLOTS KEYWORDS: AGRICULTURAL-RUNOFF RUNOFF-CONTRO
200	77 4961	VEGETATIVE-FILTER-	VEGETATIVE FILTER TREATMENT OF FEEDLOT RUNOFF KEYWORDS: VEGETATIVE-FILTER-SYSTEMS FEEDL
200	77 4872	VEGETATIVE-SOIL-FI	METHOD FOR INEXPENSIVE DISTRIBUTION OF LIQUID WASTE FROM DAIRY AND FEEDLOT KEYWORDS: LI
200	74 4757	VENTILATION	ENVIRONMENT AS A RESULT OF IN-HOUSE DRYING OF POULTRY EXCRETA KEYWORDS: POULTRY-WASTES
200	77 4775	VENTILATION	SIMPLIFIED DESIGN OF RIGID PLASTIC DUCTS FOR UNIFORM AIR REMOVAL FROM LIQUID MANURE PIT
200	74 4781	VENTILATION	SWINE BUILDING AIR CONTAMINATE CONTROL WITH PIT VENTILATION KEYWORDS: SWINE-WASTES GASE
200	73 4783	VENTILATION	SWINE HOUSING AND WASTE DISPOSAL RESEARCH AND DEVELOPMENTS KEYWORDS: SWINE-WASTES WAST
200	*76 4785*	*VENTILATION*	*VENTILATION OF TIE-STALL DAIRY BARNS IN ONTARIO KEYWORDS: VENTILATION DAIRY-INDUSTRY PO*
400	77 4831	VENTILATION	FLUSH GUTTER SYSTEMS-CUT COSTS, IMPROVE ANIMAL ENVIRONMENT KEYWORDS: CONFINEMENT-PENS
400	78 4871	VENTILATION	KEEPING FLIES OUT OF THE HEN HOUSE KEYWORDS: FLY-CONTROL POULTRY-HOUSES WASTE-REMOVAL M
400	78 5011	VENTILATION	TOXIC GASES KILL WORKER KEYWORDS: AIR-POLLUTION PUBLIC-HEALTH CONFINEMENT-PENS CATTLE-W
100	78 5053	VENTILATION	AEROSOL CONCENTRATION IN A TURKEY BARN ENVIRONMENT KEYWORDS: AIR-POLLUTION BACTERIA TUR
400	78 5163	VENTILATION	MOVE HOGS INDOORS-NEXT STEP IN HOG CONFINEMENT KEYWORDS: SWINE MANAGEMENT DESIGN ECONOM
100	78 5186	VENTILATION	MODEL STUDY OF FIVE TYPES OF MANURE PIT VENTILATION SYSTEMS KEYWORDS: VENTILATION SWINE
300	78 5218	VENTILATION	DOMESTIC FLY PROBLEMS IN DEEP PIT POULTRY HOUSES KEYWORDS: FLY-CONTROL DEEP-PITS POULTR
100	77 5258	VENTILATION	INVESTIGATIONS IN THE U K INTO METHODS OF ODOUR CONTROL FOR FARMS KEYWORDS: ODOR-CONTR
200	76 4729	VIRUSES	POSSIBILITIES OF POULTRY DROPPINGS DECONTAMINATION AS RELATED TO FARM LEVEL MANAGEMENT
300	78 5176	VIRUSES	SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICRO- BIOLOGICAL IMPLICATIONS VO
100	78 4912	VISCOSITY	INFLUENCE OF B-GLUCANASE ON FEEDING VALUE OF BARLEY FOR POULTRY AND MOISTURE CONTENT OF
100	77 4914	VISCOSITY	EFFECTS OF RATION ROUGHAGE CONTENT ON VISCOSITY AND THEORETICAL HEAD LOSSES IN PIPE FLO
100	77 5240	VOLATILES	SAMPLING, CHARACTERISATION AND ANALYSIS OF MALODOURS KEYWORDS: ODOR SWINE-WASTES POULTR
100	76 4843	VOLATILE-ACIDS	ANAEROBIC FERMENTATION OF POULTRY MANURE KEYWORDS. ANAEROBIC-DIGESTION POULTRY-WASTES V
100	77 4934	VOLATILE-ACIDS	A DYNAMIC MODEL FOR SIMULATION OF ANIMAL WASTE DIGESTION KEYWORDS: MATHEMATICAL-MODELS
200	77 4769	VOLATILE-FATTY-ACI	PERFORMANCE OF A LARGE SIZE ANAEROBIC DIGESTER FOR POULTRY MANURE KEYWORDS: ANAEROBIC D
100	77 5243	VOLATILE-FATTY-ACI	CHARACTERIZATION OF MALODOURS DURING ANAEROBIC STORAGE OF PIG WASTES KEYWORDS: WASTE-ST
100	77 5241	VOLATILE-GASES	CHARACTERIZATION OF ODORS AND OTHER VOLATILE EMISSIONS KEYWORDS: ODOR-CONTROL VOLATILE-
100	77 4934	VOLATILE-MATTER	A DYNAMIC MODEL FOR SIMULATION OF ANIMAL WASTE DIGESTION KEYWORDS: MATHEMATICAL-MODELS
200	77 4769	VOLATILE-SOLIDS	PERFORMANCE OF A LARGE SIZE ANAEROBIC DIGESTER FOR POULTRY MANURE KEYWORDS: ANAEROBIC D
200	77 4867	VOLATILE-SOLIDS	THREE YEARS OF EVALUATING A MIDWEST ANAEROBIC DAIRY LAGOON KEYWORDS: DAIRY-WASTES ANAE
200	78 4947	VOLATILE-SOLIDS	METHANE AND BIOMASS PRODUCTION SYSTEMS FOR BEEF CATTLE MANURE KEYWORDS: LIVESTOCK-WASTE
200	77 4957	VOLATILE-SOLIDS	ANAEROBIC LAGOONING OF MANURES AND MILKING PARLOR WASTEWATER KEYWORDS: DAIRY-WASTES AER
300	77 4982	VOLATILE-SOLIDS	PURPLE SULFUR BACTERIA IN LAGOONS IN THE MIDWEST KEYWORDS: SWINE-WASTES LAGOONS ODOR BA
700	76 4795	VOLATILE-SUSPENDED	ANAEROBIC DIGESTION OF SCREENED DAIRY CATTLE WASTE USING A FIBER WALL REACTOR KEYWORDS
200	76 4744	VOLATILIZATION	THE NITROGEN BALANCE SHEET KEYWORDS NITROGEN-TRANSFORMATIONS ORGANIC-WASTES SOIL-CHEMI
200	77 4772	VOLATILIZATION	CONCEPTUAL MODELLING OF NONPOINT SOURCE POLLUTION FROM LAND AREAS RECEIVING ANIMAL WAST
200	77 4959	WASTELAGE	A GRAPHICAL ANALYSIS OF LIVESTOCK PRODUCTION AND WASTE-MANAGEMENT SYSTEMS KEYWORDS: SYS
100	78 5216	WASTELAGE	A GRAPHICAL ANALYSIS OF LIVESTOCK PRODUCTION AND WASTE-MANAGEMENT SYSTEMS KEYWORDS: CAT
500	77 5288	WASTELAGE	UTILIZATION OF LIVESTOCK WASTES AS FEED AND OTHER DIETARY PRODUCTS KEYWORDS· REFEEDING
500	77 4902	WASTEWATER-MANAGEM	PROPERTIES OF WASTE WATERS KEYWORDS: WASTEWATER-MANAGEMENT WASTE-COMPOSITION BIOLOGICAL
100	78 4694	WASTEWATER-RENOVAT	TREATMENT OF DAIRY CATTLE WASTES BY A BARRIERED WASTEWATER RENOVATION SYSTEM KEYWORDS
200	77 4770	WASTEWATER-REUSE	DAIRY LAGOON EFFECTS ON GROUNDWATER QUALITY KEYWORDS: DAIRY-WASTES HOLDING-PONDS LAGOON
200	77 4809	WASTEWATER-REUSE	WASTEWATER REUSE LAGOON SYSTEMS FOR SWINE KEYWORDS: SWINE-WASTES LAGOONS FLUSHING WASTE
400	78 4931	WASTEWATER-REUSE	FARMING IN WASTE WATER MAY AID DEVELOPING NATIONS KEYWORDS: AQUACULTURE WASTEWATER-REUS
500	76 4965	WASTEWATER-REUSE	THE LAMAR BIO-CONVERSION PLANT DESIGN KEYWORDS: BIO-CONVERSION ANAEROBIC-DIGESTION CATT
400	78 4973	WASTEWATER-REUSE	KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA-PART THREE KEYWORDS: LIQUID-WASTES WASTEWATER-TRE
400	78 4977	WASTEWATER-REUSE	QUESTIONS AND ANSWERS ABOUT MANURE FLUSHING SYSTEMS FOR SWINE BUILDINGS KEYWORDS: SWINE
100	78 5056	WASTEWATER-REUSE	FLUSHING SLAT WASTE HANDLING SYSTEM KEYWORDS: SWINE-WASTES LIQUID-WASTES FLUSHING DESIG
200	*78 5109*	*WASTEWATER-REUSE*	*EARTHEN PITS FOR MANURE AND RECYCLED FLUSH-WATER STORAGE KEYWORDS: MANURE-PITS WASTE-ST*
400	78 5211	WASTEWATER-REUSE	HOLDING POND AND FLUSH GUTTERS KEYWORDS: CATTLE-WASTES FLUSHING WASTE-STORAGE RECYCLING
300	74 4752	WASTEWATER-TREATME	PRACTICAL TREATMENT OF FEEDLOT RUNOFF KEYWORDS. FEEDLOT-RUNOFF WASTEWATER-TREATMENT BIO
400	78 4973	WASTEWATER-TREATME	KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA-PART THREE KEYWORDS: LIQUID-WASTES WASTEWATER-TRE
500	77 5294	WASTEWATER-TREATME	SWINE FEEDLOT WASTEWATER TREATMENT IN ROMANIA KEYWORDS: SWINE-WASTES FEEDLOTS WASTEWATE
500	77 5295	WASTEWATER-TREATME	FEEDLOT WASTE MANAGEMENT IN UPPER SILESIA, POLAND KEYWORDS: SWINE-WASTES LIQUID-WASTES
200	77 4768	WASTE-COLLECTION	TIME-MOTION ANALYSIS OF FEEDLOT MANURE COLLECTION SYSTEMS KEYWORDS: WASTE-COLLECTION TI
200	77 4943	WASTE-COLLECTION	DAIRY CHORE REDUCTION PROGRAM PROGRESS REPORT KEYWORDS: ANIMAL-WASTES MANAGEMENT DESIGN
100	77 5020	WASTE-COLLECTION	STUDIES WITH HORSES COMPARING 4N-HCl INSOLUBLE ASH AS AN INDEX MATERIAL WITH TOTAL FECA
300	78 5037	WASTE-COLLECTION	METHODS OF FECAL COLLECTION AND NUTRIENT LEACHING IN DIGESTIBILITY STUDIES KEYWORDS: FI
100	75 4986	WASTE-COMPOSITION	VARIATIONS BETWEEN FARMS IN N, P, K, MG AND DRY MATTER COMPOSITION OF CATTLE, PIG AND PO
100	77 5061	WASTE-COMPOSITIN	CHARACTERISTICS OF AEROBIC, SOLID SUBSTRATE FERMENTATION OF SWINE WASTE-CORN MIXTURES K
100	75 4670	WASTE-COMPOSITION	FIELD TEST FOR ESTIMATING DRY MATTER AND FERTILIZER VALUE OF SLURRY-- PRELIMINARY REPOR
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100	70 4676	WASTE-COMPOSITION	FOULING OF PASTURES BY DUNG KEYWORDS: CATTLE-WASTES PASTURES WASTE-COMPOSITION DEGRADAT

400 78 4681 WASTE-COMPOSITION POULTRY MANURE FERTILIZER VALUE CUTS FARM COSTS KEYWORDS: POULTRY-WASTES LAND-APPLICATI
300 77 4683 WASTE-COMPOSITION PRELIMINARY IDENTIFICATION OF LITERATURE MODELS AND DATA FOR EVALUATING RURAL NONPOINT
200 71 4687 WASTE-COMPOSITION STORAGE OF BEEF CATTLE WASTES UNDER AEROBIC AND ANAEROBIC CONDITIONS KEYWORDS: CATTLE-W
100 78 4694 WASTE-COMPOSITION TREATMENT OF DAIRY CATTLE WASTES BY A BARRIERED WASTEWATER RENOVATION SYSTEM KEYWORDS
200 76 4705 WASTE-COMPOSITION UTILIZATION OF MANURE BY LAND SPREADING KEYWORDS: LIVESTOCK-WASTES EFFLUENTS LAND-APPLI
200 76 4711 WASTE-COMPOSITION EFFICIENT RECYCLING OF NUTRIENTS KEYWORDS: SWINE-WASTES POULTRY-WASTES CATTLE-WASTES SH
200 76 4712 WASTE-COMPOSITION THE AGRONOMIC UTILISATION OF PIG SLURRY-EFFECT ON FORAGE CROPS AND ON SOIL FERTILITY KE
200 76 4713 WASTE-COMPOSITION THE YIELD EFFICIENT NITROGEN PORTION IN TREATED AND UNTREATED MANURE KEYWORDS: LIVESTOC
200 76 4719 WASTE-COMPOSITION SOIL, WATER, PLANT RELATIONSHIP AS INFLUENCED BY INTENSIVE USE OF EFFLUENTS FROM LIVES
200 76 4737 WASTE-COMPOSITION ELABORATION OF STATISTICS ON MANURE PRODUCTION KEYWORDS: FARM-WASTES LAND-APPLICATION E
200 76 4739 WASTE-COMPOSITION SAMPLING TECHNIQUES FOR LIQUID SWINE MANURE KEYWORDS: LIQUID-WASTES WASTE-STORAGE AERAT
200 76 4740 WASTE-COMPOSITION METHODS OF ANALYSIS FOR MANURES-COMPARISON BETWEEN COUNTRIES OF THE EEC, 2ND APPROXIMAT
300 74 4752 WASTE-COMPOSITION PRACTICAL TREATMENT OF FEEDLOT RUNOFF KEYWORDS: FEEDLOT-RUNOFF WASTEWATER-TREATMENT BIO
200 74 4758 WASTE-COMPOSITION HANDLING HOUSED BEEF CATTLE FEEDLOT MANURE KEYWORDS: DESIGN FEEDLOTS CATTLE WASTE-MANAG
200 74 4759 WASTE-COMPOSITION MECHANIZED COMPOSTING SYSTEM EVALUATION KEYWORDS: COMPOSTING MICROORGANISMS DAIRY-WASTE
200 77 4767 WASTE-COMPOSITION COMMERCIAL SIZE ANAEROBIC DIGESTER PERFORMANCE WITH DAIRY MANURE KEYWORDS: DAIRY-WASTES
200 77 4769 WASTE-COMPOSITION PERFORMANCE OF A LARGE SIZE ANAEROBIC DIGESTER FOR POULTRY MANURE KEYWORDS: ANAEROBIC D
200 77 4770 WASTE-COMPOSITION DAIRY LAGOON EFFECTS ON GROUNDWATER QUALITY KEYWORDS: DAIRY-WASTES HOLDING-PONDS LAGOON
200 74 4787 WASTE-COMPOSITION UNAERATED LAGOON RESPONSE TO LOADING INTENSITY AND FREQUENCY KEYWORDS: LAGOONS SWINE-WA
400 77 4790 WASTE-COMPOSITION THE VALUE OF DRIED POULTRY WASTE AS A FEEDSTUFF IN BROILER DIETS KEYWORDS: REFEEDING P
400 77 4791 WASTE-COMPOSITION RECYCLED POULTRY WASTES OFFER MORE POTENTIAL TO COW-CALF OPERATORS KEYWORDS: REFEEDING
400 78 4796 WASTE-COMPOSITION LET SWINE WASTES CUT YOUR FERTILIZER BILL KEYWORDS: SWINE-WASTES WASTE-STORAGE PITS LAG
400 77 4798 WASTE-COMPOSITION TOP YIELDS FROM ANIMAL WASTE KEYWORDS: DAIRY-WASTES SEWAGE-SLUDGE FERTILIZERS LAND-APPL
700 76 4805 WASTE-COMPOSITION DESIGN AND DEVELOPMENT OF A SEPARATOR FOR BOVINE MANURE KEYWORDS: SEPARATION-TECHNIQUES
200 77 4806 WASTE-COMPOSITION A POLLUTANT AND NUTRIENT BUDGET FOR A SURFACE-AERATED DAIRY STORAGE LAGOON KEYWORDS: DA
200 77 4808 WASTE-COMPOSITION PREDICTION OF EFFECTS OF LAGOON DESIGN VARIABLES-NITROGEN CONSERVATION OR REMOVAL KEYWO
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400 78 4837 WASTE-COMPOSITION FERTILIZER VALUE OF TURKEY WASTE KEYWORDS: POULTRY-WASTES SOLID-WASTES TURKEYS LIQUID-W
400 78 4840 WASTE-COMPOSITION FEEDLOT SELLS MANURE KEYWORDS: WASTE-MANAGEMENT FEEDLOTS CATTLE LIQUID-WASTES FLUSHING
100 78 4842 WASTE-COMPOSITION COMPARATIVE VALUE OF ENSILED CATTLE WASTE FOR LAMBS AND GROWING-FINISHING CATTLE KEYWOR
100 77 4856 WASTE-COMPOSITION RUNOFF FROM FEEDLOTS AND MANURE STORAGES IN SOUTHERN ONTARIO KEYWORDS: FEEDLOT-RUNOFF W
300 77 4865 WASTE-COMPOSITION CHEMICAL ANALYSIS AND FERTILIZER VALUE OF TURKEY MANURE KEYWORDS: POULTRY-WASTES WASTE-
200 77 4867 WASTE-COMPOSITION THREE YEARS OF EVALUATING A MIDWEST ANAEROBIC DAIRY LAGOON KEYWORDS: DAIRY-WASTES ANAE
100 77 4868 WASTE-COMPOSITION THE PHOSPHORUS CYCLE IN PIG SLURRY MEASURED FROM 32PO4 DISTRIBUTION RATES KEYWORDS: SWI
100 70 4874 WASTE-COMPOSITION CHANGES IN BIOCHEMICAL CONSTITUENT OF SOME ORGANIC WASTE MATERIALS UNDER ANAEROBIC METH
100 78 4879 WASTE-COMPOSITION LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF. I INFLUENCE OF PRACTICAL EXTREMES IN DIET, W
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100 77 4893 WASTE-COMPOSITION THE EFFECT OF MIXING ON AN ANAEROBIC LAGOON KEYWORDS: SWINE-WASTES WASTE-TREATMENT LAGO
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500 77 4900 WASTE-COMPOSITION SOILS FOR MANAGEMENT OF ORGANIC WASTES AND WASTE WATERS KEYWORDS: ORGANIC-WASTES SOILS
500 77 4901 WASTE-COMPOSITION PROPERTIES OF AGRICULTURAL AND MUNICIPAL WASTES KEYWORDS: LAND-APPLICATION ANIMAL-WASTE
500 77 4902 WASTE-COMPOSITION PROPERTIES OF WASTE WATERS KEYWORDS: WASTEWATER-MANAGEMENT WASTE-COMPOSITION BIOLOGICAL
500 77 4907 WASTE-COMPOSITION FUTURE DIRECTION OF WASTE UTILIZATION KEYWORDS: MUNICIPAL-WASTES ANIMAL-WASTES LAND-APP
300 4920 WASTE-COMPOSITION FERTILIZER VALUE OF SWINE MANURE KEYWORDS: SWINE-WASTES FERTILIZERS WASTE-COMPOSITION W
700 76 4921 WASTE-COMPOSITION EFFECT OF BEEF CATTLE MANURE ON SOIL PROPERTIES AND CROP GROWTH KEYWORDS: CATTLE-WASTES
300 77 4923 WASTE-COMPOSITION POULTRY EXCRETA DEHYDRATION AND UTILIZATION-SYSTEM DEVELOPMENT AND DEMONSTRATION KEYWOR
100 78 4929 WASTE-COMPOSITION A ROTATING FLIGHTED CYLINDER FOR BIOLOGICAL WASTE TREATMENT KEYWORDS: ROTATING-FLIGHTED
100 77 4934 WASTE-COMPOSITION A DYNAMIC MODEL FOR SIMULATION OF ANIMAL WASTE DIGESTION KEYWORDS: MATHEMATICAL-MODELS
300 77 4937 WASTE-COMPOSITION ANIMAL WASTE MANAGEMENT AND OUR WATER QUALITY KEYWORDS: WATER-POLLUTION GROUNDWATER-POL
100 77 4945 WASTE-COMPOSITION EFFECTS ON SOLID AND LIQUID BEEF MANURE AND LIQUID HOG MANURE ON SOIL CHARACTERISTICS A
100 77 4946 WASTE-COMPOSITION MANURE MANAGEMENT IN AN IRRIGATED BASIN RELATIVE TO SALT LEACHATE TO GROUND WATER KEYWO
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100 75 4948 WASTE-COMPOSITION VOLUNTARY INTAKE AND NUTRITIVE VALUE OF SILAGE MADE OF POULTRY DROPPINGS AND GREEN MAIZ
100 78 4954 WASTE-COMPOSITION CHEMICAL COMPOSITION OF FEEDLOT MANURE KEYWORDS: CATTLE-WASTES FEEDLOTS WASTE-COMPOSITI
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300 77 4982 WASTE-COMPOSITION PURPLE SULFUR BACTERIA IN LAGOONS IN THE MIDWEST KEYWORDS: SWINE-WASTES LAGOONS ODOR BA
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100 78 5015 WASTE-COMPOSITION A REVIEW OF ANALYTICAL METHODS FOR DETECTING AND MEASURING MALODORS FROM ANIMAL WASTES
200 77 5019 WASTE-COMPOSITION HANDLING OF MANURE FROM DIFFERENT ANIMALS AND MANAGEMENT SYSTEMS KEYWORDS: WASTE-MANAGE
300 78 5023 WASTE-COMPOSITION ULTIMATE DISPOSAL OF BEEF FEEDLOT WASTES ONTO LAND KEYWORDS: FEEDLOTS CATTLE-WASTES LAN
100 77 5032 WASTE-COMPOSITION LITTER REUSE EFFECTS ON SELECTED TURKEY PRODUCTION AND PROCESSING PARAMETERS KEYWORDS
100 78 5052 WASTE-COMPOSITION QUALITY VARIATION OF STORED FEEDLOT RUNOFF KEYWORDS: FEEDLOT-WASTES WASTE-STORAGE FEEDL
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200 76 5070 WASTE-COMPOSITION USING POULTRY MANURE FOR VEGETABLES AND HYDROSEEDING KEYWORDS: POULTRY-WASTES CHEMICAL-
300 78 5079 WASTE-COMPOSITION FEEDING ANIMAL WASTE KEYWORDS: REFEEDING SAFETY ANIMAL-HEALTH PUBLIC-HEALTH COPPER-TOXI
300 77 5088 WASTE-COMPOSITION FARM WASTE MANAGEMENT -- PIGS- 1. BIOLOGICAL FILTRATION TOWER -- TEKRINGTON EHF REPORT
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200 78 5115 WASTE-COMPOSITION SURFACE APPLICATION AND INJECTION OF LIQUID DAIRY MANURE KEYWORDS: DAIRY-WASTES LIQUID-
100 77 5118 WASTE-COMPOSITION THE EFFECTS OF CATTLE SLURRY AND INORGANIC FERTILISER NITROGEN ON THE YIELD AND MINERAL
500 77 5123 WASTE-COMPOSITION POLLUTION CONTROL FOR AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES ANIMAL-WASTES WASTE-TRE
200 76 5125 WASTE-COMPOSITION AGRICULTURAL RESIDUES, INCLUDING FEEDLOT WASTES KEYWORDS: AGRICULTURAL-RESIDUES FEEDLOT
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300 78 5183 WASTE-COMPOSITION SPECIFIC COMPOSITION OF REPRESENTATIVE FEEDLOT WASTES: A CHEMICAL AND MICROBIAL PROFILE
300 78 5188 WASTE-COMPOSITION ESTIMATING U.S. LIVESTOCK AND POULTRY MANURE AND NUTRIENT PRODUCTION KEYWORDS: LIVESTOC
300 78 5194 WASTE-COMPOSITION MANAGING HORSE MANURE FOR ENVIRONMENTAL PROTECTION KEYWORDS: WATER-POLLUTION AIR-POLLUT
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300 77 5205 WASTE-COMPOSITION RESEARCH IN ANIMAL WASTE MANAGEMENT KEYWORDS: SWINE-WASTES DIGESTERS METHANE AGITATION
400 78 5207 WASTE-COMPOSITION YOU CAN PUT LIQUID MANURE ON YOUR ALFALFA KEYWORDS: LIQUID-WASTES DAIRY-WASTES LAND-APP
300 74 5213 WASTE-COMPOSITION SOIL POLLUTION FROM FEEDLOTS IN GEORGIA KEYWORDS: FEEDLOTS CATTLE-WASTES SOIL-CONTAMINA
400 78 5222 WASTE-COMPOSITION WASTIGATION KEYWORDS: CATTLE-WASTES IRRIGATION WASTE-COMPOSITION LAND-APPLICATION ECONO
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100 77 5246 WASTE-COMPOSITION ODOUR CONTROL OF LIQUID SWINE MANURE BY AERATION KEYWORDS: WASTE-STORAGE SWINE-WASTES A
100 77 5247 WASTE-COMPOSITION FRENCH EXPERIMENT IN PIG SLURRY DEODORIZATION KEYWORDS: ODOR-CONTROL SWINE-WASTES SLURR
100 77 5248 WASTE-COMPOSITION VEAL-CALF MANURE DEODORIZATION BY SURFACE AERATION KEYWORDS: ODOR-CONTROL CATTLE-WASTES
500 77 5277 WASTE-COMPOSITION BIO-ENGINEERING PROPERTIES OF FEEDLOT WASTES KEYWORDS: WASTE-COMPOSITION FEEDLOTS WASTE
500 77 5289 WASTE-COMPOSITION UTILIZATION OF ANIMAL WASTES FOR CROP PRODUCTION KEYWORDS: LIQUID-WASTES FERTILIZERS LA
500 77 5293 WASTE-COMPOSITION LAND DISPOSAL OF ANIMAL WASTES IN THE GDR KEYWORDS: SLURRIES WASTE-DISPOSAL WASTE-COMPO
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200	76	4727	WASTE-DISPOSAL VETERINARY-HYGIENIC ASPECTS OF LANDSPREADING AND TRANSPORT OF MANURE KEYWORDS: SOLID-W
200	71	4747	WASTE-DISPOSAL POLLUTION LEGISLATION IN CANADA AFFECTING THE LIVESTOCK INDUSTRY KEYWORDS: WASTE-DISPOS
300	77	4751	WASTE-DISPOSAL DISPOSAL OF FEEDLOT WASTES USING A TWO-STAGE PROCESS WITH NET ENERGY PRODUCTION KEYWORD
200	74	4758	WASTE-DISPOSAL HANDLING HOUSED BEEF CATTLE FEEDLOT MANURE KEYWORDS: DESIGN FEEDLOTS CATTLE WASTE-MANAG
200	73	4783	WASTE-DISPOSAL SWINE HOUSING AND WASTE DISPOSAL RESEARCH AND DEVELOPMENTS KEYWORDS: SWINE-WASTES WAST
700	73	4884	WASTE-DISPOSAL ANIMAL WASTE DISPOSAL LEGISLATION AND ITS IMPACT ON DAIRY FARMS IN TWO REGIONS DOMINATE
100	76	5018	WASTE-DISPOSAL COW SLURRY MANAGEMENT WITH PARTICULAR REFERENCE TO BRIDGETS KEYWORDS: CATTLE-WASTES SLU
100	65	5133	WASTE-DISPOSAL BETTER DISPOSAL OF FARM WASTES KEYWORDS: FARM-WASTES LAND-APPLICATION IRRIGATION EQUIPM
400	77	5193	WASTE-DISPOSAL KEEPING DAIRY WASTE UNDER CONTROL KEYWORDS: DAIRY-WASTES WASTE-DISPOSAL WATER-POLLUTION
500	77	5266	WASTE-DISPOSAL AGRICULTURE IN CZECHOSLOVAKIA KEYWORDS: CONFINEMENT ANIMAL-WASTES WASTE-DISPOSAL POLLUT
500	77	5273	WASTE-DISPOSAL IMPACT OF INTENSIVE ANIMAL PRODUCTION ON HUMAN ECOLOGY KEYWORDS: FEEDLOTS EPIDEMIOLOGY
500	77	5293	WASTE-DISPOSAL LAND DISPOSAL OF ANIMAL WASTES IN THE GDR KEYWORDS: SLURRIES WASTE-DISPOSAL WASTE-COMPO
500	77	5296	WASTE-DISPOSAL FEEDLOT WASTE MANAGEMENT IN HUNGARY KEYWORDS: WATER-POLLUTION LEGAL-ASPECTS FEEDLOTS SW
200	78	5102	WASTE-HANDLING ESTIMATED INVENTORY OF LIVESTOCK AND POULTRY MANURE RESOURCES IN THE UNITED STATES KEYW
200	76	4727	WASTE-HEAP VETERINARY-HYGIENIC ASPECTS OF LANDSPREADING AND TRANSPORT OF MANURE KEYWORDS: SOLID-W
200	76	4734	WASTE-MANAGEMENT TWO LEVELS OF MODELLING THE UTILISATION OF ANIMAL MANURES KEYWORDS: MODEL-STUDIES WASTE
200	76	4736	WASTE-MANAGEMENT *WASTE MANAGEMENTS SYSTEMS IN ANIMAL HUSBANDRY-APPLICATION OF FARM MODEL STUDIES AND SYS*
300	78	4745	WASTE-MANAGEMENT COSTS OF SELECTED WASTE-HANDLING SYSTEMS FOR DAIRY FARMS KEYWORDS: DAIRY-WASTES LEGAL-A
200	74	4758	WASTE-MANAGEMENT HANDLING HOUSED BEEF CATTLE FEEDLOT MANURE KEYWORDS: DESIGN FEEDLOTS CATTLE WASTE-MANAG
300	76	4814	WASTE-MANAGEMENT ODOR REGULATION BY NUISANCE LAWS KEYWORDS: LEGAL-ASPECTS ODOR FEEDLOTS ZONING SITE-SELE
400	78	4828	WASTE-MANAGEMENT WHICH WASTE SYSTEM IS BEST KEYWORDS: WASTE-MANAGEMENT DESIGN CONFINEMENT-PENS LIQUID-WA
400	77	4831	WASTE-MANAGEMENT FLUSH GUTTER SYSTEMS-CUT COSTS, IMPROVE ANIMAL ENVIRONMENT KEYWORDS: CONFINEMENT-PENS
400	78	4832	WASTE-MANAGEMENT GRAVITY DRAIN SYSTEMS FOR FARROWING AND NURSERY FACILITIES KEYWORDS: GRAVITY-DRAIN-SYS
400	78	4835	WASTE-MANAGEMENT MORE ON WASTE HANDLING KEYWORDS: WASTE-MANAGEMENT DESIGN CONCRETE-TRENCHES PLASTIC-LINE
400	78	4840	WASTE-MANAGEMENT FEEDLOT SELLS MANURE KEYWORDS: WASTE-MANAGEMENT FEEDLOTS CATTLE LIQUID-WASTES FLUSHING
400	77	4875	WASTE-MANAGEMENT FEEDLOT ODORS KEYWORDS: ODOR-INTENSITY ODOR-MEASUREMENT ODOR-CONTROL WASTE-MANAGEMENT C
400	74	4988	WASTE-MANAGEMENT PIGGERY UNDER-SLAT SCRAPER SYSTEM KEYWORDS: SWINE-WASTES CONFINEMENT HOUSING SLURRIES W
400	74	4990	WASTE-MANAGEMENT ENGINEERS OUTLINE WASTE DESIGN FACTORS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT DESIGN S
200	77	4994	WASTE-MANAGEMENT IMPACT OF STATE LAWS AND REGULATIONS OF ANIMAL WASTE DISPOSAL PRACTICES KEYWORDS: LEGAL
200	77	5019	WASTE-MANAGEMENT HANDLING OF MANURE FROM DIFFERENT ANIMALS AND MANAGEMENT SYSTEMS KEYWORDS: WASTE-MANAGE
400	78	5059	WASTE-MANAGEMENT WELL BUILT MOUNDS MANAGE THEMSELVES KEYWORDS: FEEDLOTS MOUNDS CONFINEMENT-PENS DESIGN S
200	78	5128	WASTE-MANAGEMENT DEVELOPING A LIVESTOCK WASTE MANAGEMENT PLAN KEYWORDS: WASTE-MANAGEMENT LAND-APPLICATIO
300	78	5131	WASTE-MANAGEMENT A MANUAL ON- EVALUATION AND ECONOMIC ANALYSIS OF LIVESTOCK WASTE MANAGEMENT SYSTEMS KE
400	78	5151	WASTE-MANAGEMENT HOW CONNECTICUT DAIRYMEN HANDLE MANURE KEYWORDS: WASTE-MANAGEMENT DAIRY-INDUSTRY BEDDIN
200	78	5154	WASTE-MANAGEMENT MANAGEMENT OF DAIRY MANURE HANDLING SYSTEMS KEYWORDS: DAIRY-WASTES WASTE-MANAGEMENT WAS
200	78	5155	WASTE-MANAGEMENT MISSOURI'S SHOW-ME APPROACH TO 208 INVOLVEMENT KEYWORDS: LEGAL-ASPECTS WATER-POLLUTION
400	78	5223	WASTE-MANAGEMENT MANAGING MANURE ECONOMICS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT ECONOMICS SLATTED-FLO
500	77	5267	WASTE-MANAGEMENT ANIMAL FEEDLOTS-DEVELOPMENT, TRENDS, PROBLEMS KEYWORDS: FEEDLOTS WASTE-MANAGEMENT CATTL
500	77	5277	WASTE-MANAGEMENT BIO-ENGINEERING PROPERTIES OF FEEDLOT WASTES KEYWORDS: WASTE-COMPOSITION FEEDLOTS WASTE
500	77	5278	WASTE-MANAGEMENT COLLECTION, STORAGE AND TRANSPORT OF CATTLE WASTES KEYWORDS: DAIRY-WASTES SLURRIES SOLI
500	77	5292	WASTE-MANAGEMENT COST OF ANIMAL WASTE MANAGEMENT KEYWORDS: WASTE-MANAGEMENT ECONOMICS WATER-POLLUTION CA
500	77	5297	WASTE-MANAGEMENT FEEDLOT WASTE MANAGEMENT IN THE SOVIET UNION KEYWORDS: FEEDLOTS WASTE-MANAGEMENT FERTIL
200	78	5128	WASTE-PRODUCTION DEVELOPING A LIVESTOCK WASTE MANAGEMENT PLAN KEYWORDS: WASTE-MANAGEMENT LAND-APPLICATIO
200	78	5112	WASTE-PROPERTIES DAIRY SHED EFFLUENT TREATMENT SYSTEMS IN NEW ZEALAND KEYWORDS: DAIRY-WASTES LAGOONS WAS
300	77	4913	WASTE-RECONSTITUTE WASTE AS A FEED EXTENDER KEYWORDS: REFEEDING DIGESTIBILTIY CATTLE PERFORMANCE WASTE-REC
400	78	4871	WASTE-REMOVAL KEEPING FLIES OUT OF THE HEN HOUSE KEYWORDS: FLY-CONTROL POULTRY-HOUSES WASTE-REMOVAL M
500	77	5278	WASTE-REMOVAL COLLECTION, STORAGE AND TRANSPORT OF CATTLE WASTES KEYWORDS: DAIRY-WASTES SLURRIES SOLI
500	77	5279	WASTE-REMOVAL COLLECTION, STORAGE AND TRANSPORT OF SWINE WASTES KEYWORDS: SWINE-WASTES WASTE-REMOVAL
500	77	5280	WASTE-REMOVAL COLLECTION, STORAGE AND TRANSPORT OF POULTRY WASTES KEYWORDS: POULTRY-WASTES WASTE-REMO
200	76	4706	WASTE-STORAGE AGRICULTURAL USE OF EFFLUENT FROM LIVESTOCKS-PROBLEMS AND PERSPECTIVES IN ITALY KEYWORD
200	76	4712	WASTE-STORAGE THE AGRONOMIC UTILISATION OF PIG SLURRY-EFFECT ON FORAGE CROPS AND ON SOIL FERTILITY KE
200	76	4724	WASTE-STORAGE EXAMINATION OF SOIL SAMPLES TAKEN UNDER SILAGE MANURE HEAPS AND IN MANURED FIELDS KEYWO
200	76	4726	WASTE-STORAGE TRANSPORT OF MANURE AND THE FUNCTION OF THE MANURE BANKS IN THE NETHERLANDS KEYWORDS
200	76	4727	WASTE-STORAGE VETERINARY-HYGIENIC ASPECTS OF LANDSPREADING AND TRANSPORT OF MANURE KEYWORDS: SOLID-W
200	76	4731	WASTE-STORAGE THE EFFECTS OF SEPARATING SLURRY ON ITS STORAGE, HANDLING AND SPREADING ON LAND KEYWORD
200	76	4732	WASTE-STORAGE INVENTIONS AND INNOVATIONS TO REDUCE POLLUTION OF WATER RESOURCES KEYWORDS: WATER-POLLU
200	76	4736	WASTE-STORAGE *WASTE MANAGEMENTS SYSTEMS IN ANIMAL HUSBANDRY-APPLICATION OF FARM MODEL STUDIES AND SYS*
200	76	4739	WASTE-STORAGE SAMPLING TECHNIQUES FOR LIQUID SWINE MANURE KEYWORDS: LIQUID-WASTES WASTE-STORAGE AERAT
200	75	4750	WASTE-STORAGE ALTERNATIVE CONSTRUCTION MATERIALS FOR UNDERFLOOR MANURE: STORAGE TANKS KEYWORDS WASTE
200	74	4758	WASTE-STORAGE HANDLING HOUSED BEEF CATTLE FEEDLOT MANURE KEYWORDS: DESIGN FEEDLOTS CATTLE WASTE-MANAG
200	77	4771	WASTE-STORAGE MODELING THE EFFECT OF MANAGEMENT POLICIES ON CATTLE FEEDLOT POLLUTION CONTROL COSTS KE
200	77	4774	WASTE-STORAGE A MIXED INTEGER PROGRAMMING MODEL FOR CHOOSING AN OPTIMAL SWINE MANURE HANDLING SYSTEM
200	73	4782	WASTE-STORAGE MECHANICAL AERATION OF A WASTE DISPOSAL PIT KEYWORDS: MANURE-PITS WASTE-STORAGE AERATIO
400	78	4796	WASTE-STORAGE LET SWINE WASTES CUT YOUR FERTILIZER BILL KEYWORDS: SWINE-WASTES WASTE-STORAGE PITS LAG
200	77	4806	WASTE-STORAGE A POLLUTANT AND NUTRIENT BUDGET FOR A SURFACE-AERATED DAIRY STORAGE LAGOON KEYWORDS: DA
200	72	4818	WASTE-STORAGE THE FATE OF ENTERIC BACTERIA DURING STORAGE AND DISPOSAL OF ANIMAL EXCRETA KEYWORDS: PA
400	78	4828	WASTE-STORAGE WHICH WASTE SYSTEM IS BEST KEYWORDS: WASTE-MANAGEMENT DESIGN CONFINEMENT-PENS LIQUID-WA
400	77	4831	WASTE-STORAGE FLUSH GUTTER SYSTEMS-CUT COSTS, IMPROVE ANIMAL ENVIRONMENT KEYWORDS: CONFINEMENT-PENS
400	78	4832	WASTE-STORAGE GRAVITY DRAIN SYSTEMS FOR FARROWING AND NURSERY FACILITIES KEYWORDS: GRAVITY-DRAIN-SYS
400	78	4835	WASTE-STORAGE MORE ON WASTE HANDLING KEYWORDS: WASTE-MANAGEMENT DESIGN CONCRETE-TRENCHES PLASTIC-LINE
400	78	4840	WASTE-STORAGE FEEDLOT SELLS MANURE KEYWORDS: WASTE-MANAGEMENT FEEDLOTS CATTLE LIQUID-WASTES FLUSHING
100	77	4854	WASTE-STORAGE DESIGN CONCEPTS AND CONSTRUCTION COSTS OF EIGHT DIFFERENT MANURE STORAGES KEYWORDS: DES
100	77	4856	WASTE-STORAGE RUNOFF FROM FEEDLOTS AND MANURE STORAGES IN SOUTHERN ONTARIO KEYWORDS: FEEDLOT-RUNOFF W
100	77	4864	WASTE-STORAGE FEEDLOT RUNOFF HOLDING PONDS--NUTRIENT LEVELS AND RELATED MANAGEMENT ASPECTS KEYWORDS
400	77	4875	WASTE-STORAGE FEEDLOT ODORS KEYWORDS: ODOR-INTENSITY ODOR-MEASUREMENT ODOR-CONTROL WASTE-MANAGEMENT C
700	74	4882	WASTE-STORAGE A COMPUTER SIMULATION OF BIOLOGICAL TREATMENT, STORAGE, AND LAND DISPOSAL OF SWINE WAST
100	76	4891	WASTE-STORAGE AN INTEGRATED SEPARATION, AEROBIC TREATMENT AND SLUDGE DE-WATERING SYSTEM FOR PIG SLURR
300		4920	WASTE-STORAGE FERTILIZER VALUE OF SWINE MANURE KEYWORDS: SWINE-WASTES FERTILIZERS WASTE-COMPOSITION W
200	77	4943	WASTE-STORAGE DAIRY CHORE REDUCTION PROGRAM PROGRESS REPORT KEYWORDS: ANIMAL-WASTES MANAGEMENT DESIGN
400	78	4975	WASTE-STORAGE MANURE CONTAINMENT-SLURRY WITH THE CRUST ON TOP KEYWORDS: LIVESTOCK-WASTES SLURRIES WAS
400	78	4978	WASTE-STORAGE GEORGIA FARMERS CUT COSTS WITH CORNLAGE KEYWORDS: SWINE-WASTES CONFINEMENT-PENS SLURRIE
400	74	4990	WASTE-STORAGE ENGINEERS OUTLINE WASTE DESIGN FACTORS KEYWORDS: SWINE-WASTES WASTE-MANAGEMENT DESIGN S
300	75	5002	WASTE-STORAGE SELECTING A SWINE WASTE MANAGEMENT SYSTEM KEYWORDS: SWINE-WASTES MANAGEMENT FLOORS DESI
400	78	5009	WASTE-STORAGE EARTHEN WASTE BASIN KEYWORDS: LIVESTOCK-WASTES WASTE-STORAGE HAULING PICKET-DAM DETENTI
100	78	5052	WASTE-STORAGE QUALITY VARIATION OF STORED FEEDLOT RUNOFF KEYWORDS: FEEDLOT-WASTES WASTE-STORAGE FEEDL
100	78	5056	WASTE-STORAGE FLUSHING SLAT WASTE HANDLING SYSTEM KEYWORDS: SWINE-WASTES LIQUID-WASTES FLUSHING DESIG
300	78	5063	WASTE-STORAGE ALTERNATE METHODS OF MANURE HANDLING KEYWORDS: WASTE-STORAGE DAIRY-WASTES FEEDLOT-RUNOF
400	78	5067	WASTE-STORAGE CATTLEMEN INFLUENCE ODOR CONTROL RULES KEYWORDS: AIR-POLLUTION SULFATES ODOR-CONTROL LE
200	76	5075	WASTE-STORAGE MARKETING MANURE KEYWORDS: POULTRY-WASTES-DRIED DEHYDRATION FERTILIZERS WASTE-STORAGE L
200	78	5102	WASTE-STORAGE ESTIMATED INVENTORY OF LIVESTOCK AND POULTRY MANURE RESOURCES IN THE UNITED STATES KEYW
200	78	5109	WASTE-STORAGE EARTHEN PITS FOR MANURE AND RECYCLED FLUSH-WATER STORAGE KEYWORDS: MANURE-PITS WASTE-ST
200	78	5110	WASTE-STORAGE WASTE HANDLING ALTERNATIVES FOR FARROWING UNITS KEYWORDS: SWINE-WASTES WASTE-STORAGE LI
200	76	5125	WASTE-STORAGE AGRICULTURAL RESIDUES, INCLUDING FEEDLOT WASTES KEYWORDS: AGRICULTURAL-RESIDUES FEEDLOT
300	77	5129	WASTE-STORAGE RECYCLING AGRICULTURE RUNOFF KEYWORDS: MODEL-STUDIES AGRICULTURAL-RUNOFF WASTE-STORAGE
100	78	5148	WASTE-STORAGE EARTHEN PITS FOR MANURE AND RECYCLED FLUSH-WATER STORAGE KEYWORDS: WASTE-STORAGE EARTHE
400	78	5151	WASTE-STORAGE HOW CONNECTICUT DAIRYMEN HANDLE MANURE KEYWORDS: WASTE-MANAGEMENT DAIRY-INDUSTRY BEDDIN
200	78	5154	WASTE-STORAGE MANAGEMENT OF DAIRY MANURE HANDLING SYSTEMS KEYWORDS: DAIRY-WASTES WASTE-MANAGEMENT WAS
300	78	5194	WASTE-STORAGE MANAGING HORSE MANURE FOR ENVIRONMENTAL PROTECTION KEYWORDS: WATER-POLLUTION AIR-POLLUT

400	78 5208	WASTE-STORAGE	RUNOFF CONTROL SYSTEMS FOR CATTLE FEEDLOTS KEYWORDS: FEEDLOT-RUNOFF CATTLE WASTE-STORAG
400	78 5211	WASTE-STORAGE	HOLDING POND AND FLUSH GUTTERS KEYWORDS: CATTLE-WASTES FLUSHING WASTE-STORAGE RECYCLING
200	77 5238	WASTE-STORAGE	USE OF CLIMATIC DATA IN ESTIMATING STORAGE DAYS FOR SOILS TREATMENT SYSTEMS KEYWORDS: C
100	77 5243	WASTE-STORAGE	CHARACTERIZATION OF MALODOURS DURING ANAEROBIC STORAGE OF PIG WASTES KEYWORDS: WASTE-ST
100	77 5246	WASTE-STORAGE	ODOUR CONTROL OF LIQUID SWINE MANURE BY AERATION KEYWORDS: WASTE-STORAGE SWINE-WASTES A
500	77 5265	WASTE-STORAGE	ANIMAL WASTES KEYWORDS FEEDLOTS DESIGN EFFLUENTS GASES ODOR ANIMAL-WASTES WASTE-STORAG
500	77 5278	WASTE-STORAGE	COLLECTION, STORAGE AND TRANSPORT OF CATTLE WASTES KEYWORDS: DAIRY-WASTES SLURRIES SOLI
500	77 5279	WASTE-STORAGE	COLLECTION, STORAGE AND TRANSPORT OF SWINE WASTES KEYWORDS: SWINE-WASTES WASTE-REMOVAL
500	77 5280	WASTE-STORAGE	COLLECTION, STORAGE AND TRANSPORT OF POULTRY WASTES KEYWORDS: POULTRY-WASTES WASTE-REMO
400	77 4797	WASTE-STORAGE-POND	THEY TRAP EVERY DROP OF RUNOFF KEYWORDS: FEEDLOT-RUNOFF WASTE-STORAGE-PONDS LAND-APPLIC
200	77 4943	WASTE-TRANSFER	DAIRY CHORE REDUCTION PROGRAM PROGRESS REPORT KEYWORDS: ANIMAL-WASTES MANAGEMENT DESIGN
200	76 4726	WASTE-TRANSPORT	TRANSPORT OF MANURE AND THE FUNCTION OF THE MANURE BANKS IN THE NETHERLANDS KEYWORDS
200	74 4758	WASTE-TRANSPORT	HANDLING HOUSED BEEF CATTLE FEEDLOT MANURE KEYWORDS: DESIGN FEEDLOTS CATTLE WASTE-MANAG
300	75 5002	WASTE-TRANSPORT	SELECTING A SWINE WASTE MANAGEMENT SYSTEM KEYWORDS: SWINE-WASTES MANAGEMENT FLOORS DESI
500	77 5278	WASTE-TRANSPORT	COLLECTION, STORAGE AND TRANSPORT OF CATTLE WASTES KEYWORDS: DAIRY-WASTES SLURRIES SOLI
500	77 5279	WASTE-TRANSPORT	COLLECTION, STORAGE AND TRANSPORT OF SWINE WASTES KEYWORDS: SWINE-WASTES WASTE-REMOVAL
500	77 5280	WASTE-TRANSPORT	COLLECTION, STORAGE AND TRANSPORT OF POULTRY WASTES KEYWORDS: POULTRY-WASTES WASTE-REMO
300	76 4690	WASTE-TREATMENT	GUTTER FLUSHING SYSTEMS FOR SWINE BUILDINGS KEYWORDS: FLUSHING SWINE-WASTES DESIGN LAGO
400	78 4693	WASTE-TREATMENT	LAGOONS-WHAT SIZE NEEDED FOR YOUR HERD KEYWORDS: DAIRY-WASTES LAGOONS ANAEROBIC DESIGN
100	78 4694	WASTE-TREATMENT	TREATMENT OF DAIRY CATTLE WASTES BY A BARRIERED WASTEWATER RENOVATION SYSTEM KEYWORDS
200	76 4727	WASTE-TREATMENT	VETERINARY-HYGIENIC ASPECTS OF LANDSPREADING AND TRANSPORT OF MANURE KEYWORDS: SOLID-W
200	76 4732	WASTE-TREATMENT	INVENTIONS AND INNOVATIONS TO REDUCE POLLUTION OF WATER RESOURCES KEYWORDS: WATER-POLLU
200	76 4736	WASTE-TREATMENT	WASTE MANAGEMENTS SYSTEMS IN ANIMAL HUSBANDRY-APPLICATION OF FARM MODEL STUDIES AND SYS
100	77 4746	WASTE-TREATMENT	BACTERIOLOGICAL INVESTIGATION OF ALBERTA MEAT-PACKING PLANT WASTES WITH EMPHASIS ON SAL
200	74 4758	WASTE-TREATMENT	HANDLING HOUSED BEEF CATTLE FEEDLOT MANURE KEYWORDS: DESIGN FEEDLOTS CATTLE WASTE-MANAG
200	77 4765	WASTE-TREATMENT	MICROALGAE AS A MEANS OF RECYCLING ANIMAL WASTES KEYWORDS: RECYCLING WASTE-TREATMENT SW
100	77 4766	WASTE-TREATMENT	THE APPLICATION OF NATURAL ZEOLITES IN ANIMAL SCIENCE AND AQUACULTURE KEYWORDS: ZEOLITE
200	77 4806	WASTE-TREATMENT	A POLLUTANT AND NUTRIENT BUDGET FOR A SURFACE-AERATED DAIRY STORAGE LAGOON KEYWORDS: DA
200	77 4808	WASTE-TREATMENT	PREDICTION OF EFFECTS OF LAGOON DESIGN VARIABLES-NITROGEN CONSERVATION OR REMOVAL KEYWO
400	78 4848	WASTE-TREATMENT	LIQUID COW MANURE GOES TO MARKET KEYWORDS. DAIRY-WASTES LIQUID-WASTES WASTE-TREATMENT D
100	78 4858	WASTE-TREATMENT	HORMONAL ACTIVITY IN POULTRY EXCRETA PROCESSED FOR LIVESTOCK FEED KEYWORDS: POULTRY-WAS
100	78 4878	WASTE-TREATMENT	ANIMAL PERFORMANCE AND MICROBIAL ADAPTATION OF RUMINANTS FED FORMALDEHYDE TREATED POULT
100	77 4893	WASTE-TREATMENT	THE EFFECT OF MIXING ON AN ANAEROBIC LAGOON KEYWORDS: SWINE-WASTES WASTE-TREATMENT LAGO
100	78 4958	WASTE-TREATMENT	HARVESTING ALGAE FROM LAGOON EFFLUENT KEYWORDS: LAGOONS WASTE-TREATMENT FLOCCULANTS BY-
100	78 4971	WASTE-TREATMENT	A STUDY ON THE INTERACTIONS OF ENZYMES WITH MANURES AND SLUDGES KEYWORDS: CATTLE-WASTES
400	78 4974	WASTE-TREATMENT	EUROPEAN COMPOSTING METHODS-TREATMENT AND USE OF FARM YARD MANURE AND SLURRY KEYWORDS
100	77 4989	WASTE-TREATMENT	STUDIES ON MICROBIOLOGICAL CONTROL OF LIQUID MANURE HANDLING KEYWORDS: LIQUID-WASTES WA
400	76 4999	WASTE-TREATMENT	VEGETATIVE FILTER SYSTEM CLEANS FEEDLOT RUNOFF KEYWORDS: FEEDLOT-RUNOFF WASTE-TREATMENT
300	77 5034	WASTE-TREATMENT	A METHOD OF MANURE DISPOSAL FOR A BEEF PACKING OPERATION-- FIRST INTERIM TECHNICAL REP
300	78 5055	WASTE-TREATMENT	SWINE LAGOON EFFLUENT ON A SOIL-PLANT ENVIRONMENT--AN IMPACT ASSESSMENT KEYWORDS SWINE
300	78 5065	WASTE-TREATMENT	ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUE: POTENTIAL FOR IMPROVEMENT AND IMPLEME
200	76 5068	WASTE-TREATMENT	PROCEEDINGS OF SYMPOSIUM ON THE CONVERSION OF POULTRY WASTE TO ENERGY, FEED, OR FERTILI
300	77 5088	WASTE-TREATMENT	FARM WASTE MANAGEMENT -- PIGS- 1 BIOLOGICAL FILTRATION TOWER -- TERRINGTON EHF REPORT
400	78 5091	WASTE-TREATMENT	SERPENTINE SYSTEM IS THE SOLUTION KEYWORDS SERPENTINE-WATERWAY FEEDLOT-RUNOFF WASTE-TR
500	77 5123	WASTE-TREATMENT	POLLUTION CONTROL FOR AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES ANIMAL-WASTES WASTE-TRE
200	78 5127	WASTE-TREATMENT	ALTERNATE MANURE RECYCLING SYSTEMS FOR ENERGY RECOVERY KEYWORDS: RECYCLING GAS-PRODUCTI
100	77 5135	WASTE-TREATMENT	CONTINUOUS CULTIVATION OF CHLORELLA EMERSONII ON PIG MANURE KEYWORDS: SWINE-WASTES WAST
100	78 5159	WASTE-TREATMENT	EFFECT OF DISSOLVED OXYGEN CONCENTRATION ON THE AEROBIC STABILIZATION OF SWINE WASTE KE
100	73 5167	WASTE-TREATMENT	PRINCIPLES OF TREATMENT OF ANIMAL SLURRIES KEYWORDS: SLURRIES WASTE-TREATMENT AEROBIC A
100	77 5181	WASTE-TREATMENT	THERMOPHILIC FERMENTATION OF PIG FAECES AND STRAW BY ACTINOMYCETES KEYWORDS: WASTE-TREA
500	76 5225	WASTE-TREATMENT	THE UPGRADING OF AGRICULTURAL WASTES BY THERMOPHILIC FUNGI KEYWORDS' WASTE-TREATMENT T
300	78 5231	WASTE-TREATMENT	WATER QUALITY RENOVATION OF ANIMAL WASTE LAGOONS UTILIZING AQUATIC PLANTS KEYWORDS: LA
500	77 5288	WASTE-TREATMENT	UTILIZATION OF LIVESTOCK WASTES AS FEED AND OTHER DIETARY PRODUCTS KEYWORDS: REFEEDING
500	77 5296	WASTE-TREATMENT	FEEDLOT WASTE MANAGEMENT IN HUNGARY KEYWORDS: WATER-POLLUTION LEGAL-ASPECTS FEEDLOTS SW
500	77 5298	WASTE-TREATMENT	ANIMAL WASTE MANAGEMENT IN GREECE KEYWORDS. FEEDLOTS POULTRY-WASTES SWINE-WASTES LIQUID
500	77 5301	WASTE-TREATMENT	FEEDLOT WASTE MANAGEMENT IN CZECHOSLOVAKIA KEYWORDS: FEEDLOTS LIQUID-WASTES LAND-APPLIC
400	78 5305	WASTE-TREATMENT	COLORADO BIOGAS PLANT WINS ACEC TOP PRIZE KEYWORDS: FEEDLOTS CATTLE-WASTES RECYCLING BI
300	76 4925	WATERSHEDS	MODELING PESTICIDES AND NUTRIENTS ON AGRICULTURAL LANDS KEYWORDS: AGRICULTURAL-RUNOFF M
300	77 4927	WATERSHEDS	AGRICULTURE RUNOFF MANAGEMENT (ARM) MODEL - VERSION II REFINEMENT AND TESTING KEYWORDS
200	78 5105	WATERSHED-HYDROLOG	MODELING NITROGEN MOVEMENT IN AGRICULTURAL WATERSHEDS KEYWORDS: MODEL-STUDIES WATERSHED
100	76 5304	WATER-CONSUMPTION	EFFECT OF DIETARY SODIUM AND POTASSIUM EXCESS ON WATER CONSUMPTION, URINE EXCRETION AND
400	77 4672	WATER-POLLUTION	CONTROL RUNOFF FROM OPEN LIVESTOCK FEEDLOTS KEYWORDS: AGRICULTURAL-RUNOFF RUNOFF-CONTRO
300	77 4683	WATER-POLLUTION	PRELIMINARY IDENTIFICATION OF LITERATURE MODELS AND DATA FOR EVALUATING RURAL NONPOINT
100	72 4696	WATER-POLLUTION	DISEASE HAZARD OF PATHOGENIC ORGANISMS IN FARM WASTE MATERIAL KEYWORDS: SLURRIES PATHOG
300	74 4700	WATER-POLLUTION	QUANTIFICATION OF POLLUTANTS IN AGRICULTURAL RUNOFF KEYWORDS: AGRICULTURAL-RUNOFF EROSI
300	75 4701	WATER-POLLUTION	ENVIRONMENTAL PROTECTION REQUIREMENTS FOR SWINE OPERATIONS KEYWORDS: SWINE FEEDLOTS AI
700	74 4704	WATER-POLLUTION	AGRICULTURAL AND FOREST LAND RUNOFF IN UPPER SOUTH RIVER NEAR WAYNESBORO, VIRGINIA KEYW
200	76 4705	WATER-POLLUTION	UTILIZATION OF MANURE BY LAND SPREADING KEYWORDS: LIVESTOCK-WASTES EFFLUENTS LAND-APPLI
200	76 4707	WATER-POLLUTION	FARMYARD MANURE AND CROP PRODUCTION IN DENMARK KEYWORDS: SOLID-WASTES LIQUID-WASTES DEN
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200	76 4720	WATER-POLLUTION	LEACHING OF NITRATE AND DENITRIFICATION IN A SANDY SOIL AS INFLUENCED BY MANURE APPLIC
200	76 4721	WATER-POLLUTION	PHOSPHORUS COMPOUNDS IN PIG SLURRY AND THEIR RETENTION IN THE SOIL KEYWORDS: SWINE-WAST
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200	76 4731	WATER-POLLUTION	THE EFFECTS OF SEPARATING SLURRY ON ITS STORAGE, HANDLING AND SPREADING ON LAND KEYWORD
200	76 4732	WATER-POLLUTION	INVENTIONS AND INNOVATIONS TO REDUCE POLLUTION OF WATER RESOURCES KEYWORDS: WATER-POLLU
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200	76 4737	WATER-POLLUTION	ELABORATION OF STATISTICS ON MANURE PRODUCTION KEYWORDS: FARM-WASTES LAND-APPLICATION E
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100	77 4746	WATER-POLLUTION	BACTERIOLOGICAL INVESTIGATION OF ALBERTA MEAT-PACKING PLANT WASTES WITH EMPHASIS ON SAL
300	77 4751	WATER-POLLUTION	DISPOSAL OF FEEDLOT WASTES USING A TWO-STAGE PROCESS WITH NET ENERGY PRODUCTION KEYWORD
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200	77 4772	WATER-POLLUTION	CONCEPTUAL MODELLING OF NONPOINT SOURCE POLLUTION FROM LAND AREAS RECEIVING ANIMAL WAST
200	77 4786	WATER-POLLUTION	NONPOINT POLLUTION CONTROL FOR WINTERING RANGE CATTLE KEYWORDS: CATTLE WATER-POLLUTION
700	76 4804	WATER-POLLUTION	DIFFUSE AGRICULTURAL POLLUTION--THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS KEYWORDS
200	72 4818	WATER-POLLUTION	THE FATE OF ENTERIC BACTERIA DURING STORAGE AND DISPOSAL OF ANIMAL EXCRETA KEYWORDS: PA
300	72 4821	WATER-POLLUTION	ENVIRONMENTAL PROTECTION AGENCY VS ROBERT R DEIERS-FABIAN J DEIERS-MARCELLUS J DEIERS
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300	78 4951	WATER-POLLUTION	ENVIRONMENTAL IMPACT RESULTING FROM UNCONFINED ANIMAL PRODUCTION KEYWORDS: ENVIRONMENTA
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200	77 4994	WATER-POLLUTION	IMPACT OF STATE LAWS AND REGULATIONS OF ANIMAL WASTE DISPOSAL PRACTICES KEYWORDS: LEGAL
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100	76 5013	WATER-POLLUTION	ANIMAL FEEDING FACTORIES AND THE ENVIRONMENT:A SUMMARY OF FEEDLOT POLLUTION, FEDERAL CO
300	78 5023	WATER-POLLUTION	ULTIMATE DISPOSAL OF BEEF FEEDLOT WASTES ONTO LAND KEYWORDS: FEEDLOTS CATTLE-WASTES LAN
100	77 5028	WATER-POLLUTION	INTERNALIZATION IN A STOCHASTIC POLLUTION MODEL KEYWORDS: MODEL-STUDIES FEEDLOT-RUNOFF
300	77 5047	WATER-POLLUTION	EPA SBA LOANS FOR WATER POLLUTION CONTROL KEYWORDS: WATER-POLLUTION ABATEMENT FINANCE SM

100	78	5057	WATER-POLLUTION	EFFLUENTS FROM CATFISH PONDS DURING FISH HARVEST KEYWORDS: FISH-FARMING EFFLUENT-QUALIT
200	75	5083	WATER-POLLUTION	NON-POINT SOURCES OF WATER POLLUTION KEYWORDS: WATER-POLLUTION NON-POINT-SOURCES AGRICU
400	78	5092	WATER-POLLUTION	FEDERAL FUNDS AVAILABLE TO SOLVE WATER POLLUTION KEYWORDS: WATER-POLLUTION LEGAL-ASPECT
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500	77	5123	WATER-POLLUTION	POLLUTION CONTROL FOR AGRICULTURE KEYWORDS: AGRICULTURAL-WASTES ANIMAL-WASTES WASTE-TRE
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300	78	5183	YEASTS	SPECIFIC COMPOSITION OF REPRESENTATIVE FEEDLOT WASTES: A CHEMICAL AND MICROBIAL PROFILE
400	78	5228	YEASTS	AUSTRALIANS UTILIZE FARM WASTE TO PRODUCE EDIBLE PROTEIN PRODUCTS KEYWORDS: SWINE-WASTE
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100	77	5118	ZINC	THE EFFECTS OF CATTLE SLURRY AND INORGANIC FERTILISER NITROGEN ON THE YIELD AND MINERAL
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SECTION 7

ABSTRACTS

This section contains the abstracts of the information entries contained in the bibliography. Each entry includes the title of the informational material, the author or authors, the bibliographic citation, keywords, and the abstract. The abstracts are arranged sequentially by an assigned accession number which specifically identifies the article in the collection. To the right of the accession number are the animal information category code numbers assigned to the abstract entry.

4668-B3, C2, D1, D2
CELLULOLYSIS IN FEEDLOT WASTE

G. K. Elmund
Ph.D. Dissertation, Department of Microbiology, Colorado State University, Dec., 1976, 90 p. 21 tab., 108 ref.

Keywords: Feedlot wastes, Chemical treatment, Physical treatment, Cellulolysis, Sodium hydroxide, Fermentation, Substrates, Yeasts, Enzyme production.

The goals of this study were to: (1) develop and evaluate techniques for enhancing the susceptibility of feedlot waste cellulose to cellulase and (2) to develop methods for improving the rate of synthesis and yield of cellulase during growth of *Trichoderma viride* on feedlot waste substrates. Chemical treatment with HPFS (mixtures of H_2O and $FeSO_4$) or with sodium hydroxide, as well as physical treatment by ball-milling, increased the rate and extent of hydrolysis of feedlot waste with cellulase. Hydrolysis product recoveries of chemically treated substrates showed that about half of the feedlot waste celluloses were converted to simple sugars. In contrast, about 90 percent of the cellulosic constituents in ball-milled samples were hydrolyzed with cellulase. Paper chromatographic analyses showed that about half of the total reducing sugar present in hydrolysates of ballmilled feedlot waste were accountable as glucose or xylose equivalents. Also, over 90 percent of the reducing sugar in feedlot hydrolysates was assimilated during growth of the yeast, *Candida utilis*. Dual culture fermentation of feedlot waste with *Trichoderma viride* QM 9414 and yeast reduced incubation time for maximum rate of synthesis and yield of cellulase. Dual culture fermentations with QM 9414 and *C. utilis*, as well as zero-time inoculation with both organisms, gave the most consistent results for improved enzyme production. (Merryman-East Central)

4669-C2, D2, E3, E4
CROP, LIVESTOCK RESIDUES: A FUTURE SOURCE OF FUEL?

E. Merrifield
Crops and Soils Magazine, V. 30, No. 7, p. 10-11, April-May, 1978.

Keywords: Agricultural wastes, Forestry wastes, Recycling, Pyrolysis, Fuels, Oil, Char, Gas, By-product recovery.

Ed Soltes, associate professor of forestry at Texas A&M University, is working on a method of converting agricultural and forest residues such as corn cobs and manure into usable fuels. The process involves extracting oils from the residue by pyrolysis and converting them into various types of fuel. Oil, char, and gas are produced during pyrolysis. For each ton of material fed into the pyrolysis process, 25 percent of the weight yield is oil, 25 percent is char, and the rest is gas and moisture. The oil and char are high BTU materials having 11,000 to 12,000 BTU/s per pound. The char is a suitable coal substitute. It is clean burning, smokeless, and contains no sulfur. The char could also be used to produce such products as activated charcoal and carbon blacks. The gas produced during pyrolysis is a low BTU gas (200-500 BTU's) that is similar to natural gas. Because of our dependence on petroleum technology, it may be desirable to convert the oil into a petroleum substitute. The oil can be refined into a fuel that will perform as a diesel oil. It can also be used as a synthetic gasoline, a gasoline substitute, or a gasoline extender. The economics of such recycling are unclear at present. Sources of agricultural and forestry wastes are cited. (Merryman-East Central)

4670-B2, C1, C2
FIELD TEST FOR ESTIMATING DRY MATTER AND FERTILISER VALUE OF SLURRY --PRELIMINARY REPORT

An Foras Taluntais, Johnstown Castle Research Centre, Wexford, England
H. Tunney and S. M. Molloy
Irish Journal of Agricultural Research, V. 14, No. 1, p. 84-86, 1975. 1 fig., 1 ref.

Keywords: Swine wastes, Slurries, Specific gravity, Dry matter, Nitrogen, Phosphorus, Hydrometer.

Because there is a significant straight-line correlation between specific gravity and dry-matter content of pig slurry, a hydrometer has been developed to estimate the dry matter, nitrogen and phosphorus contents of pig slurry. Studies on the estimation of the dry matter, nitrogen and phosphorus contents of cattle slurry by this method are in progress. (Merryman-East Central)

4671-A12, B1, C2
LIQUID MANURE GAS MAY POSE DANGER

Anonymous
Feedstuffs, V. 50, No. 25, p. 12, June 19, 1978.

Keywords: Air pollution, Health, Safety, Liquid wastes, Hydrogen sulfide, Carbon dioxide, Ammonia, Methane.

Toxic gases released from decomposing manure such as ammonia, methane, carbon dioxide and hydrogen sulfide can cause health dangers. Concentrations as low as 10-15 ppm can cause headaches, irritation of the respiratory tract and mucous membranes, nausea and dizziness. With concentrations over 1,000 ppm, fainting and death following respiratory paralysis can occur with little or no warning. There should be adequate ventilation with exhaust fans and a stand-by generator. If a manure pit must be entered, self-contained air packs, safety harness and posting of reserve workers outside the danger area are all good precautions. (Merryman-East Central)

4672-A4, B2, C2, D3, E2
CONTROL RUNOFF FROM OPEN LIVESTOCK FEEDLOTS

Anonymous
Crops and Soils Magazine, V. 30, No. 2, p. 22-23, Nov., 1977. 1 fig.

Keywords: Agricultural runoff, Runoff control, Feedlots, Zero-discharge, Vegetative filters, Water pollution.

University of Illinois researchers are studying zero-discharge and vegetative filter systems to handle potential feedlot runoff. The zero-discharge system requires cleaning solids from the settling basin and removing water from the holding ponds when necessary. A recent study indicates that potential benefits from a holding pond include nutrient value and a possible source of irrigation water. Because of seasonal nitrogen and phosphorus variation in the holding pond water, emptying ponds in the spring will provide maximum fertilizer benefits. However, ponds should also be emptied in the fall to provide capacity for winter runoff. Vegetative filter areas may prove a less costly runoff control system that requires less management. Pastures, grassed waterways, or cropland could be vegetative filter areas although current systems being studied have been constructed for this specific purpose. These are areas where runoff could be treated by settling, filtration, dilution, absorption, and infiltration. The portion of runoff that does not infiltrate into the ground will be treated by moving through the vegetative filter and will not pollute surface water beyond the filter. This concept also seems to have potential for reducing sediment and other pollutant contributions to streams from agricultural non-point sources. (Merryman-East Central)

4673-A8, C2, E2
THE CATTLE DUNG PATCH: 2. EFFECT OF A DUNG PATCH ON THE CHEMICAL STATUS OF THE SOIL, AND AMMONIA NITROGEN LOSSES FROM THE PATCH

Agronomy Department, Massey University, Palmerston North, New Zealand
B. N. MacDiarmid and B. R. Watkin
Journal of the British Grassland Society, V. 27, p. 43-54, 1972. 2 fig., 3 tab., 20 ref.

Keywords: Cattle wastes, Pasture, Sampling, Soil chemistry, Nitrogen, Phosphorus, Potassium, Ammonia losses.

Soil samples were taken at depths of 0-1 inches and 1-3 inches five times during a 55-day period from under and around dung patches deposited on pasture. The samples were analyzed for available N, P, and K. N, P, and K levels all rose significantly in the region of the dung patch. K levels exhibited the greatest increase but no effect was detected beyond the edge of the patch. Soil N changes were smaller but were detected up to 6 inches from the edge of the dung patch. Although a significant rise in P was detected, the effects were not as great nor as consistent as with N or K. These nutrients were probably responsible for the consistent and persistent increase in grass growth around the dung patch. During a 13-day experiment on ammonia losses, up to 247 mg of free ammonia from the dung patch was recovered in the cages equivalent to 25 lb N/ac. This loss was only 4.7 percent of the total N in the dung. Losses of nutrients may be minimized by the persistence of the organic material in the dung patch which decays from the bottom upwards and which tends to shed rain from the patch region. (Merryman-East Central)

4674-A11, B3, E3, F1
ARIZONA RECYCLING TRIAL ENDS SUCCESSFULLY

Anonymous
Calf News, V. 18, No. 6, p. 18, June, 1978.

Keywords: Refeeding, Corral Industries, Cattle wastes, Cattle, Feedlots, Performance, Economics.

Test cattle were fed processed bovine waste from a portable manure recycling unit developed and manufactured by Corral Industries of Phoenix, Arizona in order to demonstrate the value of manure processed from conventional drylot feed pens. Overall savings was 6.7 cents per pound or $23.92 per head by incorporating the processed waste into the ration. The waste fed cattle surpassed the controls to which they were compared. Both sets of cattle graded 60 percent Choice. The nice part of the refeeding system is that it is a relatively simple process. The unit can be plugged into any feedlot and a couple of days training is all that it takes to operate the recycling unit. (Merryman-East Central)

4675-C2, D3, E3
MONTANA RESEARCHER SEES METHANE PRODUCTION PROFITABLE IN FUTURE

Anonymous
Feedstuffs, V. 50, No. 24, p. 31, June 12, 1978.

Keywords: Agricultural wastes, Recycling, Methane, By-product recovery, Wheat straw, Lignin, Fermentation.

Dr. Jack Robbins, a professor of chemistry at Montana State University, feels that fuel prices are going up so much that at some point in the future, even without improved efficiency, it will be economically advisable to produce methane gas from manure. However, Robbins is trying to improve the efficiency of the processes that produce methane so that more gas can be produced from agricultural wastes. Robbins is currently working on adding wheat straw as an additional energy source for bacteria. Manure produces methane, but Robbins feels that addition of some plant material will provide an additional source of energy for gas production. The problem has been that lignin in the straw inhibits the fermentation which produces gas. Robbins is studying a biological means of removing lignin. Robbins and Dr. Dave Ward, a microbiologist at MSU, are trying to figure out what is in the fermentation of methane that causes the bacteria to shift to acids instead of methane gas once beyond a certain high energy level. Robbins adds that other products are created when methane production takes place. One of the by-products is a good source of fertilizer and the process also renders manure into an edible feed for livestock. Multiple products and greater efficiency in methane production are two avenues that must be looked at. (Merryman - East Central)

4676-A8, A11, B1, C1, C2, C3, E2
FOULING OF PASTURES BY DUNG

Agricultural Research Institute of Northern Ireland, Hillsborough, County Down, Northern Ireland
R. Marsh and R. C. Campling
Herbage Abstracts, V. 40, p. 123-130, 1970. 3 tab., 83 ref.

Keywords: Cattle wastes, Pasture, Waste composition, Degradation, Grazing, Performance.

This review examines the composition of dung from grazing cattle, its distribution on pasture, factors which affect its decomposition, and the effects of dung on the botanical composition and yield of pasture, and on the grazing behavior of cattle. The fact that cattle reject dung-affected herbage is now well established, though the extent of this rejection depends on grazing intensity and the availability of alternative clean herbage. The utilization of dung-affected herbage can be increased. Chain harrowing pastures to accelerate dung pat disintegration, increasing acceptability of fouled herbage with sweetening agents such as molasses, and treating the herbage with salt and aniseed all have drawbacks. Perhaps the most practical measure is adjustment of stocking rate. It has been shown that as stocking rate increases, cattle tend to graze closer to dung-pats, thus reducing the amount of rejected herbage. In a study in which the forage intake and production of dairy cows grazing dung-fouled herbage were compared with those of cattle grazing clean herbage it was revealed that although fouling reduced daily herbage organic matter (OM) intake as much at a low as at a high grazing intensity, daily intake of digestible OM, milk yield, milk composition and liveweight gains were not significantly reduced by fouling. It is suggested that if more emphasis were given to milk yield/ha as an index of good grazing management, rather than to milk yield per cow or to sward appearance, it is probable that less importance would be attributed by graziers to dung fouling. (Merryman-East Central)

4677-A6, B2, D2
SWINE ODOR NOT LOWERED MUCH BY CONTROL PRODUCTS

Anonymous
Feedstuffs, V. 50, No. 22, p. 14, May 29, 1978.

Keywords: Swine wastes, Liquid wastes, Odor control, Chemical treatment.

In a University of Illinois study, 24 commercial odor control products were evaluated under procedures simulating use in a typical swine finishing unit with slotted floors and below-floor pits. The odor control products failed to give significantly lower odor levels or improved odor acceptability over untreated samples. The researchers suggested that if an odor problem exists, producers may use the products at alternate treatment rates recommended by the manufacturers. (Merryman - East Central)

4678-A8, B3, C2, E2
NOTE ON SECONDARY AND MICRO-ELEMENT CONTENTS OF FERTILIZERS AND MANURES

Department of Soils, Punjab Agricultural University, Ludhiana 141 004, India
C. L. Arora, V. K. Nayyar, and N. S. Randhawa
Indian Journal of Agricultural Science, V. 45, No. 2, p. 80-85, Feb., 1975. 3 tab., 3 ref.

Keywords: Fertilizers, Poultry wastes, Livestock wastes, Land application, Soil chemical properties, Crop response, Heavy metals, Trace elements

For maintaining a record of nutrients added to the soil, it is necessary to know the concentration of secondary and micro-nutrients which are supplied by the fertilizers, as well as the contents of their primary elements. This investigation reports the data on 14 elements in 21 fertilizers and 4 manures. Prepared extracts from fertilizers and manures were analyzed by using a direct-reading emission-spectrophotometer and an atomic-absorption spectrophotometer. The S content was estimated according to the gravimetric method. It was found that piggery manure was richest in Mg, Zn, Cu, Fe, B, Cr and Pb among manures, and its Zn concentration was higher than that in any of the inorganic fertilizers except triple superphosphate. Rotted poultry manure contained the highest amounts of Ca, S, Mn, Mo, and Sr when compared with other manures. Farmyard manure was the poorest in all elements except for Fe, Al, Pb and Co. The data showed that a combination of low-analysis and straight fertilizers supplied maximum amounts of Ca, Mg, S, Zn, Mn, Mo, Co, Cr and Pb, while other combinations of high-analysis or mixed fertilizers except Sona Khad and NPK mixture supplied relatively small amounts of secondary and micro-elements. Data suggested that with a shift from single or low-analysis fertilizers to high-analysis mixed or compound fertilizers, depletion of Ca, S, Zn, Cu, Mn and Mo may become the limiting factor in crop production. (Merryman-East Central)

4679-A8, A9, B1, E2
NOTE ON DETOXICATION OF LINDANE BY FARMYARD MANURE

Division of Microbiology, Indian Agricultural Research Institute, New Delhi 110 012, India
A. C. Gaur, S. P. Magu, K. V. Sadasivam, P. S. Mathur, and S. K. Kavimandan
Indian Journal of Agricultural Science, V. 45, No. 7, p. 329-332, July, 1975. 2 tab., 7 ref.

Keywords: Insecticides, Lindane, Soil chemistry, Toxicity, Crop response, Land application, Detoxication.

Since the optimum amount of organic matter needed for detoxication of the insecticide lindane is not known, an experiment was conducted with different levels of organic matter to find out the optimum dosage which could reverse the inhibitory effect caused by the insecticide in gram (*Cicer arietinum* L.). Lindane did not inhibit nodulation and plant growth at 1 ppm, but doses higher than 5 ppm proved toxic. At 10 and 25 ppm of the insecticide almost no nodule was formed. The inhibitory effect caused by 5 ppm lindane was reversed when farmyard manure was used even at 0.2 percent carbon (about 25 tons/ha). Application at 0.4 percent carbon counteracted the toxicity caused by 10 ppm lindane in nodulation and dry matter, but farmyard manure at 0.6 percent carbon proved more beneficial in reversing the inhibitory effect caused by 25 ppm lindane. Grain yield was substantially increased when farmyard manure was applied at 0.2 percent and 0.4 percent carbon. Only the highest level of farmyard manure increased straw yield significantly. (Merryman-East Central)

4680-A9, A11, B3, C3, E2, E3
FUNGASTATIC FEED ADDITIVES IMPROVE LITTER RESULTS

Feedstuffs, Staff Editor
K. F. Chesney
Feedstuffs, V. 50, No. 22, p. 12, May 29, 1978.

Keywords: Feed additives, Fungicides, Litters, Refeeding, Poultry, Performance, Sorbic acid, Adipic acid, GV-11, Yeasts, Molds, Bacteria.

University of Florida researchers tested three fungastatic compounds on new and used litters using four dietary treatments: (1) a control diet with no fungastatic added, (2) sorbic acid at 0.8 lb/ton, (3) sorbic and adipic acid combination at 0.4 lb/ton each and GV-11 at 2 lb/ton. Six hundred male and 600 female broiler chicks were fed these dietary treatments in the form of either fresh peanut-hull litter or built-up peanut-hull litter used to raise one previous flock for eight weeks. Males exhibited the best weight gain on the sorbic-adipic acids combination. Females gained most on the sorbic acid treatment. Feed conversion was most favorable on the sorbic acid treatment at 2.10 and least favorable on the sorbic-adipic acids treatment at 2.17. The sorbic acid and adipic acid combination proved most effective in depressing microbiological growth (yeasts, molds, aerobic and anaerobic bacteria). GV-11 and sorbic acid alone also depressed yeast and mold growth rates. Immediately following the removal of the birds, the physical condition (caking and appearance) of the litter was scored by three persons individually. Their average scores showed that regardless of the litter age, the control diet resulted in the poorest litter condition. The sorbic acids diet resulted in the best litter condition, followed by dietary sorbic acid and finally, the GV-11. (Merryman-East Central)

4681-B1, C2, E2
POULTRY MANURE FERTILIZER VALUE CUTS FARM COSTS

Anonymous
Feedstuffs, V. 50, No. 26, p. 16, June 26, 1978.

Keywords: Poultry wastes, Land application, Pennsylvania, Nutrients, Nitrogen, Phosphorus, Potassium.

Poultry manure produced in Pennsylvania accounts for about one-half the fertilizer used on many of the state's farms. Fresh poultry manure or dried has a N-P-K rating of 5-5-2 on a dry weight basis. Fresh manure is about 25 percent dry matter. Most of the manure fertilizes corn acreage into which it is plowed at a rate of 2 tons/acre if dry and eight tons/acre if fresh or wet. If used on hay, grass pasture or small grains, manure should be used carefully, spread thinly and evenly and never spread in dry weather. For best results, the manure should be dried inside the poultry house, worked into the soil shortly after spreading, and spread 60 days before planting. (Merryman-East Central)

4682-A11, B3, E3, F1
POULTRY WASTES PROVIDE NITROGEN SOURCE

Anonymous
Hoard's Dairyman, V. 123, No. 11, p. 722, June 10, 1978.

Keywords: Refeeding, Poultry wastes, Dairy cattle, Milk production, Costs.

University of Maryland researchers conducted tests in which groups of 8 Holstein cows each were fed one of four diets. The diets consisted of a corn-soybean meal concentrate supplemented with either: (1) 2 percent urea, (2) 17.2 percent dehydrated poultry excreta, (3) 26 percent dehydrated poultry excreta, and (4) additional soybean meal. All diets contained 24 percent crude protein. The concentrates were mixed with corn silage; concentrates and silage each provided 50 percent of the dry matter in the diet. Cows on all four diets consumed about the same amount of feed. Cows on the 17.2 percent dehydrated poultry excreta supplemented diet produced 8 percent more milk than those on the urea supplemented diet and 7 percent more milk than cows on the 26 percent dehydrated poultry excreta or soybean meal diet. Cost of the concentrate per metric ton was $133 for the urea supplemented diet; $125 and $119, respectively, for the 17.2 and 26 percent dehydrated poultry excreta diets; and $137 for the soybean meal diet. Based on cost of concentrate per kilogram of milk produced, the dehydrated poultry excreta diets were about 11 percent less expensive than either of the two supplemented diets. (Merryman-East Central)

4683-A4, B1, C2, C3, F4
PRELIMINARY IDENTIFICATION OF LITERATURE MODELS AND DATA FOR EVALUATING RURAL NONPOINT NUTRIENT, SEDIMENT, AND PATHOGEN SOURCES

Agricultural Engineering Department, University of Minnesota, St. Paul, Minnesota
J. A. Moore, C. A. Onstad, M. A. Otterby, H. L. Person, and D. B. Thompson
Preliminary Identification of Literature Models and Data for Evaluating Rural Nonpoint Nutrient, Sediment, and Pathogen Sources, University of Minnesota and ARS-USDA, North Central Soil Conservation Research Center, Morris, Minnesota, May, 1977, 223 p. 3 fig., 4 tab., 834 ref.

Keywords: Nonpoint sources, Water pollution, Minnesota, Nutrients, Sediment, Pathogenic bacteria, Models, Waste composition.

This report: (1) reviews the literature related to sources and transport of nutrients and sediment from agricultural lands and the literature related to survival and transport of pathogens from animal waste, (2) identifies and evaluates current predictor models as tools for assessing the effect of erosion and fertilizers on surface water quality in Minnesota, and (3) identifies and assembles data sources anticipated to be necessary in evaluating the effects of animal waste, commercial fertilizers, soil losses and sedimentation upon surface water quality in Minnesota. (Merryman-East Central)

4684-A6, B1, C2, D1, D2, D3, E2
PUTTING THE LID ON ODOR

Department of Biological and Agricultural Engineering, North Carolina State University, Raleigh, North Carolina 27607
J. C. Barker
Hog Farm Management, V. 15, No. 6, p. 14, 16-18, June, 1978. 1 fig.

Keywords: Odor control, Swine wastes, Confinement pens, Hydrogen sulfide, Ammonia, Amines, Mercaptans.

Swine producers must be aware of and practice odor control measures in order to operate compatibly with neighbors. Odorous gases emitted during the handling of animal wastes are mainly intermediate and final products of anaerobic decomposition. These odorous gases are primarily hydrogen sulfide and ammonia with minute but highly odorous quantities of amines and mercaptans being formed. Odor control measures include the following: (1) Locate facilities at least 1000 ft. from the nearest inhabited dwellings. (2) Locate pollution control and waste treatment facilities as remotely as possible from areas of highest odor sensitivity. (3) Plant hedges or rows of trees strategically to shield production and waste management facilities from sight and reduce the wind speed across these facilities, allowing odorous gases more opportunity to rise vertically and dissipate into the atmosphere. (4) Keep manured surfaces on which animals are maintained clean and dry. (5) Flushing systems which recycle lagoon effluent for frequent removal of wastes from open gutters and underslat collection pits help control odor. (6) External liquid manure tanks should be covered to control odor released from stored manure either by a lid or by maintaining a dry floating crust over the manure surface. (7) Addition of lime to liquid manure storage helps control the formation of noxious gases, but large amounts are required and it is fairly costly. (8) Properly maintained anaerobic and aerobic lagoons help control odor. (9) Use of masking or deodorizing agents, counteractants, or biological inoculants and enzymes may be used. Results have been varied and not always successful. If land spreading is used for terminal treatment or reuse of animal wastes, the wastes should be spread (or better yet, injected) in the morning on dry days with little wind. Application should be on sites as far away from neighbors, public roads, water supply systems, and streams or impoundments as possible and preferably downwind from neighbors. (Merryman-East Central)

4685-A6, B1, F2
THE POLITICS OF ODOR

Anonymous
Hog Farm Management, V. 15, No. 6, p. 16, June, 1978.

Keywords: Odor, Legal aspects, Nuisance lawsuits.

Because few odorous substances are harmful in normal concentrations and the U.S. Environmental Protection Agency's position is that odors are a local rather than national problem, there are no regulatory programs on odors. So far, efforts to legislate land use planning guidelines which would offer a producer some degree of legal protection against odor complaints have been minimal. Consequently when a producer cannot resolve an odor conflict and reaches an impasse, private regulation occurs through nuisance lawsuits. The nuisance law attempts to add the element of reasonableness, and indicates that every landowner has a right to use their land as they wish; but, it must not deprive other landowners of their right to use and enjoy their land.

Any unreasonable use or interference with enjoyment constitutes a nuisance. There are problems inherent with nuisance cases decided by a trial by jury. Nuisance cases should be heard by a judge and rulings should be made based upon expert witness testimonies. The definition and corresponding implementation of best management practices as outlined by educational, technical, and service agencies should form the basis for rulings. Consideration of the technical advice available to the agricultural community will allow each livestock producer to implement the most suitable techniques for his particular situation. This should be supplemented with maintaining good public relations with neighbors. (Merryman-East Central)

4686-A6, B1
REDUCING SUMMERTIME ODORS FROM POULTRY HOUSES

University of Wisconsin, Madison, Wisconsin
J. L. Skinner
Poultry Digest, V. 37, No. 436, p. 291, June, 1978.

Keywords: Odor control, Poultry wastes

As the weather warms up, there is a greater likelihood for poultry odor problems to increase resulting in complaint calls. Steps to minimize these problems include: (1) A good surface drainage system should be estimated and maintained to keep water away from buildings, service driveways and manure holding areas. (2) Overall housekeeping should be constantly reviewed in terms of system maintainance. (3) Fly breeding should be kept to a minimum. (4) Manure should be removed and incorporated into the soil as quickly as possible. (5) Manure removal and transport equipment should be in good repair, not overloaded, and parked away from public roadways or full view. (Bates-East Central)

4687-B2, C1, C2, D3
STORAGE OF BEEF CATTLE WASTES UNDER AEROBIC AND ANAEROBIC CONDITIONS

A. K. Aasen, J. B. McQuitty, and P. H. Bouthillier
Paper No. 71-202, Canadian Society of Agricultural Engineers, CSAE Conference, Lethbridge, Alberta, July 6, 1971, 21p. 4 fig., 5 tab., 21 ref.

Keywords: Cattle wastes, Liquid wastes, Aerobic treatment, Anaerobic treatment, Waste composition, Nitrogen, Phosphorus, Potassium, Solids, Biochemical oxygen demand

Aerobic and anaerobic treatment of beef cattle wastes were compared in this study under actual conditions. A portion of the building used in this project was divided into four pens, two of which incorporated free-stalls with slatted passages and feeding areas while the other two had fully slatted floors. Two aerobic and two anaerobic pits were established beneath these four pens. Experimental results indicated the following: (1) Significant differences in concentration existed between the two forms of decomposition for all variables except total nitrogen. However, when the effect of dilution was removed, significant differences between the two treatments were only found for five-day biochemical oxygen demand, total nitrogen, ammonia nitrogen and phosphorous. (2) Significant differences in the concentrations of the variables, total solids, volatile total solids, organic nitrogen and potassium, were noted between the two levels of aeration (a pit with two rotors and a pit with one rotor) when compared on a dry matter basis (no dilution effect). (3) The pollution potential of the anaerobic treatments based on five-day biochemical oxygen demand was three to four times that of the aerobic treatments. Estimated reduction was 70-80 percent for the aerobic system and 10-20 percent for the anaerobic. (4) Regression analysis indicated that using the tests for oxygen demand index and total solids, as independent variables, an estimate of BOD_5 may be determined. Regression analysis indicated that the quantity of plant nutrients in a liquid manure pit, may be estimated using daily livestock feed records, feed analysis and the quantity of dry matter in the liquid manure. (Merryman-East Central)

4688-A6, B2, F2
TOUGHER RULES COMING FOR BUILDING LAGOONS

P. Quick
Wallaces Farmer, V. 11, No. 103, p. 24, June, 1978.

Keywords: Lagoons, Design, Legal aspects, Permits, Iowa Department of Environmental Quality

The Iowa Department of Environmental Quality's (DEQ) Air Quality Commission has toughened several new permit requirements for building new lagoons. The new rules require lagoons to be located at least 2500 ft. from a public use area or, the nearest occupied residence (other than the owner's). For lagoons serving operations with a onetime capacity exceeding 5000 hogs or 2000 cattle, the distance requirement is increased to 3750 ft. The new rules require lagoons to be built over two times the size presently required. Additional requirements dealing with lagoon design and water availability have also been added. The Iowa Senate has just passed a bill 44-3 that reorganizes the four DEQ commissions. Air quality, water quality, solid waste disposal, chemical technology commissions and an executive committee are to be combined into one seven-member commission. (Merryman-East Central)

4689-A11, B1, E2
A TECHNIQUE FOR THE STUDY OF 'FOULING' BY GRAZING CATTLE

Grassland Research Institute, Hurley, Berkshire, England
A Smith and C. C. Boswell
Journal of the British Grassland Society, V. 28, p. 21-26. 1973. 1 fig., 2 tab., 16 ref.

Keywords: Cattle, Defoliation, Treading, Fouling, Pastures, Grazing

Effects of defoliation, treading, and contamination by feces and urine on sward pastures is examined. Metal cages were devised which enable cattle to graze experimental areas, but which prevent the animals from contaminating and treading the grass. Electrified fences, arranged in rectangular units, were constructed to have a similar function to the cages. An experiment was performed to determine the quantity of herbage grazed within cages and electrified fence units by comparison with normal grazing. In this experiment, the cows were able to reach within 6 inches of the center of a cage by grazing under the two long sides. The cows either stood or kneeled to graze and rarely placed a foot inside the caged are. The animals were unwilling to reach far under the electrified fences and grazed to a line about 12 inches inside the perimeter. At the beginning of each grazing, the cows grazed inside the metal cages and around the plot fencelines more intensively than the rest of the sward. This preference was less marked during the second and third days of grazing. Swards were initially clean before the experiment, but whenever they were not enclosed by cages or electrified fences they became fouled and trodden during grazing. The amounts of herbage available before grazing were similar for enclosed and unenclosed swards, but the cattle grazed more herbage from the enclosed swards which remained clean. The quantity of herbage harvested from within the electrified fences was not significantly different from that within cages. In a second experiment, an assessment was made of the effect of fouling in the absence of treading on the quantity of swards grazed. There were similar amounts of DM available in all swards. Although the cattle harvested a greater proportion of this DM from the clean swards, the corresponding difference in the actual amount of DM harvested was not statistically significant. However, when the herbage was assessed in terms of the quantity of digestible organic matter present, significantly more was harvested from the clean than from the fouled swards. The results of both experiments taken together cannot be used to calculate indirectly the effect of treading alone because the levels of contamination were not the same for both experiments. The calculation has, however, been made elsewhere from other data and it showed that treading itself caused a reduction in herbage utilization. The effect of fouling may be largely overcome by training or by varying grazing pressure, e.g. through stocking rate. (Merryman-East Central)

4690-B2, D3
GUTTER FLUSHING SYSTEMS FOR SWINE BUILDINGS

Agricultural Engineering Department, Purdue University, West Lafayette, Indiana
D. D. Jones, J. C. Nye, B. C. Horsfield, and R. George
Leaflet AE-87, Cooperative Extension Service, Purdue University, 1976, 20 p. 16 fig., 10 tab., 10 ref.

Keywords: Flushing, Swine wastes, Design, Lagoons, Waste treatment

This publication is a design and operating manual for gutter flushing systems in hog buildings. Its purpose is three-fold: (1) to explain the concept and how it works, (2) to provide a basis for evaluating its potential for individual swine operations, and (3) to develop systems tailored to individual production programs. Worksheets, drawings, design tables and sources of additional information are provided. The publication is broken into six parts: (1) How Flushing Works, (2) Who Should Consider Using It, (3) Advantages and Drawbacks, (4) Basic Parts of a Flushing System, (5) Questions and References, and (6) Design and Equipment Worksheet. (Merryman-East Central)

4691-B2, E2
INJECTION OF DAIRY WASTE

B Butterworth
Journal of Agriculture, p. 5, Sept., 1977. 1 fig., 1 tab.

Keywords: Dairy wastes, Land application, Surface spreading, Soil injection, Pastures, Grazing, Labor

Dr. Brian Pain reports that an experiment designed by the National Institute for Research in Dairying (NIRD) indicated that injection of dairy waste had particular advantage, compared with surface spreading, when related to the grazing of the sward by dairy cattle. Besides the fact that the kilograms of dry matter available/cow/day, the kilograms of dry matter used/cow/day, and percentage of herbage utilized were greater for cows grazing the slurry injected area as opposed to the slurry spread area, the injection also yielded more efficient use of nutrients. Maize, in particular, could use slurry very efficiently In the trials that were run, it took 52.5 minutes of total cycle time for injection as compared to 33.8-47.3 minutes cycle time for surface spreading the same amount -- depending on the spreader and filling procedures. So, in terms of doing the whole job, injection was not that much slower. (Merryman-East Central)

4692-A11, A12, B3, C2, C3, E3, F1, F2
LET THEM EAT WASTE

Editor, Hog Farm Management
J. Byrnes
Hog Farm Management, V. 15, No. 6, p. 50, June, 1978.

Keywords: Refeeding, Swine wastes, Sows, Animal health, Food & Drug Administration, Legal aspects, Drug residues, Public health, Economics

The Food and Drug Administration's official position is that it does not sanction the feeding of animal wastes, but it will not become involved from a regulatory standpoint unless waste feeding causes adulterated feed or a residue problem in practice. FDA has informally left regulatory action in this area to the states. While FDA plans no policy changes on this in the immediate future, this could eventually change. Possible regulatory controls are more likely to be directed at persons selling waste and not the producer feeding back some of his own waste. A Virginia Polytechnic Institute study showed that gilts will do well when fed swine waste ensiled with ground corn. In a similar study utilizing ensiled swine waste and orchard grass, the pigs would not eat the orchard grass-waste mixture. They picked out the basal ration and left the rest. A small but significant number of producers have reduced feeding costs to gestating sows by refeeding swine wastes. Producers recycling feed to sows need to be very cautious about what kinds of medication are going through those sows. A producer refeeding waste almost has to assume those sows are getting some drugs. If he decides to market them, the withdrawal period should be the same as if the animals were being fed the drug directly. There is also concern about the potential for worms, parasites, and virus transmission being passed through the material. (Merryman-East Central)

4693-A2, A3, A4, A6, B2, B4
LAGOONS: WHAT SIZE NEEDED FOR YOUR HERD?

C L. Barth and R. O. Hegg
Hoard's Dairyman, V. 123, No. 14, p. 864, 885, July 25, 1978. 2 fig., 2 tab.

Keywords: Dairy wastes, Lagoons, Anaerobic, Design, Size, Loading rates, Odor, Agricultural runoff

Because of their great convenience, anaerobic lagoons are increasing in popularity as a means of treating manure and milking parlor wastewater. They provide an alternative to daily hauling and spreading. Recommended loading rates in pounds of volatile solids per 1000 cubic feet of lagoon space per day drops when moving from warmer to colder climates. Tables are given for computing lagoon size needed for individual dairies. Lagoons that serve only the milking parlor or parlor and holding area may receive large volumes of waste because of flushing or cow washing systems In these cases, lagoon volume can be based on liquid holding capacity rather than volatile solids loading rate. Using an estimate or measurement of daily water use, the lagoon can be designed to hold the wastewater at least 60 days or longer where winter conditions or regulations require. Lagoons can be any shape and should be a minimum of 5 feet deep. Where rapid buildup of sludge is anticipated, the lagoon width may be limited to 50 feet to allow for sludge removal by dragline. Studies have indicated that sludge accumulates at the rate of 250 cubic feet per year for a 1300-pound cow or 175 cubic feet per year for a 900-pound cow. Design volume per animal can be divided by the annual sludge accumulation rate to estimate the number of years before sludge removal will be required. An effective way to reduce the load on the lagoon and sludge accumulation is to install a solids separator ahead of the lagoon. Lagoons can be a source of odor and runoff problems so appropriate management steps should be taken to protect the environment. (Merryman-East Central)

4694-B2, C1, C2, D3, F1
TREATMENT OF DAIRY CATTLE WASTES BY A BARRIERED LANDSCAPE WASTEWATER RENOVATION SYSTEM

University of Delaware, Newark, Delaware
W. F. Ritter and R. P. Eastburn
Journal Water Pollution Control Federation, V. 50, No. 1, p. 144-150, Jan., 1978. 1 fig., 11 tab., 5 ref.

Keywords: Waste treatment, Dairy wastes, Liquid wastes, Barriered Landscape Wastewater Renovation System, Mid-Atlantic states, Design, Economics, Waste composition

A research project undertaken at the University of Delaware to evaluate the Barriered Landscape Wastewater Renovation System (BLWRS) as a means of treating livestock wastes near dense population centers in the Mid-Atlantic states prompted the following conclusions: (1) The BLWRS is an effective waste treatment system that is capable of reducing COD and nitrogen by 90 percent or more and phosphorus by 99 percent in liquid dairy cattle wastes. (2) BLWRS capacity is limited by permeability of the soil. (3) Calcium and magnesium are leached from a BLWRS and may build up to excessive amounts if the effluent is recycled and used for flushing. (4) The BLWRS will remove significant amounts of potassium, aluminum, sodium, and zinc from liquid dairy waste. (5) The BLWRS cannot be operated for the entire winter in the Mid-Atlantic states. (6) Other waste handling systems are cheaper for treating dairy cattle wastes. (7) There are many operational problems involved with waste that contains a high concentration of suspended solids. (8) The greatest potential for using BLWRS in the livestock industry would probably be with milking center wastes Design criteria for constructing a BLWRS are given. (Merryman-East Central)

4695-B2, C2, D3, E3, F1
METHANE DIGESTERS

Anonymous
Feedlot Management, V. 20, No. 6, p. 11, June, 1978

Keywords: Methane, Recycling, Digesters, Design, Economics

Dr. John Sweeten of Texas A&M University has estimated the maximum capital cost that a farmer could pay for a methane generating system (assuming typical yields) and expect to pay off the system in 7 years at $2/MCF natural gas. The economics of methane production can only be improved by higher priced energy or technological advances in digester performance. Texas research reports that higher temperature digestion -- 165° instead of 95°F -- gives twice as much gas production with the same manure and takes only 1/5 of the digester volume as does conventional 95° digesters. Other potential breakthroughs are partial pre-digestion of slurry; addition of high carbon (fibrous) wastes; separation and storage of intermediate volatile acids; and fiber wall filters that retain active bacteria. (Merryman-East Central)

4696-A4, A8, B2, C3, E2
DISEASE HAZARD OF PATHOGENIC ORGANISMS IN FARM WASTE MATERIAL

Agricultural Research Council, Institute for Research on Animal Diseases, Compton, Newbury Berkshire, England
D. A. Haig
Journal of the Science of Food and Agriculture, V. 23, p. 795, 1972.

Keywords: Slurries, Pathogenic bacteria, Land application, Pastures, Salmonella, Animal health, Grazing, Water pollution

In order to make livestock waste management easier, many livestock owners have turned to handling the wastes in slurry form. Linked to slurry management is the danger that pathogenic organisms may be present. Preliminary experiments have revealed that while the pathogenic organisms examined did not appear to multiply in slurry held under static conditions, the organisms could persist for up to 12 weeks. Subsequently, it was found that under conditions of intense aeration the viability of salmonellas decreased more rapidly, presumably due to the rise in pH which accompanied aeration. Experiments have been done to examine the effects of applying salmonella contaminated slurry on pasture. It was found that under the conditions of the tests, a strain of *S dublin* persisted for only 7 or 8 days on the higher levels of pasture but could persist for considerably longer periods (12 weeks) in the soil. The survival of the organisms was apparently dependent on such factors as grass cover, sunlight, temperature and rainfall. Calves allowed to graze pasture contaminated with slurry containing 10^6 organisms/ml became infected within a few days. When, however, the rate of contamination was lowered to 10^3/ml, none became infected. In a subsequent trial calves were allowed to graze an acre of pasture which had been contaminated 1 week before with 10^5 salmonellas/ml. Continuous testing of the pasture was carried out and it was found that while organisms were present at grass levels below 1 in (25.4 mm) for at least one month, none could be detected in the upper portion of the grass and none of the animals became infected. (Merryman-East Central)

4697-A4, A5, A6, B2, C3, E2, F1
DAIRY WASTE DISPOSAL

P. Pattison
Journal of Agriculture, V. 119, No. 5, p. 32-33, 35, 1969. 3 fig.

Keywords: Waste disposal, Land spreading, Economics, Spray irrigation, New Zealand, Pastures, Animal health, Grazing, Pathogenic bacteria, Spreading, Ponding, Pumping

The waste disposal system chosen by the individual farmer depends upon the amount and dilution of the waste, stocking rate, farm size, farm's soil characteristics and topography, the requirements of any permit issued to protect the receiving waters, the effectiveness of the present system, and the finance available. A New Zealand dairy wastes committee considers spray irrigation, under good management, to be generally the most effective and satisfactory means of disposal of dairy shed wastes. It may also be the most economical. Under some circumstances, salmonella has been found on pasture more than 60 days after spraying, however. The animal health division of the Department of Agriculture recommends that after spraying on pasture the maximum possible withholding period be observed before cows are again grazed, even under favorable conditions. Other systems in use include pumping with spreaders, ponding, and large sumps in conjunction with manure distribution and drains. Pumping with spreaders is less effective on wet soils and the thick layer of material associated with this method can possibly assist the spread of salmonella, leptospirosis, mastitis and other diseases of this nature. This method may also damage pasture and stimulate weed growth. Under some circumstance a well designed lagoon system can provide a satisfactory means of disposal, but it may be a costly choice in the long term. Disadvantages of a pond system are the possible pollution of groundwater and odor nuisance if the pond is not operating effectively. If the ponds are close to watercourses there could be pollution through seepage and, in some instances, fine particles of waste may eventually seal the soil and leave a sump type of ponding area which would eventually overflow, possibly creating a pollution problem. Use of large sumps in conjunction with manure distribution can enable a farmer to distribute waste on those areas that he considers will obtain the most benefit. A problem associated with this system is that in wet weather, it will probably be difficult to use wheeled vehicles because of the damage to roadways and pastures. A well designed and properly maintained sump system will cost almost as much as a spray disposal scheme to install and can take more time to clean out. (Merryman-East Central)

4698-B3, E2
PERSISTENCE AND MOVEMENT OF SIMAZINE IN SOIL

Nuclear Research Laboratory, Indian Agricultural Research Institute, New Delhi, India
O. P. Joshi and N. P. Datta
Journal of the Indian Society of Soil Science, V. 23, No. 2, p. 263-265, 1975. 1 tab., 3 ref.

Keywords: Land Application, Herbicides, Farmyard manure, Simazine, Soil contamination

A study was conducted at the Indian Agricultural Research Institute farm in New Delhi, India to evaluate the influence of organic manures on reduction of residual toxicity of simazine in maize-wheat rotation on alluvial soils. The experiment was a split plot design consisting of 64 treatments and three replications. Two levels of farmyard manure were used on the maize crop and two levels each of farmyard manure, green manure *Ipomoea carnosa* and sludge were used on a wheat crop to see the reduction of phytotoxicity of simazine to maize and residual wheat crop. The herbicide was applied at four levels -- 0, 0.5, 1.0 and 1.5 kg/ha. Soil samples were analyzed for initial residue and for residues after one month, three months, and before sowing the wheat crop. It was found that in general, at 0.5 and 1.0 kg/ha rates the concentration of chemical was found to be reduced by the application of FYM (farmyard manure) while in the case of 1.5 kg/ha, it was found to be increased at each stage of sampling. A possible explanation for this is that at 0.5 and 1.0 kg/ha dosages, the organic matter activated the decomposition while at 1.5 kg/ha dose more chemical was adsorbed than decomposed. In the upper 15.2 cm layer after 108 days of application of simazine at 0.5, 1.0, and 1.5 kg/ha, the concentration of the herbicide left was 2.72, 3.54, and 4.22 percent respectively of initial residues. (Merryman-East Central)

4699-E3
FEEDING FEEDLOT WASTE TO CATTLE

M. Hoelscher
Feedstuffs, V. 50, No. 29, p. 27, July, 1978 4 tab.

Keywords: Refeeding, Feedlot wastes, Cattle, Havesting, Ensiling

This article outlines methods of harvesting and refeeding feedlot wastes. In the Southwest, feedlot waste is harvested in basically two ways: (1) scraping shallow, dry dusty layer accumulated on the surface of open pens, and (2) scraping packed layer of feedlot waste on an annual or semi-annual basis. Among other systems being tested and developed, feedlot waste is collected from feeding pens and blended with other ingredients and ensiled prior to feeding. The loose dry accumulation of waste on the surface of open feedyard pens should be ground before storing; whereas the packed layers must be allowed to dry before grinding and storing. The feedlot waste used in the ensiled process should be harvested while wet. Results of refeeding trials using these and other types of feedlot wastes are reported. The decision to use or not to use feedlot waste as an ingredient in a feedlot situation should be based on its cost-benefit ratio in a given situation. (Merryman-East Central)

4700-A3, A4, A9
QUANTIFICATION OF POLLUTANTS IN AGRICULTURAL RUNOFF

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J. N. Dornbush, J. R. Andersen and L. L. Harms
Environmental Protection Agency Technology Series Report, EPA-660/2-74-005, Feb. 1974, 149 p. 24 fig., 15 tab., 73 ref.

Keywords: Surface runoff, Agricultural runoff, Erosion, Nutrients, Phosphorus, Nonpoint pollution sources, Chemistry, Sediments, Water pollution sources, Pesticides, Bacteria, South Dakota, Bioindicators, Rainfall, Snowmelt.

Surface runoff from snowmelt and rainfall in eastern South Dakota was measured during a three year period. The size of the research sites ranged from 7.18 to 18.69 acres, and all sites had crops of corn, oats, pasture or hayland. Composite samples of the runoff were used for various chemical, physical and biological determinations. Runoff samples from 108 snowmelt events and 36 rainfall events were collected. Equipment fabrication and installation resulted in some incomplete data for the initial year, but successful monitoring of each runoff event was accomplished thereafter. Sediment losses were considerably lower than anticipated. Pesticide concentrations were low in both water and sediment samples, and were usually less than the analytical test limits. Coliform and fecal levels were consistently greater than accepted surface water quality criteria. Most of the nutrients were found to be soluble and/or associated with snowmelt runoff. (Dornbush - South Dakota State University)

4701-A4, A6, A7, B1, F2
ENVIRONMENTAL PROTECTION REQUIREMENTS FOR SWINE OPERATIONS

Texas Agricultural Extension Service, Texas A&M University, College Station, Texas
J. M. Sweeten
Fact Sheet L-1302, Agricultural Extension Service, Texas A&M University, 1975, 4 p., 6 fig

Keywords: Swine, Air pollution, Odor, Water pollution, Regulation, Permits, Texas Water Quality Board, Environmental Protection Agency.

Summarized in this report are the State and Federal water and air pollution control regulations pertaining to swine operations. The Texas Water Quality Board (TWAB) requires a "Certificate of Registration" for swine feeding operations with more than 50 head of hogs. This certificate stipulates no discharge of wastewater or runoff from the premises. A procedure is presented that will meet the "no-discharge" standard. The EPA requires a permit for swine producers of more than 2500 hogs in confinement in which the "no-discharge" standard also applies. A joint permit may be obtained to satisfy both state and federal agencies. The Texas Air Control Board requires a construction and operating permit on new production operations with more than 1000 head of hogs. This applies also to any existing operations that are planning to expand 100 percent or more in feeding capacity. The TACB also regulates odors from existing swine feeding facilities under a general nuisance regulation. The procedure for obtaining permits from the TWQB, TACB, and the EPA is presented as well. (Bates - East Central)

4702-A6, B1, F2
ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS. ALLEN BECKER, D/B/A BECKER'S CHICKEN-EGG FARM, RESPONDENT

Illinois Pollution Control Board
PCB 73-346, Illinois Pollution Control Board, Feb. 14, 1974, 5 p.

Keywords: Poultry wastes, Management, Odor, Regulation, Lawsuits, Environmental Protection Agency, Illinois Pollution Board, Dead Animal Disposal Act.

A complaint was filed with the Illinois Pollution Control Board by the Environmental Protection Agency against Allen Becker, owner of Becker's Chicken-Egg Farm. This action was taken because it was alleged that Becker was operating the chicken farm in such a manner as to violate the odor section of the Environmental Protection Act and the Dead Animal Disposal Act. A hearing was held on December 18, 1973. In lieu of a full hearing, a written stipulation and proposal for settlement, submitted by the EPA and Becker, was entered into the record as a basis for mutual agreement between the parties in this enforced action. This stipulation included additional facts and proposed terms of settlement. Because of existing marketing conditions, the Becker Egg Farm closed as of July 1, 1974. Until that time Becker agreed to dispose of the accumulated chicken manure and chicken carcasses in a safe and sanitary manner and in compliance with the odor section of said act and the Dead Animal Disposal Act. A penalty of $800 was assessed against Becker for all violations alleged in the complaint. This action was approved by the Illinois Pollution Control Board. (Bates - East Central)

4703-A4, A11, B1
AERATION, WATER QUALITY, AND CATFISH PRODUCTION

Agricultural Engineering Department, Auburn University, Auburn, Alabama
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Transactions of the ASAE, V. 17, No. 3, p. 433-435. May-June, 1974. 5 fig., 1 tab., 8 ref.

Keywords: Catfish production, Management, Mechanical aeration, Algae aeration, Water quality, Energy, Biofilters, Surface sprinkling, Air injection, Paddle-wheel, Performance.

Evaluation of catfish pond aeration systems has shown that day-time aeration by algae overshadows mechanical aeration and can reduce power requirements. The paddle-wheel (modified oxidation ditch rotor) appears as the most reliable system. Paddle-wheel tests have evolved a Level Raceway Concept which promises several advantages over the conventional earthen raceway. (Copyright 1974 - Transactions of the ASAE)

4704-A3, A4, C1, C2
AGRICULTURAL AND FOREST LAND RUNOFF IN UPPER SOUTH RIVER NEAR WAYNESBORO, VIRGINIA

Virginia Polytechnic Institute and State University, Blackburg, Virginia
E. V. Southerland
M.S. Thesis, Virginia Polytechnic Institute and State University, Sept., 1974, 139 p. 14 fig., 19 tab., 77 ref.

Keywords: Water pollution, Agricultural runoff, Forest land runoff, Virginia, Sampling, Chemical properties, Physical properties, Industrial effluents, Domestic effluents.

Sources and yields of organic matter, suspended solids and nutrients in the Upper South River Basin were investigated during the summer low flow period of 1974. Parameters monitored at sampling stations in the basin included chemical oxygen demand, total suspended solids, turbidity, specific conductance, total phosphorus, total Kjeldahl nitrogen, nitrate, and iron. These data were used with flow and drainage area data to determine the relative magnitude and daily yields of materials from various sources. Sources of organic matter, suspended solids, and nutrients entering the South River included agricultural, forest and urban land drainage as well as domestic and industrial wastewater effluents. The yields of materials from the various sources were computed during an intense storm in May, wet weather flow in June, and dry weather flow in July. During the short term period of high storm flows, land runoff was the primary source of all pollutants. On the long term basis, however, wastewater effluents were the major contributors of all parameters except total suspended solids. Industrial effluents contributed the greatest proportion of chemical oxygen demand and total nitrogen. Waynesboro sewage treatment plant supplies the greatest phosphorus loading. In comparison with forest drainage, agricultural land drainage was found to be a greater source of all materials monitored. Urban runoff was not analyzed separately, but it appears to contribute significant pollutant loads. It was found that reduction of phosphorus in the Waynesboro sewage treatment plant effluent may reduce excessive algal production in the South River below the city of Waynesboro. (Southerland - Virginia Polytechnic Institute and State University)

4705-A1, A4, A5, A8, B1, B5, C1, C2, C3, E2, F1
UTILIZATION OF MANURE BY LAND SPREADING

J. H. Voorburg, editor
Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, 732 p.

Keywords: Livestock wastes, Effluents, Land spreading, Commission of the European Communities, Water pollution, Groundwater pollution, Soil contamination, Crop response, Sampling, Chemical analysis, Physical properties, Economics.

This publication contains the proceedings of a seminar held in Modena, Italy on September 20-24, 1976, under the auspices of the Commission of the European Communities as a part of the CEC programme of coordination of research on effluents from livestock. The subject of the seminar, utilization of manures by land spreading, was subdivided into the following themes: (1) manure and crop production, (2) manure and pollution of surface waters, (3) manure and pollution of soil and groundwater, (4) regional aspects, (5) veterinary aspects, (6) miscellaneous, (7) models on landspreading of manure, (8) sampling and analysis. One important objective of the seminar was to assess the current situation and the available knowledge. A second important objective was to review the present analytical methods for the purpose of assessing an improved homogeneity in the expression of the results. (Merryman - East Central)

4706-A8, B2, B5, C1, C2, E2, F1 AGRICULTURAL USE OF EFFLUENT FROM LIVESTOCKS: PROBLEMS AND PERSPECTIVES IN ITALY

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Utilization of Manure by Land Spreading, A Seminar in the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 1-5.

Keywords: Swine wastes, Livestock, Italy, Slurries, Waste storage, Lagoons, Oxidation tanks, Land spreading, Application wastes, Nutrients, Economics.

Most pig production is undertaken on too small a scale for purification plants to be used economically in Italy. Consequently, the swine wastes are predominantly spread on the land. Problems related to land spreading are: (1) quantity of slurry produced by livestock, possibilities of reducing volume and storage of slurry, (2) composition and fertilizing value of slurry, (3) best times for spreading, livestock per ha and spreading methods, and (4) the systematic study of effects of slurry on different crops and soils. The most common, economical, and rational solution to slurry storage is that of lagoon storage which, if used as straightforward accumulation pits, can have a depth of over 3 m and a capacity of not less than 3 m^3 per head. If the pits are used as oxidation tanks, then the depth must be halved. Forage crops have been found to respond best to slurry application. Doses of 500 m^3 per hectare yield the highest production. However, the most economical doses have been found to be those which do not go above 250 m^3 per ha. Liquid trailer or organic irrigation are the best landspreading methods. (Rowe - East Central)

4707-A4, A7, B2, B3, B5, E2, F1, F2 FARMYARD MANURE AND CROP PRODUCTION IN DENMARK

Askov Experimental Station, Denmark
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Utilization of Manure by Land Spreading, A Seminar in the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 29-43. 3 fig. 8 tab., 2 ref.

Keywords: Solid wastes, Liquid wastes, Denmark, Land application, Confinement pens, Water pollution, Air pollution, Legal aspects, Economics.

In Denmark for many years the use of 20-30 t/ha solid farmyard manure and 10-15 t/ha liquid manure on root crop fields every third and fourth year was a common practice. Manure was applied to crops which showed the greatest ability to utilize them and herd size was based on the amount of food grown in the field. However, confinement feeding is now becoming more predominant. Such feeding is accompanied by inherent problems. Concentrated animal production has left some farms completely without organic manure and others with a surplus. Nowadays, the handling of solid and liquid wastes from intensive animal production forms a considerable expense factor and with the possibility of making up for losses of nutrients from the field by application of commercial fertilizers, the farmer has less interest in careful storing of solid and liquid manure and thus there is a potential risk of pollution of surface waters. Buying feeds for confined animals released livestock owners from dependence on the land for crop production. This means that in such a system of animal production the animal manure tends to be a waste product, difficult to dispose of in a economic way. A handling system for animal wastes which gives the best utilization of their plant nutrients at the same time may be the best security against a potential pollution of air and surface water. This means that animal manure must be incorporated into the soil soon after spreading and that it should be spread in limited amounts and in the right season for the crops which are utilizing the plant nutrients. With the increasing awareness of the public with regard to pollution of the environment from agricultural sources, Denmark must expect restrictions to be imposed which will protect that environment. (Merryman - East Central)

4708-A1, A5, A8, B2, B5, C2, E2 CONSEQUENCES OF SEMI-LIQUID PIG MANURE SPREADING

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Utilization of Manure by Land Spreading, A Seminar in the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 45-50. 2 tab., 2 ref.

Keywords: Slurries, Swine wastes, Land spreading, Nutrients, Crop response, Environmental effects, France.

When spreading semi-liquid swine manure, problems of judicious limits of spreading arise in two different aspects: (1) agronomic (yield and quality of crops, fertility of soils), (2) environmental (particularly the quality of waters). A number of experiments are being undertaken by the Centre de Recherches de Dijon in France to study these problems. The following parameters are being studied: yield and quality of crops, quality of drainage water, evolution of physical, physico-chemical and also biological properties of the soil (microflora and fauna). Results obtained so far, in all the experiments, are too limited to give details. While it is difficult to determine, without experiments, the largest amount of manure which is tolerable in a given situation, some recommendations are obvious. For example, since drainage is most critical during the rainy period in winter, major pig manure spreading on bare soil should be avoided because of its contribution of nitrates and soluble organic matter to the groundwater. (Merryman - East Central)

4709-A8, B2, B5, C2, E2 SLURRY UTILISATION ON THE DAIRY FARM

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Utilization of Manure by Land Spreading, A Seminar in the EEC Programme of Co-ordination of Research in Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 51-63. 2 fig., 9 tab., 15 ref.

Keywords: Dairy wastes, Slurries, United Kingdom, Land application, Grassland, Application rates, Soil injection, Surface spreading, Maize, Crop response, Chemical properties.

Experiments were designed to determine the maximum rates of slurry that could be applied to grassland. Heavy slurry applications had less effect on forage maize than on grassland, but shortly before drilling if 500 t ha^{-1} was incorporated into the land, then plant maturity was delayed and dry matter yields depressed. Cow slurry was not a balanced grassland fertilizer and could only be used effectively by supplementing with organic nitrogen. When slurry was injected or inorganic fertilizer applied, animal grazing intakes were similar but reduced by 30 percent when slurry was spread on the surface. A combination of spring applied slurry and inorganic nitrogen fertilizer gave higher yields in maize. The maturity of the crop was delayed by high rates of slurry and/or high rates of nitrogen fertilizer and it depressed yields. Factorially designed field trials demonstrated the yield benefits that could be obtained by using slurry, or a combination of slurry and inorganic nitrogen fertilizer, for spring barley. When fertilizer value of the liquid and fiber resulting from mechanical separation was investigated, it was found that more nitrogen was in a plant available form in the liquid than in unseparated slurry. An appreciable savings in the energy input to crop production was obtained. Further experiments are being conducted on livestock effluents. (Rowe - East Central)

4710-A8, B2, B5, C2, E2 EFFECT OF RATE OF APPLICATION OF ORGANIC AND INORGANIC NITROGEN ON CROP PRODUCTION AND QUALITY

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Utilization of Manure by Land Spreading, A Seminar in the EEC Programme of Co-ordination of Research on Effluents, organized by

the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 73-85. 6 fig., 5 tab., 1 ref.

Keywords: Cattle wastes, Poultry wastes, Slurries, Netherlands, Land application, Crop response, Potatoes, Beets, Nitrogen.

The results of excess rates of manure application on yield and quality of field crops was studied. Nitrogen was the most common factor that limited yield and quality of field crops. Various quality characteristics of potatoes and sugar beets were found to be related to the amount of available soil N present in spring and the fertilizer applied. To prevent excess applications of animal manure, two possibilities exist. First, for the nitrogen contained in animal manure, there should be a gradual assumption of higher nitrogen-effectiveness coefficients; in doing so the cumulative residual effect of this nitrogen is taken into account. Second, before the start of the growing season, the amount of available N in the soil profile should be determined; the amount of additional nitrogen needed in the form of fertilizer is then calculated. From the same trial, yield and quality of crops grown in the same year were found to be well correlated with the amount of available N, regardless of its source. (Rowe - East Central)

4711-A8, A11, B2, B5, C2, D1, E2, F1, F3
EFFICIENT RECYCLING OF NUTRIENTS

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Utilization of Manure by Land Spreading, A Seminar in the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 87-103. 4 fig., 10 tab., 16 ref.

Keywords: Swine wastes, Poultry wastes, Cattle wastes, Sheep wastes, Slurries, Land application, Northern Ireland, Climate, Soil nutrient levels, Grassland, Animal health, Hypomagnesaemia, Potassium, Copper, Separation techniques, Energy, Economics, Sampling.

Northern Ireland agriculture has a tradition of livestock production arising mainly from the influence of climate and farm structure. The moist climate restricts tillage and harvesting operations and at present only 10 percent of the agricultural land is under arable crops. To augment income on such farms, the farmer often keeps pigs and/or poultry as well as cattle and sheep. Also movements and mechanization seems to have restricted the area under cultivation. In the early 1960's it became apparent that on many of the more intensive and well managed farms, the soil nutrient levels were increasing as a result of land application of manure. The high levels of potassium which can arise from such applications increase the risk of hypomagnesaemia and the buildup in copper levels may also be important. The liquid condition of slurry is responsible for some of the major problems that may arise when slurry is spread on land -- such problems as the risk of pollution and nutrient enrichment of drainage water, the slow breakdown of the solids on the surface of grassland and the possibility of phyto-toxic compounds being produced by anaerobic decomposition of the finer solids in the soil. The extent of these problems would be reduced if much of the water in slurry could be removed before spreading on the land. Most of the existing methods of separation or drying are expensive, requiring either a considerable input of energy or the provision of absorbent materials. Laboratory studies suggest that it may be possible to develop a settlement technique with a low energy requirement. More study needs to be done. Further studies also need to be done concerning the effects of slurry dressings on soil nutrient levels. The problems arising from soil sampling suggest that for advisory purposes and field experimental work, it would be useful to adopt a standard depth for sampling. (Merryman - East Central)

4712-A8, B2, B5, C2, D1, E2, F1, F3
THE AGRONOMIC UTILISATION OF PIG SLURRY: EFFECT ON FORAGE CROPS AND ON SOIL FERTILITY

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Utilization of Manure by Land Spreading, A Seminar in the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico." 41 100 Modena, Italy, Sept. 20-24, 1976, p. 105-118. 7 fig., 2 tab., 16 ref.

Keywords: Swine wastes, Slurries, Land application, Crop response, Chemical properties, Accumulation effect, Italy, Costs, Waste storage, Lagoons, Mechanical separation.

Research has been carried out for the past 5 years in the Parmigiano-Reggiano district in order to: (1) evaluate the quantity of slurry produced by livestock, (2) determine the chemical composition of slurry, (3) ascertain whether this slurry can be used at heavy rates as fertilizer for various crops, and (4) study the effect of slurry dressing on soil. The research is still in progress. The trials have revealed that the husbandry of one pig produces an average of 9 m /year of slurry. To simplify lagoon storage, mechanical separation, and land application, it is advisable to use husbandry systems which reduce the washing waters. It was found that, at the present cost of chemical fertilizers, 1 m of slurry has a N, P_2O_5, and K_2O value of L.1500. The best dry matter yields of tested fodder grasses were obtained with 400-500 m^3/ha of slurry but, at these doses, the nutrients' utilization ratio was low. The dose which gave a high enough yield and utilized the nutrients well was half of the above volume. Sometimes the crude protein of forage also increased at dressings of over 500 m^3/ha. During the five years of repeated slurry dressings (up to very high doses) in the same plots, maize and sorghum were indifferent to 'accumulation effect' and it seemed that they only utilized the last application. During this time, soil nutrients increased but without reaching dangerous levels. Further study is needed to determine the influence of slurry application on the soil physical properties and on the quantities of nitrogen lost dangerously by leaching and harmlessly by denitrification. (Merryman - East Central)

4713-A8, B2, B3, B5, C2, D1, E2
THE YIELD EFFICIENT NITROGEN PORTION IN TREATED AND UNTREATED MANURE

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 129-141. 8 fig., 4 tab., 9 ref.

Keywords: Livestock wastes, Waste management, Land spreading, West Germany, Application rates, Nutrients, Crop yields, Equipment, Carbon nitrogen ratio, Nutrient requirements.

Livestock manures are made up of feces and urine with different contents and ratios of nutrients. By changing the portions of feces and urine, the ratio of nutrients in the manure is changed. The difficulty of matching the demand of crop and soil requires some kind of standardization by well adjusted mechanical equipment for collecting wastes, for storing and treating the wastes, and for mixing, loading, and spreading them on the land. The effect of manure on soil conditioning and crop yield depends on the following factors: (1) the tools and implements for manure distribution on the land. (2) the ratio of carbon to nitrogen which is influenced by various treatments that decrease the loss of nitrogen or accelerate the decomposition process of organic matter -- in general, the narrower the C:N ratio, the higher the manure effect on crop growth. (3) the available nitrogen portion of total nitrogen in the manure depends again on various treatments; the greater the urine portion together with an appropriate quantity of water added, the higher the content of ammonia nitrogen. Depending on different arrangements of these 3 factors, different effects on crop yield are to be observed, ranging from depressing to very high. Thus, it is concluded that the products of liquid manure practices exercise a higher yield effect than solid manure, and the quantities applied together with fertilizers should be coordinated with the nutrient requirements of the crop and the supply of the soil. Dietary supplements should also be considered in relation to their effects on manure. Such supplements should also be considered in relation to their effects on manure. Such supplements may modify the biodegradation of wastes as well as their manuring effect in crop production and in nitrogen uptake. Recommended rates of manure application are mostly based on nitrogen content and on the available portion of it which is estimated. Very little information is available concerning the rate of biological decay of organic materials and no prediction can be given about the availability of the organic bound nutrients with satisfying certainty. However, in order to protect the environment, it is increasingly important to match nutrient supply with crop needs in order to produce maximum yields with highest rates of uptake without harm to the environment. (Merryman - East Central)

4714-A11, B2, B5, C2, E2
THE INFLUENCE OF ANIMAL MANURES ON THE GRAZING BEHAVIOUR AND HERBAGE INTAKE OF CATTLE

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Utilization of Manure by Land Spreading, A

Seminar on the EEC Programme of Co-ordination of Research on Effluents, Organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 143-152. 6 tab., 8 ref.

Keywords: Cattle wastes, Swine wastes, Poultry wastes, Slurries, Ireland, Grassland application, Chemical properties, Cattle grazing, Rejection, Performance.

An experiment was started on May 7, 1976 to determine whether or not cattle would reject grass swards which were treated with cattle, pig and poultry slurries and if so, for how long and what effect this might have on animal performance. Because the experiment has existed for such a short period, the findings to date cannot be considered definitive. Initially animals on the slurried pasture were reluctant to eat the herbage, but in time they became accustomed to it with the result that if the rate applied is not excessive, rejection of such swards by grazing animals will be small. It was also found that cattle will graze herbage grown with very high rates of slurry provided no other choice exists. Animal behavior because of the slurry was modified as was reflected in grazing time and animal performance. Such effects, however, seem to be temporary and while a reduction in liveweight gain by the animal occurs, it is felt that this can be recovered later in the grazing season. If the slurry had been applied earlier in the season, it is possible that the longer time that would elapse between spreading and grazing would have allowed the rain to wash the slurry into the soil more thoroughly and no effect from it might have been evident. The effects of mid and late season slurry applications and cumulative effects of slurry applications over 2 or 3 years remain to be studied. (Merryman - East Central)

4715-A8, B2, B5, C2, E2
ANIMAL ORGANIC MANURES IN DUTCH FORESTRY: APPLICATION AND RESTRICTIONS

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, Organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 153-169. 9 tab., 15 ref.

Keywords: Liquid wastes, Poultry wastes, Swine wastes, Land application, Forests, Netherland, Crop response, Conifers, Poplars, Nitrogen

The consequences of heavy dressings of organic manure in conifer stands and with provisional data obtained from current research with Euramerican poplar are discussed. It has been found that hardwoods, in particular poplars, seem more suited for disposal of animal organic manure than conifers. Not only growth, but also healthiness of trees is a very important or even decisive criterion for judging possibilities of disposal of organic manure. Only data on short-term effects are available, but long-term effects for conifers can reasonably be estimated. Much less is known about hardwoods. The most important parameter for estimating permissible amounts of animal organic manure is nitrogen: annual addition of ca. 100 kg N/ha (inorganic) is considered optimal, the amount of organic manure can be estimated from data on effectiveness of total N in manure. This means roughly that those quantities of organic manure which contain 200-400 kg total N/ha can be applied, but not for too long a period (some years) in order to avoid overdosage. Disposal of ca. 100 t pig slurry/ha for some years in poplar stands seems to be acceptable. (Merryman - East Central)

4716-A3, A4, C2, E2
RUNOFF AS A FACTOR IN EUTROPHICATION OF SURFACE WATERS IN RELATION TO PHOSPHORUS MANURING

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, Organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 19765, p. 181-196. 2 fig., 6 tab., 14 ref.

Keywords: Land application, Water pollution, Eutrophication, Netherlands, Phosphorus, Agricultural runoff

Because phosphorus is the only element essential to algal growth, the phosphorus load to Holland's surface waters needs to be reduced in order to improve water quality. The phosphorus load resulting from runoff from agricultural land receiving manure fertilization is examined. In Holland, runoff during the growing season is of minor importance because the water storage capacity of the topsoil is usually sufficient to absorb rainfall amounting to 20-35 mm/day. Only arable and grassland clay soils that are impermeable or poorly drained may result in some runoff on 1-5 days a year. When the soil is frozen during the winter, about 25 mm of precipitation may accumulate and reach surface waters in the spring as meltwater. Such runoff may amount to 0.04 -- 0.8 kg P per ha per year, depending upon the soil type and the amount of phosphorus applied. Manure surpluses produced in regions with sandy soils should be utilized on marine clay soils because they have a high phosphorus adsorption capacity. Winter application of manure to grassland must be considered a potential danger to the quality of surface water. (Rowe - East Central)

4717-A8, B2, B5, C2, E2
RELATIONS BETWEEN PEDOLOGICAL ORGANISATION OF THE SOIL AND PIG SLURRY LAND-SPREADINGS IN BRITTANY

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Utilization of Manure by Land Spreading, A Seminar on the EEC programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 197-203. 2 tab., 9 ref.

Keywords: Pedology, Swine wastes, Slurries, Soil physical properties, Soil types, Soil dynamics, Drainage basins, Infiltration, Agricultural runoff, Land spreading, Nutrients, France.

The Soil Science Laboratory of Ensa - INRA (Rennes, France) has chosen a pedological approach in studying the agronomical consequences of pig slurry spreading. Characterization of the different types of soils (brown soils, leached soils, podzolic soils, hydromorphic soils), study of their adsorbing complex, and study of the stability of soil physical properties (structure, porosity) before and after landspreading were conducted. Two drainage basins, each one covering nearly 20 hectares, near Lamballe, France constituted the study sites. The first site received a moderate rate of semi-liquid slurry: 50 m^3/ha/year. The second received a high rate of application: more than 300 m^3/ha/year. In the basin receiving 50 m^3/ha/year, infiltration of slurry was quite good and runoff was not observed. The following tendencies were observed with regard to the chemistry of the soils of the basin receiving 300 m^3/ha/year: (a) Soil became enriched in P. (b) Ratio Mg/K on the adsorbing complex decreased. (c) More generally, a slight redistribution of the elements at the slope of the basin was noticed. Calcium, in particular, was leached away into the lower part of the basin, probably in consequence of its partial substitution on the adsorbing comples by NH_4^+ (Merryman - East Central)

4718-A3, A4, A8, B2, B5, C2, E2
THE EFFECT OF SOIL TYPE AND SEASON OF APPLICATION ON INFILTRATION AND RUNOFF OF NUTRIENTS FROM ANIMAL MANURES

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Utilization of Manure by Land Spreading, A Seminar on the EEC programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 205-212. 2 tab., 12 ref.

Keywords: Land spreading, Cattle wastes, Swine wastes, Slurries, Soil types, Infiltration, Drainage, Agricultural runoff, Nutrients, Grass, Crop response, Ireland.

Animal waste disposal in Ireland is not a national problem, but there are localities where animal manures contribute to pollution of surface waters. Most of the pollution incidents occur in the inland lakes located in the Drumlin belt. An experiment was set up at Johnstown Castle to study infiltration and runoff of nutrients resulting from land spreading of animal manures on different soil types. Three sites were chosen which would provide soils of poor drainage, imperfect drainage, and free drainage. Each site had six experimental plots with uniform 8-10 percent slope. Each plot received a different treatment: (1) Control 22.5 m^3/ha water, (2) Fertilizer NPK plus 22.5 m^3/ha water, (3) Cattle slurry @ 45 m^3/ha, (4) Pig slurry @ 22.5 m^3/ha, (5) Pig slurry @ 45 m^3/ha, and (6) Pig slurry @ 90 m^3/ha. Treatments were applied about every 8 weeks. There was no direct surface runoff from any treatment at any site. The plots were harvested after 7 weeks and the nitrogen in the grass and in the top 15 cm soil was determined. There were differences between sites, but the trends were similar. Cattle slurry depressed grass yield at

all 3 sites. Slurry applied in summertime compared very unfavorably with calcium ammonium nitrate as a source of nitrogen for grass. (Merryman - East Central)

4719-A8, B2, B5, C2, E2
SOIL, WATER, PLANT RELATIONSHIP AS INFLUENCED BY INTENSIVE USE OF EFFLUENTS FROM LIVESTOCK

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Utilization of Manure by Land Spreading, A seminar on the EEC programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 225-246. 7 fig., 7 tab., 5 ref.

Keywords: Land spreading, Effluents, Soil-water-plant relationships, Chemical properties, Nutrients, Saturation extract, Belgium.

During the past 15 years, intensification of livestock raising has led, in some parts of Belgium, to a pronounced increase of the ratio between the number of animals and the land surface. Consequently, production of animal wastes locally has reached such a level that its content of NPK largely exceeds the normal fertilizer requirement of the soil. Faced with such a problem, the question arises as to how much livestock effluent a soil can normally receive and recycle. Experiments were performed to shed some light on this situation. Equilibration tests with different textured soils showed the influence of heavy doses of livestock effluents on the chemical composition of soil and soil water. Drastic changes were observed after such treatments. The electrical conductivity of the saturation extract of the soil was found to be a practical criterion regarding excessive use of liquid manure. The excess of several nutrient elements in soil and soil water is clearly reflected by the chemical composition of crops Thus different pot experiments showed increasing contents of Na^+ and K^+, together with decreasing Ca^{++} Mg^{++}concentrations. Furthermore, nitrate contents in plants were unacceptably high after heavy treatment with livestock effluents. Repeated use of liquid manure and its dumping is to be avoided and an even more moderated use of such effluents should be accompanied with chemical soil analysis as a warning system. (Merryman - East Central)

4720-A4, A5, A8, B3, C2, E2
LEACHING OF NITRATE AND DENITRIFICATION IN A SANDY SOIL AS INFLUENCED BY MANURE APPLICATION

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Utilization of Manure by Land Spreading, A Seminar on the EEC programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 247-255 3 fig , 3 tab , 6 ref.

Keywords: Swine wastes, Poultry wastes, Land application, Application rates, Leaching, Transport velocity, Denitrification, Water pollution, Groundwater pollution, Soil dynamics, Netherlands.

Laboratory experiments were conducted on the leaching of nitrate and organic matter and the possibility of denitrification, especially in the saturated zone. Transport of soluble organic matter was measured to a depth of some 2.5 m and was quite similar for the four experimental fields. The differences in nitrate concentration below groundwater level were small in the experimental fields even though there were large differences in manure application. A sandy soil (0.7 percent organic matter) was percolated at different flow rates with natural groundwater enriched with nitrate to the desired level in order to study the denitrification process. A higher transport velocity of the groundwater resulted in a higher removal rate of nitrate from the soil solution. Extrapolation of the average field conditions in the Netherlands leads to a nitrate removal rate of 0.6 mg $N.l^{-1}day^{-1}$ under the given experimental conditions -- 20°C; pH 6.0-7.0, 0.7 percent organic carbon. (Rowe - East Central)

4721-A4, A5, A8, B2, C2, E2
PHOSPHORUS COMPOUNDS IN PIG SLURRY AND THEIR RETENTION IN THE SOIL

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept 20-24, 1976, p. 257-266. 2 fig., 4 tab., 8 ref.

Keywords: Swine wastes, Slurries, Land application, Phosphorus compounds, Soil adsorption, Soil retention, Water pollution, Groundwater pollution, Soil profile.

Phosphorus in animal wastes, which in some agricultural areas are applied to the soil in excessive amounts, is a potential pollutant of surface and groundwater. Retention of inorganic phosphate in the soil is determined by the adsorption characteristics of the soil. The main factors influencing adsorption in the soil are organic matter, aluminum and iron content, specific surface area of the soil and soil pH. To be able to evaluate inorganic and organic phosphorus movement in the soil properly, columns of undisturbed soil of 80 cm length have been set up under unsaturated flow conditions and treated with the equivalent of 800 m^3/ha of pig slurry (7 percent dry matter). Phosphorus, chloride and phosphatase activity are monitored in the column effluent, resulting from a simulated rainfall of about 1 cm/day. Preliminary results indicate that organic phosphorus compounds move almost as fast as chloride. Chloride breakthrough in the column effluents occurred after one month and organic phosphorus broke through less than a week later, and reached concentrations of 1-2 mg P/litre. The organic phosphorus compounds in the effluent were mainly (70-80 percent) of high molecular weight, as has also been found for organic P in solution in pig slurry. Inorganic P in the effluent has not significantly increased and is of the order of 0.01-0.1 mg P/litre. After about 1-2 years the soil profile will be analyzed for inorganic and organic phosphorus and phosphatase activity. On the basis of various parameters, a computer model of phosphate transport in the column will be made and the results of simulation compared with practice. (Merryman - East Central)

4722-A8, B2, B5, C2, E2
HEAVY APPLICATION OF LIQUID MANURE ON SOIL: EFFECT ON SOIL SALINITY

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 279-288. 1 fig., 5 tab., 10 ref.

Keywords: Liquid wastes, Land application, Application rates, Soil chemical properties, Salinity, Crop response, Italy.

The effect of repeated applications of different rates of liquid manure on soil salinity was investigated. A field experiment was established in which duplicated plots received different doses of liquid manure (0 - 200 - 400 and 600 m^3/ha) in two applications in 1975. Subsequently, the plots received 0 - 75 - 150 and 225 m^3/ha of liquid manure every 3 - 4 months from Oct., 1975 - May, 1976. Soil sampling depths were: 0-20, 20 - 40, and 40 - 60 cm. No problem level of salinity was found in experimental plots which had received up to a total amount of 1275 m^3/ha of liquid manure in a year. An investigation was also conducted on a farm near Gubbio, Italy. An estimated slurry production of about 40 m^3/day was pumped from a lagoon to fields where the slurry was applied on 40 hectares of land which are continuously cropped with maize for silage. Each hectare received an average of 365 m^3 of slurry per year. The soil, which is rich in clay, poorly drained, low in organic matter and in bad structural condition, showed no problem due to salinity level. Crops germinated and grew regularly both in the experimental plots and the farm fields. (Merryman - East Central)

4723-A8, B2, B5, C2, E2
ASPECTS OF CU ACCUMULATION IN SOIL FOLLOWING HOG MANURE APPLICATION: SOME PRELIMINARY RESULTS OF STUDIES ON THE MOBILITY OF CU

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 289-297. 2 fig., 5 ref.

Keywords. Swine wastes, Slurries, Land application, Copper accumulation, Soil dyna-

mics, Soil columns, Crop response, Netherlands.

In Holland, the combined burden on the environment of copper originating from livestock waste is estimated at 875 metric tons of copper on an annual basis. The majority of this copper results from pig feeding. Copper, which is added to swine feed at levels of about 225 ppm, when combined with the copper already present in the soil results in average copper contents of 250 ppm. The copper content of swine manure amounts to roughly 80 ppm copper for slurry with 8 percent dry matter and 180 ppm copper for solid manure with 23 percent dry matter. Copper removal from the soil on an annual basis is about 30 g/ha for pasture and 80 g/ha for arable land. Since the total annual application of copper to soil as fertilizer amounts to about 200 metric tons, it is apparent that copper removal by crops does not correspond properly. Preliminary experiments were initiated to establish the measurement of break-through curves for small soil columns of copper solutions in which copper occurred in various forms. Soil used in the experiments was of the so called "old arable land soil" type with an organic matter content of about 2.5 percent. Percolation of solutions was performed in unsaturated flow by dropwise addition of the solution on the one side and maintenance of a negative pressure at the end of the column at the other; addition and effluent discharge were controlled by use of a multichannel dosing pump. The percolation rate amounted to 80 cm/day. Breakthrough curves were measured simultaneously on 4 different soil columns. Copper concentrations of 10 ppm in the application solutions were obtained by adding $CuSO_4$, $CuSO_4$ and Na_2EDTA, respectively. Whereas solutions of 10 ppm CuEDTA showed a complete breakthrough after percolation with 5-10 times the pore volume of the soil column, such breakthrough was not yet arrived at after percolation of 200 times the pore volume in the case of $CuSO_4$. It was felt that the copper originating from $CuSO_4$ probably also forms insoluble compounds in the soil in addition to being bonded on the soil solid phase; this effect exerts itself in the continued removal of copper from the percolating solution, even following passage of very large amounts of percolate. Although this method has to be adapted for specific problems met when considering the percolation with solutions containing manure constituents, it may nevertheless be concluded that it probably provides a useful tool for the measurement of the mobility in soil of different forms of copper. As such, it may make a valuable contribution in the evaluation of the effects of increased copper mobility with respect to leaching through the soil. (Merryman - East Central)

4724-A8, B3, B4, C2, E2 EXAMINATION OF SOIL SAMPLES TAKEN UNDER SILAGE MANURE HEAPS AND IN MANURED FIELDS

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept 20-24, 1976, p. 299-304. 4 tab., 2 ref

Keywords: Manure heaps, Waste storage, Leaching, Denmark.

An investigation on the problems of leaching from manure heaps was carried out on loamy and sandy areas in the southern part of Jutland, Denmark. Preliminary results from the years 1973-74 and 1974-75 are presented. Soil samples were taken just after removal of the manure heaps and, in some cases, also a year later. The area in the meantime was exposed to the weather and cropped normally. The sampling was done at 50 cm intervals down to 400 cm by the use of a sampling tube working inside a casing 10 cm wide. In general the accumulation of NH_4-N went down to about 200 cm, in some cases in rather large quantities. The large variation between localities showed no significant differences between types of heap or between types of soil. With the exception of one locality, the content of NO_3-N was much smaller than the NH_4-N content but the tendency to accumulation down to 200 cm was the same for both. There was a tendency in the material that soils beneath heaps of silage had a higher content of NH_4-N in 1975 than soils beneath manure heaps. If there is a need to store silage or farmyard manure temporarily, care should be taken. The heaps should not be located directly over a drain pipe, nor on a slope leading to a stream or lake, and the same locality should never be used twice. In field experiments on the effect of moderate and heavy amounts of animal manure, soil samples were taken down to 2 m depth and analyzed for the contents of different elements. There was a slight tendency for larger amounts of manure to result in larger contents of mineralized nitrogen in the soil, a tendency which might serve was a warning against applying manure too heavily. (Merryman East Central)

4725-A1, A4, A11, B1, C2, E1, E2 WATER POLLUTION BY LIVESTOCK EFFLUENTS

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico" 41 100 Modena, Italy, Sept. 20-24, 1976, p. 313-328. 4 fig., 5 tab., 5 ref.

Keywords: Water pollution, River Ijzer, Belgium, Fish kills, Livestock wastes, Eutrophication, Direct discharge, Nutrients, Land spreading.

About 20 years ago the River Ijzer was a healthy river abounding in fish. In the last few years, fish mortality has recurred frequently. Entering Belgium from France, where it covers 37 out of the 78 km of its course, the River Ijzer flows slowly through a predominantly agricultural, sparsely populated (180 inhabitants/km^2), poorly industrialized region, the altitude of which does not exceed 5 m. Though the exact contribution of livestock breeding to the pollution of the river was indeterminable, discharges of intensive cattle breeding farms were found to have a significant influence on the eutrophication of the River. While it was felt that the problem of eutrophication of rivers flowing through a mainly agricultural region cannot be solved immediately, it was stated that direct discharging of livestock effluents in surface waters cannot be allowed. Of the 2 solutions offered (a waste water treatment plant or landspreading of livestock effluents), only land spreading seemed acceptable. Expense, location selection, and inefficiency made waste water treatment impractical. While land spreading seems to be the answer, even this solution may have its problems. The direct influence on the soil, the crops and indirectly on the surface water through runoff and infiltration cannot yet be foreseen. (Merryman - East Central)

4726-B2, B4, E2 TRANSPORT OF MANURE AND THE FUNCTION OF THE 'MANURE BANKS' IN THE NETHERLANDS

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 329-333. 1 tab.

Keywords: Slurries, Manure transport, Manure banks, Waste storage, Netherlands, Land application, Equipment.

When manure surpluses caused by regional concentration of livestock operations in the Netherlands became a problem some years ago, manure banks were established. The work of the manure banks consisted of: (1) Improving liquid manure transport, especially over greater distances, (2) Liaising between livestock units and arable farms which were interested in using liquid manure, (3) Advising about the correct application of liquid manure. Presently, manure banks are working in 3 provinces of the Netherlands. Depending on the manure bank, about 55-75 percent of the quantities of slurry transported is over distances ranging from k-20 km. A combination of good transport equipment, sufficient storage capacity on the livestock production unit and intermittent storage pits on the arable farm has made it possible to transport slurry over longer distances (Merryman East Central)

4727-A4, A8, A11, A12, B2, B3, B4, C3, D1, D2, D3, E1, E2 VETERINARY-HYGIENIC ASPECTS OF LANDSPREADING AND TRANSPORT OF MANURE

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept 20-24, 1976, p. 351-362. 2 fig., 17 ref.

Keywords: Solid wastes, Liquid wastes, Feedlots, Confinement pens, Waste storage, Waste treatment, Waste disposal, Land spreading, Epidemiology, Animal health, Public health, Disinfection, Dung heaps, Slurries, Direct discharge.

Epidemiological problems involved in large

animal feedlots are closely associated with those of animal waste disposal. Incidence of latent infections increases when animals are concentrated in confined areas. Most pathogenic agents are eliminated by infected animals in their feces so that germs ultimately come into contact with the floors of the buildings and are thus spread. Conventional livestock units utilizing bedding do not cause special epidemiological problems. If managed properly, dung heaps develop such high temperatures that pathogens are destroyed. After three weeks, such dung heaps are considered to be disinfected and can be used for agricultural purposes. The development of large animal units and modern rural livestock management techniques has brought with it new housing systems in which animal excreta is usually collected in slurry form. The slurry is either collected and stored within the animal building or it is drained off the building and kept in under- or above-ground reservoirs until it is used. This has resulted in new problems. Because slurries are not self-disinfecting, hygienic treatment is necessary. Because land disposal of infected animal wastes can result in transmission of pathogenic micro-organisms to man and animals, infected slurry must receive on-site treatment of liquid manure by chemical or physical methods. Even when infected animal slurries are treated by settling out solids, aeration, or sludge drying, pathogens are not eradicated. Therefore such wastewaters must not be discharged into river waters without disinfection. Chlorine disinfection is the most common method. (Merryman - East Central)

4728-A11, B2, B5, C3, E2
AN APPROACH TO THE PROBLEM OF SLURRY AS A POSSIBLE SOURCE OF PASTURE CONTAMINATION WITH HELMINTH PARASITES OF CATTLE

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 363-373. 4 tab., 6 ref.

Keywords. Cattle wastes, Slurries, Helminth parasites, Pasture applications, Animal health, Ireland, Anthelmintics, Fenbendazole.

In Ireland, an increasing number of cattle are being housed during the winter on slatted floors Resulting slurry is then applied to swards in the spring. It is felt that such slurry may be a potential source of helminth parasitic infection in livestock. The possible role of slurry as a disseminator has so far not been investigated in Ireland and the problem appears to have received relatively little attention in other countries. Slurry as a possible source of helminth infection in cattle can be studied under the following headings: (a) Survey work to ascertain the occurrence, degree and distribution of contamination/infection in the stored material, (b) Field experiments to determine the capacity of slurry to initiate or augment pasture infection, (c) A study of the viability and persistence of parasties in slurry during storage and following application to land, (3) Investigations of slurry as an infection source in relation to liver fluke, should its use as a fertilizer expand, bringing fluke eggs into snail habitats, (e) An evaluation of sampling procedures. Preliminary investigations are in progress to study some of these problems. A limited survey was carried out in March, 1976. Fecal samples from one year old cattle at ten different farms were examined to determine the numbers of 'strongyle' eggs per g of feces. The majority of the cattle were found to be voiding worm eggs in March, despite the fact that on seven of the ten farms the animals had received at least one anthelmintic dose during the winter. The egg counts were low on average, only 12 percent of the cattle having counts greater than 200 eggs per g. A grazing trial was also conducted in which infected slurry was applied to pasture land. This trial is in progress, but herbage sampling in May/June revealed that levels of infection with 'strongyle' larvae were very low at the outset. If it is found that slurry spreading constitutes a risk of increased parasitic infection, it will be necessary to study ways of overcoming the problem. Anthelmintics have not been fully effective in reducing worm egg output because they have failed to reduce sufficiently the numbers of 4th stage larvae. However, a recent anthelmintic fenbendazole is highly active against these 4th stage larvae and may merit investigation. It is hoped that future work will include examinations of slurry for the presence of viable *D. viviparus* larvae and *F. hepatic* eggs. (Merryman - East Central)

4729-A11, A12, B1, C3, D1, D2, D3, E2
POSSIBILITIES OF POULTRY DROPPINGS DECONTAMINATION AS RELATED TO FARM LEVEL MANAGEMENT TECHNIQUES

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Keywords: Poultry wastes, Management, Pathogenic bacteria, Decontamination, Germany, Land application, Drying, Composting, Incineration, Viruses, Antibiotic fungal activity.

In Germany, a total of 92 million chickens produces about 6 million tons of manure annually to be utilized and/or disposed of. Poultry wastes are utilized by either applying the manure as fertilizer on company owned or farm owned land or by selling or giving it to other farmers for land application. If this is not possible, then the manure must be dried, burned or composted. Poultry manure is of concern as a source of pathogens. Such manure may contain pathogenic strains from the entire range of microorganisms likely to be encountered. Preliminary studies have been made to determine the effect of antibiotic fungal action on bacteria elimination. However, this research has been concentrated on trash and garbage so that further research is needed to determine such activities in poultry manure. Questions that merit future study are: (1) How long do tuberculosis bacteria remain viable in poultry manure and litter, and how can they be inactivated early by other means? (2) What is the role of antibiotic fungal activity in elimination of bacteria? (3) What is the behavioral pattern of non-coated viruses in poultry manure/litter, what is their survival rate, and what other means are available for their inactivation? (Merryman-East Central)

4730-A11, A12, B1, B5, C3, E2
A STUDY OF THE EFFECTS OF ANIMAL EFFLUENT UTILISATION FOR GRASSLAND PRODUCTION ON LEVELS OF CERTAIN PATHOGENIC BACTERIA IN FOOD ANIMALS AND THEIR CARCASES: PRELIMINARY FINDINGS

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 381-390. 2 fig., 7 tab.

Keywords: Land application, Effluents, Grasslands, Animal health, Public health, Cattle, Pathogenic bacteria, *Escherichia coli*, *Salmonella*, Antibacterial agents, In vitro resistance, Ireland.

Commercial herd calves, experiment station calves, and fattening cattle were examined from February to June, 1976 for *Escherichia coli* which display in vitro resistance to antibacterial agents, or *Salmonella*. Bacteriological examinations of grass, hay and silage fed to the above cattle plus bacteriological examinations of feces and slurry originating from these cattle were also conducted. In the study involving the fattening cattle, of 32 *E. coli* isolated from rectal swabs taken from 30 cattle which had been receiving 9 g of flavomycin/day in their feed, 9.4 percent were resistant in vitro to ampicillin and 3.1 percent to nitrofurazone. In the case of 30 *E. coli* isolated from rectal swabs from 30 cattle which had not been receiving dietary flavomycin, no in vitro resistance to any of the 7 reagents used was observed. Resistance transfer studies on the isolates are now in progress. Carcasses of fattening cattle which had been fed silage and were kept in slatted floor houses until early May when they were put out onto grassland which had not received animal slurry for 4 years, were examined for R-positive *E. coli* and *Salmonella*. A high degree of in vitro antibacterial resistance was found. Results from the commercial calf study indicated persistence of in vitro resistance to tetracycline, ampicillin, chloramphenicol and streptomycin. Resistance transfer studies confirmed the presence of R-factor in the majority of the multi-resistant *E. coli* examined. In the experimental station study, 408 *E. coli* were isolated and subjected to in vitro antibacterial sensitivity analysis. During the summer the calves were housed at night and turned out daily to graze on paddocks which had been dressed with farmyard manure annually. There was a gradual decline in prevalence of in vitro resistance to single reagents and combinations of these reagents with age. Resistance transfer studies confirmed the presence of R-factors in a majority of the multi-resistant *E. coli*. *Salmonella typhimurium*, which was isolated from one calf house in March, was sensitive in vitro to each of the reagents tested. An investigation of the possible effects which pH, Aw and storage temperature may have on the presence of in vitro resistance of *E. coli* present in slurry samples collected at the commercial calf and beef units is now in progress. The origin of carcass contaminants, and the extent of distribution of multi-resistant *E. coli* in the mesenteric lymph nodes of cattle and other animals which may or may not excrete multi-resistant *E. Coli* in their feces, will be the subject of further investigation. (Merryman - East Central)

4731-A4, A6, A11, A12, B2, B3, B4, B5, C2, C3, D1, E2, F1
THE EFFECTS OF SEPARATING SLURRY ON ITS STORAGE, HANDLING AND SPREADING ON LAND

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico" 41 100 Modena, Italy, Sept. 20-24, 1976, p. 403-412. 3 fig., 7 ref.

Keywords: Slurries, Separation techniques, Waste storage, Land spreading, Economics, Equipment, Water pollution, Odor, Pathogenic bacteria, Nutrients, England.

Whether slurry separation is worthwhile for a particular farm must be determined after considering the farm's own special problems and the benefits of slurry separation for that farm. A modern efficient slurry separator will produce from undiluted pig or cattle slurry a solid fraction with 20-25 percent DM which can be stacked and a liquid fraction with 2-7 percent DM which can be stored and handled as if it were water. A separator adds to the cost of equipment needed for handling manure from housed livestock and disposing of it on land. However, the following should be considered: (1) The extra cost of separating slurry mechanically into solid and liquid fractions may be offset by the resulting economies and benefits. (2) Separation reduces storage costs and makes the mixing and emptying of stored wastes cheaper and easier. (3) Liquid fractions can be applied to land more cheaply than slurry by means of small pumps and pipelines. (4) Separation can permit higher stocking densities without increasing water pollution risks. (5) A liquid fraction can be applied to land in winter with less risk of runoff than whole slurry. (6) Separation reduces odor nuisance by producing a solid fraction which composts without smell and a liquid fraction which can be handled and spread on land with less smell than slurry. (7) Separation can reduce the chances of pathogen survival in both the solid and liquid fractions. (8) It is easier to use the plant nutrients in slurry efficiently if it is separated before storage. (Merryman-East Central)

4732-A4, A5, B2, B3, B4, C2, D2, E2, E4, F1
INVENTIONS AND INNOVATIONS TO REDUCE POLLUTION OF WATER RESOURCES

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Utilization of Manure by Land Sprading, A Seminar on the EEC Programme of Coordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico", 41 100 Modena, Italy, Sept. 20-24, 1976, p 441-445. 1 tab., 6 ref.

Keywords: Water pollution, Ireland, Waste storage, Waste treatment, Recycling, By-product recovery, Economics, Slurries, Nutrients, Fertilizers, Polymers, Methane, Wilting, Silage effect, Landspreading.

Direct landspreading of manure is not always a practical proposition. Consequently, the Irish Agricultural Institute has recommended that adequate storage be provided for storing slurry over long periods, only spreading when climatic conditions permit. Because storage is expensive and rate of slurry production often exceeds storage capacity, the Agricultural Institute has investigated other possible approaches to the slurry waste problem. Research utilizing chemical methods of treatment has led to the patenting of a process based on the production of a urea-form polymer, which encapsulates nutrients in the slurry. Thus in obtaining the reduction of pollution in the area, a premium slow release fertilizer which may be packaged and marketed easily, is produced. Methane is obtainable as a by-product and can be utilized to raise the dry matter content in the end product. In Ireland, as in other countries, where the climatic conditions are not suitable for wilting, the disposal of silage effluent is becoming a larger problem each year as production increases, approximating 8 million tons during 1975. In the past, holding tanks have been utilized to handle this waste problem. However, such tanks have been found to be expensive and unsatisfactory as a solution to this sporadic and seasonal problem. Thus researchers studied the possibilities of landspreading, concurrent with the production of the effluent. A system for achieving this was developed, based on these simple requirements: (1) Directing of effluent by channels to a collection of about 50 gallons capacity. (2) A fine screen at ingress to prevent straw and solid matter fouling the pump. (3) A simple centrifugal water pump that will spread the effluent and irrigate the land over some 100 metres. (4) A float-switch that will control the operation of the pump, and (5) Neutralization with lime or limestone if necessary. The water sources for most farms in Ireland are derived from deep or shallow wells, mostly the former, and pose a number of problems. The most important of these are: (1) "Hard" waters causing scale in boiler and heating systems and even blockages in hot-house irrigation systems and nipple-type poultry drinking troughs. (2) Contaminated waters, often from surface drainage water and farm effluents. (3) Ferruginous waters, with iron content that is beyond acceptable limits for farm or domestic use. (4) Waters of a "spa" type with a high hydrogen sulphide content. Research workers of the Agricultural Institute have had a fair measure of success in alleviating some of these problems. (Merryman-East Central)

4733-A8, B2, C2, E2
MATHEMATICAL MODELLING OF AMMONIUM OXIDATION IN EFFLUENTS

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico" 41 100 Modena, Italy, Sept. 20-24, 1976, p. 447-458. 6 fig., 4 ref.

Keywords: Mathematical models, Effluents, Land application, Ammonium oxidation, Temperature, Nitrifying bacteria, pH, Oxygen partial pressure, Nitrification, Nitrites, Soil dynamics, Belgium.

A nitrification process mathematical submodel was built which attempted to account for the influence of initial population density of nitrifying bacteria, temperature, pH, oxygen partial pressure, and substrate concentration of ammonium in soils receiving effluents. The relationship used in this study was the hyperbolic equation referred to as either Michaelis or Monod. Experiments with the model showed that lowering the temperature decreased the transient concentration of nitrite and that increasing the temperature above 20° C increased the transient nitrite concentration. The possibility was also found to exist that side reactions occur in which nitrite may cause nitrogen loss by changing the conditions of ammonium oxidation. Such losses may be advantageous if they lead to a decrease of the efficiency of ammonium fertilizers. The extent of these losses may be easily calculated if the kinetics of the reaction involving nitrite is known. It was also found that one-third to one-half of the nitrogen in the ammonium added to the system was lost during nitrification under conditions of temperature and acidity prevailing in many trophical soils. Another result of the model showed that a limited supply of oxygen induces a transient accumulation of nitrite. Consequently, the BOD for nitrification is less likely to exceed the O_2 supply at lower temperatures. These results make it possible to calculate the temperature at which the BOD will exceed supply since ammonium-nitrogen concentrations in effluents account for most of the BOD in effluents. Furthermore, the marked shift for nitrite oxidation in conditions of limited oxygen supply is quite evident and this would favor reactions competing with its biological oxidation. (Bates-East Central)

4734-A4, B1, B5, D3, E2
TWO LEVELS OF MODELLING THE UTILISATION OF ANIMAL MANURES

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico" 41 100 Modena, Italy, Sept. 20-24, 1976, p. 467-495. 10 fig., 4 ref.

Keywords: Model studies, Waste management, Land disposal, Aerobic treatment, Application rates, Water pollution.

Four manure management models have been produced at the University of Newcastle upon Tyne. Each model or stage represents a different strategy in dealing with the animal waste problem and spans thinking from the limitations on disposal to the factors which maximize the efficiency of utilization. A brief summary of the four stages are: (a) The climatic, soil and cropping factors which constrain the quantity of animal manure that can be applied to the land without increasing serious risks of stream pollution. This stage is concerned with returning animal manures to farm land, mainly as a means of disposal. (b) The capacity of the soil to retain, without risk in the long term, the constituents of animal manures. Stage (b) is also concerned with returning animal manures to farm land, but with the intention of recycling the nutrients in the manure through a crop. In modeling either stage a or b, the main information needed is that required to calculate a mass balance for the process. (c) A quantitative description of aerobic treatment as an aid to recycling animal manures. This model relates the rate of growth of microbial population to food supply and requires an understanding of both

the principal factors involved in the aerobic treatment of animal manures and measurements of rate processes in controlled laboratory type experiments. (d) A quantitative description at the micro-level of the climatic and soil factor which influence the release of plant nutrients from animal manures. Formidable difficulties in the way of a model of stage (d) were encountered in that the processes of transfer of nutrients from manures to plants through the soil are complex and very dependent on changes in soil moisture and temperature, which in turn are related to changes in atmospheric conditions. The steady state approach adopted in modelling stages (a-c) is not suitable for stage (d). (Bates - East Central)

4735-A1, B1, E2, E3, F1
THE SOCIO ECONOMIC ASPECTS OF LAND SPREADING ON MANURES VERSUS OTHER USES - A SYSTEM APPROACH

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 497-506. 1 tab., 13 ref.

Keywords: Waste disposal, Recycling, Land spreading, Economics, Intermediate markets.

A systems analysis approach was used to show possible design processes to allow for improved use of manure in the context of a global point of view. From a micro-economic point of view, the problem is to dispose of manure at the lowest cost or, if possible, with some profit. The system is the farm, which may or may not include fields. Using France as an example, with the pressure of the whole economy towards more and more concentrated and capital intensive agriculture, the proportion of manure produced in great quantities on very limited areas is increasing rapidly. Some of the many problems related to this trend are: (a) odor problems in the surrounding area, (2) difficulties in finding a large enough area to spread the manure and for a long enough period, (3) risk of water or groundwater pollution, (4) risk of crop pollution, (5) changes of ion distribution in the soil, time lag between land spreading and cultivation of the field, etc. Therefore in order to be successful, a project requires long and careful study including: a preliminary survey of the area, trial tests -- study of soils, cultures, efficiency control, etc., and routine checks when the project has been completed For small or medium-sized farms, such a project is frequently considered too complex and too costly, or is not considered at all, and the actual course of action chosen remains quite unsatisfactory. To reach optimum use of manure in each specific case, a broad field of potential uses should be considered. Manure components can be used as animal feed, as a direct or indirect energy source, as the starting point for a food chain, as well as a fertilizer The economic interest of these uses increases with the evolution of food and agricultural systems considered as a whole. Both agriculture and the food industry are producing increasing amounts of wastes. Solutions envisaged to cope with these increasing amounts of waste are linked with the development of intermediate markets and with the technologies produced by the intermediate system or in reaction against its effects. Examples are given. (Merryman East Central)

4736-A1, A6, A11, B2, B3, B4, B5, C2, C3, D3, E2, E3, F1
WASTE MANAGEMENT SYSTEMS IN ANIMAL HUSBANDRY: APPLICATION ON FARM MODEL STUDIES AND SYSTEM ANALYSIS

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Utilization of Manure by Land Spreading, A Seminar on the EEC programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 507-520. 1 fig., 6 tab., 1 ref.

Keywords: Waste management, Liquid wastes, Solid wastes, Cattle wastes, Swine wastes, Economics, Environmental effects, Denmark, Waste storage, Waste treatment, Land application, Equipment, Animal health, Odor, Costs.

This paper is based on a 1975-76 report concerning an economic and environmental analysis and evaluation of alternative waste management systems on cattle and pig farms (Christensen, 1976). Some of the research findings are presented. Economic considerations are given precedence over those relating to technology and biology. There are 4 principal stages in manure handling: gathering and removal from the stable, treatment and storage, removal, and application to cropland. Different methods and technical plants are connected with each stage and by combination, a number of complete manure handling systems can be formed. Evaluation of management stages to be used are based on total costs per year, the value of manure, and different environmental problems. The net costs of a slurry system are lower than the net costs of a system with farmyard manure and liquid manure. However, problems inherent in using a slurry system are: more disease, decrease in growth of the animals, an increase in feed consumption by the animals, and risk of poisonous gases. In consideration of practical and environmental circumstances, a storage capacity of at least 6 months must be recommended. If landspreading conditions are particularly favorable, a smaller capacity can be justified. At least 3 months' storage must be available. Treatment of the animal wastes may be desirable for a variety of reasons. Generally the greatest interest inside research work has been in favor of biological treatment. Four such methods are: (a) below house oxidation ditch, (b) liquid composting, (c) solid composting, and (d) anaerobic digester, biogas plant. The highest costs are incurred by the below house oxidation ditch and liquid composting. Ultimately, landspreading is still the only way to dispose of manure. To keep down the costs of loading, transport and spreading, it is important that the capacity of machinery fits in with the total quantity of manure. Costs of carting out liquid and farmyard manure are roughly equivalent. Two methods of spreading the manure are open spreading and soil injection. Injection adds to the costs of land spreading because of more expensive equipment and a high-powered tractor, but it is a comparatively cheap step to reduce slurry odor. A rapid ploughing-in of the wastes increases the nutrient value of the manure and is often possible without additional costs. (Merryman - East Central)

4737-A1, A4, A8, B5, C2, E2
ELABORATION OF STATISTICS ON MANURE PRODUCTION

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Utilization of Manure by Land spreading, A Seminar on the EEC programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 521-537. 3 fig., 7 tab.

Keywords: Farm wastes, Statistics, Land spreading, Environmental effects, Nutrients, Soil contamination, Water pollution.

The maximum amount of farmyard manure or semi-liquid manure that the soil can receive without damage is limited by several factors such as the specific crop requirements, the equilibrium of the nutritive elements of the soil, the nature of the soil, the protection of the surface waters, etc. Too frequent spreading of manure constitutes a potential risk to the environment. Before a solution to the waste disposal problem can be found, one must first collect exact information concerning the production of the wastes, ie. quantity, origin, geographical distribution, composition for each animal species. This paper is intended to be a step in that direction. Much of the information is presented in the form of tables, maps and histograms. Estimates are given of the average weight of different animals. The weight of the animals is also calculated in terms of livestock units. Estimates are given for the weight of wastes produced by one livestock unit for each of the animal species. Estimates in percent of the chemical composition of the wastes of the animal species are given. Percentages are given for the distribution of the types of cultivation in 9 provinces. Optimum amount of landspreading per hectare in each of the provinces is calculated in relation to the distribution of the cultivations and based on the following landspreading quantities: grassland 25t, cereals 45t, root plants 60t, other cultivations 40t. Percentages of wastes produced per animal species in each of the 9 provinces are computed. Consumption and cost of mineral fertilizers are tallied. Maps have been drawn up for each province and district in which the communes are colored differently in relation to the quantities of animal waste. (Merryman - East Central)

4738-A8, B1, E2
SOME ASPECTS OF THE PROBLEM OF MODELLING THE UTILISATION OF ANIMAL MANURES BY LAND SPREADING

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 539-548. 3 fig , 4 ref.

Keywords: Model studies, Farm wastes, Land spreading, Soil-Water-Plant Relationships, Ireland.

This paper outlines an approach to the problem of modelling the land spreading of animal manures. The model attempts to simulate the soil-water-plant system. Among the factors it takes into account are: (a) Water movement in unsaturated soil allowing for the conduction, diffusion and plant uptake of water. (b) Ion exchange, solubilization or precipitation of slightly soluble salts and dissociation of soluble ion pairs including Ca-Mg exchange, Ca-Na exchange, Na-NH exchange, solubility and precipitation of gypsum, undissociated Ca and Mg sulphate, dissociated of $CaCO_3$ in water. (c) Reactions involving nitrogenous species including the hydrolysis of urea, the mineralization-immobilization of organic-N and NH_4^+-N, nitrification of NH_4^+-N and immobilization of NO_3^--N. (d) The movement of water soluble species. (e) The uptake of N by the crop. (f) The effect of moisture content and temperature on the above. Efforts to test the model are outlined. As more experimental results become available, it should be possible to improve the predictive power of the model. This will lead to an even more detailed model which will be suitable for use in analyzing the results of lysimeter work where the soil and crop specific parameters are well known. However, it is doubtful whether all this detail is relevant when one is trying to predict the results of spreading animal manures over a wide area. The large uncertainties of the soil and crop parameters over the area could render sophistication of the model beyond a certain point superfluous and misleading. However, the model could be used to find out how sensitive the outputs of the model are to variations in the soil and crop parameters, allowing one to know the degree of uncertainty in the outputs which results from any given degree of uncertainty in the parameters fed into the model. (Merryman - East Central)

4739-B2, B4, C1, C2
SAMPLING TECHNIQUES FOR LIQUID SWINE MANURE

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico" 41 100 Modena, Italy, Sept 20-24, 1976, p. 561-569. 2 fig., 4 tab , 2 ref.

Keywords: Liquid wastes, Sampling, Aerated storage basins, Storage pits, Holland, Chemical oxygen demand, Dry matter, Ash, Kjeldahl nitrogen

Sampling techniques for liquid swine manure in aerated storage basins and storage pits beneath the pig sty are described. The following conclusions were given: (a) A simple and reliable method to sample a storage pit consists of sampling each tanker when the manure is removed. All samples can be combined to one sample. (2) To obtain information about representative liquid swine manure, the storage pit has to be emptied completely and the pit will be required to have been emptied completely on the previous occasion as well. (3) The dilution of liquid swine manure with cleaning water and spilled drinking water must be taken into account. (4) Using method 1 2, the reliability of sampling places increases. (5) The composition of the manure in the pump pit is not representative for the total storage area. (Merryman - East Central)

4740-C1, C2
METHODS OF ANALYSIS FOR MANURES: COMPARISON BETWEEN COUNTRIES OF THE EEC, 2ND APPROXIMATION

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 571-583. 1 fig., 3 ref.

Keywords: Farm wastes, Chemical analysis, Measurement, Standardization.

This report incorporates comments and additions suggested by the member countries after circulation of "Methods of analysis for Manures, 1st Approximation" in May, 1976. Sampling methods, analysis of unstable parameters, and analysis of constant parameters are discussed. Parameters which should be measured and reported for animal manures used in EEC projects include: pH, dry matter, suspended solids, chemical oxygen demand, biochemical oxygen demand, Kjeldahl nitrogen, ammonium nitrogen, nitrate nitrogen, ash, calcium, magnesium, potassium, copper, phosphorus, and chloride. Other parameters may be measured for specialist studies. Standardization of methods of measurement of the listed parameters is desirable to allow researchers to compare experience across the EEC. One method for accomplishing this is for every laboratory to adopt the same rigid and detailed standard. This seems the only approach for parameters which are unstable during transport or storage. For parameters which remain constant in storage, samples can be exchanged between laboratories and the separate methods used can be compared. If agreement is not satisfactory, further standardization can be recommended. (Merryman - East Central)

4741-A8, C2, E2
PROPOSITIONS ON THE HARMONISATION OF CHEMICAL METHODS OF SOILS ANALYSIS IN THE EEC COMMON PROGRAMME ON LANDSPREADING OF ANIMAL MANURE

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy. Sept 20-24, 1976, p 613-622

Keywords: Farm wastes, Land spreading, Soil analysis, Soil chemical properties, Sampling.

This report includes (a) The list of methods communicated by the national reporters on the soil chemical analysis (the physical analysis will be reported elsewhere) (b) A list of common methods. (c) A list of recommended methods. It is proposed that core-samples be taken below the soil surface to a depth of at least root penetration of the soil, between 0 and 0.30 to 1 meter, and, if possible, depending on the soil type, to 2 meters (pollution balance). The thickness of each slice may be about 0.15-0.20 m depending also on the soil type. Before investigation, the soil sample should be dried, sieved at 2 mm. and stored at room temperature for all the determinations except mineral nitrogen (NO_2^-, NO_3^-, NH_4^+). For these it is best to make the determinations as soon as possible. Common methods for analysis are proposed for determining: pH, conductivity, volatile and mineral matter, total $CaCO_3$, Kjeldahl and total Nitrogen, organic compounds, and active lime. (Merryman - East Central)

4742-A3, A4, A5, A8, B5, C1, C2, E2
HARMONISATION OF METHODS FOR SAMPLING AND FOR CHEMICAL AND PHYSICAL ANALYSIS

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy. Sept 20-24, 1976, p 655-658.

Keywords: Sampling, Soil analysis, Crop analysis, Water quality, Chemical properties, Physical properties, Farm wastes, Land spreading

A survey was made of sampling and analysis methods used by EEC institutes researching effects of landspreading of manures on soil, crop, and water quality. Proposals for harmonization were made by J. C. Brogan (Ireland) for manures, P. Herman, G. Neirinck and R. de Borger (Belgium) for water, G. Catroux (France) for soils, and A. Klasink and R. Mahlop (Germany) for crops. It was decided that the project had been too ambitious and that there had been insufficient time for consultation of experts. Consequently, it was suggested that the rewriting of proposals for sampling and chemical analysis should be delegated to a small working group of analytical experts to be formed. Manure characteristics to be measured should include: dry matter, settleable solids (only for liquid manures), chemical oxygen demand (only for liquid manures?), Kjeldahl, ammonium, and nitrate nitrogen (the latter only in aerobically stored liquid manures), pH, ash, potassium, calcium, magnesium, phosphorus; chloride; copper and zinc (only for pig manure). Determinations for pollution of groundwater, drain water, or surface water pollution should be based on: pH, conductivity, suspended matter and/or (?) settleable solids, dry matter; ash (or volatile solids); chemical oxygen demand; biochemical oxygen demand; total, ammonium, nitrite and nitrate nitrogen; total, ortho and organic phosphorus; chloride, potassium, copper and zinc. Chemical properties to be checked in the soil should include: pH, conductivity, organic matter; total and active $CaCO_3$; total, ammonium, nitrite and nitrate nitrogen; total and extractable (?) phosphorus, sulphur; chloride; extractable (?) potassium, total and extractable (?) copper and zinc. Soil physical determinations that should be made for the study of transport of

manure components include: moisture content; particle size distribution; particle and bulk density; total porosity; pore size distribution (pF-curve) "unsaturated permeability"); water saturated permeability. "First priority" parameters for crops to be determined in the laboratory for establishing the effect of manuring should be: (1) for all crops: dry matter; ash; organic nitrogen; total phosphorus; potassium. (2) for grass: nitrate nitrogen; magnesium and calcium; in vitro digestibility; copper and zinc (where pig manure is concerned). (3) for sugar beets: sugar content (and amino acids?). (4) for starch potatoes: starch content. (Merryman - East Central)

4743-A11, A12, B5, C2, E2
MICROBIOLOGICAL ANALYSIS OF ANIMAL MANURES WITH PARTICULAR REFERENCE TO THE ISOLATION OF ESCHERICHIA COLI AND SALMONELLA SPECIES AND THE DETERMINATION OF THEIR IN VITRO ANTIMICROBIAL SENSITIVITY

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Utilization of Manure by Land Spreading, a Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 665-673. 3 fig., 4 ref.

Keywords: Land application, Cattle wastes, Sheep wastes, Pathogenic bacteria, Carcass contamination, Public health, Animal health, *Salmonella spp.*, *Escherichia coli*.

Land application of animal manures can result in the contamination of grasslands with such pathogenic micro-organisms as *Salmonella spp.* and *Escherichia coli*, both of which may be antibiotic-resistant. Along with the animal health problems which may arise therefrom, the extent to which such treatment may give rise to indirect contamination, with these organisms, or sheep and cattle carcasses during slaughter is also a matter of concern. Work is in progress to elucidate these problems. Cattle and sheep are being kept under: (1) commercial and (2) experimental conditions to be examined during a 2 x 1 or a 1 x 2 year cycle (for cattle) and a 1 year cycle (for sheep) while on (i) grass, (ii) silage and/or (iii) hay from (a) slurry-treated or (b) untreated grassland. The carcasses of these animals will be examined at community approved slaughtering premises. Sampling and analytical methods are outlined. (Merryman - East Central)

4744-A8, B5, C2, E2
THE NITROGEN BALANCE SHEET

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Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the "Istituto Sperimentale Agronomico," 41 100 Modena, Italy, Sept. 20-24, 1976, p. 693-698. 2 ref.

Keywords: Nitrogen, Organic wastes, Soil chemical properties, Biological fixation, Leaching, Volatilization.

The input of the nitrogen store in the soil consist of the following elements: rainfall, seed, biological fixation -- (a) non-symbiotic (*Azotobacter, clostridium butyricum*, blue-green algae) and (b) symbiotic (legumes), organic manures and fertilizers. The output of the soil's nitrogen store consists of: nitrogen removed from the harvested crop, nitrogen leached, nitrogen volatilized -- (a) ammonia or (b) denitrification (N_2O, N_2). The nitrogen contribution of seeds, rainfall, manure, fertilizer, crop N_t-store at the end of the experiment, and N_t-store at the start of the experiment can be established very exactly by analyzing water and soil quantities for their total nitrogen content. Biological fixation, leaching and volatilization are less easy to establish exactly. Because it is very difficult to get a precise estimation of the amount of nitrogen fixed from the air by biological activity, legumes are generally excluded from the experiments. Nitrogen input via non-symbiotic fixation is estimated at about 7 kg N $ha^{-1}.y^{-1}$. Nitrogen leaching can be determined by measuring the amounts of drainage water and the nitrogen concentration of this water. Volatilization is determined only indirectly by difference, taking into account input, output, and change in soil nitrogen. It will be necessary to verify the nitrogen balance sheet by measuring elements which are not lost to the air and which are not fixed from the air, to get an impression of the real value of the nitrogen balance sheet. Such an element may be chlorine or total phosphorus. Short term residual effect of nitrogen can be determined by means of field experiments in which fertilizer and/or organic manure is applied in different, increasing amounts. The first year effect in the next year can be found by measuring dry matter production in that year without fertilizer application. The first year effect and residual effect of organic manures can be measured in the same way and expressed as a percentage of 100 kg N. ha^{-1} applied as fertilizer. This type of research will never give any information about leaching and denitrification because no real balance sheet is made. (Merryman - East Central)

4745-A3, A4, B2, E1, E2, F1, F2
COSTS OF SELECTED WASTE-HANDLING SYSTEMS FOR DAIRY FARMS

Department of Agricultural Economics and Agribusiness, Louisiana State University, Baton Rouge, Louisiana
K. W. Paxton and M. Hromadka
Louisiana Agriculture, V. 20, No. 2, p. 10-11, 1977-78. 2 tab.

Keywords: Dairy industry, Waste handling, Regulation, Louisiana, Economics, Land disposal, Irrigation, Lagoons, Water pollution, Agricultural runoff.

Dairy farmers in Louisiana as well as livestock producers throughout the nation will be faced with decisions about investments in waste-handling facilities. This report has presented a summary of research directed toward providing information to be used in the decision-making process. The survey of dairy farms in Louisiana revealed that smaller scale daily operations are likely to be more severely affected by EPA regulation, primarily because smaller dairy operations and waste-handling systems are not generally considered adequate to meet the proposed guidelines. Larger daily farms, on the other hand, tended to be better equipped to meet these guidelines. The economic engineering analysis demonstrated that land disposal was a costly addition to a waste-handling system regardless of the method used. Not only was land disposal more expensive, but this also tended to require more labor. Labor requirements of a waste-handling system with land disposal could be minimized by investing in additional equipment, such as an irrigation system. (Merryman - East Central)

4746-A4, A12, B2, C3, D1, D3
BACTERIOLOGICAL INVESTIGATION OF ALBERTA MEAT-PACKING PLANT WASTES WITH EMPHASIS ON SALMONELLA ISOLATION

Microbiology Laboratory, Environmental Protection Service, Environment Canada, Edmonton, Alberta, Canada
J. M. Vanderpost and J. B. Bell
Applied and Environmental Microbiology, V. 33, No. 3, p. 538-545, March, 1977. 8 tab., 22 ref.

Keywords: Meat-packing plant wastes, Salmonella, Waste treatment, Effluents, Coliforms, Fecal coliforms, Drug resistance, Water pollution, Public health.

The waste treatment facilities and final effluents of 11 meat-packing plants in the province of Alberta were investigated primarily to determine the numbers of indicator bacteria and the presence of *Salmonella*. This was done to discover the efficiency of the treatment systems presently in operation in reducing bacterial numbers and to establish the need for disinfection and for bacterial standards for these effluents. Data obtained showed that the final effluents were of very poor quality bacteriologically, with numbers of indicator organisms comparable to those found in raw sewage. Primary treatment facilities were ineffective in reducing the numbers of these bacteria. The secondary treatment facility investigated achieved greater than a 99 percent reduction of indicator bacteria. *Salmonella* were isolated from the final effluents of 78 percent of the plants, including the plant using secondary treatment. In total, 21 *Salmonella* serotypes were isolated. *Salmonella* isolates were not antibiotic resistant, but certain coliform and fecal coliform isolates demonstrated resistance to chloramphenicol, tetracycline, and ampicillin. (Vanderpost-Environment Protection Service)

4747-A4, A7, A8, B1, E1, F2
POLLUTION LEGISLATION IN CANADA AFFECTING THE LIVESTOCK INDUSTRY

Engineering Research Service, Canada Agriculture, Ottawa, Canada
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Paper No. 71-920, American Society of Agricultural Engineers, 1971 Winter Meeting, Chicago, Illinois, Dec. 7-10, 1971, 13 p. 4 ref.

Keywords: Waste disposal, Pollution, Regulation, Legal aspects, Canada, Federal Fisheries Act.

Documents that have compiled and consolidated much of the pollution legislation and judiciously selected sections of Acts and their Regulations were reviewed to indicate the extent of existing legislation pertinent to livestock production and manure management in Canada. The Federal Fisheries Act has implications in all parts of Canada since this legislation covers the control of pollution in water frequented by fish, and fish frequent most lakes and rivers in Canada. Each province has legislation covering the general control from any source of water pollution beyond certain limits or where the public health is endangered. Some provinces have extended control to include the pollution of soil and air, while one province, Ontario, encompasses a broad range of contaminants present in the natural environment. In three provinces, reasonable land disposal of animal waste from traditional or normal farm operations are exempted from certain requirements of their Acts, while Alberta and New Brunswick have rather specific regulations under their health acts directed at livestock production and/or manure management. Although it is not legislation, Ontario has a Suggested Code of Practice concerning the establishment of livestock buildings and animal waste disposal, and one province, Saskatchewan, has a pollution control act directed specifically to their livestock production industry. (Hore - Canada Agriculture)

4748-B3, C1, D1
A MATHEMATICAL DRYING MODEL FOR MANURE BASED ON THE CONCEPT OF A RECEDING EVAPORATIVE INTERFACE

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D. H. Willits, I. J. Ross, G. M. White, and H. E. Hamilton
Paper No. 74-4512, American Society of Agricultural Engineers, Chicago, Illinois, Dec. 10-13, 1974, 58 p. 9 fig., 10 tab., 36 ref.

Keywords: Model studies, Evaporative interface model, Exponential drying model, Drying, Poultry wastes, Cylinders, Spheres, Temperature.

Two versions of a semi-empirical model based on the concept of a receding evaporative interface have been developed to describe the drying of formed poultry manure. The two-parameter version of the evaporative interface model, equation (23), was developed for cylindrical geometries using equation (21) to describe the behavior of the interface temperature. The one-parameter version was developed for cylindrical and spherical geometries (equations (26) and (28) respectively) using equation (24) to describe the interface temperatures. Both versions of the model were evaluated using data obtained from the drying of poultry manure formed into two shapes (cylindrical and spheres), for three diameters (25.4, 19.1, and 12.7 mm for cylinders; 31.8, 25.4, and 19.1 mm for spheres) and three air temperatures (65.6, 93.3, and 121.1°C). The results indicate that the one-parameter version is superior to the two-parameter version for the purpose of predicting drying times. They also show that, for the conditions of this study, the predicted values of the parameter p and the surface conductance h_e (for the one-parameter version of the model) are sufficiently well behaved that p can be treated as a constant and h_e can be represented by equation (33) for cylinders and equation (34) for spheres. For p equal to 0.563 and h_e determined as above, the one-parameter version of the evaporative interface model was used to predict drying times with an overall average percent error of less than 10 percent. The one-parameter version of the evaporative interface model was compared to the exponential drying model using the same data as above. The results indicate that both models performed equally well in describing the drying of poultry manure. The evaporative interface model, however, possesses the following advantages over the exponential model: (1) It directly incorporates most of the variables that influence drying into a single expression. (2) It can be more easily extended to situations not covered by available drying data because of the reasonable behavior of the predicted values of h_e and p. (3) It provides a more complete understanding of the mechanisms of drying highly porous materials. Thus, the evaporative interface model is a significant model for both the designer and the researcher concerned with the drying of highly porous materials such as poultry manure. (Willets - North Carolina State University)

4749-A11, B2, C2
THE APPLICATION OF FLUSHING MANURE-HANDLING SYSTEMS TO POULTRY BUILDINGS

Agricultural Engineering Department, University of Kentucky, Lexington, Kentucky
R. L. Fehr, R. J. Smith, and L. Blaylock
Paper No. 76-4512, American Society of Agricultural Engineers, 1976 Winter Meeting, Chicago, Illinois, Dec. 14-17, 1976, 13 p. 4 fig., 6 tab., 4 ref.

Keywords: Poultry wastes, Flushing, Design, Waste treatment, Recycling, Ventilation, Performance, Ammonia, Temperature.

The design and operation of flushing manure-handling systems installed at Iowa State University and at the Supersweet Research Farm are discussed. A flushing-gutter manure-handling system for 1000 birds has been operating in Unit D, Poultry Research Center, Iowa State University, for the past 3 years. The system includes in-house recycling, effluent treatment, and effluent recycling. The other flushing-gutter manure-handling system, for 5000 birds, was installed at the Supersweet Research Farm, Courtland, Minnesota. This system also utilizes flushing trays, but the cage arrangement was altered to increase the cage density within the building. A novel feature of the Courtland installation was the provision of air distribution tubes to evaluate the feasibility of zone ventilation for poultry. Two experiments were performed at the Supersweet Research Farm to determine the influence of manure-handling and ventilation systems on layer performance. The studies indicated that (1) Flushing manure-handling systems do not adversely affect layer performance. (2) A ducted-air-distribution system, coupled with a flushing system, can improve layer performance and may reduce deaths. (3) There is a significant interaction between ammonia-nitrogen concentrations in the flush water and atmospheric-ammonia concentrations; therefore, the ammonia-nitrogen concentration of the flush water should be maintained at as low a level as possible. (4) Flushing systems can reduce the temperature of a poultry house if water is recycled from outside storage or a lagoon during cold weather. Some beneficial cooling may also occur in the summer. (5) Flushing systems should be designed with some control over flushing frequency, rather than control over duration. (6) Flush trays should be built without vertical lips, but the tray-support system should be adjustable to allow for leveling after construction. (7) Flushing manure-handling systems are economically feasible but are subject to the same constraints as flushing systems used for other species. These constraints include environmental aspects of anaerobic lagoons, and the need to have control over land on which to apply lagoon effluent. (Merryman - East Central)

4750-B2, B4, F1
ALTERNATIVE CONSTRUCTION MATERIALS FOR UNDERFLOOR MANURE-STORAGE TANKS

Department of Agricultural Engineering, Iowa State University, Ames, Iowa
R. L. Huhnke and J. O. Curtis
Paper No. 75-4508, American Society of Agricultural Engineers, 1975 Winter Meeting, Chicago, Illinois, Dec. 15-18, 1975, 30 p. 7 fig., 10 tab., 12 ref.

Keywords: Waste storage, Storage tanks, Design, Construction materials, Costs.

This study was undertaken to find the most economical underfloor manure-storage tank among four alternatives: (1) reinforced concrete, (2) reinforced concrete masonry, (3) reinforced surface bonded, and (4) wood. A quantitative analysis of all labor, supplies, and materials costs was used to determine the most economical tank design. The conclusions of this study are as follows: (1) The reinforced concrete wall was consistently the highest cost wall compared to the other three alternatives. The high cost was due to the necessity of forms for the placement of the concrete. In some instances, the cost of material and labor for the forms was double the material and labor cost of the wall itself. (2) The wood wall, at the 4 ft level, was found the most economical wall. In some cases, wood was also the most economical at the 6-ft height. (3) The reinforced concrete-masonry wall was found to be the most economical overall wall for an underfloor manure-storage tank. Reinforced concrete masonry continually ranked first or second as the most economical alternative. (4) Because of the differences of materials cost between mortar and surface bond, the reinforced surface-bonded wall was uniformly greater in cost than the reinforced concrete-masonry wall. In some instances, the difference is only a few cents per linear ft of wall, resulting in reinforced surface bonding ranking with reinforced concrete masonry. (5) Standard estimating guides can be used to set trends for cost comparisons, but local prices and wages must be used to make the final decision. (Huhnke-Iowa State University)

4751-A4, B1, D2, D3, E4, F1
DISPOSAL OF FEEDLOT WASTES USING A TWO-STAGE PROCESS WITH NET ENERGY PRODUCTION

Kansas Water Resources Research Institute, Manhattan, Kansas
K. A. Bishop and H. F. Rosson
Project Completion Report KWRRI Contribution No. 186, Kansas Water Resources Research Institute, Jan., 1977, 62 p. 10 fig., 17 tab., 18 ref

Keywords: Water pollution, Feedlots, Waste disposal, Oxidation, Incineration, Energy, By-product recovery, Effluents, Economics.

Control of water pollution from feedlot operations continues to be a major problem. In certain cases, the choice of a disposal process which will result in a saleable by-product could partially or completely defray the expense of manure disposal. A process in which energy is the by-product is thermodynamically feasible; about half of the heating value of the manure can be recovered as useful thermal energy. A process was envisioned in which wet, undried feedlot manure would undergo a wet oxidation reaction followed by a second incineration step to complete the oxidation, with requisite heat exchange to recover thermal energy. In support of the wet oxidation step, experimental data on heating value, equilibrium oxidation, and kinetic rate were obtained. These data correspond reasonably well to literature values for domestic sewage sludge, the principal variation probably being due to particle size distribution. Because small particle size tends to favor rapid kinetics, control thereof should lead to lower pressure operation in smaller equipment, resulting in capital and operational economies. Because of the very dilute nature of the wet oxidation effluent and the low heating value of the contained solids, use of a second-stage incinerator was counterproductive to the overall system. (Bishop-Kansas Water Resources Research Institute)

4752-B2, C1, C2, D3
PRACTICAL TREATMENT OF FEEDLOT RUNOFF

Water Resources Research Institute, University of Nebraska, Lincoln, Nebraska
T. J. McGhee
Research Project Technical Completion Report, University of Nebraska, June 15, 1974, 18 p. 11 fig., 1 tab., 8 ref.

Keywords: Agricultural runoff, Feedlots, Waste water treatment, Biological treatment, Aerobic treatment, Chemical properties, Color, Adsorption, Design, Chemical oxygen demand, Soils.

A field treatment system was designed, based upon the results of laboratory studies, to treat settled feedlot runoff. The system was operated at liquid retention times of one to four days. Routine data measurements included COD of the raw and treated wastes, influent, effluent, and mixed liquor suspended solids, organic and ammonia nitrogen, mixed liquor dissolved oxygen and effluent BOD. Laboratory studies of residual color removal by adsorption on soil columns were conducted. The soil columns ranged in depth from three to six feet and were loaded at rates ranging from one to four inches per day. Routine determinations of influent and effluent COD and color were made. Conclusions were: (1) settled feedlot runoff may be effectively stabilized in an aerobic biological treatment system operated at a liquid retention time of two days; (2) the design parameters for such a system are similar to those of high-rate activated sludge; and (3) the humic color characteristic of feedlot runoff is effectively removed by adsorption in soil particles. (McGhee - Water Resources Research Institute)

4753-B1, E3
A REVIEW OF MULCHES TO CONTROL WIND EROSION

Soil Scientist, North Central Region, USDA-ARS, Manhattan, Kansas
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Transactions of the ASAE, V. 20, No. 5, p. 904-910, Sept.-Oct., 1977. 3 tab., 17 ref.

Keywords: Wind erosion, Mulches, Crop residues, Chemical soil stabilizers, Feedlot wastes.

The need to increase food production and improve the quality of our environment has prompted a search for materials to control wind and water erosion. This paper is a review of research and development associated with application, methods, and amounts of mulch types -- crop residues, chemical soil stabilizers, and feedlot wastes (manure) -- required to control wind erosion. An effective wind erosion control treatment is one that can resist a 38.0 m/s wind as measured at 15.2 m. Any crop residue, either grown in place or hauled in and spread, can control wind erosion. Hauled-in residues must be spread and anchored to the soil surface by a packer or an anchoring agent, i.e., cutback asphalt or asphalt emulsion. Depending on residue type, minimum amounts needed to control wind erosion are 4.5 to 11 t/ha. Chemical soil stabilizers, i.e., asphalt, polyvinyl alcohol, styrene-butadiene latex emulsions, and resins-in-water emulsions control wind erosion effectively if properly diluted and applied to cover the total soil surface at volumes of at least 3785 L/ha. Wet feedlot manure applied to a highly-erodible sand controlled erosion with 31.8 t/ha surface-applied or 52.3 t/ha tilled-in with a tandem disk. (Armbrust-USDA)

4754-A4, A12, B1, C3
MICROBIOLOGY AND CHEMISTRY STUDIES OF WATER QUALITY FACTORS IN A WATERSHED USED FOR MUNICIPAL SUPPLY AND WASTE DISPOSAL (PHASE II)

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MUJWRRC Report No. 74, Montana University Joint Water Resources Research Center, Montana State University, March, 1976, 124 p. 71 fig., 21 tab., 47 ref.

Keywords: Municipal watersheds, Water quality, Logging, Cattle wastes, Animal wastes, Agricultural runoff, Sewage, Indicator bacteria, Stream chemistry, Urban pollution, Bacterial distributions, Public health.

Chemical and bacteriological studies of several land uses were performed to determine relative impacts on water quality. Outdoor recreation, camping, and a winter ski development demonstrated no measurable adverse impacts on water quality. Clearcut logging with the use of streamside buffer zones resulted in little change in stream quality in the South Fork of Bozeman Creek. Wild animals appeared to cause bacterial contamination in the Bozeman Creek municipal watershed. Cattle grazing also resulted in some bacteriological stream quality degradation in several tributaries of the Hyalite drainage. Further research is required to assess adequately the public health significance of the bacterial levels observed. Agricultural runoff caused increased levels of chemical nutrients and indicator bacteria in the lower reaches of Bridger Creek, Hyalite Creek, and in the East Gallatin River. It appears that better streamside land-use practices could alleviate these adverse water quality impacts. Suburban and urban pollution along Bozeman Creek resulted in large increases in stream bacterial concentrations; much of which could be eliminated by repairing sewer leaks. Municipal sewage treatment plant effluent caused degraded conditions in the East Gallatin River for approximately 14 miles downstream from the outfall. Problems associated with recovery of indicator bacteria from water were also investigated. Bacterial injury was observed to result in incomplete recovery of indicator bacteria from streams by some laboratory methods. Differences in the degree of aquatic injury were also observed at various locations throughout the Gallatin drainage. Changes observed in coliform species distributions and in survival rates for different bacteria lead to questions concerning some of the assumptions that have been made regarding coliforms and enteric pathogens. (Schillinger-Montana State University)

4755-B1
BEEF FEEDLOTS IN THE HUMID SOUTHEAST

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Paper No. 76-4519, American Society of Agricultural Engineers, 1976 Winter Meeting, Chicago, Illinois, Dec. 14-17, 1976, 10 p. 4 fig., 3 tab.

Keywords: Feedlots, Cattle, Southeast U.S., State-of-the-art, Design.

A state-of-the-art is presented concerning beef feedlots constructed in the Southeast. The Southeast is characterized as having high rainfall and high temperatures, usually resulting in high humidities. Four beef feedlots in South Carolina, which offer a range in size, housing facilities and waste management techniques exemplifying the types of feedlot operations existing in the Southeast, are featured in this paper. Criteria that were taken into account in the original design of the feedlots and modifications or desired modifications which would improve management were also discussed. Study results revealed the following criteria as a basis for design standards for beef feedlots in the Southeast: (1) 75 to 150 head per lot, (2) 30 to 50 square feet of lot area per head, (3) entire feedlot area under roof without sidewalls, (4) 5 to 8 inches of feeder space per head, (5) 1 to 2 inches of watering space per head, (6) full line of cattle handling equipment and facilities, (7) concrete floors throughout feedlot, cable, wire or rod fences, (9) manure removal each 10 to 20 days in solid floor systems, and (10) preconditioning of animals on pasture or unsurfaced lots is desirable. (Merryman - East Central)

4756-B2, E2
DEVELOPMENT OF A LIQUID MANURE SPREADING AND INJECTION SYSTEM

Hawk Bilt Co., Vinton, Iowa
J. H. Hodgson
Paper No. 76-1585, American Society of Agricultural Engineers, 1976 Winter Meeting, Chicago, Illinois, Dec. 14-17, 1976, 16 p. 6 fig., 1 tab.

Keywords: Equipment, Liquid wastes, Land spreading, Soil injection, Design.

This paper describes the design of a liquid manure spreader and a three-point tractor mounted injector. This system can either surface spread or inject slurry with equal speed and precision The system was designed so that the pumping means on the spreader would: provide adequate agitation while unloading, create enough pressure to force material through the injector, be able to discharge slurries to 15 percent solids at 500 gal/min, be able to be powered at 540 or 1000 RPM, eliminate any valves that would tend to freeze or corrode, and not leak or spill in transit. The system was designed to provide adequate flotation in hauling and a wheel tread suitable for row crops. The injector is highly maneuverable, has a capacity to inject 500 gal/min at 10-12'' depth, has adjustable chisel spacing, and has good depth control and trash clearance. Production was started in May, 1976 and market acceptance has been excellent. (Hodgson - Hawk Belt Co.)

4757-A1, A7, B1, D1
ENVIRONMENT AS A RESULT OF IN-HOUSE DRYING OF POULTRY EXCRETA

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J. E. Dixon, M. L. Esmay, J. B. Gerrish, C. C Sheppard, C. J. Flegal, H. C. Zindel, and T. S. Chang
Paper 74-4529, American Society of Agricultural Engineers, 1974 Winter Meeting, Chicago, Illinois, Dec. 10-13, 1974, 13 p. 1 fig., 3 tab., 22 ref.

Keywords: Poultry wastes, Drying, In-house environmental effects, Temperature, Humidity, Ventilation.

A demonstration project was undertaken to design, construct and test a poultry house which would maximize the drying of poultry manure, ultimately producing a dry, relatively stable product. The purpose of this paper was to report the effect, if any, of the drying on the environment within the house. Study of the cage laying house, which used ventilating air to dry droppings, yielded the following facts. It was found that, except during summer conditions, drying of manure under cages can be done while maintaining the recommended in-house temperature. In the summer, the in-house temperature exceeds the recommended inside temperature. It was also found the drying of the manure can increase the relative humidity to values greater than are recommended. Air velocities under the cages indicated that a large portion (88 percent) of the air passing under the cages through the cage rows passed along the floor. (Merryman - East Central)

4758-B1, B4, C1, C2, D1, D3, E2, E3
HANDLING HOUSED BEEF CATTLE FEEDLOT MANURE

ARS, USDA, University of Nebraska, Lincoln, Nebraska 68503
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Paper No. 74-4004, American Society of Agricultural Engineers, 1974 Annual Meeting, Oklahoma State University, June 23-26, 1974, 21 p 2 fig., 4 tab., 6 ref.

Keywords: Design, Feedlots, Cattle, Waste management, Waste storage, Waste treatment, Waste transport, Separation techniques, Physical properties, Chemical properties, Flushing, Waste disposal, Recycling.

A housed beef cattle waste management system may be designed for liquid, solid, or combination liquid and solid waste handling. Several of the system components may be interchangeable with other components if designed properly. A knowledge of the individual feeder's operation, physical and chemical properties of the waste, and regulatory aspects will provide insight to integrating components into a workable system. (Gilbertson - University of Nebraska)

4759-B3, C1, C3, D1, D3, F1
MECHANIZED COMPOSTING SYSTEM EVALUATION

Department of Agricultural Engineering, University of Maryland, College Park, Maryland
J. W. Hummel, and B. V. Lessley
Paper No 74-4513, American Society of Agricultural Engineers, 1974 Winter Meeting, Chicago, Illinois, Dec. 10-13, 1974, 9 p. 1 fig., 4 tab.

Keywords: Composting, Mechanical equipment, Dairy wastes, Temperature, Moisture content, Costs.

Studies at the University of Maryland on factors that control the aerobic composting process led to a laboratory mechanized composting system. The success of the laboratory mechanized composting system and the potential use for the material produced culminated in a pilot scale mechanized composting system for the University's 80-cow dairy herd on the College Park Campus. The system concept provides oxygen to support the aerobic microorganisms, agitation to counteract moisture migration and settling, and moves the composting mass through a 60-foot channel in approximately 15 days. The thermophilic microorganisms increase the manure temperature to 120° F during the first 24 hours. During the remaining 14-day residence in the channel, the temperature ranges from 120 to 160° F. Since the material is not completely composted by the end of the 15 days, it is removed from the channel and placed in programmed windrow storage for 15-20 more days. It was found that this composting system: (1) requires very strict adherence to maximum charge material moisture content, (2) requires very little additional management, (3) produces a material which is appealing to urban homeowners, and (4) can produce composted cow manure at a cost that is competitive with other similar or substitute products already marketed. An economic analysis of the system, including an investment analysis and cost of the system per unit of compost produced, is given. (Merryman - East Central)

4760-B2, B4, F1
A NEW APPROACH IN NON-SLATTED LIQUID WASTE SWINE HOUSING SYSTEMS

Agricultural Engineering Department, College of Agricultural and Life Sciences, University of Wisconsin, Madison, Wisconsin
D. J. Meyer
Paper No. 74-4533, American Society of Agricultural Engineers, 1974 Winter Meeting, Chicago, Illinois, Dec. 10-13, 1974, 7 p. 1 fig., 2 tab., 11 ref

Keywords: Swine wastes, Housing, Design, Storage pits, Performance, Costs.

A new approach in swine confinement finishing is discussed in terms of building construction, waste removal system and the system's performance. A ''round'' (10-sided) building of 76-foot diameter was constructed which has a feeding-sleeping area toward the outer part of the circular plan, and a manuring-watering area toward the center. The 10 pens are wedge-shaped and can hold 50 pigs each. The center of the building has a small, short-term storage pit for the liquid and solid wastes. Floors sloping toward the pit aid in draining the liquid wastes. A rotating sweep collects and transfers the solid wastes from the manuring-watering area to the storage pit, but further developmental work is necessary to optimize this unit. Currently, daily hand scraping moves the manure into the pit. All solids and liquids are retained in the center pit until mixed and then they are gravity flushed to a large outside storage facility. The building and waste removal system have performed with a minimum of labor since April 12, 1974, with no winter experience yet. The hog and pit odors are less than in slatted floor confinement units, primarily due to the large air duct draft and daily manure removal. (Merryman East Central)

4761-A5, A8, B1, C2
NITROGEN LEVELS UNDER A SWINE FEEDLOT IN SOUTH CAROLINA

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R. A. Spray and T. C. Peele
Paper No. 74-4534, American Society of Agricultural Engineers, 1974 Winter Meeting, Chicago, Illinois, Dec. 10-13, 1974, 18 p. 10 fig., 1 tab

Keywords: Feedlots, Swine, Management, South Carolina, Soil contamination, Groundwater pollution, Guidelines, Nitrogen.

A field study was conducted of a commercial pig feedlot operation to determine its effects on the soil and groundwater. The study was conducted in order to collect background information for developing management guidelines for farmers with similar operations. The feedlot studied was located in the Coastal Plain of South Carolina with a sandy loam soil. The swine were finished on the ground with no buildings. Determinations were made of nitrates in the soil and groundwater under three adjacent lots. Soil samples were taken 3 times and groundwater samples were taken nine times during the 16 months that the lots were observed Data collected from the study cannot be used to establish guidelines for controlling soil and groundwater nitrate levels

because this was a field study rather than an experiment designed to eliminate variations statistically. However, the following recommendations were made as a result of the study: (1) The 3 lots should be used in the hog feeding operation with a rotational schedule that keeps animals off the lot for 4 months each year. (2) Lots should be cropped to utilize the fertilizer reserve in the soil. (3) Soil compaction in the base areas around the feeders and fence line should be tilled so that vegetation could be reestablished in these spots. (Merryman - East Central)

4762-A12, B1
SAFETY HAZARDS ASSOCIATED WITH LIVESTOCK WASTE

National Safety Council, Chicago, Illinois
W. J. Fletcher
Paper No. 71-911, American Society of Agricultural Engineers, 1971, 13 p. 2 fig., 8 ref.

Keywords: Feedlots, Accidents, Management, Safety, Livestock wastes, Equipment, Drownings, Gases, Toxicity, Explosions, Prevention.

While changes in livestock waste handling methods have added new risks to the job with which feedlot workers are not always familiar, survey shows incidence of waste handling accidents appears to be falling. This paper attempts to put into perspective feedlot hazards, the incidence of accidents, and the countermeasures which must be continually brought to the attention of engineers, farmers, and workers to prevent unexpected occurrences which may result in accidents. Accidents occurring in "solid" waste are primarily related to machinery and equipment. Wrapping up of legs in the manure spreader power take-off is probably the most frequent accident of this type. Front end loaders on agricultural tractors tend to be unstable during loading and transport unless adequate counter-balancing weights are put on the rear. Quick turns or even small bumps in the travel path have caused these loaded tractors to overturn with disastrous results. Most other accidents are traceable to facilities using liquid or slurry forms of waste handling. These include such accidents as: drownings in liquid manure pits, temporary illness resulting from exposure to manure gases, and explosions related to manure gas accumulations. Attention must continually be directed toward the obvious and obscure hazards that surround any facility where livestock waste or other organic wastes are stored or handled. Protective measures must be taken to prevent falls. Provision for fail-safe gas removal facilities should be incorporated in all livestock housing facilities where liquid wastes are stored. Supplied-air breathing equipment or positive ventilation of enclosed waste storage should be provided for anyone who must enter these enclosed spaces. Water traps or some positive device to prevent flow of toxic gases from outside storage pits back into livestock structures should be provided. Thorough ventilation is usually the best defense against a gas explosion. No person should enter any enclosed space, particularly one underground, unless he has an assistant in a safe atmosphere and is connected to a life line with the necessary lifting force to take him out of the hole should this become necessary. (Merryman East Central)

4763-B1, D3
MODELING TECHNIQUES AND COMPUTER SIMULATION OF AGRICULTURAL WASTE TREATMENT PROCESSES

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D. T. Hill, and R. A. Nordstedt
Paper No. 77-4030, American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 25 p. 12 fig., 12 ref.

Keywords: Computer models, Biological treatment, Swine wastes, Poultry wastes, Food wastes, Design, Biodegradability, State-of-the-Art, Equations.

Over the past three years, mathematical modeling and simulation of biological waste treatment processes have produced two verified models using real data. Wastes that have been simulated using these models includes swine, poultry, and a food waste. Much experience gained building these models is now being incorporated into design recommendations for extension personnel. The start-up period, the first 15 to 30 days, is most critical for digestion. Without constant attention, the acid-pH combination will inhibit the digester. A complete draining and restart is necessary at this point. If the failure is caught before complete inhibition, one can sometimes salvage the process without a restart by adding sodium bicarbonate. From a model analysis standpoint, the period where the model is most likely to diverge or become unstable is in the first thirty days as well. Since all variables are maintained in units of moles/l internally in the model, and since the concentrations are very small, input variables are critical. Even a slight mistake in calculating input variables will cause instability in the mathematical calculations. It has been commonly agreed that swine waste is both less biodegradable and more acid than poultry waste under digestion. Quantitatively, no one knew for sure. Using these models and the mathematics developed, values can now be placed on these terms. For swine waste the "biodegradability" constant (YCIX) are 0.249 and 0.55, respectively. The values for poultry waste are 0.243 and 0.85. Within the framework of the model, these values produced the best fit of simulated data to real data and verify the qualitative statement above. These constants are defined only for use within these models. They have no absolute meaning. These two models are inexpensive to run on IBM 370 equipment. A typical run for the lagoon model for 365 days is about $.40. The digester model will run for 365 days for about $1.00. This includes graphical output of data. These are indeed cheap design tools when compared to physical experimentation. However, one must realize that they were developed and verified at great expense using physical simulators. These models represent state-of-the-art in simulating agricultural waste treatment processes. They are intended as a base in which further refinement will produce better models. (Hill - University of Florida)

4764-A3, A8, B2, B5, C2, E2
LONG-TERM FESCUE AND COASTAL BERMUDAGRASS CROP RESPONSE TO SWINE LAGOON EFFLUENT

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Paper No. 77-2002, American Society of Agricultural Engineers, 1977 Annual Meeting North Carolina State University, June 26-29, 1977, 27 p. 2 fig., 15 tab., 4 ref.

Keywords: Land application, Swine wastes, Effluents, Coastal bermudagrass, Fescue, Crop response, Agricultural runoff, Soil chemical properties.

Irrigation of swine lagoon effluent on Coastal bermudagrass - Norfolk sandy loam plant-soil sites for four years and on fescue - Cecil clay loam plant-soil sites for two years have not adversely affected yields or caused nutrient abnormalities in the foliage, even with high application rates such as 1350 kg/ha/yr of TKN. Yields were generally excellent for all irrigated plots and removal of most elements in 1973-1975 was unusually high for the low-rate Coastal bermudagrass plots. The Coastal bermudagrass crop removal compared to applied amounts was about 65 to 70 percent for N and 60 to 70 percent for K for the low-rate treatment. This percent decreased with increased loading rate, and for the high rate treatment was only about 30 to 35 percent for N and 25 to 30 percent for K. Since large amounts of the nutrients applied on the high-rate plot have not been removed in the foliage, they are subject to accumulation or water transport. Transport by surface runoff at the Coastal bermudagrass sites has been less than 5 percent of the amount applied in essentially all cases, but the subsurface lateral water transport has not been evaluated. Soil concentration levels have generally increased with loading rate and with years of irrigation, but, as stated previously, elemental composition of the Coastal bermudagrass has not been adversely affected. Irrigation of swine lagoon effluent on Coastal bermudagrass and fescue during their growing seasons provides an excellent means of utilizing swine wastes as well as disposal of lagoon effluent. However, the maximum allowable loading rate for long-term application cannot be evaluated from two to four years of data. Soil reserve increases and nitrate movement downward indicates that more years of application are needed to determine long-term effects. (Westerman-North Carolina State University)

4765-A6, B2, C2, D2, D3, E3, F1
MICROALGAE AS A MEANS OF RECYCLING ANIMAL WASTES

Agricultural Engineering Department, University of Florida, Gainesville, Florida
E. P. Lincoln, D. T. Hill and R. A. Nordstedt
Paper No. 77-5026, American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 18 p. 9 fig., 6 ref.

Keywords: Recycling, Waste treatment, Swine wastes, Lagoons, Anaerobic conditions, Algae, Refeeding, Economics, Ammonia nitrogen removal, Odor reduction.

The essential feature of any implementation plan involving algal recycling is to make best use of existing waste treatment facilities. In the present study, these consisted of a reliably functioning anaerobic lagoon and an adequate flushing system. The initial cost of materials and labor for the algae production unit was

about $4,000, excluding power-line installation. Somewhat less than half of this was invested in the separation plant. Thus the growth unit itself cost in the neighborhood of $2,250. For the degree of waste treatment obtained, this is unquestionably a good investment. Of primary interest in this report, though, is the economic feasibility of the feed recycling scheme. In the present culture, where algal growth was relatively abundant, the mean retrieval rate of the dry algae was about 180 kg (400 lbs) per million liters processed. The operating expense of major consequence is the cost of flocculating chemicals. The standard reagent for this purpose is alum which, at the time of purchase, cost $136 per ton. The optimal dosage of 70 ppm by weight therefore brought the flocculation cost to $53 per ton of dry algae. Obviously, flocculation is not the only cost in algae production, but it is the main operating expense, since automation will largely replace labor in subsequent generations of the system, and amortization of capital equipment can probably be justified by waste treatment alone in most situations where recycling will be a consideration. The cost of electric power is negligible, ordinarily running less than $1.25 a week. In terms of overhead, therefore, the algae production facility cannot be considered excessive, especially as an adjunct to a fully staffed animal production unit. The economics of this system, in the last analysis, reduces to the weight of flocculant used per unit weight of dry algae recovered. In recent harvests, this ratio has been brought as low as 1/8. Also, on occasion, it has been as high as 5/4. At the above $136 per ton for flocculant, the cost per ton of algae ranges from $17 to $170. By comparison, the competing product, soybean meal, now costs the livestock producer $325 per ton. Even with a considerable margin for error, the algal product appears to be economically competitive. This, of course, does not mean that one might go into algae production for profit. What it does mean is that the producer who is now feeding 70 percent more protein nitrogen than he is marketing might, with such a recycling scheme, recoup some of the losses due to wastage. In closely competitive business, this could be a significant advantage. (Lincoln University of Florida)

4766-A6, A8, A11, B1, C2, D2, E3
THE APPLICATION OF NATURAL ZEOLITES IN ANIMAL SCIENCE AND AQUACULTURE

Department of Geology, Texas A&M University, College Station, Texas 77843
F. A. Mumpton and P. H. Fishman
Journal of Animal Science, V. 45, No. 5, p. 1188-1203, Nov., 1977. 12 fig., 9 tab., 44 ref.

Keywords: Zeolites, Dietary supplements, Soil amendments, Agriculture, Aquaculture, Waste treatment, Ion exchange, Ammonia, Animal health, Odor control, Japan, United States.

As agriculturalists increase their efforts to expand crop and animal production, numerous mineral materials are receiving greater attention as soil amendments and as dietary supplements in animal husbandry. The zeolite group of minerals stands out among the rest, and its exciting bag of physical and chemical tricks promises to contribute to many areas of agriculture and aquaculture in the next decade. Their abundance and availability has aroused considerable interest in experiment stations of several nations, although the number of publications and amount of "hard" data on their usefulness in agriculture are still small. A review of this subject reveals that both the ion-exchange and adsorption properties of natural zeolites can be exploited to make more efficient use of feed nitrogen in animal nutrition, to reduce intestinal diseases prevalent in young swine and ruminants, to control moisture and ammonia content of animal manure, to purify recirculating hatchery waters in aquaculture, to provide oxygen-enriched air for fish breeding and transportation, and to reduce the nitrogen content of feedlot and hatchery-runoff waters. Most of this work has been carried out in Japan where zeolite tuffs have been used for years to control the malodor of animal wastes and to raise the pH of acidic volcanic soils. The addition of about 10 percent clinoptilolite to the diets of chickens and pigs appears to increase feed efficiency by as much as 25 percent. Studies in Japan and in the United States suggest that the incidence of scours in the young swine may be substantially reduced by adding zeolites to the animal's rations. These same zeolites can be used to extract NH_4^+ from animal wastes and hatchery waters by ion exchange. Numerous deposits of natural zeolites are known in the U.S. totaling several hundred million metric tons. Their flat-lying nature and closeness to the surface suggests a large supply of inexpensive zeolite are available to the industry in the $50.00 to $75.00 per metric ton price range. (Mumpton-Texas A&M University)

4767-B2, C1, C2, D3, E3
COMMERCIAL SIZE ANAEROBIC DIGESTER PERFORMANCE WITH DAIRY MANURE

Research and Development Division, A. O. Smith Corporation, Milwaukee, Wisconsin
D. L. Pigg
Paper No. 77-4055, American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 19 p. 8 fig., 3 tab., 6 ref.

Keywords: Dairy wastes, Anaerobic digester, Gas production, Methane, Recycling, Gas storage, Total solids, Nitrogen, Effluents, Fertilizers.

Harvestore structure components were modified to erect a single stage, mixed, and heated (35°C) anaerobic digester on a Wisconsin dairy farm. The digester had an operating liquid volume of 120 m^3 (4250 ft^3) and a floating roof providing a variable gas storage of 28.3 m^3 (1000 ft^3). A. O. Smith Corporation operated the experimental digester for an 18 month period. A batch loading procedure at a frequency of 2 to 5 days per week was used. The organic loading rate ranged from 0.8 to 4.6 gm VS/liter/day (.05 to 29 lb/ft^3/day). Average daily gas production was 96 m^3 (3400 ft^3) at an average loading rate of 1.92 gm VS/liter/day (0.12 lb/ft^3/day) and a hydraulic retention time of 36 days. Methane content of the biogas averaged 54 percent. Heat to the digester required 48 percent of the annual gas production. Total solids were reduced 33 percent and 100 percent of the nitrogen was recovered in the digester effluent. (Pigg-A. O. Smith Corporation)

4768-B3, F1
TIME-MOTION ANALYSIS OF FEEDLOT MANURE COLLECTION SYSTEMS

Department of Agricultural Engineering, Texas A&M University, College Station, Texas
J. M. Sweeten, D. L. Reddell, and C. B. Parnell, Jr.
Paper No. 77-4033, American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 34 p. 4 fig., 9 tab., 12 ref.

Keywords: Manure collection, Time-motion analysis, Feedlots, Elevating scraper, Wheel loaders, Plowing, Energy, Economics.

Time-motion analysis was used to compare alternate methods of feedlot manure collection at 4 Texas feedlots (28,000 to 100,000 head capacities) on the basis of machine productivity, energy consumption, and cost. Collection systems studied were elevating scraper, wheel loader, and wheel loader plus plowing or rototilling. Other objectives were to compare wheel loader operator performances and to determine the optimum combination of wheel loader and truck fleet sizes for efficient feedlot manure loading and hauling. From the data analysis, the following conclusions were drawn. (1) The maximum manure collection rate of 176 tons per hour was obtained with the wheel loader/chisel plow combination. This was followed in order by the elevating scraper (126 tons/hour), wheel loader (118 tons/hour), and wheel loader/rototiller (117 tons/hour). These values are based on 100 percent job efficiency (i.e. 60 minutes operation per hour). (2) Wide variation in observed collection rates indicates that more observations are needed to establish reliable averages. (3) Assuming 100 percent job efficiency, the most energy efficient system of manure collection was the elevating scraper (1.07 hp-hr/ton). Plowing or rototilling the manure pack prior to wheel loader collection reduced energy consumption by 30 percent (to 1.17 and 1.21 hp-hr/ton) as compared to collection with only the wheel loader. (4) Manure collection costs were similar for the four systems studied averaging $0.19 per ton (at 100 percent job efficiency). (5) Job efficiencies for the elevating scraper, wheel loaders and tractor-drawn scarifiers engaged in manure collection averaged 90 percent, 79 percent, and 84 percent, respectively. (6) The average rate of manure loading into spreader trucks by wheel loaders was 205 tons per hour. Time required to load spreader trucks (10.3 tons per load) averaged 3.0 minutes (2.13 to 3.7 minute range). Loading rates were governed mainly by the cycle time achieved by the loader operator. (7) Cost of loading feedlot manure ranged from $0.08 to $0.14 per ton, averaging $0.11 per ton. (8) The loader operator rating scale and the spreader truck cycle time curve developed from the time-motion study can be useful tools in controlling operator performance. (9) Finite source-cyclic queueing theory (FCQT) can be successfully applied to manure loading and hauling operations to determine the most economic number of manure trucks and loaders for a given feedlot. (Sweeten-Texas A&M University)

4769-B2, C1, C2, D3, E3
PERFORMANCE OF A LARGE SIZE ANAEROBIC DIGESTER FOR POULTRY MANURE

Agricultural Engineering Department, College of Agricultural and Life Sciences, University of Wisconsin, Madison, Wisconsin
J. C. Converse, G. W. Evans, C. R. Verhoeven, W. Gibbon, and M. Gibbon
Paper No. 77-4051, American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 14 p. 1 fig., 7 tab., 6 ref.

Keywords. Anaerobic digester, Poultry wastes, Liquid wastes, Performance, Recycling, Methane, Energy, Chemical properties, Physical properties

A 96.5 m^3 liquid volume poultry digester with a floating cover was evaluated for net methane production. The digester is 5.5 m in diameter and 3.7 m high with a 1.8 m cone on the bottom. Mixing is done hydraulically with a propeller in a 10 cm by 4 3 draft tube. The 35° C temperature was maintained using a 25491 W output boiler attached to 74 m by 5.0 cm diameter black iron pipe. Manure was added almost daily. The feeding rate ranged from 1.4 to 2 0 kg VS/m^3/d with detention time ranging from 30 to 53 days. The four test periods were 64 to 121 days long. The digester was mixed 15 minutes every 2 hours during the first 2 test periods and 15 minutes every 4 hours during last 2 test periods plus some mixing during feeding of the digester. Poultry manure was diluted to a total solids concentration ranging from 8.8 to 12 8 percent with volatile solids ranging from 63 to 67 of TS. Total nitrogen ranged from 7,000 to 12,000 mg/1 of which 60 to 65 percent was ammonia. Volatile fatty acids ranged from 17,000 to 24,000 mg/1 as acetic and alkalinities ranged from 14,000 to 19,000 mg/1 as $CaCO_3$. Influent pH was 7 4 to 7.5. Digester content total solids ranged from 3.8 to 6 3 percent with volatile solids ranging from 47 to 60 percent of TS. Total nitrogen ranged from 7,500 to 10,300 mg/1 of which 78 to 82 percent was ammonia. Alkalinities ranged from 23,000 to 30,600 mg/1 as CaCO. Volatile fatty acids were from 10,000 to 18,000 mg/1 as acetic with pH ranging from 7.7 to 8.0. Gas output ranged from .58 to .77 m /m /day or .36 to 47 m^3/kgVS added with methane concentration ranging from 55 to 63 percent. H S concentration ranged from 3 8 to 11 8 mg S per liter of gas. NH_3 concentration averaged .013 mg N per liter of gas. Gross energy output ranged from 1280 to 1633x10^6 J/day. Heat energy input ranged from 15 percent (summer) to 71 percent (winter) of gross energy output. Mixing energy ranged from 4.5 to 7.7 percent gross output. Boiler water circulation energy ranged from 6 to 2.4 percent of gross output. Net energy output ranged from 19 to 75 percent of gross but does not incude energy to load digester and dispose of the extra volume of manure due to dilution. (Converse - University of Wisconsin)

4770-A3, B2, C1, C2, C3, D3, E3
DAIRY LAGOON EFFECTS ON GROUNDWATER QUALITY

Agricultural Experiment Station, The University of Tennessee, Knoxville, Tennessee
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Paper No. 77-4050, American Society of Agricultural Engineers 1977 Annual Meeting, North Carolina State University, June 26-29 1977, 16 p. 5 fig., 4 tab., 6 ref.

Keywords. Tennessee, Dairy wastes, Holding ponds, Lagoons, Anaerobic conditions, Wastewater reuse, Flushing, Groundwater quality, Chlorides, Nitrates, Dissolved solids, Bacteria

At the West Tennessee Experiment Station, an anaerobic dairy lagoon system was put into operation in May, 1974; and the approximate loading rate has been 72.5 mg volatile solids/1/day. Water from the holding pond has been recycled for flushing the dairy lots since January, 1975. Seven test wells were installed near the system for obtaining water quality samples. Water-quality parameters for samples from the wells were evaluated for six months before loading the lagoon system and for two and one-half years afterward. Nitrate-nitrogen and chloride concentrations in groundwater near the lagoon rapidly increased during the six months immediately following system loading. Probably because of the development of effective seals in the lagoon and holding pond, No_3-N later tended to decrease to levels near those of the period prior to system loading. Median NO_3-N concentrations for all test wells were less than 10 mg/1. Fecal coliform and fecal streptococci were higher after system loading than before. Median fecal coliform counts after loading were 90 colonies per 100 ml sample. The highest concentrations were associated with high liquid levels in the holding pond. After three years, the primary lagoon has an approximate floating crust depth of 23 cm and a sludge accumulation of 10 cm. The holding pond has a total solids content of 2,550 mg/1, pH of 7.2 COD of 765 mg/1, NO -N concentration of 75 mg/1, and electrical conductivity of 4,500 micromhos/cm. During two years of recycling, chloride concentrations and electrical conductivity have increased markedly while total dissolved solids and NO -N have increased at a somewhat lesser rate. Recycling lagoon water for flushing has caused no noticeable adverse effects on dairy system operations. (Sewell - University of Tennessee)

4771-A2, B2, B4, E2
MODELING THE EFFECT OF MANAGEMENT POLICIES ON CATTLE FEEDLOT POLLUTION CONTROL COSTS

Department of Agricultural Engineering, Oregon State University, Corvallis, Oregon
R. M. McDowell, R. B. Wensink, and P. R. Miner
Paper No 77-4032, American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 25 p. 14 tab., 7 ref.

Keywords: Computer models, Feedlots, Runoff control, Management, Economics, Equipment, Design, Waste storage, Land disposal.

A computerized economic model was developed and used to estimate the cost of open feedlot runoff control systems. The model required market prices of equipment, service, land, and taxes, and the following basic engineering design parameters: feedlot area, design pumping rate, required storage volume, annual pumping days, total disposal land area, and single day's disposal area. The model generated investment and annual operating costs for standardized runoff control systems. Charges were estimated for hand move, side roll, big gun, and traveling big gun systems at seven locations in the United States. Budgets were developed for each system with five different pumping rates, seven management alternatives (with respect to the timing of disposal), and two disposal policies on 405, 4 05, 40.5 ha feedlots (symbolizing 200, 2,000 and 20,000 animal feedlots, respectively). Results indicate that economics of feedlot size exist in controlling runoff and that pumping capacity could not economically substitute for reservoir volume. At most locations, the all-year pumping policy produced the lowest cost; however, the additional cost associated with more restrictive management policies was not significant. The hand move irrigation system was the least expensive disposal system; big gun was second, followed by side roll and traveling big gun. At many locations, the cost differences were not significant for larger feedlot operations. Costs varied widely between geographic regions in the U.S., with the humid areas (Midwest and Southeast) costing more for runoff control than the more arid locations. (McDowell-Oregon State University)

4772-A3, A4, A8, B1, C2, E2
CONCEPTUAL MODELLING OF NONPOINT SOURCE POLLUTION FROM LAND AREAS RECEIVING ANIMAL WASTES: I. NITROGEN TRANSFORMATIONS

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K. R. Reddy, R. Khaleel, M. R. Overcash, and P. W. Westerman
Paper No. 77-4046, American Society of Agricultural Engineers, 1977 Summer Meeting, North Carolina State University, June 26-29, 1977, 43 p. 12 fig., 6 tab., 57 ref.

Keywords: Model studies, Land application, Agricultural runoff, Nonpoint pollution, Nitrogen transformations, Water pollution, Poultry wastes, Swine wastes, Cattle wastes, Volatilization.

Pollution of lakes and streams through surface runoff from the land areas receiving animal wastes are considered as one major nonpoint source pollution. In this paper N as a pollutant from these areas was discussed. The objective of the conceptual modelling was to describe the availability of N compounds in the surface soil layers of soil-manure system between the rainfall events, during the rainfall event, and N species to be transported in the surface runoff. Emphasis was placed on the effect of N transformation (major ones of importance considered were mineralization of organic N and NH_3 volatilization in the soil manure system) on the availability of N compounds at the soil surfaces. The model presented is based on a state-of-the-art approach, which describes the transformations and transport of the N compounds during the rainfall events and between the rainfall events. The model considers the C/N ratio approach to describe the availability of the potentially mineralizable N in different manures. From the results presented it can be concluded that 50 percent of the potentially mineralizable N present in the poultry and swine manures after the application to the soil, is made available (converted to inorganic forms) during first 3 weeks after application, whereas beef manure it took 4 months after application to decompose 50 percent of the potentially mineralizable nitrogen. Manures were also characterized based on their initial ammonium N concentration. It was observed from the data presented in the paper, that at least 90 percent of ammonium N initially present in the manures is lost through volatilization during first week after application. The factors influencing these two processes, namely, mineralization of organic N and NH_3 volatilization were also presented. (Reddy-North Carolina State University)

4773-B2, C1, C2, D3, E3
SOME MECHANICAL ASPECTS OF ANAEROBIC DIGESTION OF BEEF MANURE

Agricultural Engineering Department, Iowa State University, Ames, Iowa
M. E. Hein, R. J. Smith, and R. L. Vetter
Paper No. 77-4056, American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 42 p. 9 fig., 4 tab., 27 ref.

Keywords: Anaerobic digestion, Cattle wastes, Design, Recycling, Methane, Retention time, Loading rates, Temperature, Mixing energy, Nitrogen, Chemical oxygen demand.

Beef manure can be successfully digested anaerobically over a long period of time to produce methane if loading rate, retention time, temperature, and mixing energy are properly controlled. A maximum loading rate of 0.30 lb VS/ft^3 day (4.8 g VS/1 day) is recommended with a 10-day retention time for digesting beef manure. Lower loading rates are necessary for longer retention times. Beef wastes which are subject to nitrogen losses before entering the digester may be capable of higher loading rates and longer retention times to limit ammonia nitrogen concentrations below 1500 to 2000 mg/1. Beef wastes which are subject to nitrogen losses before entering the digester may be capable of higher loading rates and longer retention times. A COD reduction in the range between 35 and 45 percent, based on the COD of the methane, can be expected with digestion of beef manure, depending on loading rate and retention time selected. A gas production efficiency in the range between 12 and 20 ft^3 gas/lb COD reduced (0.75 to 1.25 1 gas/g COD reduced) with a CH_4 content of 45 to 55 percent can also be expected with beef manure digestion. The theoretical rate of CH_4 production from COD reduction (e.g., 6 ft^3 CH_4/lb COD, 0.375 1 CH_4/g COD) was low compared to actual measured values for beef manure conversion to methane; 7.0 to 9 7 ft^3 CH_4/g COD (0.44 to 0 61 1 CH_4/g COD). Failure to obtain realistic COD analyses may have in part contributed to the anomalous values of gas volume/unit of COD destroyed Inadequate mixing energy appears to initially create mechanical handling and control problems, which indirectly lead to biological failure. A mixing energy level of 2.5 hp/1000 ft^3 (66 W/m^3) is sufficient for mixing a 100 gal (3801) pilot-plant digester. A large reduction in the mixing energy level appears possible for larger digester units. Smaller farm-scale digesters for beef manure (e.g., less than 10,000 ft^3, 280 m^3) may best employ intermittent impeller mixing. Large units should probably use gas-recirculation mixing on a continuous basis. The heating energy required for an anaerobic digester unit is best estimated through theoretical calculations since the geometry, unit size and hydraulic retention directly determine this requirement. A large energy savings could be accomplished with a simple, reliable heat exchanger for recovering waste thermal energy from effluent slurry and preheating influent slurry Fixed-cover digesters with vented overflows are likely candidates for simple economical farm-scale use Moving slurries to and from the digester may prove difficult because manure solids settle so quickly. More long-term operating experience with full-scale digester units is needed before reliable design recommendations can be made (Hein-Iowa University, Merryman-ed.)

4774-B2, B4, E2, F1
A MIXED INTEGER PROGRAMMING MODEL FOR CHOOSING AN OPTIMAL SWINE MANURE HANDLING SYSTEM

Israel Institute of Technology, Haifa, Israel
I. Amir and J. R. Ogilvie
Paper No. 77-4029, American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 19 p. 4 fig., 3 tab.

Keywords: Computer models, Swine wastes, Management, Waste storage, Land applications, Costs.

A mixed integer programming model is presented for choosing, among many available feasible systems, an optimal manure handling system. The criterion for optimality is minimum annual operating costs of an entire system subject to capital, manpower and swine manure volume limitations. The results for 300, 500, 800, and 1,000 herd sizes and a post-optimal sensitivity analysis are presented No single swine manure handling system has been found to be the optimal one for all the herd sizes considered. However, a system comprising: full slotted floor for collecting the manure, underfloor tank for two months' storage, pumping the manure to underground tank and transporting for land application by transportation tanker was found to be the second best solution for all herd sizes. From an annual operations cost viewpoint, it has been found that a herd size of 300 head is significantly more expensive ($7.50 per head per year) than 500, 800, and 1,000 head herd sizes, the larger herd sizes have about the same annual operating cost per head of $7 00 per head per year. Systems comprising an irrigation network for liquid manure and a tractor loader and spreader for solid manure are significantly cheaper than other systems, but they have a lower stability factor. From an operations point of view, an endgate spreader seems to be inefficient for transportation and spreading Perhaps, transportation by another vehicle and spreading the manure by spreader might improve the land application stage enabling the usage of relatively cheap manure systems. No systematic relations have been found between operation cost and invested capital, invested capital and manpower and operating cost versus stability factor. This is, perhaps, the reason for the fact that no single manure handling system exists in practice. These unpredicted relations give rise to the importance of a general but reliable model which should be able to describe various conditions, to determine several best solutions and to analyze them for decision making. (Amir-Israel Institute of Technology; Merryman -ed)

4775-A6, A7
SIMPLIFIED DESIGN OF RIGID PLASTIC DUCTS FOR UNIFORM AIR REMOVAL FROM LIQUID MANURE PITS

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P. D. Bloome, J. E. Garton, and R E Punnett
Paper No 77-4040, American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 15 p. 3 fig , 3 tab , 11 ref.

Keywords: Design, Ventilation, Odor, Air pollution, Uniform-draw ventilation ducts, Equations.

Procedure for design of uniform-draw ventilation ducts is outlined as follows: (1) Choose the ventilation rate and length of pipe Example: 4 cfm (.37 m^3/min-m) and 60 ft (18.3 m). Q - 240 cfm (6.8 m^3/min). (2) Select a fan with this approximate rated capacity at a static pressure of 0.5 inch (1 27 cm) of water or 34.5 ft (10.5 m) of air. (3) Calculate area of various size inlet holes. (4) Find the discharge per hole for various size holes when the static pressure head if 25 ft (7.6 m) of air. (5) Find the approximate number of holes that would be required in each size. (6) Determine inside diameters and areas of 160 class plastic pipe. (7) Select the size of pipe which will give an exit velocity of about 20 ft/sec (6m/sec). (8) Find the Reynolds Number at the exit. (9) Calculate the friction factor. (10) Find the head loss due to friction assuming full flow for the full distance. (11) Find the actual head loss due to friction for spatially varied flow. (12) *Find the head loss due to velocity. (13) Find* total head loss. (14) Find the negative static pressure at the zero discharge (dead) end of the pipe. (15) Determine the general equation for negative pressure at distance X from the fan end of the duct. (16) Determine the desired intake volume per unit length of duct. (17) Assume the first pair of holes are 2 ft (.61 m) from the fan end. Find the negative pressure at X = 2. (18) Calculate the intake volume for the first pair of holes. (19) Determine the proper hole spacing to give the desired intake volume per unit of length. (20) Repeat 17, 18, and 19 for each pair of holes. (21) Complete a design table. (22) If all distances are reduced by 0.6 ft (0.4 m), the hole pattern will be centered in the 60 ft (18.3 m) space (23) Mark the holes according to the hole spacing schedule Drill 2 holes at each location Use a 1-inch hole saw to provide uniform holes Each of the holes will be oriented 30° below horizontal to the side of the duct to avoid drawing liquids into the duct (24) Mount the duct using non-corroding hanger materials. (25) Attach the fan to the duct. Where practical, a collar can be attached over the fan inlet and slipped inside the duct. Where these ducts will extend through foundation walls below grade, a small concrete annex may be provided with the fan mounted above to evaluate the annex A standard 90° elbow can also be used to bring the duct above grade. Equations are given for necessary computations (Merryman East Central)

4776-B1, F4
AGRICULTURAL WASTE MANAGEMENT IN NORTH CAROLINA

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Paper No 77-5005, American Society of Agricultural Engineers, 1977 Summer Meeting, North Carolina State University, June 26-29, 1977, 7 p. 3 ref.

Keywords: Agricultural wastes, Management, North Carolina

The department program and current activities are discussed Benefits of cooperative extension and research efforts to address local and national needs are reviewed. Interagency involvement with demonstration sites and field monitorings has enhanced work quality

and quantity and helped provide regulatory procedures which assist and encourage compliance. Opportunities for extension to provide feedback information from actual user experiences for competent and practical program direction are high-lighted. (Humenik - North Carolina State University)

4777-B2, D3, E3
EXPERIENCES FROM OPERATING A FULL SIZE ANAEROBIC DIGESTER

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H. D. Bartlett, S. Persson, R. W. Regan, and A. E. Branding
Paper No. 77-4053, American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 9 p. 1 fig., 1 tab.

Keywords: Anaerobic digesters, Design, Slurries, Biogas.

A 100 m^3 anaerobic digester for biogas production has been used for two winters (1976 and 1977) to process the gutter discharge from a 50-cow stall barn. The digester construction, slurry handling methods, heating systems and gas agitation system are described. The biogas generation system was filled with municipal sewage sludge for seeding in later December, 1976 and increasing daily increments of manure were added until the total manure production from the barn was supplied to the digester, twice daily, by the end of three weeks. By the end of January 1977, biogas production was sufficient to operate the boiler continuously. Thereafter gas in excess of the heating system needs was produced. However, gas leaks which developed in the dome have prevented accurate determination of the total gas production. A summary of the data on the biogas generator operation for the period February 1 to April 30, 1977 is presented in Table 1. Based on these data, the energy balance for February shows that gas production was in excess of heating needs by approximately 140,000 BTU/day - the equivalent of approximately 1 gallon of heating oil. However, estimates of gas production based on volatile solids reduction of the substrate indicate approximately 80 m^3/day instead of 62 m^3/day, which would yield a net excess energy production of approximately 521,000 BTU/day, Modifications to the dome are presently underway to make a complete seal in order to determine accurately the total gas production (Bartlett Pennsylvania State University, Merryman, ed.)

4778-A8, A11, B2, B5, C2, E2
ANAEROBIC BEEF SLURRY AS A FERTILIZER FOR BERMUDAGRASS AND BAHIAGRASS

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G. L. Newton, W. H. Marchant, and W. C. McCormick
Paper No. 77-2003, American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 14 p. 11 tab., 16 ref.

Keywords: Slurries, Cattle wastes, Land application, Crop response, Forage yield, Forage composition, Cattle gains, Performance.

This study was conducted to evaluate the use of surface applied liquid beef cattle wastes as a fertilizer on two species of Southern pasture grasses, Coastal bermudegrass and Pensacola bahiagrass. Two trials were used in order to obtain more precise information on the effects of using manure rather than chemical fertilizer on the two grasses. Results on forage yield and composition; animal performance, nitrogen utilization and available nutrients from the manure are presented, along with soil test data from the experimental pastures. It was tentatively concluded that, under some conditions, liquid manure may be as effective as chemical fertilizer supplying equivalent nutrient levels in promoting dry matter production by the two grasses and that cattle gains are not affected by the source of nutrients applied to the grass. This study was presented as a preliminary report on research that is in progress. (Bates - East Central)

4779-B2, D1, D3, E3
FIBER WALL REACTOR DIGESTION OF DAIRY CATTLE MANURE

Agricultural Engineering Department, North Carolina State University, June 26-29, 1977, 24 p. 10 fig., 11 tab., 13 ref.
D. D. Jones
Paper No. 77-4054, American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 24 p. 10 fig., 11 tab., 13 ref.

Keywords: Dairy wastes, Anaerobic treatment, Fiber wall reactors, Separation techniques, Loading rates, Detention times, Recycling, Methane.

The effect of a fiber wall in a digester to provide longer cell retention time was studied using screened dairy cow manure. The fiber wall units performed better than standard high rate units at detention times of 60, 30, 20, and 15 days, but the main benefit was at low detention times. (Jones - Purdue University)

4780-A8, E2
SOIL AND CROP CONSIDERATIONS FOR RECYCLING WASTES

USDA, ARS, NCR, University of Minnesota, St. Paul, Minnesota
W. E. Larson and J. R. Gilley
Paper No. 74-2540, American Society of Agricultural Engineers, 1974 Winter Meeting, Chicago, Illinois, Dec. 10-13, 1974, 27 p. 6 fig., 5 tab., 14 ref.

Keywords: Land application, Soil properties, Soil dynamics, Crop response.

Properly designed waste recycling systems require consideration of the properties of the waste, soil, and crop. The soil profile must be considered in its entirety. The hydraulic properties of the soil should allow rapid intake and transmission of water. Sufficient depth of the soil and underlying material should be present for interaction between waste components and soil. In most cases some topographic modification will be necessary to limit surface runoff. Soil chemical properties that enhance ion exchange and formation of insoluble precipitants are important. Crop considerations include the yield potential of the crop, amount of nutrients and elements taken up by the crop, adaptability of the crop to the conditions imposed by the waste, evapotranspiration, and insect and disease susceptibility under the conditions imposed by the waste. Climatic considerations include length of the growing season and length of season when wastes can be applied. As in the normal production of agronomic crops, land disposal of wastes requires basic soils information. However, because of the nature of the material being placed on the land and public reaction to it, the soils physical and chemical properties become even more important. Agricultural management practices have been developed to maximize economic production while minimizing inputs of fertilizer and water. However, under many waste application systems the objective is to maximize waste application to the land while preventing environmental contamination and still produce an acceptable crop yield. This requires considerable adjustments from the usual crop and soil management practices. As a body in which to incorporate wastes, the soil profile with all of its horizons must be considered in its entirety. The texture and structure of each horizon are important as it influences water, air, heat transmission, and root growth. The soil profile serves as a medium where microorganisms can oxidize large amounts of organic wastes and dissipate it largely as carbon dioxide and water. Because it is a multilayer system, and soil can, under some conditions, provide conditions for oxidizing nitrogen in the upper horizons and reducing conditions for converting nitrates to gases in lower horizons. Soils have the capacity to tightly absorb some chemicals and thereby prevent their transport. Soils can act as a filter for pathogenic organisms. The roots of plants as they grow through the soil can absorb plant nutrients and remove them from percolating waters. Guideline tables are given for soil limitations for accepting nontoxic biodegradable liquid wastes and nontoxic biodegradable sludges and solids. For intensive disposal systems the nature of the underlying rock must be considered. If the geologic material is unconsolidated soil-like material, it may further filter and absorb materials. Rock material that has relatively large channels such as certain igneous rocks or limestone with solution channels may not be an effective filter. (Larson-University of Minnesota; Merryman, ed.)

4781-A7, B4, C2
SWINE BUILDING AIR CONTAMINATE CONTROL WITH PIT VENTILATION

Agricultural Engineering Department, Texas Tech University, Lubbock, Texas 79409
W. Grub, E. P. Foerster, and L. F. Tribble
Paper No. 74-4532, American Society of Agricultural Engineers, 1974 Winter Meeting, Chicago, Illinois, Dec. 10-13, 1974, 3 p.

Keywords: Swine wastes, Gases, Slotted floors, Storage pits, Ventilation, Anaerobic conditions, Hydrogen sulfide, Ammonia, Carbon dioxide, Methane.

The positive removal of gases and atmospheric contamination from enclosed swine buildings is essential when slotted floors and storage pits are utilized. The collection and storage pits become the source of potentially

lethal quantities of certain toxic gases that are by-products of anaerobic decomposition. Unless exhausted directly out of the pit area by a fan system, these gases move by natural convection and air movement upward through the slotted floor into the room above. Tests were conducted in three fully insulated windowless steel buildings of the Texas Tech University swine research unit, all of which contained either partially or fully slotted floors. Air was exhausted from the test pits at rates of one to five cfm per square foot of slotted floor area. When a perforated duct was utilized, the air movement through the slotted floor was found to be uniformly downward over the entire slotted floor area. Tests were also conducted with a slotted floor in which a single fan exhausted air from the end of an eighty by forty pit. Downward air flow was uniform for 1/4, 5/8, and 1 inch slot widths at air flow rates of 4 to 5 cfm per square foot of slotted floor surface. In all tests, the continuous removal of gases from the pit area below the slotted floor prevented the accumulation of hydrogen sulfide, ammonia, carbon dioxide, and methane in the room air. The most positive ventilation of the pit occurred when air was exhausted downward through the slot at a velocity greater than 16 fpm. This turbulence caused erractic downward flow at air velocity rates in the slots of less than 16 fpm. (Merryman - East Central)

4782-A6, B2, B4, D1, E2, F1
MECHANICAL AERATION OF A WASTE DISPOSAL PIT

Area Agricultural Engineering Specialist, Higginsville, Missouri
L. V. Ellis and R. M. George
Paper No. 73-5545, American Society of Agricultural Engineers, 1973, 6 p. 2 fig., 4 ref.

Keywords: Manure pits, Waste storage, Aeration, Odor, Suspended solids, Land spreading, Costs.

A swine producer in Johnson County, Missouri has developed a system to aerate his manure pits in a swine nursery house. Initially he used a vane-type compressor pump from his liquid hauling wagon to pump air through polyethelyne lines installed at the center bottom of each pit. The pump was attached to the PTO of a tractor. The first trial resulted in greatly decreased odor and the solids in the pits being broken up and held in suspension. A second system was installed that used a vane-type compressor pump from a used milking machine unit. The final results of this experiment are not all known at this time. However, the producer feels the offensive odors have been greatly reduced in the pits, his building, and from the effluent when it is spread on his fields and there have been few complaints from neighbors when the effluent was spread on the fields. The producer feels that this is an economical way to aerate his manure pits. (Bates - East Central)

4783-A6, B1, B2, D1, D3, E1
SWINE HOUSING AND WASTE DISPOSAL RESEARCH AND DEVELOPMENTS

Research & Development Division, Farmland Industries, Inc., Kansas City, Missouri
G. Foree, O. Vanderslice, and D. Pfost
Paper No. 73-4510, American Society of Agricultural Engineers, 1973 Winter Meeting, Chicago, Illinois, Dec. 11-14, 1973, 7 p. 2 fig.

Keywords: Swine wastes, Waste disposal, Dairy wastes, Poultry wastes, Oxidation ditch, Bedding, Ventilation, Odor, Design, Aeration.

Swine housing facilities and waste disposal methods for Farmland Industries, Inc. Research and Demonstration Farm are discussed. The facilities include a 65 head dairy barn, a 270 head beef feeding barn, a 600 head swine unit, and a 3,000 head poultry unit. Design parameters are given. It was observed that: (1) Treatment of animal wastes by mechanical oxidation ponds appeared to be a practical method of maintaining an intensive livestock enterprise in close proximity to surburban residents. (2) Pit ventilation with variable-speed fans, combined with under-slat oxidation ditches, minimizes the "clinging odor problems" for operators of swine confinement units. (3) Using peanut hull bedding in conjunction with an oxidation ditch under a free-stall dairy barn, the ditch contents should be kept diluted to maintain the total solids content below the 3 percent level. Sterilized dried manure bedding or artificial mats in free stalls may offer a practical alternative to using peanut hulls or other coarse, granular bedding with oxidation ditches. (Merryman-East Central)

4784-B2, C2, D3, E3, F1
UTILIZATION OF METHANE FOR FARM PRODUCTION ENERGY: DISCUSSION

W. C. Fairbank
Paper No. 75-1072, American Society of Agricultural Engineers, 1975, 4 p.

Keywords: Cattle wastes, Dairy wastes, Recycling, Methane, New York, Feedlots, Equipment, Economics, Anaerobic digestion.

This is a discussion of a paper in which the total energy budgets for a typical 100-cow dairy and a 1000-head beef feedlot in New York are developed; the potential net methane energy that might be extracted by anaerobic digestion from the cattle waste is estimated; a positive on-farm energy self-sufficiency is suggested; the methods and equipment for utilizing energy in biogas are mentioned. Strength of this study are the analyses of total purchased fuel and electrical energy needed under typical New York farming conditions for a 100-cow dairy and a 1000-head capacity beef feedlot; and the theoretical biogas production from the total defecated wastes of those cattle. The authors seem to oversimplify the opportunities and equipment to effectively utilize recovered energy. A labor evaluation relative to operation of the digester and to work inefficiencies caused by added fuel handling inconveniences and very reduced engine output would be helpful. Not mentioned in the paper are hazards attendant to operation of a digester and use of the biogas. Toxicity and explosion potentials are real. These problems will undoubtedly have continuing bearing on the acceptance of biogas systems and should be of concern to all agricultural engineers. (W. C. Fairbank; Merryman-ed.)

4785-B1
VENTILATION OF TIE-STALL DAIRY BARNS IN ONTARIO

Agricultural Engineer/Food Producer, Glanworth, Ontario, Canada
R. G. Winfield
Paper No. 76-4526, American Society of Agricultural Engineers, 1976 Winter Meeting, Chicago, Illinois, Dec. 14-17, 1976, 10 p. 9 ref.

Keywords: Ventilation, Dairy industry, Porous ceiling concept, Design.

Except for very unusual circumstances, ventilation of tie-stall dairy barns in Ontario is the simplest challenge faced by persons involved in the design of ventilation systems for animal housing units. Very conventional cross-flow systems will do an effective job for fall-to-spring ventilation of most tie-stall dairy barns. The porous ceiling concept was developed to solve the specific problem of conserving animal heat while reducing relative humidity in the colder climate regions of Ontario. It has done that job effectively. (Winfield - Ontario)

4786-A3, B1, C2, C3
NONPOINT POLLUTION CONTROL FOR WINTERING RANGE CATTLE

Department of Agricultural Engineering, University of Idaho, Moscow, Idaho
J. E. Dixon, G. R. Stephenson, A. J. Lingg, D. V. Naylor, and D. D. Hinman
Paper No. 77-4049, American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 31 p. 4 tab., 49 ref.

Keywords: Cattle, Water pollution, Nonpoint sources, Barnlot-pasture operations, Range operations, Nutrients, Microorganisms, Agricultural runoff.

Slightly less than 50 percent of the cattle inventory of the United States is a part of the cow-calf portion of the beef industry. These cow-calf operations might broadly be classified as: (1) a barnlot-pasture operation, and (2) a range operation often involving confined wintering. Public Law 92-500 addresses itself to control of pollution from nonpoint sources with special emphasis for nonpoint source control beginning in 1977. The cow-calf operation as a whole and the wintering operation, particularly the range-type, fits the definition of a nonpoint source. (Some barnlots might be classified as a point source.) There are little data available concerning the wintering of the cow-calf operations as a nonpoint source of pollution. Data available indicate the range-type of confined wintering most probably will contribute little to the nutrient and chemical load of a stream. The operation very likely could contribute to microorganism contamination of the stream, however. The barnlot-pasture type of operation would very likely contribute all three types of pollutants to a stream. Microorganisms as a pollutant from range-type wintering operations might be overemphasized because they may be the only discernable pollutant from the operation. On the other hand, their direct effect on individual people can be quite severe, and there is a potential latent effect because, under some conditions, the microorganisms have an extended life in manure. There seems to be no data from which to directly prepare guidelines for management of cattle wintering operations to minimize nonpoint pollution. Using related data, it seems a prime management factor would be to minimize erosion and sediment load which would also lower nutrient losses. Based on data from feedlots, it might be expected that

the characteristics of the hydrological event will influence the loss of pollutants to a greater extent than the slope of the land or the density of cattle. Furthermore, winter conditions involving snowfall and thawing will most likely add more to the pollution load of streams from cattle winter operations than rainfall and summer-like conditions. When evaluating a cattle wintering operation as a potential nonpoint source, the background or "natural" pollution load should be considered. Furthermore, the evaluation of data from samples of runoff from these areas and nearby streams needs to consider the location of the sampling point in relation to the source, the dilution of pollutants, and the sampling time in relation to the hydrograph. Space allocation of cattle in wintering can range from 0.15 to 51 square meters/kilogram of live animal weight. A realistic range of values for the dry manure defecated upon these wintering areas might be 0.36 to 123 metric tons/hectare. The concentration and quantity of pollutants from cattle wintering areas is not known. (Dixon-University of Idaho; Merryman-ed.)

4787-B2, C2, D3
UNAERATED LAGOON RESPONSE TO LOADING INTENSITY AND FREQUENCY

Department of Biological and Agricultural Engineering, North Carolina State University, Raleigh, North Carolina 27607
E. S. Howell, M. R. Overcash, and F. J. Humenik
Paper No. 74-4514, American Society of Agricultural Engineers, 1974 Winter Meeting, Chicago, Illinois, Dec. 10-13, 1974, 33 p. 18 fig., 9 tab., 15 ref

Keywords: Lagoons, Laboratory anaerobic reactors, Swine wastes, Loading rates, Chemical properties.

A study was made of the response of 14-liter laboratory anaerobic reactors to loading rates of 1.2 SCS, 4.8 SCS and 10.8 SCS and loading frequencies of once per week, twice per week, thrice per week, once per two weeks, and quasi-continuous. It was found that: (1) There is some advantage in improved biological activity to loading anaerobic swine lagoons on a continuous or nearly continuous basis. Concentrations of pollutional parameters were lower for the 14-liter laboratory reactor loaded at the reference rate on a quasi-continuous basis than for the reactor loaded once per week at the same rate. (2) There was no significant difference in supernatant concentration levels or amount remaining in the sludge for laboratory reactors at the reference rate for loading frequencies of once per week, twice per week, thrice per week, and once per two weeks. (3) The quality of effluent is significantly affected by loading rate, and concentration levels of all pollutional parameters increase as the loading rate increases. (4) Caution should be exercised when transferring sludge buildup data from laboratory and pilot scale reactors to actual field situations. (5) A 14-liter laboratory reactor at 10.8 times the reference rate was drastically overloaded, therefore biological activity and settling were restricted. (Howell-North Carolina State University; Merryman-ed.)

4788-A7, A11, A12, B1, C3
SALMONELLA AND OTHER MICROORGANISMS POSE A NEW PARAMETER TO DESIGNERS OF POULTRY HOUSES

Farm Electrification Research Branch, University of Minnesota, St. Paul, Minnesota
W. A. Junnila, K. A. Jordan, M. C. Kumar, and B. S. Pomeroy
Paper No. 71-429, American Society of Agricultural Engineers, 1971 Annual Meeting, Washington State University, June 27-30, 1971, 9 p. 5 ref.

Keywords: Poultry houses, Design, Animal health, Public health, Marek's disease, Salmonellosis, Vectors, Air pollution.

The disease problem in present day poultry operations is a serious one. From 10 to 15 percent of the replacements started are lost by the time they are ready to lay and an additional 20 percent die during the first laying year. Ninety-five percent of the chicken broilers started reach market. Recently, Marek's disease has become critical. Diseases hazardous to man are also of concern. Salmonellosis is considered currently to be the most important of the zoonotic diseases, since it affects more people than any other disease of this type. Salmonella control is no easy matter. Salmonellae survive a long time in external environments. In designing poultry houses, the engineer must keep exposed structural members to a minimum. In a study concerning the permeability of various poultry house interior linings to microorganisms and decontamination practices, it is believed that after 4 years *Salmonella typhimirium* has been eliminated from one poultry house on the experimental farm. The interior surfaces were lined with exterior plywood. Floors were of concrete. A two-part resin was applied as a complete envelope to the interior surfaces. The electrical wiring was thin-wall conduit with standard type boxes. All junction boxes were taped with plastic electrician's tape and controls were wrapped with plastic sheeting. A strong disinfectant was applied with a high pressure spray gun. It took three washdowns with the sprayer along with hand-brushing of the interior surfaces. The characterization of air as a vector in the transmission of disease in poultry houses has also been studied and it has been found that the bacteriological content is initially low in buildings which have been cleaned and rises as the poults grow, either reaching a maximum at the end of the experiment or reaching a maximum and decreasing to some lower level. It is suspected that environmental and litter conditions determine the pattern of bacteriological development and testing procedures have been initiated which should allow such a coorelation. A present attempt is being made to relate the environmental factors to the growth pattern as found within a poultry structure. Thus, samples are collected and analyzed, and litter moisture content, temperatures and dew points are being recorded throughout the day. (Merryman - East Central)

4789-E3
'RED WIGGLERS': TURN WORMS TO PROTEIN SUPPLEMENT: RESEARCHERS.

Feedstuffs Southeastern Correspondent
R. H. Brown
Feedstuffs, V. 49, No. 52, p. 24, Dec. 19, 1977.

Keywords: Feeds, Recycling, Worms, Protein, Design, Organic wastes, Liquid wastes.

Red wiggler worms may have some potential as protein for livestock and poultry feeds say some researchers probing into the possibilities at Ft. Valley (Ga.) State College. Live earthworms are 10 percent protein, or 60 percent protein on a dry matter basis. If they can be grown in large quantities and processed into a protein supplement similar to soybean meal and fish meal on an economical basis, they could be a marketable product for the feed industry. Earthworms thrive in large numbers in any moist, neutral soil medium containing one-third decayed organic matter such as peat moss, manure, leaf compost, peanut hulls and other plant byproducts. To get volume, a grower should use a long rectangular bed of convenient width made of concrete blocks or wood on the ground. Sides of the bed do not need to be higher than 10 inches. The worms may be fed corn meal, screenings, chicken mash feed, cottonseed meal, etc. The Ft. Valley workers are playing with a pilot automated system for raising the worms as a protein supplement using liquified animal waste as the sole source of feed. A prototype mechanical harvester which could dig the worms out of the beds in sufficient quantities and at an economical cost is under construction. (Merryman - East Central)

4790-B3, C2, E3
THE VALUE OF DRIED POULTRY WASTE AS A FEEDSTUFF IN BROILER DIETS

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A. R. El Boushy and F. W. A. Vink
Feedstuffs, V. 49, No. 51, p. 24, 26, Dec. 12, 1977. 5 tab., 21 ref.

Keywords: Refeeding, Dried poultry waste, Broilers, Performance, Nutrients.

An experiment was conducted to determine the effect of dried poultry waste (DPW) on broilers till six weeks of age. Dehydrated poultry waste, which may vary widely in composition and nutrient value depending on type of ration, age and type of birds, extent of feed spillage, quantity of feathers present, and age of choppings before drying temperature and duration, was fed in five levels from 5 to 15 percent compared with a basal ration. All rations were formulated on an isocaloric, isonitrogenous, constant methionine and lysine percent and a constant Ca to P ratio. At concentrations up to 15 percent of DPW, a slight decrease in body weight, growth and a slight increase in feed consumption were observed. Feed efficiency was significantly depressed with increasing concentrations of DPW. DPW was found to be a reasonable feedstuff as N-source. Its protein content is rather low, but methionine and lysine content is acceptable. Five percent DPW seems to be a reasonable addition in broiler rations with no harmful effects. Factors encouraging the use of properly treated DPW include the following: (1) DPW contains undigested feed, metabolic excretory products and residues resulting from microbial synthesis. (2) It contains microorganisms, which convert some to the uric acid in the poultry excreta into microbial protein, which can then be utilized by the fowl, (3) It is well known that it provides an unknown growth factor, (4) It contains some true protein besides the non-protein nitrogen, (5) Its use will reduce pollution. (Merryman - East Central)

4791-B3, C1, C2, E3
RECYCLED POULTRY WASTES OFFER MORE POTENTIAL TO COW-CALF OPERATORS

Feedstuffs Southeastern Correspondent
R. H. Brown
Feedstuffs, V. 49, No. 50, p. 5, 35, Dec. 5, 1977.

Keywords: Refeeding, Poultry wastes, Litters, Brood cows, Nutrients.

Recent winter conditions and droughts have caused many feeders to look at some by-product with which to feed cattle. Recycled poultry wastes seem to offer one solution. Such wastes offer more potential for brood cows than as a material for feeding finishing beef cattle. R. H. Stricker, Rocco Foods, Harrisonburg, Virginia, sees poultry litter as a winter ingredient to help alleviate shortages of other commodities. He also sees it as a tool to lessen the cost of backgrounding feeders. The TVA has done some analysis on a dry matter basis and has found ranges from 60 to 84, and total digestible nutrients varied from 26 to 64. Protein varied from 13 to 31 percent. TVA suggests that management needs to start trying to produce material that is more uniform if such materials are to be used as feed ingredients. (Merryman - East Central)

4792-A6, A7, F2
HOW AIR POLLUTION REGULATIONS AFFECT AGRICULTURAL OPERATIONS

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D. E. Durst
Paper No. 76-3540, American Society of Agricultural Engineers, 1976 Winter Meeting, Chicago, Illinois, Dec. 14, 1976, 14 p.

Keywords: Air pollution, Regulation, Odor, Agriculture.

Air pollution regulations are discussed in terms of direct agricultural production and agricultural-related industries. Pollutants which are regulated in direct agricultural production include dust emissions from animal feeding and grain harvesting operations and fugitive dust created by tilling. Odors also are considered an air pollutant under some air pollution laws and the control of odors, in connection with confined animal feeding operations, presents a very serious problem in some areas. Two schemes for development of air pollution control regulations are: (1) the development of new source emissions standards, and (2) the approval or promulgation of State Implementation Plans designed to attain and maintain National Ambient Air Quality Standards. Specific examples of air pollution regulations are given. (Merryman - East Central)

4793-E3, F2
ANIMAL WASTE FEEDING GUIDES SET FOR STATES

Feedstuffs Southeastern Correspondent
R. H. Brown
Feedstuffs, V. 49, No. 48, p. 1, 34, Nov., 21, 1977.

Keywords: Refeeding, Processed animal wastes, Regulations, Guidelines.

The Association of American Feed Control Officials' committee on recycled animal waste regulations has completed a first draft of model regulations to be presented and recommended at the AAFCO session next August. These model regulations are designed to promote uniformity among the various states in the process of drawing regulations, especially for poultry waste, although the regulations cover any other recycled material designed for commercial channels. The regulations would be applicable only to the commercial sale of recycled material and would exempt farmers who feed waste from their own farms to animals and poultry. Under terms of the model regulations, a product must be of specified quality and uniform composition, safely labeled for proper use under the quality control of the manufacturer and with distribution controls. Of major concern are drug residues, pesticides, mycotoxins, bacteria contamination and heavy metals--especially mercury, copper, selenium, cadmium and arsenic, many of which are used in animal feeds for specific reasons. Strict adherence to a 15-day withdrawal period is important to provide a "clean" product for marketing. The model regulations define the following products in very specific terms: dried poultry waste, dried poultry waste--NPN extracted, dried poultry litter, dried ruminant waste, dried swine waste, undried processed animal waste product and processed animal waste derivative. The processed animal waste product should carry warning and caution statements, and manufacturers would need to keep close records of where the product is distributed for follow-ups in the event of contamination. (Merryman - East Central)

4794-A3, A5, A8, B1, C2
ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS

Department of Agricultural Engineering, University of Florida, Gainesville, Florida
K. L. Campbell, D. A. Graetz and R. A. Norstedt
Paper No 77-4048, American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 14 p. 4 fig., 1 tab., 4 ref.

Keywords: Cattle, Management, Pasture, Semi-confinement, Confinement pens, Flatwoods soils, Lagoons, Agricultural runoff, Soil water movement, Groundwater pollution, Chemical properties.

With today's trends toward more intensified use of land for animal production, the overall environmental impact of more intensified animal production techniques must be examined. In this study, beef cows and their calves were produced at the following stocking rates: (1) pasture (5400 m^2 per cow-calf unit), (2) semi-confinement (680 m per cow-calf unit), and (3) confinement (18.6 m^2 per cow-calf unit). A natural forest area also was included in the study for comparison with the other systems. All three production systems, as well as the forest area, were on sandy, high-water-table flatwoods soils. Cattle in the confinement system were on concrete while the others were on bahiagrass - white clover pasture. Wastes from the confinement system were handled by a combination retention basin - lagoon. Runoff from the other systems was through natural drainage-ways. Water quality measurements from the four study areas included chemical oxygen demand, pH, specific conductivity, and forms of nitrogen and phosphorus. Hydrologic measurements included precipitation, evaporation, surface runoff, water table levels, and lateral groundwater movement around the lagoon. Water quality was measured in surface runoff, soil solution, and groundwater. Losses of nutrients in surface runoff from the study areas were minimal throughout the two-year period due partially to low rainfall. Nutrient concentrations in runoff also were relatively low. Soil solution and groundwater quality were very similar in the pasture and forest areas. Soil solution and groundwater quality also were very similar in the semi-confinement area except for a nitrate buildup in the top 1.2 m. No significant water quality changes were observed in the confinement area during the study. No serious water quality impacts are apparent from this study; however, the semi-confinement area especially needs further study under more normal precipitation conditions to determine if water quality problems are likely to occur. (Campbell - University of Florida)

4795-B2, C1, C2, D3, E3
ANAEROBIC DIGESTION OF SCREENED DAIRY CATTLE WASTE USING A FIBER WALL REACTOR

D. D. Jones
Ph.D. Dissertation, Department of Agricultural Engineering, Purdue University, May, 1976, 206 p. 62 fig., 53 tab., 100 ref.

Keywords: Anaerobic digestion, Fiber wall reactors, High rate digesters, Design, Detention times, Performance, Volatile suspended solids, Methane, Recycling.

Digestion of cattle waste in a fiber wall reactor (FWR) was compared to digestion in a conventional high rate digester (HRD). The fiber wall reactor concept employs a porous membrane which acts as a site for bacteria growth. The experimental design consisted of a 2 x 4 factorial design with the two digester types as the first factor and four detention times of 60, 30, 20, and 15 days as the second factor. Best performance, for both types of digesters, occurred at detention times of 30 and 20 days. Gas composition averaged 62 percent methane for both digester types. Gas production from the FWR units averaged 0.42 m^3/kgVSS added over the range of detention times tested while the HRD units averaged 0.34 m^3/kgVSS added. Volatile suspended solids reductions averaged 83.5 percent in the FWR units over the range of detention times studied while the HRD units averaged 50.6 percent reduction of the VSS added. Reduction in VSS decreased as detention time was lowered in both digester types. FWR units were significantly more effective in breaking down organic matter and in gas production than were the HRD units. Performance of FWR units at low detention times and in response to changes in detention times was much better than for the HRD units. (Merryman - East Central)

4796-B2, B4, C2, E2
LET SWINE WASTES CUT YOUR FERTILIZER BILL

J. Hudson
Progressive Farmer, V. 93, No. 1, p. 50, 71, Jan., 1978. 1 fig.

Keywords: Swine wastes, Waste storage, Underfloor pits, Lagoons, Nutrients, Land application.

While many swine producers don't have the manpower to spread manure or the land to spread it on, utilization of stored swine wastes is to be encouraged if such use is practical. Swine wastes taken from an underfloor pit can range in value from $6 to $10 per 1,000 gallons. As important as getting the manure onto the land is knowing the nutrient content of the waste. Stored wastes should be analyzed regularly. Depending on the storage system used, some wastes retain nutrient values longer than others. About 20 percent of the nitrogen is lost from wastes stored in underfloor pits, while over 50 percent may be lost from lagoon storage. Nearly all of the phosphorus and potassium is retained in pig storage, but about 90 percent of the phosphorus and 25 percent of the potassium is lost when using lagoon effluent. When applying wastes, it is a good idea to leave a grass buffer strip between a stream and the lower edge of any field on which waste is applied. Wastes should be applied to the surface only on cool, dry days, in the morning when the air is warming and rising. Odors may be reduced if the wastes are injected into the surface 8 to 10 inches of soil, covering the injection slit immediately. Applications should be scheduled early in the week. Applications should be done as far away from and as out of sight of neighbors as possible. Added benefits of applying swine waste to farmland are the improved water-holding capacity of the soil and the reduction of erosion. (Merryman East Central)

4797-A2, B2, B4, B5, E2
THEY TRAP EVERY DROP OF RUNOFF

F. D. Phillips
Progressive Farmer, V. 92, No. 12, p. 14, Dec., 1977. 2 fig.

Keywords: Feedlot runoff, Waste storage ponds, Land application, Sprinkler irrigation, Crop response, Grasses, Fescues, Corn Sorghum.

C. E. Neill and son Joe near Vinita, Oklahoma, have found a way to make runoff pay big dividends. Beginning in 1968, the Neills began constructing waste storage ponds below the feedlots to trap the runoff water and wastes. In 1972 they completed the ninth pond for a total storage capacity of 100 acre-feet. Drainage from 86 acres is caught by these nine ponds. This waste water is spread over 90 acres of bermuda and fescue pasture by a traveling sprinkler irrigation system. Having fescue in the pasture facilities year round irrigation. In the spring of 1977, the Neills stocked the 90 acres with 158 500-pound heifers and still cut 200 tons of grass for feedlot use. Manure is spread on nearby corn and sorghum land when the lots and ponds are cleaned out. The manure-treated land has produced from 17 to 20 tons of corn and sorghum silage per acre compared with 12 tons per acre on nearby areas where manure is not used. (Merryman-East Central)

4798-A8, B1, B5, C2, E2
TOP YIELDS FROM ANIMAL WASTE

T. Curl
Progressive Farmer, V. 92, No. 12, p. 24, Dec., 1977. 1 fig.

Keywords: Dairy wastes, Sewage sludge, Fertilizers, Land application, Crop response, Soil properties, Nutrients.

University of Tennessee researchers recently completed a 3-year study that compared land applications of dairy waste, city sewage sludge, and fertilizer. Top yields (more than 22 tons of silage per acre - at 70 percent moisture) came from manure applied at a rate of 16 tons per acre for three years. The sludge produced 17.5 tons, and commercial fertilizer (at 150-80-80) produced 19 tons per acre. This past summer, no manure, sludge or fertilizer was applied in order to find out just how much fertility the soil would retain. All three plant food treatments produced similar yields. Areas treated with dairy wastes had better soil tilth and water-holding capacity. It is recommended that farmers should apply about 16 tons of waste per acre (dry matter basis) -- about 40-50 tons of fresh dairy manure. The manure should be incorporated into the soil as soon after application as possible. Heavy application on slopes should be avoided. In a three-year study at the USDA research center at Bushland, Texas, scientists found that 10 tons of manure annually equalled about 250 pounds of anhydrous ammonia on a Pullman clay soil. Manure is about 80 percent as valuable as commercial fertilizer on the basis of phosphate and 90 percent as valuable on the basis of potash. Value of the waste should be based on crop needs, not on nutrients in the waste. (Merryman - East Central)

4799-A11, B1, C3
STUDIES ON THE SURVIVAL OF *SALMONELLA TYPHIMURIUM* AND *SALMONELLA BOVIS-MORBIFICANS* ON SOIL AND SHEEP FAECES

Department of Microbiology, University of Otago, Dunedin, New Zealand
G. W. Tannock and J. M. B. Smith
Research in Veterinary Science, V. 13, p. 150-153, 1972. 2 tab., 8 ref.

Keywords: Salmonella, Animal health, Sheep wastes.

Ennumeration of salmonellae (*Salmonella typhimurium* and *S. bovis morbificans*) on experimentally inoculated plots containing soil or sheep faeces under various climatic and environmental conditions, suggests that survival is greatest where the organisms are protected from the direct action of sunlight, and where organic material is present. In all situations, a decline in the number of viable salmonellae present was observed. (Tannock-University of Otago)

4800-B2, C2, D3, E3, F1
METHANE ON THE MOVE: A DISCUSSION OF SMALL ANAEROBIC DIGESTERS

S. Schellenbach, W. Turnacliff, F. Varani, J. L. Burford, Jr., S. B. Don, and D. M. Updegraff
Final Report to Four Corners Regional Commission, Technical Assistance Grant FCRC 651-366-075, Bio-Gas of Colorado, Inc. and Colorado Energy Research Institute, March, 1977, 95 p. 6 fig., 15 tab., 12 ref.

Keywords: Methane, Anaerobic digesters, Mobile units, Design, Economics, Feasibility studies.

This report is a discussion of small anaerobic digestion units, stimulated by experiments operated by Bio-Gas of Colorado. A grant from the Four Corners Regional Commission to the Colorado Energy Research Institute enabled Bio-Gas to build a 12 to 50 cow digestion unit on a trailer which could be pulled by a tractor to 19 different demonstration sites in Colorado, New Mexico, Arizona, Utah and Nevada. During this same period, Bio-Gas conducted laboratory experiments to determine yield coefficients of different manures and defined parameters to evaluate the economic feasibility of building digesters on a small or self-sufficiency scale. The report contains three separate discussions. First, it describes the mobile digestion unit of 6,000 gallons with its start-up phases, operation, production and problems. Secondly, a discussion of the tour and a summary of the Journal in the Appendix tell how the digester performed and how it was received among the people who came to see the demonstration. Finally, the report includes designs for four different sizes of digesters based on data collected from the mobile unit, the tour and the laboratory, along with an order blank for shop drawings. A series of design tables which let interested persons easily size a digestion system and tailor it to their specific needs are included. These tables estimate gas production from a variety of manures and system sizes so the economics of the system can be studied. In "site specific" instances where energy use and price are both high and the available manure has a good gas yield, an energy producing digestion system can be justified on an economic basis. A general discussion about the national gas pricing system fits this digester design into a broader economic picture. (Schellenbach)

4801-A10, B1
INFLUENCE OF AVAILABLE POULTRY MANURE BREEDING HABITAT ON EMERGENCE DENSITY OF SYNANTHROPIC FLIES (DIPTERA)

Division of Biological Control, Citrus Research Center, Riverside, California 92502
E. F. Legner and W. R. Bowen
Annals of the Entomological Society of America, V. 66, No. 3, p. 533-538, 1973. 7 fig., 1 tab., 15 ref.

Keywords: Poultry wastes, Flies, Breeding habitats.

Larger areas of available breeding habitat produced significantly lower average densities of 6 synanthropic fly species: *Muscina stabulans* (Fallen), *Fannia canicularis* (L.), *F. femoralis* Stein, *Ophyra leucostoma* (Wiedemann), *Stomoxys calcitrans* (L.) and *Phaenicia* spp. on 12 poultry ranches with 2 management systems over the greater part of 20 months. The common house fly, *Musca domestics* L., generally developed significantly higher average densities on the larger ranches. These responses are related to the species relative dependence on humans for existance. (Legner - Citrus Research Center)

4802-B2, C2, D2, D3, E3
STUDIES ON LIVESTOCK EXCRETA DISPOSAL BY METHANE FERMENTATION. I. BASIC EXPERIMENT ON CONDITIONS OF FERMENTATION

Department of Animal Hygiene, Nippon Veterinary and Zootechnical College, Tokyo, Japan
S. Kamata and K. Uchida
Bulletin of the Nippon Veterinary and Zootechnical College, V. 21, p. 79-83, 1972. 3 fig. 4 tab., 15 ref.

Keywords: Swine wastes, Mesophilic fermentation, Thermophilic fermentation, Chemical properties, Methane.

Samples were collected from the feces of swine which had been fed a mixed ration. They were not filtered, but were diluted three times. Each sample was mixed and stirred by the mixer for 15 minutes. Then it was pulverized perfectly and used for an experiment on continuous methane fermentation. The following results were obtained. 1. In the mesophilic fermentation, the volume of gas produced showed a tendency to increase about the 10th day. It amounted to 600-700 ml/d about the 15th day. 2. In the thermophilic fermentation, the volume of gas produced showed a tendency to increase about the 8th-9th day, amounting to 600-900 ml/d about the 15th day. 3. The gas produced in the mesophilic and thermophilic fermentation was analyzed for composition. The contents of CH and CO were 71-86 percent and 13-29 percent, respectively. 4. The mesophilic fermentation made it possible to remove 82.0 percent of the COD and 84.4 percent of the BOD when 50 ml/d of sample had been inoculated. 5. The thermophilic fermentation made it possible to remove 72.6 percent of the COD and 87.0 percent of the BOD when 500 ml/d of sample had been inoculated, and 67.1 percent of the COD and 75.2 percent of the BOD when 75 ml/d of sample had been inoculated. 6. The mesophilic and thermophilic fermentation made it possible to remove 43.0 percent and 44.7 percent of the solids, respectively. (Kamata-Nippon Veterinary and Zootechnical College) (Article is written in Japanese)

4803-B2, C2, D2, D3, E3
STUDIES ON LIVESTOCK EXCRETA DISPOSAL BY METHANE FERMENTATION. II. OPTIMUM LOAD AND COMPARISON BETWEEN MESOPHILIC AND THERMOPHILIC FERMENTATION.

Department of Animal Hygiene, Nippon Veterinary and Zootechnical College, Tokyo, Japan
S. Kamata and K. Uchida
Bulletin of the Nippon Veterinary and Zootechnical College, V. 21, p. 84-92, 1972. 9 fig , 6 tab., 11 ref

Keywords. Swine wastes, Mesophilic fermentation, Thermophilic fermentation, Optimum load, Performance, Methane.

Samples were collected from the feces and urine of swine raised on a mixed ration. Three of them were of untreated feces and urine. Another three of them were of unfiltered feces, a mixture of unfiltered feces and urine (1:1), and a mixture of feces and urine filtered through an 0.5 mm filter. The aim of this investigation was to compare the continuous mesophilic methane fermentation and the continuous thermophilic methane fermentation experimentally, and examine the adaptation load of the mesophilic and thermophilic methane fermentation. The results obtained are summarized as follows. 1. The volume of gas produced was compared between the mesophilic and thermophilic methane fermentation. In the case of unfiltered feces, the thermophilic methane fermentation was more effective than the mesophilic. The difference in volume of gas produced between the thermophilic and the mesophilic fermentation was 20-30 ml/d when the amount of organic matter was within 4-7 g/l/d. In the case of unfiltered feces and urine, the thermophilic methane fermentation was superior to mesophilic methane fermentation over the first half period of methane fermentation (the amount of organic matter being 1.2-3.62 g/l/d). The mesophilic methane fermentation, however, was superior to the thermophilic over the second half period (the amount of organic matter being 3.662-6.643 g/l/d). 2. The removal for COD and BOD was determined in the mesophilic methane fermentation. It was 93.2 percent for COD and 94.4 percent for BOD when unfiltered feces had been tested. It was 90.7 percent for COD and 92.8 percent for BOD when unfiltered feces had been tested. It was 90.7 percent for COD and 92.8 percent for BOD when a mixture of unfiltered feces and urine (1.1) has been tested. 3. The removal ratio for COD and BOD was determined in the thermophilic methane fermentation. It was 90.3 percent for COD and 94.4 percent for BOD when unfiltered feces had been used. It was 85.7 percent for COD and 95.3 percent for BOD when a mixture of unfiltered feces and urine has been used. 4. The adaptation load was determined for the mesophilic and the thermophilic methane fermentation. Judging from the pH value, the volume of gas produced per gram of organic matter, and the removal ratio of COD and BOD, the amount of organic matter was 6-7 g/l/d for unfiltered feces and 4-5 g/l/d for a mixture of unfiltered feces and urine in the mesophilic methane fermentation. It was 7-8 g/l/d for unfiltered feces and 5-6 g/l/d for a mixture of unfiltered feces and urine in thermophilic methane fermentation. 5. From the results mentioned above, it is concluded that the treatment of swine feces and urine which must be done at reasonable cost can be carried out by the mesophilic methane fermentation. (Kamada-Nippon Veterinary and Zootechnical College)

4804-A3, A4, A5, A8, B1, C2, E2, F1, F2
DIFFUSE AGRICULTURAL POLLUTION: THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS

Schneider, R. R.
Ph.D. Thesis, Department of Agricultural Economics, University of Wisconsin, 1976, 190 p. 29 fig., 57 tab., 67 ref

Keywords: Water pollution, Groundwater pollution, Land spreading, Agricultural runoff, Sediments, Nitrates, Regulation, Economics, Wisconsin, Dairy industry.

The study examines policies designed to curtail 3 types of diffuse agricultural pollution, namely, 1. runoff from winter-spread manures; 2. sediment in rill and sheet erosion; 3. nitrate pollution of the ground water resulting from field-applied manure and chemical nitrogen. Policies tested on 4 farm sizes at 4 locations are: 1. enforce Wisconsin's Model Sediment Control Ordinance; 2. prohibit manure spreading in winter; 3. prohibit winter manure spreading on sloped land; 4. prohibit winter manure spreading close to streams, lakes and open ditches; 5. restrict excess of applied nitrogen over estimated plant uptake of nitrogen; 6. combine 1, 3, 4 and 5 above; 7. combine 1, 2, and 5 above; 8. restrict average total sediment yield. Effects of these policies in the glaciated and unglaciated regions of the state are explored. Estimation of appropriate data for the economic analysis (partial competitive equilibrium) is an integral part of the study. Marginal cost of pollution reduction is calculated for each policy and a cost curve is generated for a sediment policy on selected farms. Data include physical quantities of pollutant reduction. Major conclusions are: 1. Sediment limit should be differentiated by region; 2. Sediment limits based on ton/acre/farm is superior to ton/acre/field; 3. Nitrate pollution from manure and chemicals is unlikely to be a major problem in Wisconsin; 4. Assuming compliance, the restriction of winter-spread manure to slopes of 4 percent or less is superior to complete prohibition of winter spreading. (Water Resources Scientific Information Center)

4805-B2, C2, D1, E2, E3
DESIGN AND DEVELOPMENT OF A SEPARATOR FOR BOVINE MANURE

R. E. Bos
M.S. Thesis, Department of Agricultural Engineering, The Pennsylvania State University, Nov., 1976, 45 p. 5 fig., 14 tab., 27 ref.

Keywords: Separation techniques, Equipment, Cattle wastes, Slurries, Moisture content, Nutrients, Odor, Refeeding, Fertilizers.

Study objectives were: (1) To design and develop equipment to separate the fibrous cellulose material from the liquid phase of bovine manure slurry and to dewater the solids enough to prevent seepage of water from the solids phase. (2) To evaluate the machine under various operating conditions to find the range of optimum performance. (3) To evaluate the solids and the liquid for their respective plant and animal nutritional values. A vibrating screen alone did not remove sufficient water to prevent seepage of liquid from the solids separate. A two-stage separator, consisting of a vibrating screen in conjunction with a porous belt conveyor and press rolls, was developed. The resulting fibrous separate had a moisture content of approximately 75 percent and was free of seepage and odor problems. It dried quickly at room temperature. The following conclusions were drawn from the investigation: (1) The d'Arcy equation was inadequate as a model for dewatering manure slurries. (2) Dewatering by means of compression was impractical without prior removal of fine particles. (3) Vibration separation means can only be expected to increase the dry matter content of the solids separate to about 10 percent. (4) Dilution rates of 1:1 manure and water provided optimum consistency for effective flushing of fines. (5) The fibrous separate was too low in nutrient value, and the liquid separate was too low in dry matter to be

considered practical for refeeding. (6) Most of the crop nutrient value was in the liquid separate. (Merryman - East Central)

4806-A1, A6, B2, B4, C1, C2, D1, D3, E2
A POLLUTANT AND NUTRIENT BUDGET FOR A SURFACE-AERATED DAIRY STORAGE LAGOON

Department of Animal Sciences, Washington State University, Pullman, Washington, 99164
R. E. Hermanson, M. H. Ehlers, and D. F. Bezdicek
Paper No. 77-4570, American Society of Agricultural Engineers, 1977 Winter Meeting, Chicago, Illinois, Dec. 13-16, 1977, 21 p. 1 fig., 7 tab., 33 ref.

Keywords: Dairy wastes, Lagoons, Waste treatment, Waste storage, Chemical properties, Physical properties, Land disposal, Irrigation.

The concentrations of waste parameters in the lagoon influent from 65 lactating dairy cows varied from the wet season to the dry seasons because of differences in the volume of lot runoff. From a mass-balance analysis, reductions of TS and VS varied from 38 to 41 percent in the winter to 54 and 62 percent in the summer, with study means of 46 and 52 percent. These reductions occurred with a VS loading rate of 1.16 kg/m^3/day and a short detention time of 5-6 weeks. VS reduction in laboratory and field studies with sludge recovery have ranged from 19-75 percent. An alternative analysis for VS reduction was made using the regression equation for influent and effluent VS as a function of TS. A unit of effluent TS was divided into the FS and VS components according to the effluent regression. The amount of influent VS associated with the previously calculated FS quantity then was calculated from the influent regression and the relationship among TS, FS, and VS. With the influent and effluent VS known, the VS reduction was calculated to be 32 percent -- less than the value from the mass-balance analysis. Inasmuch as the change in regression coefficient from the influent to effluent equation is due to a reduction in the VS fraction and the correlation coefficients were extremely high, the calculated VS reduction should be correct. The reduction of 32 percent indicates that actual biochemical destruction of VS. The mass-balance, 52-percent reduction indicates what might be expected in farm practice with effective, but normally incomplete, solids removal during lagoon pumpout. The production of COD, TS, VS, and TKN from the cows in this research exceeded the amounts estimated from current average data. It was concluded that the increase resulted from the above-U.S.-average milk production of the herd, which indicates greater ration consumption. Aerators sized according to the recommendation of providing an oxygen-transfer rate of 1.5 items BOD loading rate minimized malodors in the lagoon vicinity during operation, but did not adequately reduce malodors during lagoon mixing and pumpout to sprinkler-irrigation disposal. The aerators used exceeded another recommendation for sizing of 8 kW/1000 m of lagoon surface. The recommendation of 1/2 the COD loading rate was not tried, but because of the greater oxygenation rate would possibly control all malodors. The manure-collection and transport system performed adequately, but would be improved by lengthening the sluice box to facilitate manure movement into the sewer. Removal of lagoon sludge would be improved by adding a high-volume, low head manure pump to provide continuous and better mixing than the irrigation manure pump provided. (Hermanson - Washington State University; Merryman - ed.)

4807-B2, C2, C3, D2, D3
BACTERIAL RESPONSE TO SALTS IN AN ANAEROBIC DAIRY LAGOON

Department of Agricultural Engineering, University of Missouri, Columbia, Missouri
D. Georgacakis and D. M. Sievers
Paper No. 77-4572, American Society of Agricultural Engineers, 1977 Winter Meeting, Chicago, Illinois, Dec. 13-16, 1977, 24 p. 10 fig., 6 tab., 12 ref.

Keywords: Dairy wastes, Lagoons, Anaerobic conditions, Salt additions, Bacterial response, Cations, Gas production, Toxicity.

A series of laboratory microcosms were established to study the bacterial response to various cations when added to an anaerobic lagoon. Five cations (Na, K, NH_4, Ca, Mg) were added as the chloride salts on a slug basis to sludge-effluent mixtures obtained from an anaerobic dairy lagoon. Concentrations ranged from 0.02N to 0.8N. Gas production was used as an indication of bacterial activity. Salt concentration was expressed as electrical conductivity (E.C.). The biological activity as influenced by the addition of a single cation was found to conform to a regression curve of the form $Y = ae^{bx}$. All the curves made an excellent fit to the experimental data (R^2-values greater than 0.980 for all curves). A more representative curve for the combined data was developed by nonlinear regression analysis. The regression curve resulted from the Least Squares Method has a R^2-value of 0.896. From this combined curve, the peak stimulation was found to occur at 6.5 mmhos/cm corresponding to a gas production of 110.6 percent of the control. The crossover point occurred at 13.0 mmhos/cm where the gas production was 89.0 percent of the control. Beyond the crossover point, increasing concentrations of cations resulted in rapidly increasing toxicity. The toxicity order of the cations tested was found to be (increasing toxicity): Ca, Mg, Na, K, NH_4. The order of toxicity appeared to be strongly influenced by the effects of antagonism and synergism. (Georgacakis - University of Missouri)

4808-B2, C2, D3, E2
PREDICTION OF EFFECTS OF LAGOON DESIGN VARIABLES - NITROGEN CONSERVATION OR REMOVAL

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M. R. Overcash, F. J. Humenik, P. W. Westerman, and J. C. Barker
Paper No. 77-4575, American Society of Agricultural Engineers, 1977 Winter Meeting, Chicago, Illinois, December 13-16, 1977, 15 p. 4 fig., 14 ref.

Keywords: Swine wastes, Lagoons, Design, Waste treatment, Anaerobic conditions, Effluent quality, Land disposal, Model studies, Residence time, Lagoon depth, Nitrogen.

A mechanistic model was developed based on the major loss pathway for nitrogen. The model does not treat the multitude of microbial reactions or interactions between sludge and supernatant since the number of independent constants to be evaluated is prohibitive. Utilizing known raw waste characteristics, (i.e., waste volumes, Q; net sludge storage, α TKN: lagoon area, A; and the characteristic mass transfer coefficient per unit area, b_{TKN}(the annual mean lagoon effluent concentration and the ratio of lagoon depth to residence time, Q/A, a design can be selected to meet swine producer objectives for the total pretreatment-land application system. (Overcash - North Carolina State University)

4809-B2, C2, C3, E2, E3
WASTEWATER REUSE LAGOON SYSTEMS FOR SWINE

Agricultural Engineering Department, Auburn University, Auburn, Alabama 36830
H. E. Hamilton
Paper No. 77-4574, American Society of Agricultural Engineers, 1977 Winter Meeting, Chicago, Illinois, Dec. 13-16, 1977, 16 p. 1 fig., 4 tab., 7 ref.

Keywords: Swine wastes, Two cell lagoon systems, Flushing, Wastewater reuse, Land disposal, Loading rates, Salt concentrations, Nitrogen.

Experiments were conducted to determine the effects of loading on two-cell swine lagoons where wastewater from the second cell is reused for flushing manure from the buildings into the first lagoon. Loading rates were 40, 80, 160, and 320 grams volatile solids per day per cubic meter. The data indicate that salt concentration would limit land application of wastewater from the second cell when plant uptake is the primary criteria. The lower and the higher loading rates resulted in more rapid accumulation of wastewater due to more total rainwater on the lagoon receiving the lowest loading rate (larger surface area) and the higher volume of manure placed in the lagoon receiving the highest loading rate. Only about 50 percent of volume input can be accounted for in the discharge from the lagoon systems during the first year. Ammonia nitrogen accounted for 88 to 100 percent of the total Kjeldahl Nitrogen in the lagoon cells. (Hamilton-Auburn University)

4810-B2, C2, D1, D3
NITRATE PRODUCTION AND CONTROL IN AN OXIDATION DITCH

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T. J. Greninger, D. L. Day, and A. H. Jensen
Paper No. 77-4576, American Society of Agricultural Engineers, 1977 Winter Meeting, Chicago, Illinois, Dec. 13-16, 1977, 14 p. 6 fig., 4 tab., 18 ref.

Keywords: Swine wastes, Oxidation ditch mixed liquor, Aeration, Model studies, Field studies, Nitrates.

The influence of denitrification on the formation of nitrate in swine manure mixed liquor in an oxidation ditch was studied under field conditions and in a laboratory model which successfully reproduced field conditions. The project is further reported in M.S. thesis by Greninger (1977). Degree of nitrification in the ODML was varied by varying the amount of aeration in the oxidation ditch. Since the aerators worked at constant speed, the amount of aeration was varied by changing the length of time between aerations by means of a time clock setting regulating the "on" and "off" periods for the rotor. Although time of aeration was the only parameter that was changed deliberately, and an attempt was made to keep all other parameters unchanged, the day-to-day operations of the Moorman Swine Farm, such as change in population of the swine house, feeding, etc., were not under experimental control, and these uncontrolled factors may have caused some variations in the experimental data. The following were true of both the field ditch and the laboratory simulation: Under the most stringent conditions, the amount of nitrates formed in the oxidation ditch mixed liquor did not reach the theoretical maximum calculated from the total nitrogen available in the ditch feed. Since nitrate formation under the most drastic conditions was roughly half that expected, the probable maximum nitrate formation in an oxidation ditch can be predicted by multiplying the total nitrogen available in the ditch feed by a factor of 0.5. Nitrate formation can be inhibited by creating conditions favoring denitrification. In the present experiments, denitrification was encouraged during periods of non-aeration of the ditch liquor. (Greninger - University of Nebraska)

4811-A2, B2, E1, E2
SIZING COMPONENTS ON OPEN FEEDLOT RUNOFF CONTROL SYSTEMS

Agricultural Engineering Department, Kansas State University, Manhattan, Kansas
J. A. Anschutz, J. L. Koelliker, J. J. Zovne, T. A. Bean, and M. J. Peterson
Paper No. 77-4579, American Society of Agricultural Engineers, 1977 Winter Meeting, Chicago, Illinois, Dec. 12-16, 1977, 19 p. 4 fig., 7 tab., 17 ref.

Keywords: Computer models, Agricultural runoff, Feedlots, Runoff control, Performance, Climatic variables, Irrigation, Evaporation, Moisture deficit.

A computer simulation model for open feedlot runoff control systems was used to develop a data base to determine important climatic variables that affect the performance of systems that use irrigation or evaporation for disposal of runoff. The moisture deficit was found to be most important for irrigation disposal systems and the ratio of precipitation to evaporation for evaporation systems. A method to size components of the feedlot runoff control system for any specific location is presented. The necessary coefficients for the method are also included. The designer is cautioned not to indiscriminately use the method in areas where climatic conditions are very much different than those used to develop the relationships. (Anschutz-Kansas State University)

4812-B3, C1, C2, D2, E3, E4
UTILIZATION AND DISPOSAL OF RESIDUE FROM THE PARTIAL OXIDATION OF CATTLE MANURE

B. H. Khara
M.S. Thesis, Department of Civil Engineering, Texas Tech University, Aug., 1975, 76 p. 2 fig., 24 tab., 64 ref.

Keywords: Oxidation, Fluid bed reactor, Cattle wastes, Methane, Recycling, Char, Ash, Pollution potential, Adsorption, Coagulation, Chemical properties, Physical properties, Fuels, Fertilizers, Adsorbents.

A plant to produce synthesis gas by partial oxidation of cattle manure generates char and ash as solid residue. The objectives of this project were to identify solid waste problems associated with the synthesis gas process and to suggest alternative solutions to these problems. The determination of the pollution potential of the by-products and of possible utilization schemes were the prime objectives. The chemical and physical characteristics of the char and ash were determined. Based on this data and the results of laboratory scale adsorption and coagulation experiments, the following conclusions were drawn: (1) Potassium, sodium, calcium, magnesium, phosphorus, silicon, chloride, and sulfate were identified as the major constituents of manure ash. (2) The specific gravity of the ash varied from 2.02 to 2.46 and the fusion temperatures ranged from 1,099°C to 1,288°C. (3) The water soluble content varied from 32 percent to 51 percent; potassium, sodium, chloride, and sulfate being the major soluble constituents of ash. (4) Analysis of ash prepared from manure samples from 2 different feedlots and from different locations within a feedlot showed little variability in the physical and chemical characteristics determined. (5) Based upon the low heating value, difficulty with ignition, and the large quantities of resultant ash, the prospects of using char as a primary fuel are not encouraging. However, its use as a supplemental fuel may be feasible. (6) Char and ash seem quite conducive to disposal in a carefully designed and operated sanitary landfill. The pollution potentials of these wastes are not great. (7) Application of manure ash as fertilizer is probably not feasible due to its high sodium content. (8) The adsorption ability of char in removing synthetic color from water was close to that of activated carbon. Ash was also found to have appreciable color adsorbing capability. (9) Composition of the ash and its high percentage of soluble components indicate that its use as an admixture in cement, concrete, or lime may not be feasible. It is recommended that in the partial oxidation process, the condensation of organic vapors on solid residue should be prevented. This will reduce the pollution potential of the char, thereby enhancing its use as an adsorbent. Additional study in these and other areas of reuse are recommended. (Merryman-East Central)

4813-A11, B1, C3, E3
LISTERIA-ENCEFALITIS IN COWS THROUGH LITTER FROM A BROILER-FARM

Animal Health Service in Friesland, Leeuwarden, Holland
R. G. Dijkstra
Zentralblatt fuer Bakteriologie, Parisitenkunde und Infektionskrankheiten und Erste Abt. Orig. Reihe B. Hyg. Praev. Med., V. 161, No. 4, p. 383-385, 1976. 3 ref.

Keywords: Animal health, Poultry litter, Disease, *Listeria monocytogenes*, Cattle, Holland.

An outbreak of *Listeria-encefalitis* at a loose-housed cattle-farm precipitated an investigation of the disease's origin. Poultry litter which was used on the confinement pen floor was the suspected culprit. In order to check the manner in which broilers can excrete *Listeria-bacteria* and infect the litter, an investigation was conducted to examine the intestinal contents of broilers ready for use. The cooperation of a poultry-slaughterhouse and of the meat inspection-service was secured. *Listeria-bacteria* was isolated from the intestinal contents of broilers. Consequently, it was ascertained that litter could be infected. Therefore, litter of broilers put in loose-housed cattle farms can be a potential danger from the standpoint of *Listeria-encefalitis* infections. (Merryman-East Central)

4814-A6, A7, B1, F2
ODOR REGULATION BY NUISANCE LAWS

Department of Agricultural Economics, Texas A&M University, College Station, Texas
J. M. Sweeten and D. R. Levi
Fact Sheet L-1449, Texas Agricultural Extension Service, Texas A&M University, 1976, 4 p.

Keywords: Legal aspects, Regulation, Odor, Feedlots, Zoning, Site selection, Waste management

The Congress, the state legislatures, the U.S. Environmental Protection Agency and state agencies have established a legal framework which has had a profound impact on environmental protection in the last 10 years. But today, the most powerful force in environmental protection is the court. The laws and regulations are interpreted by the courts in individual odor complaint cases, thus bringing about public regulation of odors. The actual nuisance lawsuit is in most instances a civil lawsuit between two or more individuals or businesses. The suits usually involve nearby neighbors who are requesting the court to award them monetary damages for an injunctive relief from the production or waste disposal operations of the defendant. To the extent that injunctive relief or monetary damages are granted, the producer is subjected to private regulation of his business. Less formal but equally effective regulation results from actions taken by a producer to avoid such litigation. From recent private nuisance lawsuits involving livestock feeding operations, it can be concluded that callous disregard for proper waste management can result in expensive punitive damages. On the other hand, injunctions are harsh remedies and are not granted by the courts without substantial cause. Therefore, normal, reasonable operations generally have been allowed to continue. (Sweeten-Texas A&M University)

4815-A11, B3, C2, E3
NITROGEN UTILIZATION BY LAMBS FED WHEAT STRAW ALONE OR WITH SUPPLEMENTS CONTAINING DRIED POULTRY WASTE, COTTONSEED MEAL OR UREA

University of Arizona, Tucson, Arizona 85721
R. S. Swingle, A. Araiza, and A. R. Urias
Journal of Animal Science, V. 45, No. 6, p. 1435-1441, Dec., 1977. 5 tab., 31 ref.

Keywords: Diets, Sheep, Refeeding, Dried poultry wastes, Cottonseed meal, Urea, Wheat straw, Nitrogen utilization.

Three growing ram lambs were used in a 3 x 3 latin square to determine utilization of nitrogen (N) from diets containing wheat straw supplemented with dried poultry waste (DPW), cottonseed meal (CSM) or urea. Supplements formulated from the three N sources provided 85 percent of the total dietary N. The DPW and CSM provided over 90 percent and urea over 70 percent of the N in their respective supplements. Daily intakes of total dry matter (67g/W$^{.75}$), straw dry matter (46g/W$^{.75}$) and N (25.7 g) were not affected ($P < .05$) by source of supplemental N. Apparent digestibility of N was higher ($P < .05$) for the urea supplemented diet (74 percent) than for DPW (68 percent) or CSM (67 percent) diets. Daily urinary N excretion was highest ($P < .05$) on the urea diet (16 g) followed by DPW (14g) and CSM (11g) diets. Approximately 35 percent of the absorbed N was retained on the CSM diet compared with 16 percent for DPW and urea diets ($P < .05$). Upon completion of the latin square, the lambs were fed only wheat straw for 70 days. Nitrogen balances were determined after 10, 28 and 63 days. Daily intakes of straw dry matter (52g/W$^{.75}$) and N (4.7 g) were similar ($P > .05$) for all three collection periods. Although the lambs were in negative N balance throughout this unsupplemented phase, the degree of negativity decreased in each succeeding collection period. (Swingle - University of Arizona)

4816-A7, A11, B3, C2, E3
MANURE REMOVED WEEKLY FROM HIGH-RISE HOUSES

Anonymous
Poultry Digest, V. 37, No. 431, p. 27, Jan., 1978. 2 fig.

Keywords: Poultry wastes, Manure pits, Weekly removal, Cleaning, Land spreading, Labor.

Creekwood Farms, Inc., Lake Mill, Wisconsin, has turned to weekly removal of manure from the manure pits under their high-rise poultry houses due to sloppy manure resulting from leaks in the cup watering system, seepage of rain water, and moisture rising by capillary action through the sandy soil. Not only was the water dilution reducing the manure's fertilizer value, but the ammonia and hydrogen being released were not good for the poultry. Spillage from the watering system has been corrected by use of filters and regular checking of cups for leaking. Cleaning is done by means of a Model 8N Standard Ford tractor which utilizes a scraper to push the manure into a cross trough which has a conveyor that takes the manure and elevates it for deposit in a spreader outside. The manure is then spread on the farm's acreage. Time to remove a one-week's manure accumulation from two 52,000-layer three-deck, high-rise cage houses is two 8-hour days for one man. (Rowe East Central)

4817-B2, C2, D2, D3, E3, E4, F1
POULTRY MANURE MAKES DEBUT AS ENERGY SOURCE

Anonymous
Wallaces Farmer, V. 102, No. 22, p. 30, Nov. 26, 1977. 1 fig.

Keywords: Poultry wastes, Animal wastes, Fermentation, Anaerobic digestion, Methane, Electricity, Recycling, By-product recovery, Algae production, Land disposal.

Daryl Rockey of Sunny Time Energy located in Des Moines, Iowa developed a system which proved that animal wastes can be used to produce methane gas. A 50,000-gallon airtight concrete digestor (tank) formed the main part of the methane gas collector. About 40 tons of manure from the 160,000 layers, kept in two houses, was scraped directly into the digestor each day. To liquefy the manure and speed up the natural biological fermentation process, heated water was added to the digestor. A gas that is about 90 percent methane was produced. The methane was used to power an LP-gas driven generator. Developers expect that when the system is fully operative, it can produce most of the electricity used on the farm. This could mean a savings of up to $2000 a month in electrical bills. Additional benefits of the system are: (1) The process liquefies the manure, making it easier to handle and inject in soils. (2) Possible runoff and odor problems from applying the manure are eliminated by handling it as a liquid. (3) Effluent produced by the digestor may prove effective for growing algae that can be used for poultry feed. The complete system would cost $150,000 new. (Rowe - East Central)

4818-A3, A4, B2, B4, C3, D3, E2
THE FATE OF ENTERIC BACTERIA DURING STORAGE AND DISPOSAL OF ANIMAL EXCRETA

M. R. Evans
Paper presented at ARC Symposium, Farm Waste, Glasgow, Scotland, 1972, 4 p. 1 ref.

Keywords: Pathogenic bacteria, Waste storage, Aerobic treatment, Anaerobic treatment, Salmonellae, Retention time, Land disposal, Agricultural runoff, Water pollution.

To help evaluate the likely extent of the dissemination of pathogens from confinement house animals, (a) the survival of salmonellae in swine wastes, during storage and aerobic treatment prior to disposal, and (b) factors effecting the passage of enteric bacteria from excrement through land into sub-surface drains were studied. Experimental results indicated that if salmonellae are present in animal wastes, some are still likely to be present at the time of disposal. The numbers of surviving salmonellae in sludges from aerobic treatment of the excrement, however, would depend on the sludge retention time. Only in low rate treatment systems, having a sludge retention time of up to 20 days, would a significant reduction of viable salmonellae occur. Untreated excrement, in the form of a semi-liquid slurry, or sludges resulting from aerobic waste treatment, are normally disposed of by spraying them into the surface of grasslands. The concentration of enteric bacteria in the drainage water of a pasture was found to be affected by three factors (1) the flow rate of water through the soil; (2) the numbers of enteric bacteria in or on soil and vegetation; and (3) the application to the land of large volumes of semi-liquid animal excrement over short periods of time. It was indicated that the application of infected excrement to land could result in high concentrations of salmonellae gaining access to water courses. (Bates - East Central)

4819-A8, B3, B5, C2, E2
EFFECT OF FARMYARD MANURE ON THE YIELD AND CHEMICAL COMPOSITION OF THE WHEAT CROP

Department of Chemistry and Biochemistry, Punjab Agricultural University, Ludhiana, India
G. S. Mann, H. S. Jagirdar, and S. M. Sood
Journal of Research, V. 10, No. 4, p. 438-441, 1973. 2 tab., 10 ref.

Keywords: Farmyard manure, Land application, Wheat, Crop response, Compost, Nitrogen, Phosphorus, Potassium.

An investigation was carried out to see the effect of compost in combination with NPK on the yield and chemical composition of wheat. The results revealed that N.P_2O_5.K_2O (120: 60: 60) + 2 tonnes of compost gave the highest yield of grains. The N content of grains increased as the quantity of compost increased. The reducing sugars decreased and the non-reducing sugar increased in the grains from the fertilized crop as compared with those in the grains from the unfertilized control crop. (Mann-Punjab Agricultural University)

4820-A6, A7, B1, F2
ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS. PROCESSING AND BOOKS, INC., AN ILLINOIS CORPORATION, NATIONAL-MELLODY FARM FRESH EGG COMPANY, AN ILLINOIS CORPORATION: AND AEROGLIDE CORPORATION, A NORTH CAROLINA CORPORATION QUALIFIED TO DO BUSINESS IN ILLINOIS, RESPONDENTS.

Illinois Pollution Control Board
PCB 72-148, Illinois Pollution Control Board, May 10, 1973, 12 p.

Keywords: Air pollution, Illinois Pollution Control Board, Poultry wastes, Odor, Environmental Protection Agency, Environmental Protection Act, Regulation, Public hearing, Processing and Books, Inc., Aeroglide Corporation, National-Mellody Farm Fresh Egg Company.

The Environmental Protection Agency (EPA) filed a complaint against Processing and Books, Inc.; National-Mellody Farm Fresh Egg Company; and Aeroglide Corporation with the Illinois Pollution Control Board. The EPA alleged that the respondents caused air pollution in violation of Section 9 (a) of the Environmental Protection Act and that they installed equipment affecting air quality without first obtaining a permit in violation of Section 9 (b) of the Act. The alleged air pollution consisted of odors from operation of: (1) a manure drier used to convert chicken manure into saleable fertilizer, (2) an incinerator used to dispose of dead chickens, (3) exhaust emissions from chicken houses, and (4) the spreading of chicken manure on farm acreage. It was alleged that the gaseous emissions settled into homes, other buildings and open areas located within 1/2 mile of the poultry farm. A public hearing was held which

included lengthy testimony from both sides. The Board decided that: (1) Aeroglide Corporation was not guilty of the charges brought against it. (2) Respondents Processing and Books, Inc., and National-Mellody were not guilty of violation of Section 9(a) of the Act, however, they were adjudged guilty of violating Section 9(b) of the Act and a fine of $3,000 was assessed against the respondents. Respondents were ordered to cease and desist from violating Section 9(a) of the Act. (Bates - East Central)

4821-A4, A6, B2, F2
ENVIRONMENTAL PROTECTION AGENCY VS. ROBERT R. DETERS; FABIAN J. DETERS; MARCELLUS J. DETERS; ALVIN L. DETERS; WILLIAM H. DETERS, JR.; AND NORMA MARIE DETERS WIEMAN

Illinois Pollution Control Board
PCB 72-260, Illinois Pollution Control Board, Nov. 8, 1972, 3 p.

Keywords: Dairy wastes, Cattle wastes, Feedlot runoff, Water pollution, Regulation, Illinois, Environmental Protection Agency, Environmental Protection Act, Illinois Pollution Control Board, Odor, Turbidity.

The Environmental Protection Agency (EPA) filed a complaint against Robert R. Deters; Fabian J. Deters, Marcellus J. Deters; Alvin L. Deters; William H. Deters, Jr.; and Norma Marie Deters Weiman, with the Illinois Pollution Control Board. The EPA alleged that the Deters operated their dairy farm in such manner as to cause the discharge of dairy product wastes and cattle lot runoff into a roadside ditch to an unnamed tributary of Curtis Creek so as to cause water pollution, in violation of Section 12(a) of the Environmental Protection Act and also to cause odor and turbidity to such a degree as to create a nuisance, in violation of Rule 1.03 (c) of the Illinois Sanitary Water Board Rules and Regulations SWB-14 and also Rule 203 (a) of the Illinois Water Pollution Regulations (adopted March 7, 1972). Hearing was held on September 20, 1972 at which time the parties filed a Stipulation of Facts wherein the respondents admitted to the allegations in the complaint. It was ordered that the respondents shall cease and desist from all violations found in the Illinois Pollution Control Board Opinion after January 22, 1973. It was also ordered that the respondents pay to the State of Illinois by December 15, 1972 the sum of $5,000 as a penalty for the violations found in the proceeding. (Bates - East Central)

4822-A6, A7, B1, F2
ENVIRONMENTAL PROTECTION AGENCY, COMPLAINANT, VS. LESTER KIPLING, D/B/A KIPLING CHICKEN HATCHERY, RESPONDENT

Illinois Pollution Control Board
PCB 73-329, Illinois Pollution Control Board, April 4, 1974, 4 p.

Keywords: Poultry wastes, Odor, Air pollution, Regulation, Environmental Protection Agency, Environmental Protection Act, Illinois Pollution Control Board, Odor abatement program.

The Environmental Protection Agency (EPA) filed a complaint against Lester Kipling, d/b/a Kipling Chicken Hatchery, with the Illinois Pollution Control Board. EPA alleged that Kipling operated his facilities causing air pollution in violation of Section 9 (a) of the Environmental Protection Act. This air pollution was the odor from unhauled manure at the egg-production facility. A hearing took place in Macomb, Illinois, on November 7, 1973. EPA relied on 13 citizen witnesses and 2 EPA employees to establish its case. The EPA recommended a penalty and a compliance program. The Illinois Pollution Control Board concurred with the EPA and ordered Kipling to pay a penalty of $500 for violations of section 9 (a) of the Environmental Protection Act and to institute an odor abatement program which included: weekly cleaning and removal of manure from the facility, construction of gravel road to permit hauling of manure in inclement weather, hauling manure at times to insure least possible nuisance to neighbors, maintenance of a continuous flow watering system to avoid the mixture of water with manure, installation of dust filtering devices, disposal of all dead poultry in compliance with the Dead Animal Disposal Act, and experimentation with chemical deodorizing agents. (Bates - East Central)

4823-B3, C2, D1, D3, E3
MORE DEAR MOTHER (A LETTER FROM JIM LAWRENCE)

J. Lawrence
Mother Earth News, No. 49, p. 168, Jan./Feb., 1978.

Keywords: Manure water heaters, Recycling, Denmark, Physical treatment, Biological treatment, Recycling, Methane.

Jim Lawrence discusses an article he has read which states that researchers at Denmark's Royal Veterinary and Agricultural University have studied a system that uses manure to heat water-- a system which involves transporting fresh manure to the interior chamber of a double-walled silo. (The area between the two walls is filled with water). The natural composting process accelerates because the manure is aired constantly with a ventilating fan. The heat (up to 154° - 176° F) passes through the walls to warm the water that is circulated by pipes to a radiator in the house. As new manure begins to fill the silo, already composted material is removed by spiked rollers from the bottom and transferred to a holding area to await final disposal. Although the system isn't yet perfected, it presents an economical alternative for water heating by using materials readily available on most homesteads. (Bates - East Central)

4824-B2, C2, D3, E3, E4, F1
ENERGY POTENTIAL THROUGH BIO-CONVERSION OF AGRICULTURAL WASTES

Bio-Gas of Colorado, Inc.
J. L. Burford, Jr. and F. T. Varani
Final Report to Four Corners Regional Commission, Technical Assistance Grant -- FCRC No. 651-366-075, Bio-Gas of Colorado, Inc., Sept. 1, 1976, 196 p.

Keywords: Agricultural wastes, Animal wastes, Anaerobic digestion, Recycling, Economics, Resources, Design, Methane Fertilizer, Algae, Feasibility study, Impact statements.

Bio-gas of Colorado instituted a study in order to evaluate the energy potential and economic feasibility of producing methane gas through anaerobic digestion of agricultural wastes from the four state area of Colorado, Arizona, Utah, and New Mexico. This was done with the ultimate objective in mind of constructing a commercial facility. Funding for this report was made possible through a grant by the Four Corners Regional Commission to the Colorado Energy Research Institute which sub-contracted Bio-gas of Colorado. The project addressed itself specifically to inventorying agricultural wastes in the four state area as derived from (1) livestock manures, (2) crop residues, and (3) food processing wastes which would be available in significant collectable quantities. Resource maps with legends have been drawn up to show location of all livestock operations and other necessary resources such as natural gas pipelines, highways, irrigated cropland, and electrical transmission grid. A design study was made of a plant process for converting animal waste into the methane gas, fertilizer, and protein materials through anaerobic fermentation and algae culture. The economics of this plant and its operation were evaluated and gas predictions were made on the basis of the most recently available livestock industry statistics. A theoretical market for the products was developed and evaluated and the impact that these products might have in the four state area was estimated. (Bates - East Central)

4825-A6, B1, F2
RECENT TRENDS IN ODOR NUISANCE LAWSUITS

J. M. Sweeten and D. R. Levi
Texas Agricultural Extension Service Leaflet, July, 1976, 4 p.

Keywords: Odor, Nuisance lawsuits, Regulation, Swine, Cattle, Confinement pens, Feedlots, Balance of Interests test, Maximum permissable odor intensity, Reasonableness.

Six court cases that show recent trends in odor nuisance lawsuits are presented. The first two cases emphasize the importance of good management. A swine production operator was found not guilty because he was employing reasonable, commercially-acceptable production methods. In another suit, charges were dropped against a Texas cattle feedlot operator because he was using management practices that were equal or superior to common practice in the industry. The next two cases considered involve the "balance of interest test". In one case, judgement forced an Arizona feedlot to move away from a land development project, but the developer was ordered to pay the costs of the move. In another case, a Texas court decided in favor of a cattle feedlot that was adjacent to a new residential subdivision because the feedlot complied with every applicable law and regulation. The jury evidently found the social utilitarian value of feedlots to outweigh the temporary inconvenience of the newly arrived residents. The next case discussed involves the use of odor intensity standards to establish "reasonableness". A cattle feedlot which had operated inside the city limits of El Paso for 15 years was closed as a permanent public nuisance by District Court decree. A

significant feature of the judgement was the stipulation of a *maximum permissable odor intensity* of seven dilutions to theshold at the property line, as measured using a Barneby-Cheny Scentometer. The last case involves the use of punitive damages against a swine operation that disregarded reasonable management practices. In this case, effluent from the hog operation was allowed to run onto the plaintiff's property and no measures were used to control odor from the operation. The jury returned a verdict against the swine operation awarding $46,200 actual damages and $90,000 punitive damages. (Bates - East Central)

4826-A4, A5

METHODS FOR IDENTIFYING AND EVALUATING THE NATURE AND EXTENT OF NONPOINT SOURCES OF POLLUTANTS

U.S. Environmental Protection Agency
Environmental Protection Agency Report EPA-430/9-73-014, Oct., 1973, 261 p. 29 fig., 24 tab , 366 ref.

Keywords: Water pollution, Groundwater pollution, Non-point sources, Agriculture, Silviculture, Construction, Mining, Pollutants, Pollutant identification, Model studies.

Agricultural, silvicultural, construction and mining activities contribute several pollutant substances to surface and groundwaters, and thus share with other activities the responsibility for protecting the quality of this country's water resources. This report was undertaken to provide documentation of presently available knowledge in four areas: silviculture, agriculture, mining and construction. Particularly important are factors which relate an emitted pollutant to its source, for the study is designed to assist the planner/engineer in evaluating nonpoint sources of pollutants and their effects on water quality in regional planning areas. The specific objectives of the program were: (1) To provide descriptions of nonpoint sources of information relevant to water pollution problems, including the nature of sources, type of pollutants, relative importance of pollutants from each source, and pollution loads related to natural and operational factors. (2) To determine methods, techniques, and procedures that can be used for identifying, measuring, and evaluating the nature and extent of the pollutants from nonpoint sources. (3) To provide analysis of the effect of nonpoint source pollutants on water quality management. The following were investigated as sources of pollution: (1) Agriculture: croplands, grasslands, and livestock. (2) Silviculture: forest culture, harvesting and logging practices. (3) Mining: new, current and abandoned surface and subsurface mines, and associated sites and facilities. (4) Construction: land development, highways, and roads, and other heavy construction. This study provides a substantial and very useful fund of information and data on hand for use in describing base-line characteristics of water quality planning regions, and for developing the rules of thumb, equations, nomographs and other predictive tools needed by the planner (Bates - East Central)

4827-A11, B1, C2

EXPERIMENTAL STUDY OF THE NITROGEN EXCRETION OF BASS (*DICENTRARCHUS LABRAX*) DURING GROWTH. III. EFFECTS OF WATER VOLUME AND INITIAL AMMONIA CONCENTRATION ON THE EXCRETION OF AMMONIA AND UREA

Station Marine d'Endoume, 13007 Marseille, France
O. Guerin-Ancey
Aquaculture, V. 9, No. 3, p. 253-258, 1976. 2 fig., 8 ref.

Keywords: Fish, Nitrogen excretion, Bass, Water volume, Ambient ammonia, Toxicity, Urea.

The effects of water volume and ambient ammonia were examined for young fish acclimated to 16, 18 and 20°C. *Dicentrarchus labrax* excreted less ammonia nitrogen when ambient ammonia was increased and when the volume of water was decreased. Fishes subjected to increasing ambient ammonia levels showed an increase in the rate of urea excretion. Ammonia poisoning occurred at an ammonia level of 10 mg/l. The minimum non-autotoxic volume for bass is 12 l/kg at 16°C, 15 l/kg at 20°C. (Guerin-Ancey-Station Marine d'Eddoume) (Publication in French only)

4828-A6, A7, B2, B3, B4, E2

WHICH WASTE SYSTEM IS BEST?

Anonymous
Confinement, V. 3, No. 1, p. 6, Jan., 1978.

Keywords: Waste management, Design, Confinement pens, Liquid wastes, Solid wastes, Waste storage, Land spreading, Odor control, Air pollution.

Louis Lubinus of South Dakota State University describes several swine waste handling systems. In the first system, manure is collected with a tractor and scraper from the floor, loaded into a manure-spreader, and hauled to the field. Liquid manure-handling systems usually store all manure (both solids and liquids) in a pit under slotted floors, in an underground tank or holding pit, or in an anaerobic lagoon. With storage pits, no collecting equipment is needed, but the wastes must be removed periodically by a manure pump and then spread on the fields. However, odors and gases are a problem with this type of system. Other liquid systems use mechanical scrapers or hydraulic flushing equipment and gutters to remove the wastes from the facility. This eliminates gases and odors. These systems must be carefully designed and additional equipment is needed to collect the manure. Economic conditions, management skills, personal preferences, type of operation and location should be considered in deciding which system is best for each producer. (Bates - East Central)

4829-A2, B2, B4, E2

RUNOFF CONTROL

Anonymous
Confinement, V 3, No. 2, p. 8, Feb., 1978

Keywords: Feedlot runoff, Runoff control, Design, Debris basins, Locations, Holding ponds, Irrigation.

A three-year study of the best location (inside or outside the feedlot) for the debris basin of the runoff-control system identifies pros and cons of both locations. Debris basins located inside the pen use land efficiently and cattle can use berms of the basin to avoid muddy lots in extended wet periods. Basins inside the pens dry faster in dry weather and facilitate easier spreading or mounding in the pen at cleaning time. On the other hand, these debris basins are damp longer in cool, wet weather and have repeated drainage problems in summer and winter. Berms of basins must be occasionally rebuilt and placement of the fenceline can also be a problem. Debris basins located outside pens are generally drier and easier to manage and are less likely to plug drains. However, extreme snowmelt slurry runoff can bury fencelines, solids may accumulate at fencelines, and weed control on sideslopes of basins is difficult. Shallow basins are favored over deep basins. Locating the holding pond beside the debris' basin has two advantages: Runoff from a storm exceeding design capacity of the basin will overflow directly into the holding pond, and the basin can be smaller. The disposal system should be designed for use whenever the holding pond must be emptied rather than primarily for irrigating cropland. (Bates - East Central)

4830-B1, F4

INNOVATIONS ARE SEEN IN 1980s CATTLE FEEDING

E. Clark
Feedstuffs, V. 50, No. 8, p. 12, Feb. 20, 1978.

Keywords: Cattle feeding, Research and development, Feed additives, Intake stimulants, Digestion stimulants, Protein sources, Methane.

Dr. Robert Totusek, Animal Science Department, Oklahoma State University, predicts many innovations will be seen in 1980's cattle feeding. Totusek predicts that cattle entering the feedlot in the 1980s will not only receive standard immunization and parasite treatments but will also be vaccinated against founder, emphyzema, and "sudden" death and will receive rumen innoculations for adaptation to high energy rations. Cattle will be fed rations "least costed" on the basis of known and undiscovered nutrients, as well as "ration factors", such as cement dust and industrial fermentation residue. Rations will contain specific intake stimulants, specific digestion stimulants and certain lower cost protein sources. Rations will also contain protected proteins to prevent degradation in the rumen, animal waste and non-animal waste, and specific additives to inhibit *methane production in the animal*, but encourage production in the feces. Totusek also examined the status of cattle research in his report, which includes: ammonia treatment of high moisture grain, cement dust as feed, liquid trace mineral supplements, Monesin as a supplement, value of high moisture corn, rumen innoculants, silage additives, implants, slow release urea, and waste refeeding. (Bates - East Central)

4831-A7, A11, B2, B4

FLUSH GUTTER SYSTEMS: CUT COSTS, IMPROVE ANIMAL ENVIRONMENT

Anonymous
Confinement, V. 2, No. 10, p. 19, Nov-Dec., 1977. 1 fig.

Keywords: Confinement pens, Swine wastes, Waste management, Design, Manure storage pits, Flushing, Ventilation.

Agricultural Engineering Associates of Uniontown, Kansas offers considerable expertise in swine confinement facility design. Of particular concern in this article is the problem of waste management. They feel that many swine confinement facilities are constructed with inadequate waste handling systems. John George, president of the firm, indicates that the problem with most facilities is inadequate capacity of the flushing system. This firm presents these two solutions to the problem: (1) A trapezoidal-shaped, free swinging tip tank mounted on 1½" shafts with pillow-block ball bearings. The tanks are built in sizes from 60 gal/2' long to 450 gal/10' long and have capacities on open gutters up to 250' long and slotted gutters to about 150' long. (2) A modular siphon made of fiberglass with an average discharge rate of over 600 gal/min. Modules can be ganged in tanks of any size to produce flows of 1200, 1800, 2400 (and on up) gal/min. to flush any width and length of gutter desired. The tanks are built in sizes from 600 gpm/180 gal storage to 3000 gpm/900 gal storage. Agricultural Engineering Associates also has the capability to custom-design higher capacity siphons for individual installation where pre-built models are inadequate. (Bates - East Central)

4832-B2, B4
GRAVITY DRAIN SYSTEMS FOR FARROWING AND NURSERY FACILITIES

University of Wisconsin-Extension
D. J. Meyer
Confinement, V. 3, No. 2, p. 12-14, 23, Feb., 1978. 10 fig., 2 tab.

Keywords: Gravity drain systems, Waste management, Swine wastes, Confinement pens, Design, Waste storage.

A new alternative to consider with liquid manure handling systems is the gravity drain system. It's basically a modification of the deep narrow gutter. The advantages of this system over long-term storage pits under swine buildings include: (1) Odor and gas concentrations are reduced in and around the building. (2) No pit fans are necessary. (3) The system lends itself to a central manure storage or liquid-solid separation. This system is different from the flush system in six major aspects: (1) No dump tanks or siphons are necessary. (2) The shape of the trench is similar to a "Y". (3) The trench must be fitted with a water-tight plug. (4) Manual pulling of the plug is required every 4 to 7 days. (5) Covered storage tanks or pits can be used instead of lagoons to reduce outside odor. (6) The gravity drain system adds very little moisture to the building air which may be more ideal for farrowing and nursery units. The gravity drain system is working successfully in all existing farrowing and nursery operations where it has been installed. The gutter slope, length, and trench side slope are critical to proper operation. Included in this presentation are design specifications and installation diagrams. (Bates - East Central)

4833-A11, A12, E3, F1
RECYCLING TAKES EXTRA MANAGEMENT

Texas Agricultural Extension Service, Texas A&M University, College Station, Texas 77843
J. Sweeten
Beef, V. 14, No. 6, p. 56, 60-61, Feb., 1978. 2 fig.

Keywords: Livestock wastes, Poultry wastes, Refeeding, Animal health, Public health, Economics.

According to a panel of national experts at a seminar on feedlot manure recycling for nutrient recovery held in Ada, Oklahoma, feeding livestock and poultry manure is not only safe from an animal and human health standpoint, but it can also provide economic advantages to the cattleman and can help extend the nation's food supply. The major points presented by the speakers were: (1) Keep manure and harvesting costs low. (2) Don't spend money on processes that don't enhance the nutritive value. (3) Keep manure fraction of the ration at reasonably low levels (5-25 percent). (4) Keep moisture content of manure fairly low (15 percent). (5) Let economics guide the decision on use of manure. (6) Monitor the nutrient and residue content of manure being refed. To realize appreciable benefits, manure refeeding takes more careful management than does conventional grain feeding. Participants at the seminar were told that the FDA would soon announce its new stand on the legality of manure as a feed additive. (Bates East Central)

4834-A11, B3, E3
BROILER LITTER IMPROVED GAIN DURING WINTER, STUDY SAYS

E. Clark
Feedstuffs, V. 50, No. 10, p. 14, March 6, 1978.

Keywords: Broiler litter, Refeeding, Cattle, Performance, Liver copper levels, Choline, Dietary supplements

Dr. K. E. Webb, Jr., Dr. J. P. Fontenot and W. H. McClure, animal scientists at Virginia Polytechnic Institute and State University, evaluated the long-term effects on performance and liver copper levels resulting from feeding broiler litter during the wintering period. They found that weaning rates and number of calves born tended to be higher for the cows fed the litter and corn plus additional copper and that gain was slightly better for cows fed the broiler litter than those fed a hay ration. In a second trial, weaning heifers were fed differing rations of corn silage soybean meal, grain and broiler litter silage. It was found that the rate of gain was higher in the calves fed rations containing the litter silage. Carcass quality tended to be higher with corn-litter silage than for cattle fed plain corn silage. A study was also made of the effect of dietary choline on rate and efficiency of gain in finishing calves fed urea or soybean meal. Study results gave no clear answer, however. (Bates - East Central)

4835-B2
MORE ON WASTE HANDLING

Environetics, Inc., 9824 Industrial Drive, Bridgeview, Illinois 60455
T. Thurber
Confinement, V. 3, No. 2, p. 22, Feb., 1978.

Keywords: Waste management, Design, Concrete, Plastic liners, Environetics, Inc.

Tom Thurber of Environetics, Inc., lists some of the negative aspects of concrete trenches used to transport and store manure from confinement buildings. They are: (1) Costly farming, which is okay if the farmer is absorbing the manhours himself. (2) Difficult-to-impossible installation in cold months. (3) Wide variations in the cost of delivered concrete. (4) Concrete is not the best surface for holding waste; it is rough and solids will build up. In contrast, plastic liners offer interesting and economical alternatives: (1) Slippery--no solids buildup with proper design. (2) Quicker to install, hence more economical. (3) The "lasting qualities" of various plastics are pretty well known. Depending on the grades of plastic used and how it is designed into an installation, life expectancies may exceed concrete. (Bates - East Central)

4836-A6, B1, D2, D3
DEALING WITH ODORS

J. Dawson
Confinement, V. 3, No. 1, p. 1-2, Jan., 1978.

Keywords: Odor control, Masking agents, Enzymatic products, Chemicals, Odor absorption, Odor counteractants.

Several research projects have been conducted or are in progress to determine the effectiveness of the various odor control products for manure storage areas. Some of the researchers are: Ron Miner of Oregon State and Clyde Barth of Clemson University, who divided the products into masking agents, odor counteractants, odor absorption, and enzymatic products and found that some were helpful; Don Day, University of Illinois, whose category breakdown includes: disinfectants, deodorant, digestive, enzymatic, chemical oxidant, and masking agent and whose work is still in progress; and John Nye, Purdue, who found that none of the products substantially changed things. A complete rundown of about 216 products on the market is impossible. The following random samplings show part of the range of choices. Calrox, Carus Chemical Co., is a chemical oxidant. Tec II, Agra-Labs, is a deodorizer that uses orthodichlorbenzene for inhibiting bacterial growth. Sludge Away, A G. Chemicals, is a liquifier that breaks down cellulose by enzymatic activity. Subdu, BZD Livestock Products, uses a bacterial culture to speed up biological processes. Sanzyme, Enzyme Industries, is both a deodorant and digestive. Envaid, Western Anti-Pollution Products, is a natural surfactant and digestive. MPC (Multi-Purpose Chemical) is an orthodichlorobenzene product. The author cautions producers to try any odor control product before paying for it. (Bates East Central)

4837-B2, B3, C2, E2
FERTILIZER VALUE OF TURKEY WASTE

University of Arkansas
L. H. Hileman
Confinement, V. 3, No. 2, p. 10, Feb., 1978. 1 tab.

Keywords: Turkey manure, Solid wastes, Liquid wastes, Sampling, Chemical analysis, Nitrogen, Phosphorus, Potassium, Fertilizers, Application rates.

Samples of both solid and liquid turkey manure were collected by county extension agents and turkey growers and sent to the University of Arkansas Soil Testing and Research Laboratory for chemical analysis. The samples were dried and the moisture content was determined. Nitrogen, phosphorus and potassium contents were determined. At 13.4 percent moisture content, a ton of solid turkey manure, plus litter was found to contain 2.39 percent N, 5.84 percent P, and 3.31 percent K. With the moisture content at 77.8 percent, a ton of turkey manure slurry was found to contain 0.38 percent N, 1.68 percent P, and 0.72 percent K. The values reported here are averages of approximately 100 samples. These data indicate that turkey manure is a valuable source of phosphorus, potassium, and nitrogen, and that such manure can and should be used in a sound soil fertility and crop production program. It is suggested that under most conditions solid turkey manure could be applied at a rate of 2 tons/acre and liquid turkey manure at a rate of 4-5 tons (1000 gal)/acre. (Bates - East Central)

4838-A8, B3, B5, C2, E2
FEEDLOT MANURE, SUPERPHOSPHATE FERTILIZING STUDIED

Anonymous
Feedstuffs, V. 49, No. 51, p. 4, Dec. 12, 1977.

Keywords: Land application, Fertilizers, Phosphates, Alfalfa, Crop response.

Feedlot manure at $5/ton or less and applied once every three years is better than superphosphate as a source of phosphate for irrigated alfalfa in the Southern Great Plains, according to Dr. Don Goss, U.S.D.A. soil scientist. Research at the Les Darsey farm near Allanreed, Texas showed that adequate phosphorus fertilization was essential for high alfalfa yield. Manure with 1.6 percent phosphate was applied at 10 and 20 tons/acre. This amounted to 320 and 640 lb. of phosphate/acre. This was compared to 1600 and 3200 lbs/acre of 20 percent superphosphate which contained the same amount of phosphate as the manure. In the next two years, unfertilized areas yielded 5 tons of hay/acre. Phosphate from either manure or commercial fertilizer boosted the yield to 10 tons/acre. (Bates - East Central)

4839-A11, B3, C2, E3
MISSISSIPPI APPROVES SALE OF POULTRY WASTE FEED

Anonymous
Animal Nutrition and Health, V. 33, No. 1, p. 9, Jan.-Feb., 1978. (Abstract only)

Keywords: Dried poultry wastes, Refeeding, Cattle, Mississippi, Protein supplements, Performance

The Mississippi Department of Agriculture has set standards and approved the sale of dried cage layer waste (DPW) as a feedstuff for beef cattle in the state. Mississippi Agricultural and Forestry Experiment Station scientists H. W. Essig, F. T. Withers and L. J. Smithson conducted a study to measure animal performance and protein consumption of heifers fed either DPW or cottonseed meal as protein supplements. One group of heifers received CSM: salt (2:1) as the protein supplement; another group received a 20 percent crude protein range cube, with 59 percent in the cube supplied by DPW. Heifers given the DPW range cube gained more than those fed CSM:salt and consumed slightly less silage equivalent. (Animal Nutrition & Health) (Abstract only)

4840-B2, B4, C2, E2
FEEDLOT SELLS MANURE

R. Watkins
Beef, V. 14, No. 7, p. A8-A9, March, 1978. 2 fig.

Keywords: Waste management, Feedlots, Cattle, Liquid wastes, Flushing, Holding lagoons, Irrigation, Nitrogen, Phosphorus, Potassium, Land application, Costs.

Farmers Cooperative Feedlot in northwest Iowa is selling manure. The confinement cattle feedlot finishes 25,000 cattle a year in buildings with flush-flume floors. The manure is flushed to a holding lagoon and from there, in the spring and fall, is pumped onto nearby farmers' fields, up to two miles away, using a traveling gun irrigation system. The going rate is about $21/acre for laying on 1½ inches of lagoon liquid. Several area farmers use the system and they feel that it's a good deal. The liquid supplies from 250 to 300 lbs of N/acre, 90-160 lbs P/acre, and 100-120 lbs of K/acre. Also the farmers get the benefit of the excess moisture for their crops. Feedlot manager Evan Vermeer feels that manure handling systems like this are a trend of the future. (Bates - East Central)

4841-A7, A11, B1
ATMOSPHERIC AMMONIA AFFECTS SWINE HEALTH

University of Illinois
S. E. Curtis, J. G. Drummond, and J. Simon
Feedstuffs, V. 50, No. 10, p. 32, March 6, 1978. 3 tab.

Keywords: Air pollution, Confinement pens, Swine, Ammonia, Hydrogen sulfide, Bacteria, Dusts, Performance, Animal health.

A series of studies were conducted at the University of Illinois on the health effects of air pollution on swine in confinement-type housing. Swine-house air pollutants of major concern include dust and gases (ammonia and hydrogen sulfide) and bacterial contamination. The initial experiments consisted of seven trials using dynamic-type air-pollutant exposure chambers and focused on determining the effects of aerial ammonia, hydrogen sulfide and swine-house dust--separately or in various combinations-on the health and performance of growing pigs. From the results of the trials, it was concluded that these air pollutants, at levels and in combinations resembling those in closed swine houses, had essentially no effects on the pig's rate of body-weight gain or respiratory-tract disease in the pig. Further studies involved the use of tracer bacteria (a non-pathogenic strain of E. coli) to measure pulmonary bacterial clearance in young pigs. It was found, after exposing the pigs to a fine mist of tracer bacteria, that atmospheric ammonia at concentrations of 50 or 75 ppm lowered the young pig's ability to clear its lungs of the bacteria. It was also found that an atmospheric ammonia concentration of 100 ppm exacerbates the effects of the early stages of ascarid infection. (Bates - East Central)

4842-A11, B3, C2, E3
COMPARATIVE VALUE OF ENSILED CATTLE WASTE FOR LAMBS AND GROWING-FINISHING CATTLE

The Pennsylvania State University, University Park, Pennsylvania 16802
H. W. Harpster, T. A. Long, and L. L. Wilson
Journal of Animal Science, V. 46, No. 1, p. 238-248, Jan., 1978. 7 tab., 21 ref.

Keywords: Ensiled cattle wastes, Refeeding, Sheep, Steers, Rations, Performance.

Rations containing ensiled cattle waste (ECW) were compared to corn silage (CS) rations in sheep metabolism and steer growth trials. ECW contained approximately 60 percent cattle excreta and 40 percent chopped hay on a fresh weight basis. Metabolism trial rations (four wethers/treatment were a CS, high moisture corn (HMC), soybean meal (SBM) control; 100 percent CS; CS plus SBM (CS/SBM); and ECW plus 0, 40, or 50 percent HMC. Nitrogen retention and digestibility of dry matter, organic matter, ether extract, NFE and energy were lower ($P < .05$) for 100 percent ECW. Addition of HMC to ECW increased ($P < .05$) means for these parameters, although the values were generally less than those observed for the control and CS/SBM rations. Four rations were compared in a three-phase, 183-day growing-finishing trial with steers (avg st 258 kg). Treatments were a CS, HMC, SBM control; 75 percent ECW, 25 percent HMC; 50 percent ECW, 50 percent HMC; and 40 percent ECW, 60 percent HMC. All rations were readily consumed during all periods. Overall feed efficiency favored the control-fed steers. Average daily gains were highest ($P < .05$) for steers fed the control diet, but were not different from those receiving 40 percent ECW, 60 percent HMC. Gains and quality grade were less ($P < .05$) for steers receiving the high level of ECW. (Harpster-The Pennsylvania State University)

4843-B2, C2, C3, D3, E3
ANAEROBIC FERMENTATION OF POULTRY MANURE

School of Mechanical Engineering, Cranfield Institute of Technology, Cranfield, Bedford MK43 OAL, England
A. E. Adderley, I. E. Smith and S. D. Probert
Applied Energy, V. 2, No. 3, p. 163-173, 1976. 6 fig., 6 ref.

Keywords: Anaerobic digestion, Poultry manure, Volatile acids, Methane bacteria, Acidification, Methane production.

Although both in nature and in conventional anaerobic decomposition process plants, acidification and gas production occur simultaneously, the rates of methane production and waste stabilisation can be enhanced by arranging that the process occurs in two stages. Initially, the waste is fermented at an optimal temperature of 25° C and a 2.5 percent, by weight, total solids dilution of organic acids, and is subsequently transferred to a tank and held at optimal conditions for the methane producing bacteria. (Adderley-Cranfield Institute of Technology)

4844-B3, C2, E3, F1
UTILIZATION OF COW-MANURE, HATCHERY-WASTE AND PARTLY DRIED MOLASSES IN POULTRY FEEDS

Haryana Agricultural University, Hissar, Haryana, India
K. S. Chillar, V. Sagar, and I. S. Yadava
Indian Journal of Animal Sciences, V. 42, No. 7, p. 520-525, 1972. 4 tab., 13 ref.

Keywords: Refeeding, Poultry, Sun-dried cow-manure, Molasses, Diets, Performance, Economics.

In a growth study from the age of 5 to 12 weeks, 120 Rhode Island Red chicks were randomly divided into 8 groups and fed different diets with 20 percent protein, to compare the effect of certain industrial and farm by-products. The treatments were: control; 5, 10 and 15 percent levels of sun-dried cow-manure; 5 percent level of hatchery-waste; and one-quarter, half and three-quarters dried levels of 15 percent molasses. Weekly body weights and feed consumptions were recorded. Sun-dried cow manure up to 10 percent satisfactorily replaced a part of the maize grain with considerable saving in feed cost. The sun-dried hatchery-waste at 5 percent level replaced groundnut cake. Feeding of 15 percent sun-dried cow-manure and all the 3 mashes containing 15 percent molasses dried to 3 levels were not able to replace maize grain satisfactorily. (Chillar-Haryana Agricultural University)

4845-A10, B1
LEAVE PAD OF MANURE FOR NATURAL PREDATORS

Anonymous
Poultry Digest, V. 37, No. 431, p. 27, Jan., 1978.

Keywords: Fly control, Predators, Manure pad, Poultry wastes, Manure clean-out.

If a manure clean-out machine will not leave a 12- to 15-inch high pad of manure under poultry cages at cleanout time, simply clean out every-other row, tossing the manure of the uncleaned row over for the pad of the cleaned row. Thus the habitat of the existing natural predators such as ants, mites, beetles, and parasites can be preserved. The natural enemy complex otherwise may take six months up to years to re-establish on a ranch where all manure is removed. Preservation of predators during the winter helps against the spring build-up of Fannia populations. (Merryman-East Central)

4846-B2, E3
FLUSH SYSTEM CLEANS SWINE PENS

V. Miller
Progressive Farmer, V. 93, No. 2, p. 38, Feb., 1978. 1 fig.

Keywords: Swine wastes, Confinement pens, Flushing, Design, Lagoons, Recycling.

The Hesemann brothers of Owensville, Missouri operate a farrow-to-finish operation in which they utilize a bucket to dump water automatically about once an hour when the weight of the flushing water trips the bucket. Two unique features about their system are: (1) The only moving part is the bucket as it swings on its pivot points. (2) The bucket is free swinging, so it doesn't bang against the floor or gutter as it dumps. Except for bearing lubrication about once a year, the system requires no maintenance. All wastes are flushed to a lagoon. Water from the lagoon is recycled for flushing. The Hesemanns greatly praise this effortless system. (Merryman East Central)

4847-A11, E3, F1
YOU MAY FIND PROFITS IN WASTE FEEDS

D. Deterling
Progressive Farmer, V. 92, No. 12, p. 43, 46, Dec., 1977. 1 fig.

Keywords: Feeds, Food processing wastes, Brewery wastes, Poultry litter, Beef wastes, Refeeding, Livestock, Performance, Economics.

Some livestock producers are reducing feed costs by using unconventional feedstuffs such as day-old bread, cookies, and rolls; corn and potato chips; brewers' spent grain; cannery wastes; mess hall garbage; poultry litter and beef manure, cotton burs and grain stalks. The factors to be considered in deciding to utilize such feedstuffs are: (1) Source. What is the availability of waste feeds: (2) Feed value. What is the nutritional composition? What supplementation will be required to provide a balanced ration? (3) Costs. What are the comparative costs of waste feeds and competitive grains, roughages, or supplements on a feed value basis? (4) Labor. Will feeding wastes take more manpower or less? (5) Facilities required. Will you need extra storage or feeding equipment? Is additional processing required? (6) Consistency of supply. If supplies are not consistent, will you have to buy or store other feed to maintain operations? What impact will this have on labor requirements? Will production be disrupted because of frequent changes in rations? (7) Livestock performance. Check research data on animal performance you can expect from specific waste feeds. Will feeding waste products lengthen the feeding period? How will these feeds affect milk or carcass quality? Will they lower or raise costs of gain? (8) Aesthetics. What about potential odor problems? Flies? (9) Safety. What are potential problems with contaminants such as excessive salt, chemical residues, packaging materials, bone scraps? Does feeding wastes violate state or local health or sanitation laws? Does it have or require Food and Drug Administration approval? (10) Economics. Will feeding wastes result in greater net returns? (Merryman - East Central)

4848-B2, C2, D2, E3, F1
LIQUID COW MANURE GOES TO MARKET

Kim Allen
The Furrow, V. 83, No. 1, p. 28, Jan., 1978. 1 fig.

Keywords: Dairy wates, Liquid wastes, Waste treatment, Deodorizers, Recycling, Fertilizers, Costs.

Richard Briggs of Woodbury, Tennessee has a patented method of treating and deodorizing manure in a convenient liquid form. Briggs' product contains a deodorizer that controls the anaerobic bacteria in the manure, killing odors and preventing gas buildup inside the bottles. Briggs has franchise agreements with dairymen throughout the country, granting them the right to bottle and sell manure using his brand name, "Nature's Own Deodorized Liquid Cow Manure." The liquid manure is collected in slurry-holding pits and processed at participating dairies. The slurry is mixed with the deodorizer, and packaged in plastic bottles. The product sells well in garden shops and nurseries. Dairymen wholesale the processed product for $2.00 per gallon. It retails for $3.00 per gallon. They buy franchise rights from Briggs for a basic price plus a percentage of sales. Briggs has licensing agreements with farmers for franchises covering all the United States. He has even had inquiries from overseas buyers about bulk shipments. (Merryman - East Central)

4849-B2, B3, C2, D3, E3, F1
STATE-BASED PLANT TURNING CATTLE MANURE INTO METHANE GAS

Associated Press
The Ada Sunday News, p. 8A, April 2, 1978.

Keywords: Cattle wates, Recycling, CRAP, Inc., Thermonetics Inc., Methane, Refeeding, Fertilizer, Anaerobic digestion, Economics.

CRAP, Inc (Calorific Recovery Anaerobic Process) near Optima, Oklahoma is converting cattle manure into methane gas. A pipeline is scheduled to begin carrying the gas to Chicago in the next few weeks, where it is expected to furnish enough power to meet the natural gas needs of 3,500 homes each year. The plant is scheduled to turn 1 million pounds of cattle manure into 1.76 million cubic feet of methane gas daily. Plans call for the plant to sell 584 million cubic feet of methane gas produced from manure to People's Gas each year for $1.13 million. The plant, whose parent firm is Thermonetics, Inc., of Oklahoma City, is also expected to produce 75,000 tons of cattle feed annually from the manure. Material left after the production of methane gas and cattle feed will be sold as liquid fertilizer. Though more expensive than federally regulated interstate gas, CRAP's gas is competitive because it offers a steady supply and because the price of natural gas is expected to rise. CRAP has tentative plans to build 3 manure gasification plants in the Texas Panhandle, near Hereford and Dumas. The company is also considering building a plant in California. At least 100,000 head of cattle must be available before a manure gasification plant is economically feasible. (Merryman-East Central)

4850-B2, C2, D3, E3
MANURE DIGESTER BEING BUILT ON MINNESOTA FARM

Anonymous
Feedstuffs, V. 49, No. 52, p. 6, Dec. 19, 1977.

Keywords: Anaerobic digestors, Recycling, Poultry wastes, Methane, Fertilizers, Minnesota, IMT Corporation.

A digestive system developed by IMT Corporation, Chaska, Minnesota, is being incorporated into DuWayne Deziel's Clear Lake, Minnesota poultry farm for the purpose of converting poultry manure into methane gas and organic fertilizer. The system is designed to produce a minimum of 30,000 cubic feet of gas per day from about six tons of poultry manure. Mr. Deziel will use 24,000 cubic feet to generate electricity for the digester operations, and storage is planned for the other 6,000 cubic feet. (Merryman East Central)

4851-A6, B1, E2
MANAGE FEEDLOT WASTE TO CONTROL ODORS

Anonymous
Wallaces Farmer, V. 103, No. 3, p. 66, Feb. 11, 1978.

Keywords: Livestock wastes, Feedlots, Odor control, Drainage, Location, Manure pack, Land spreading.

Feedlot odors can be controlled to a large extent by location and management. Manure should be kept as dry as possible. This is accomplished by controlling stocking rates, maintaining good drainage and water facilities, and keeping manure solids out of runoff retention ponds. Only minimal quantities of manure and waste water should be kept on hand. Drainage rate is another important factor affecting feedlot odor. Good drainage allows the feedlot to return to the aerobic state quickly after rain. A feedlot with 3 percent to 4 percent slope has good drainage with minimum erosion. For controlling odors, the ideal program of manure collection is: (1) Collect manure frequently - at least once per month. (2) Collect only the aerobic surface manure layer. (3) Leave an undisturbed manure pack about 2 inches thick. The manure pack seals the surface from percolation, provides a firm base for cattle footing, and for subsequent collection efforts, decreases water absorption, and speeds surface drying. Odors can be reduced when spreading manure on fields by: (1) Not spreading manure near downwind residences or heavily traveled highways, (2) plowing manure under as soon as possible, (3) applying manure uniformly at light to moderate application rates, 10 to 30 tons per acre, (4) spreading on days when predicted wind speed exceeds about 5 mph, (5) spreading manure when the morning air is warming and rising rather than in the late afternoon. (Merryman - East Central)

4852-B2, C2, D1, D3, E2, E3, F1
MANURE MAKES THE ROUNDS

F. Hilliker
Feedlot Management, V. 19, No. 13, p. 40, 42, Dec., 1977. 3 fig.

Keywords: Feedlot wastes, Anaerobic digesters, Carbon dioxide, Methane, Hydrogen sulfide, Lagoons, Irrigation, Land disposal, Costs.

Jim Allison of Custer, Michigan scrapes his feedlot manure daily into an underground holding tank. The manure is then pumped automatically into an anaerobic digester. The digester is air tight and covered with a 30 mm. plastic/cloth reinforced cover that balloons out under pressure to about 10 ft. high. The gas is formed by chemical reactions inside the bubble. Anaerobic bacteria digest the manure, producing carbon dioxide, methane, and a trace of hydrogen sulfide. Because this gas is not very pure, a method of "scrubbing" was devised to eliminate the carbon dioxide. Because the gas is readily soluble in water, it's bubbled through water and emerges as almost pure methane, about 65 percent of the original volume. The methane is then pumped into a 500 gallon underground tank where it is pressurized to 150-200 psi. The methane is then pumped as needed through a regulator to a six-cylinder engine which has been specially modified to burn methane gas. The engine powers a 30 kilowatt generator which provides electricity for power and heating. After 3-4 weeks, the manure is pumped into a holding lagoon and later pumped through irrigation lines to cropland. Allison's investment, including equipment and maintenance costs, runs about 3½¢ per kilowatt hour of electricity generated. That's about the same price he pays a power company now (Merryman - East Central)

4853-A6, B2, D3
THE EFFECT OF ANAEROBIC DIGESTION UPON SWINE MANURE ODORS

Department of Food Science, Cornell University, Ithaca, New York
F. W. Welsh, D. D. Schulte, E. J. Kroeker, and H. M. Lapp
Canadian Agricultural Engineering, V. 19, No. 2, p. 122-126, Dec., 1977. 2 fig., 4 tab., 13 ref.

Keywords: Swine wastes, Odor, Anaerobic digestion, Sampling, Solids retention time, Agitation rates, Temperature.

A series of odor panels were established to determine the effect of anaerobic digestion on the odor of swine manure. Samples from digesters of various solids retention time, agitation rates and operating temperatures were tested. Anaerobically digested manure that had been stored for various periods of time and undigested manure samples were also tested. The results indicated that anaerobic digestion was effective in reducing odors but that some negative quality in the odor remained. Anaerobic digestion at 35C was more effective for reducing odor than anaerobic digestion at 25C. In certain cases, increased solids retention times and agitation rates were found to improve the odor-reducing capability of anaerobic digestion. (Copyright 1977-Canadian Agricultural Engineering)

4854-B2, B3, B4, F1
DESIGN CONCEPTS AND CONSTRUCTION COSTS OF EIGHT DIFFERENT MANURE STORAGES

Engineering Research Service, Research Branch, Agriculture Canada, Ottawa, Ontario K1A 0C6, Canada
J. E. Turnbull, P. A. Phillips and F. R. Hore
Canadian Agricultural Engineering, V. 19, No. 2, p. 65-70, Dec., 1977. 3 fig., 3 tab., 4 ref.

Keywords: Design, Costs, Waste storage, Liquid wastes, Solid wastes.

Using the unit-quantity method, construction costs were estimated for four liquid manure and four semisolid or solid manure storage designs developed by the Canada Plan Service. For comparison, costs ($/ft³) were plotted against storage volumes (ft) on log-log paper, for two or three limiting sizes of each design. Rectangular roofed storages were the most expensive, ranging from 0.95 to 0.76 $/ft³. Earth-banked storages were least expensive where suitable soil (clay) was available on-site or nearby. Of concrete liquid manure tanks, the aboveground silo was least expensive. The curbed storage slab for stacked solid manure was also relatively cheap, but suitable only for dry or bedded manure. Surface/volume ratios were calculated for the unroofed storages as an aid to selecting storages most suitable for dry versus humid climates. (Copyright 1977-Canadian Agricultural Engineering)

4855-B2, D2, D3, E3
AGRICULTURAL BIOMASS WASTES: UTILIZATION ROUTES

Engineering Research Service, Agriculture Canada, Ottawa, Ontario K1A 0C6, Canada
G. E. Timbers and C.G.E. Downing
Canadian Agricultural Engineering, V. 19, No. 2, p. 84-87, Dec., 1977. 6 fig., 2 tab., 7 ref.

Keywords: Agricultural wastes, Recycling, Anaerobic digestion, Pyrolysis, Hydrolysis, Energy.

The amount of biomass produced by Canadian agriculture is estimated at 118 X 10 tonnes. Of this total, approximately 73 percent is considered marketable in the form of grain, animal products, fruit and vegetables. When the unharvested biomass and waste products are added together, an estimated additional 30 X 10 tonnes of material can be credited to agricultural production. Animals, which are the only means of harvesting much of the biomass produced on our marginal lands, provide not only a source of protein but also a source of manure. The availability of this manure combined with that of plant waste must not be overlooked as a possible renewable energy source. Anaerobic digestion, pyrolysis and hydrolysis are methods for utilizing the biomass system wastes. In today's energy-conscious society, the possibilities of converting these wastes into viable energy forms demands immediate investigation. (Copyright 1977-Canadian Agricultural Engineering)

4856-B2, B4, C1, C2
RUNOFF FROM FEEDLOTS AND MANURE STORAGES IN SOUTHERN ONTARIO

D. R. Coote and F. R. Hore
Canadian Agricultural Engineering, V. 19, No. 2, p. 116-121, Dec., 1977. 6 tab., 21 ref.

Keywords: Agricultural runoff, Feedlots, Waste storage, Ontario, Prediction equations, Nutrients, Suspended solids.

Runoff from a paved and an unpaved feedlot, and from paved storages containing solid and semi-solid manure was measured, sampled and analyzed for nutrients and solids over a 2-yr period. Data on total and seasonal runoff volumes are presented, along with prediction equations for individual runoff events. A prediction procedure is also presented for water quality parameters. Statistically significant differences were seen to exist between the sites and between summer and winter runoff for most water quality parameters. Total solids, biochemical oxygen demand, total Kjeldahl, ammonia, nitrate and nitrite nitrogen, total phosphorus and soluble ortho-PO_4 phosphorus were all significantly related to the suspended solids concentration. Runoff volumes and water quality concentrations have been combined to estimate nutrient losses from each site on a per animal unit basis. (Copyright 1977-Canadian Agricultural Engineering)

4857-B3, C3
A COMPARISON OF DROP-PLATE AND POUR-PLATE METHODS FOR BACTERIAL POPULATION COUNTS OF POULTRY ANAPHAGE (DEHYDRATED CAGED LAYER EXCRETA)

Poultry Science Department, Michigan State University, East Lansing, Michigan 48824
D. Richmond and T. S. Chang
Poultry Science, V. 57, No. 1, p. 293-295, Jan., 1978. 1 tab., 9 ref.

Keywords: Dried poultry wastes, Bacteria, Drop-plate analysis, Pour-plate analysis.

Pour-plate and drop-plate methods for bacterial population counting of poultry anaphage (dehydrated caged layer excreta) were compared and were not found to be significantly different. (Copyright 1978-Poultry Science)

4858-B3, C2, C3, D1, E3
HORMONAL ACTIVITY IN POULTRY EXCRETA PROCESSED FOR LIVESTOCK FEED

C. C. Calvert, L. W. Smith and T. R. Wrenn
Poultry Science, V. 57, No. 1, p. 265-270, Jan., 1978. 6 tab., 18 ref.

Keywords: Poultry wastes, Hormones, Refeeding, Androgens, Estrogens, Waste treatment, Dehydration, Aerobic conditions, Anaerobic conditions, Temperature.

Experiments were conducted to determine the kind and amount of endogenous hormonal activity present in various sources of poultry excreta processed for use as livestock feed. These experiments were conducted to determine: (1) the presence of both androgenic and estrogenic activity in poultry excreta; (2) the amount of activity found; and (3) the effect of processing methods, such as dehydration, upon the level of hormonal activity. Experiments in which chick comb growth was bioassayed showed that caged laying hen excreta processed by house fly larvae contained androgenic activity that ranged from 2.18 to 9.36 μg. of testosterone equivalents per gram of dried excreta. This activity was not present in fresh excreta and was not affected by drying times or temperatures up to 48 hr. at 100°C. In rat uterine growth assays, fresh, dried caged laying hen excreta contained up to 1.6 μg of estradiol equivalents per gram of dried excreta. Holding excreta for 5 to 7 days under either aerobic or anaerobic conditions reduced estrogenic activity, but drying temperatures up to 100°C. did not appear to affect the level of these hormones in excreta. (Copyright 1978-Poultry Science)

4859-B3, C2, D3, E3, F1
ENERGY RELATIONSHIPS FOR A 320-ACRE IOWA FARM: AN ATTEMPT TO INCREASE PRODUCTION OF GRAIN AND MEAT WHILE RENDERING THE FARM ENERGY SELF-SUFFICIENT BY GENERATING METHANE THROUGH ANAEROBIC FERMENTATION OF RESIDUES

Iowa State University, Ames, Iowa
R. J. Smith, J. A. Miranowski, and R. L. Vetter
Termination report to the Agricultural Research Service of the U.S. Department of Agriculture, Grant 12-14-1001-597, Sept., 1976, 160 p. 96 ref.

Keywords: Livestock wastes, Crop residues, Refeeding, Recycling, Energy, Methane, Anaerobic digestion, Economics, Computer models.

Energy shortages, coupled with rising fossil-fuel prices, have generated increased interest in policies designed to conserve energy and achieve a greater degree of energy self-sufficiency. The agricultural sector is responding to the crisis by considering technologies such as on-farm anaerobic digestion for methane production and expanded use of organic fertilization. Both technologies reduce dependency on fossil-fuel supplies. Also, increasing awareness of the impact of feeding livestock grain that might be used directly for human sustenance has generated moral concern among some livestock producers. New livestock-production alternatives, such as recycling livestock manures and crop residues, may increase feed-grain efficiency and release land for food-grain production. This study was conducted by the three disciplines: Agricultural Economics, Agricultural Engineering and Animal Science. Although each discipline communicated regularly with the others, the three reports can be read in isolation. The common starting point was a typical mixed-farming enterprise of 320 ac in central Iowa, but each discipline examined the farm activities in light of their particular expertise, consequently, some variations will be noted among sections (e.g., sizes of animal-production facilities). The economic study developed linear-programming models that would allow specification of activity levels for either maximum profitability or minimum energy use. Data for the economic model were provided by Agricultural Engineering and Animal Science when new technology was involved. The Agricultural Engineering portion of the study examines on-farm energy use, anaerobic digestion of livestock wastes, and the design of a low-cost digester for farm use. The contribution from the Animal Science Department is concerned with the nutritional aspects of incorporating livestock manure and crop residues in a ruminant-feeding program. Their contribution also discusses the harvesting of corn stover and its deterioration under various methods of storage. (Smith-Iowa State University)

4860-A3, A8, B5, C2, E2
EFFECTS OF SOIL, COVER CROP, AND NUTRIENT SOURCE ON MOVEMENT OF SOIL, WATER, AND NITROGEN UNDER SIMULATED RAIN-SLOPE CONDITIONS

Ohio Agricultural Research and Development Center, Ohio State University, Wooster, Ohio 44691
G. D. Hoyt, E. O. McLean, G. Y. Reddy, and T. J. Logan
Journal of Environmental Quality, V. 6, No. 3, p. 285-290, 1977. 2 fig., 7 tab., 22 ref.

Keywords: Soil-Water-Plant relationships, Fertilizers, Rainfall-runoff relationships, Slopes, Leaching, Soil permeability, Nitrogen, Phosphorus, Potassium.

Nitrogen, P, and K as manure, chemical fertilizers + straw, or chemical fertilizers alone were added to microplots of soils, which were then either cropped to wheat (*Triticum aestivum*) or left bare, and finally subjected to simulated rainfall. The N, P, and K were each applied at 224 kg/ha in the forms of: (i) N- and P-enriched cow manure (7.35 metric tons/ha, dry weight); (ii) urea, triple-superphosphate (TSP), and KCl + straw at the same weight of dry matter as the manure; and (iii) fertilizers alone. A 5-day rainfall sequence was imposed with varying intensities, durations, and soil slopes. The movement of N generally increased as the quantities of solids, runoff, and leachate increased. Where discrepancies occurred, they could usually be explained by differences in structure, crusting of the soils, or clogging of their pores by manures, or by effects of straw on soil permeability to water or on increased microbial activity. In general, almost all the mineral N moving in the leachate, and about half of that moving in runoff, was in NO_3^- form. (Hoyt-Ohio State University)

4861-A11, B1, E2
THE BEST OF FOUR BARNS

Staff editor, *Feedlot Management*
G. Lamp
Feedlot Management, V. 19, No. 13, p 4-6, 8, Dec , 1977. 4 fig.

Keywords: Confinement pens, Design, Cattle, Performance, Land disposal.

John DeKock has built four different semi-confinement barns on his feedlot, all slightly different and all slightly better than the last. Adverse weather conditions prohibited efficiently raising cattle on open feedlots. The fourth barn, and what John feels is the best, was completed in 1977 with a total feeding capacity for 550 head. Design features of each barn are discussed. According to DeKock the biggest advantages to the semi-confinement facilities are: (1) increased feed efficiency, (2) increased dressing percentage (up to about 1

percent), (3) increased average daily gain (now about 2.7 lb./head/day) (4) increased crop production from use of manure as a fertilizer, (5) easier to keep cattle on feed. (Rowe - East Central)

4862-A8, B3, C1, C2, E2
LAND DISPOSAL OF BROILER LITTER: CHANGES IN CONCENTRATION OF CHLORIDE, NITRATE NITROGEN, TOTAL NITROGEN, AND ORGANIC MATTER IN A CECIL SANDY LOAM

Southern Piedmont Conservation Research Center, Watkinsville, Georgia 30677
W. A. Jackson, S. R. Wilkinson, and R. A. Leonard
Journal of Environmental Quality, V. 6, No. 1, p. 58-62, 1977. 4 fig., 3 tab., 17 ref.

Keywords: Broiler litter, Land disposal, Soil nutrient translocation, Chloride, Nitrates, Total nitrogen, Organic matter, Application rates.

Broiler litter at rates of 0, 22.4, 44.8, 89.6, and 134.4 metric tons/ha, was surface applied semiannually for 2 years to established plots of Kentucky-31 tall fescue (*Festuca arundinacae* Schreb) grown on a Cecil soil. After 2 years almost all the added Cl had moved below 107 cm, although there was increased Cl concentration at the lower soil depths. Nitrate nitrogen in the soil profile increased significantly between rates, but not between years. There was no significant change in total N in the soil after correction for NO_3 -N. Organic matter decreased significantly between check and application rates, but not within rates or between years. Rates of 22.4 metric tons/ha applied semiannually were considered excessive from the standpoint of potential losses of a valuable N resource for crop production. (Jackson-Southern Piedmont Conservation Research Center)

4863-A8, B3, E2
REDUCTION OF CRUST IMPEDANCE TO SIMULATED SEEDLING EMERGENCE BY THE ADDITION OF MANURE

Texas Agricultural Experiment Station, College Station, Texas 77843
K. G. Chaudhri, K. W. Brown, and C. B. Holder
Soil Science, V. 122, No. 4, p. 216-222, Oct., 1976. 1 tab., 7 fig., 19 ref.

Keywords: Manure, Land application, Soil physical properties, Crusting, Seedling emergence.

The influence of manure additions to the seedbed of two soils noted for their emergence-retarding crusts was investigated. The Lufkin soil is typical of crusting fine sandy loam soils containing low amounts of organic matter often found in humid temperature regions. Hoban is typical of crusting soils containing large amounts of silt and some sodium. Such soils are most often found in semiarid regions of the world. Crusts formed on the two untreated soils were quite different. When soil was set, the application of manure over the entire surface of the Hoban soil resulted in a somewhat lower impedance, but when the surface dried, the crust was stronger than that formed on the untreated soil. On both soils, the band applications were successful in reducing the strength of the crust. In the Hoban soil, the addition of soil-manure mixtures in bands was less effective per increment of manure for mixtures greater than 50 percent. In the Lufkin soil, the maximum impedance decreased linearly as the fraction of manure added in the bands increased. In all cases the impedance increased as the moisture content decreased to the range of 2-4 percent. It was suggested that the relationship between crust impedance and moisture content is independent of the rate of drying for untreated soils. One factor that may inhibit emergence, is the presence of a rainfall-induced crust. Results indicate that, in bands directly above the rows, the application of small quantities of organic waste, induce the formation of cracks which result in a large reduction of the force required for a seedling to emerge. (Rowe - East Central)

4864-A2, B2, B4, C2, E2
FEEDLOT RUNOFF HOLDING PONDS -- NUTRIENT LEVELS AND RELATED MANAGEMENT ASPECTS

Agricultural Engineering Department, 245 Agricultural Engineering Building, University of Illinois, Urbana-Champaign, Illinois 61801
E. C. Dickey and D. H. Vanderholm
Journal of Environmental Quality, V. 6, No. 3, p. 307-312, July-Sept., 1977. 8 fig., 2 tab., 11 ref.

Keywords: Livestock wastes, Feedlots, Agricultural runoff, Holding ponds, Nutrient losses, Waste storage, Land disposal, Nitrogen, Phosphorus, Potassium.

Collection, storage and ultimate land disposal of livestock feedlot runoff is becoming a more common practice as a result of increasing state and federal regulations prohibiting uncontrolled discharge of runoff. As a result of chemical, physical, and biological actions during the storage phase, the runoff applied to land from storage is often greatly different from that entering storage directly from the feedlot. This study was designed to observe those changes in the runoff during storage, and to evaluate their effect on land disposal practices. Six concrete paved feedlots with runoff control systems were studied, with emphasis on variations in nitrogen, phosphorus, and potassium in holding ponds used for storing runoff. Seasonal variations in nutrient content of the holding ponds result from precipitation patterns, nutrient losses, and other factors. Early spring dewatering of the holding ponds, followed by frequent summer dewatering if possible, will result in the best conservation of nutrients. Large differences in nutrient content of holding ponds were observed for different species of livestock, with stored swine feedlot runoff containing nearly eight times as much nitrogen as stored beef feedlot runoff. (Dickey-University of Illinois)

4865-B2, B3, C2, E2, E3
CHEMICAL ANALYSIS AND FERTILIZER VALUE OF TURKEY MANURE

L. H. Hileman
Arkansas Farm Research, V. 26, No. 6, p. 9, Nov-Dec., 1977. 2 tab.

Keywords: Turkey wastes, Nutrients, Fertilizers, Liquid wastes, Solid wastes, Nitrogen, Phosphorus, Potassium, Application rates.

There was a potential production of 811,046 tons of turkey manure in Arkansas in 1976. Samples of both solid and liquid turkey manure were collected and sent to the University of Arkansas Soil Testing and Research Laboratory for analysis. Phosphorus was the predominate fertilizer constituent found in the turkey manure. The potassium level was lower than the phosphorus level but it still was high enough to supply adequate potassium under most conditions. Turkey manure was found to be relatively low in nitrogen. This study indicated that turkey manure can and should be used in a sound soil fertility, and crop production program because it is a valuable source of phosphorus, potassium, and nitrogen. Under most conditions, solid turkey manure could be applied at the rate of 2 tons per acre and liquid turkey manure at the rate of 4 to 5 tons (1,000 gallons) per acre. (Rowe - East Central)

4866-A7, A11, C2, C3
ATMOSPHERIC AMMONIA AFFECTS SWINE HEALTH

S. E. Curtis, J. G. Drummond, and J. Simon
Illinois Research, V. 19, No. 4, p. 8-9, Fall, 1977. 2 fig., 2 tab.

Keywords: Air pollution, Closed swine houses, Ammonia, Hydrogen sulfide, Swine-house dust, Performance, Bacteria, Ascarids.

An experiment was conducted at the University of Illinois to determine the effects of aerial ammonia, hydrogen sulfide, and swine-house dust (separately and various combinations) on health and performance of growing pigs. Study results showed that these air pollutants, at levels and in combinations resembling those in closed swine houses, had essentially no direct effect on the pigs' rate of body-weight gain or on respiratory-tract structure. The possibility that air pollutants influence respiratory-tract disease in the pig was not precluded, however. A technique was developed for measuring pulmonary bacterial clearance in young pigs. A tracer bacteria was introduced into the atmosphere as a fine mist. Thus the pigs' lungs were loaded with bacteria. After 2 or 3 hours in a chamber of filtered air, the number of live bacteria remaining in the lungs were measured to determine any influence of the air pollutant on clearance of bacteria from the lungs. It was concluded that air pollutants might predispose the pig to infections of the respiratory tract. A system was also developed to study the effects of the air environment on the tract. A system was also developed to study the effects of the air environment on the onset and course of pneumonia in the young pig. Several ascarid-ammonia trials were conducted with young pigs weighing 15 pounds at the start. Those pigs inoculated with 50,000 embryonated ascarid ova gained one-fourth less body weight than the control animals. In the pigs inoculated with ova and exposed to ammonia, the weight gain was reduced by about one-third. Thus, effects of the ascarids and air pollutant were additive. It was found that the threshold concentration for a detectable effect of aerial ammonia on a healthy pig's ability to gain weight lies somewhere between 75 and 100 ppm. Therefore, a pig's response to increasing concentrations of aerial ammonia is not linear. (Rowe - East Central)

4867-B2, C1, C2, D3
THREE YEARS OF EVALUATING A MIDWEST ANAEROBIC DAIRY LAGOON

Agricultural Research Service, U.S. Department of Agriculture, Columbia, Missouri
J. R. Fischer, C. D. Fulhage, J. H. Porter, and N. F. Meador
Paper No. 77-4571, American Society of Agricultural Engineers, 1977 Winter Meeting, Chicago, Illinois, Dec. 13-16, 1977, 26 p. 16 fig., 5 ref.

Keywords: Dairy wastes, Anaerobic treatment, Lagoons, Design, Performance, Sampling, Physical properties, Chemical properties, Temperature, Loading rates.

The performance of an anaerobic lagoon was monitored to gain an insight into the suitability of current design recommendations, and to establish certain parameters which are characteristic of properly operating lagoons. The anaerobic lagoon monitored in this study was at the University of Missouri (Columbia) Foremost Dairy Farm. The lagoon received animal wastes from the milking parlor, holding pen, and feeding loafing areas. Two sampling locations at eight depths were established in the lagoon and liquid samples were collected on a nominal once/month basis. These samples were analyzed for total solids, volatile solids, total Kjeldahl nitrogen, ammonia nitrogen, pH, electrical conductivity, and alkalinity. Temperature data was recorded during 3 two-hour intervals/day. The conclusion reached from results of the analyses are: (1) The calculated volatile solids reduction in the lagoon was 80 percent. (2) A relationship between the temperature of the lagoon and lagoon degree days was calculated. (3) A relationship between lagoon loading rate to lagoon degree days and mesophyllic digestor loading rates was developed. (4) NH_3-N accounted for 50-80 percent of the total Kjedahl nitrogen in the lagoon. (5) Conductivity values of 2800 mhoc/cm were observed in the latter sampling periods in the lagoon. (Bates - East Central)

4868-B2, C2
THE PHOSPHORUS CYCLE IN PIG SLURRY MEASURED FROM $^{32}PO_4$ DISTRIBUTION RATES

Institute for Soil Fertility, Haren, The Netherlands
R. G. Gerritse and I. Zugec
Journal of Agricultural Science, V. 88, Part 1, p. 101-109, 1977. 3 fig., 8 tab., 11 ref.

Keywords: Swine wastes, Slurries, Phosphorus, Feeds, Aerobic conditions, Anaerobic conditions, Feeds.

The rate of isotopic distribution of labelled phosphorus, added as $H_3{}^{32}PO_4$, between inorganic and organic phosphates and phosphates contained in micro-organisms was measured in pig slurry. Incorporation of P in all these phosphates occurred quickly in both aerated and non-aerated pig slurry. On the basis of a simplified model, turn-over times for phosphorus were calculated to be of the order of 10-20 weeks for both non-aerated and aerated pig slurry. Pig slurry contains 1-2 percent P (of dry matter) of which 10-30 percent is in organic molecules and 2-3 percent is in micro-organisms. About 10-20 percent of the orgahnic phosphates is in soluton, amounting to 10-20 mg P/1. The concentration of inorganic P in solution is of the order of 10-100 mg/l though, at low Ca/P ratios in the feed, can be as high as 1000 mg/1. Organic phosphates in solution in pig slurry are of high molecular weight and probably consist of DNA complexes with polyphosphates, Ca and (if used in the feed) Cu. It is concluded that all organic phosphates in pig slurry are of microbial origin and that the feed composition has little influence on the organic phosphate content of the slurry. Arguments for application of the results to pig slurry in general and to wastes from other animals are given. (Gerritse-Institute for Soil Fertility)

4869-B2, E2
UNIFORM SLURRY SPREADING WITH A CENTER PIVOT IRRIGATION SYSTEM

Valmont Industries, Inc., Valley, Nebraska
J. A. Chapman and R. G. Myers
Paper No. 76-2515, American Society of Agricultural Engineers, 1976 Winter Meeting, Chicago, Illinois, Dec. 14-17, 1976. 4 fig., 1 ref.

Keywords: Slurries, Land spreading, Irrigation, Design.

This paper describes a design for the handling of irrigation water and slurry (manure) distribution. The design is patented and was recently introduced to the agricultural market. The pumping and spreading of slurries of relatively low solid (3 - 7 percent) has been effectively achieved with automated center pivot equipment. (Chapman - Valmont Industries, Inc.)

4870-A4, A5, A8, A11, B3, C2, E2, F4
APPLICATION OF SEWAGE TO CROPLAND: APPRAISAL OF POTENTIAL HAZARDS OF THE HEAVY METALS TO PLANTS AND ANIMALS

Council for Agricultural Science and Technology
Environmental Protection Agency Report EPA-430/9-76-013, Nov., 1976, 63 p. 26 tab., 87 ref.

Keywords: Land application, Sewage sludge, Crop response, Toxicity, Heavy metals, Animal health, Water pollution, pH control, Application rates, Application sites.

This report examines the present state of knowledge regarding the potential effects on agricultural crops and animals by heavy metals in sewage sludges applied to cropland, as well as some consideration of possible groundwater and surface water contamination. Other potential effects associated with land application of sewage sludge are not addressed in detail. The potential effects of metals in sewage sludges applied to cropland are discussed within a national perspective based upon the volume of sludge being produced (present and projected), the concentrations of heavy metals in sludges, the total acreage of cropland potentially affected and resulting impacts on the crops grown. The problem is also addressed in terms of its localized variability, emphasizing the differences in observed effects as dependent upon the characteristics of the sludge applied, the application site characteristics, the method, rate and duration of application and other agricultural management practices (such as pH control), the particular metal of concern, and the crops and animals involved. Various approaches that could be used singly or in combination to reduce the potential impacts are discussed. As a current state-of-the-art report, recent research results are summarized and the many gaps in data and understanding are identified. Where possible, the importance of missing data is indicated. The report addresses some of the problems associated with monitoring metals concentrations in sludge, soil and plant tissues as well as with determining toxicity under widely varying circumstances. The report concludes that the overall impact of sewage sludge use on agricultural practices is very small. Even if all the sewage sludge currently produced were applied to cropland, the actual acreage affected would still be very small and would continue to be so even with the anticipated increase in sludge production after full implementation of P.L. 92-500. Nevertheless, in certain localities the percentage of cropland affected could be quite significant. The report further concludes that many metals are probably not a significant potential hazard, either because they are generally present in low concentrations, are not readily taken up by plants under normal conditions, or are not very toxic to plants and/or animals. Two unanswered questions are identified as crucial in determining the potential hazards of applying sewage sludges to croplands. First, and possibly most important to determining hazards to humans, what percentage of an individual's diet is composed of foods affected by heavy metals from sewage sludge? Second, for determining the relationship between plant uptake and transfer to farm animals as well as the humans (about which relatively little is known) what are the cumulative effects of repeated applications of metals in sewage sludges over time? The committee-prepared report indicates that most heavy metals are susceptible to control through choice of appropriate application sites, limiting the sludge application rate to that required to meet crop nutrient demands, and applying the sludge to well-aerated soils with pH controlled by sound management practices. Several metals (particularly Cd, Zn, Mo, Ni, Cu) are labeled as posing a potential serious hazard under certain circumstances, however, with cadmium presently being the metal of most concern. (Bastian-EPA)

4871-A9, A10, B1, D1, D2
KEEPING FLIES OUT OF THE HEN HOUSE

Rhodia Inc., Hess & Clark Division
D. C. Moore
Animal Nutrition and Health, V. 33, No. 1, p. 12, Jan./Feb., 1978. 2 fig.

Keywords: Fly control, Poultry houses, Manure removal, Moisture content, Ventilation, Residual insecticides, Costs.

Manure management is a key point in controlling fly populations in laying houses. Programmed (1-5 day interval) removal of all manure from open manure pits in the houses usually eliminates fly development. Thin spreading of manure permits rapid drying and exposure of pupae and mature larvae. Fly development decreases as the moisture content of manure decreases with development ceasing in 28-30 percent moisture manure. Moisture levels in manure or litter can often be controlled by adjustment of

ventilation systems When low moisture levels cannot be achieved, use of a residual insecticide may be necessary. A table is provided which gives an example of fly control costs based on the Hess & Clark products Residual fly Spray and Pyrenone Poultry House & Livestock Spray. (Bates East Central)

4872-B2, E2, F1
METHOD FOR INEXPENSIVE DISTRIBUTION OF LIQUID WASTE FROM DAIRY AND FEEDLOT

Department of Agricultural Industries, Southern Illinois University, Carbondale, Illinois
J J. Paterson, J. H. Jones, F. J. Olsen, and G C. McCoy
Paper No. 77-4582, American Society of Agricultural Engineers, 1977 Winter Meeting, Chicago, Illinois, Dec. 13-16, 1977, 11 p. 2 fig., 2 tab , 4 ref

Keywords. Liquid wastes, Dairy industry, Feedlots, Illinois, Vegetative-soil filter systems, Settling basins, Holding tanks, Agricultural runoff, Slopes, Design, Economics.

This is a report of one part of a statewide study of different types of vegetative-soil filter systems which have been in operation in various parts of Illinois over the past four years. The Southern Illinois University-Carbondale project was concerned with utilization of liquid wastes from a 70-cow dairy herd on the University Farms. Basic project objectives were (1) determine the pollution potential of liquid wastes from milkhouse and feedlot for a small dairy operation, (2) assess the value of the vegetative-soil filter method in reducing pollution from such an operation, and (3) formulate design criteria and operating procedures for a vegetative-soil filter system for the soils and climate of Southern Illinois. The system developed at the Southern Illinois University had a collection and distribution system consisting of three parts: (1) a settling basin to receive feedlot runoff, both liquid and solid during rain, (2) a holding tank, to receive daily washwater from the milkhouse and the liquid portion of feedlot runoff, and (3) a vegetative soil filter utilization area with a distribution system The distribution system was of a gravity-sheet flow type using a 4 inch perforated 1200 lb test PVC pipe (later replaced by 1500 lb. test PVC pipe for more strength) to carry the effluent over an area of good tall fescue sod with a uniform slope of about 3 percent which was within a reasonable pumping distance from the feedlot and dairy but at a slightly higher level This system was found to be less expensive than lagoon and sprinkler equipment for both operation and equipment. However, frequent (bi-weekly) inspection and maintenance is necessary for satisfactory performance. (Bates - East Central)

4873-A6, B1
LIVESTOCK WASTE ODOR CONTROL

Agricultural Engineering Department, Oregon State University
J. R. Miner
WRAES Quarterly, V 1, No 4, p. 7-8, Nov., 1976

Keywords: Livestock wastes, Odor control, Location, Odor measurement, Moisture reduction.

In order to operate compatibly within the community and to provide maximum self protection from odor complaints, the livestock producer must be aware of some basics concerning odor control and be prepared to practice those techniques appropriate to his location. While odors arise primarily from manure decomposition, other sources of odor include food processing wastes fed to animals and dead animals. Odors may be measured by such a device as a scentometer. Frequently, by consulting published data on wind direction, velocity, and relative humidity, it is possible to calculate an estimated odor distribution or frequency. This calculation is helpful in assessing the severity of an odor problem. One of the most commonly used odor control techniques is moisture reduction. By maintaining a manure - covered surface in a dry condition (less than 40 percent moisture), anaerobic biological decomposition is generally halted. (Merryman - East Central)

4874-B3, C1, C2, D3, E3
CHANGES IN BIOCHEMICAL CONSTITUENT OF SOME ORGANIC WASTE MATERIALS UNDER ANAEROBIC METHANE FERMENTATION

Indian Agricultural Research Institute, New Delhi, India
C. R. Prasad, K. C. Gulati, and M. A. Idnani
Indian Journal of Agricultural Science, V. 40, No 10, p. 921-924, Oct., 1970. 2 tab , 12 ref.

Keywords Anaerobic digestion, Fermentation, Organic wastes, Cattle wastes, Chemical degradation, Cellulose, Hemicellulose, Pentosans, Lignins, Methoxyl.

Barker (1943, 1956), Kluyver and Schnellen (1947) and Buswell (1956) studied the decomposition of organic compounds like sugars, cellulose, proteins, glycerol, aliphatic and aromatic organic acids by different species of methane-forming organisms. Fowler and Joshi (1923), Norman (1929), Acharya (1935) and Nelson et al. (1940) investigated the decomposition of plant materials by methane bacteria and other organisms. The previous studies were mostly devoted to the understanding of the mechanism of fermentation and the verification of the quality of biogas produced by the use of different substrates, but the studies on the breakdown of various biochemical constituents of organic materials are meagre. Therefore studies were made on the changes in the percentage composition of cellulose, hemicellulose, pentosans, lignins and methoxyl contents in various organic waste materials of plant origin along with cowdung, by the action of mixed species of methane-forming organisms. (Prasad-Indian Agricultural Research Institute)

4875-A2, A6, B1
FEEDLOT ODORS

Anonymous
Animal Nutrition and Health, V. 32, No. 8, p. 9, Nov.-Dec , 1977.

Keywords: Odor intensity, Odor measurement, Odor control, Agricultural runoff, Waste management.

Odor intensities measured at two cattle feedlots in Texas ranged from 1.5 to 170 dilutions per threshold (DT) which covers the measurement range of the Barnabey-Cheney Scentometer, an instrument used to measure odors. The average odor reading at the surface of a 4000-head feedlot, determined by monitoring 4 randomly selected pens for 7 months, was 31 DT. In conducting this research, Texas Agricultural Experiment Station workers found that the runoff settling basin and retention pond averaged 68-48 DT. Odor intensities were diluted to 1.5 to 2 DT within 1250 and 1650 feet downwind of the feedlot. It was suggested that calcium bentonite as a ration ingredient could be used to reduce odor from feedlots plus enhance cattle performance during the first 21 days of feeding. (Bates - East Central)

4876-A11, B2, C1, C2, D1, E3
EFFECTS OF LIQUID FRACTION PRESSED FROM DAIRY CATTLE EXCRETA (LE) IN LAMB DIETS

United States Department of Agriculture, Agricultural Research Service, Beltsville, Maryland 20705
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Journal of Animal Science, V. 46, No. 2, p. 478-483, Feb., 1978. 5 tab., 21 ref.

Keywords: Dairy wastes, Diets, Sheep, Separation techniques, Performance, Digestibility, Nitrogen balance, Dry matter, Organic wastes, Screw press.

Liquid was separated from fresh dairy cattle excreta (LE) by the use of a screw press. LE (8 percent Dry matter) that contained 95 percent neutral-detergent solubles dried on corn cobs replaced 0, 2.8, to 6 percent units of the dry matter of 40 percent corn cob diets. The remainder of the dry matter of the three diets consisted of 40 percent corn meal, 6.4 percent soybean meal, 2.5 percent alfalfa meal, .5 percent salt, and .6 percent units of the dry matter of 40 percent corn cob diets. The remainder of the dry matter of the three diets consisted of 40 percent corn meal, 6.4 percent soybean meal, 2.5 percent alfalfa meal, .5 percent salt, and .6 percent dicalcium phosphate. The three pelleted complete diets were fed *ad libitum* in four growth trials with 18 lambs (initial weight 28.1 kg) in each trial. Digestibility and nitrogen balance were conducted at the end of each growth trial with three lambs from each treatment. The two levels of LE did not affect nutrient digestibilities ($P > .05$), and means were: dry matter, 59 percent; organic matter, 60 percent; cell walls, 40 percent; and nitrogen, 56 percent. Daily nitrogen retention averaged 3.8 g and did not differ ($P > .05$) as a result of added levels of LE Lamb performance did not differ ($P > .05$) as a result of LE in diets, and means were: daily dry matter intake, 1.31 kg; average daily gain, 229 g; digestible organic matter for growth, 343 g; and partial conversion of digestible organic matter to gain, 1 55 kg/kg. Efficiency of nutrient utilization for growth by lambs was neither adversely affected nor stimulated by these levels of dietary additions of LE. (Smith-ARS, USDA)

4877-B3, C1, C2, C3, D3, E3
FERMENTATION AND UTILIZATION OF BROILER LITTER ENSILED AT DIFFERENT MOISTURE LEVELS

Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061
L. F. Caswell, J. P. Fontenot and K. E. Webb, Jr.
Journal of Animal Science, V. 46, No. 2, p. 547-561, Feb., 1978. 11 tab., 30 ref.

Keywords: Broiler litter, Ensiling, Refeeding, Sheep, Nitrogen utilization, Digestibility, Coliform bacteria, Moisture content.

The feasibility of ensiling broiler litter alone or with added moisture was evaluated by measuring fermentation characteristics, nitrogen utilization and ration digestibility. Wood shaving broiler litter was ensiled in small, laboratory silos at moisture levels of 15.6 (no water added), 20, 30, 40 and 50 percent. Optimum fermentation was approached at 40 percent moisture, as measured by pH and levels of lactic acid, acetic acid and water-soluble carbohydrates of the silages. Coliform bacteria were eliminated by ensiling at 20 to 50 percent moisture. In a subsequent large-scale study, litter was ensiled alone (22 percent moisture) or with added water to elevate the moisture to 40 percent. In the silage containing 40 percent moisture, active fermentation occurred, and coliforms were eliminated. Twenty-four wethers were used in a metabolism study to evaluate rations supplemented with: 1) dry heat processed litter (260 C at a depth of 1.3 cm for 30 min); 2) 22 percent moisture litter silage; 3) 40 percent moisture litter silage; or 4) soybean meal. Supplements supplied 50 percent of the nitrogen in the experimental rations. Calculated TDN was equalized among rations by varying quantities of corn cobs and corn sugar. Nitrogen retention was lower ($P < .01$) for the ration supplemented with processed litter. Digestion coefficients were not significantly different among the three rations supplemented with litter, but values for dry matter and crude fiber were higher ($P < .05$) than for the ration supplemented with soybean meal. (Caswell-Virginia Polytechnic Institute and State University)

4878-A11, B3, C2, D2, E3
ANIMAL PERFORMANCE AND MICROBIAL ADAPTATION OF RUMINANTS FED FORMALDEHYDE TREATED POULTRY WASTE

University of Illinois, Urbana, Illinois 61801
S. E. Koenig, E. E. Hatfield and J. W. Spears
Journal of Animal Science, V. 46, No. 2, p. 490-498, Feb., 1978. 7 tab., 32 ref.

Keywords: Poultry wastes, Waste treatment, Formaldehyde, Refeeding, Sheep, Cattle, Performance, Microbial adaptation, Uric acid.

Forty-four ewe lambs and 48 crossbred steers were used to determine the feasibility of recycling formaldehyde treated poultry waste (PW) in ruminant diets. Caged layer waste was treated with a 37 percent formaldehyde solution and then used at either 0 or 10 percent of the diet on a dry matter basis. Lamb weight gains and feed/gain ratios were not different ($P > .05$) for the steers receiving PW but due to the decreased feed intake, the feed/gain ratios were not different ($P < .05$) between treatments. The final study was designed to determine the period of time required for rumen microorganisms to adapt to the high level of uric acid supplied by the PW. Rumen fluid taken daily from wethers adapting to the PW diet was incubated in flasks containing graded levels of supplemental uric acid. It appeared from the *in vitro* cellulose and uric acid disappearance data that the rumen microbes were capable of utilizing the uric acid nitrogen in PM after a 2- to 3-day adaptation period and that adapted microbes were capable of degrading uric acid within a 6-hr incubation period. (Koenig-University of Illinois)

4879-B3, C2, E3
LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF I. INFLUENCE OF PRACTICAL EXTREMES IN DIET, WASTE MANAGEMENT PROCEDURE AND STAGE OF PRODUCTION ON COMPOSITION

University of Guelph, Guelph, Ontario, Canada, N1G 2W1
E. Evans, E. T. Moran, Jr. and J. P. Walker
Journal of Animal Science, V. 46, No. 2, p. 520-526, Feb., 1978. 5 tab., 12 ref.

Keywords: Poultry wastes, Refeeding, Poultry, Diets, Nutrients, Nitrogen, Ash, Gross energy, Acid detergent fiber, Neutral detergent fiber, Composting.

The effects of hen diet, stage of production and manure management on the composition of laying hen waste were tested. Four-hundred Single Comb White Leghorn laying hens were grouped by 10 and each were assigned to treatments of high (HPN) or low plane of nutrition (LPN) diets. Excreta from half of the groups on each diet was removed at 3-day intervals, while the excreta from the remaining groups were allowed to accrue during the 252-day experiment. Nutrient profiles of waste from all groups were determined at four intervals in the production cycle. At all times tested concentrations of nitrogen and ash were higher ($P < .05$) while gross energy, acid detergent fiber and neutral detergent fiber were lower ($P < .05$) in the fresh manure originating from the HPN-as compared to the LPN diet. Composting reduced ($P < .05$) moisture, nitrogen and organic matter and increased ($P < .05$) the ash content of excreta samples. Decreases in total nitrogen as composting progressed were largely attributable to losses occurring in the uric acid fraction Stage of production did not appear to be a major factor contributing to compositional changes in hen excreta. (Evans-University of Guelph)

4880-A11, B2, C2, D1, E3
LAYING HEN EXCRETA AS A RUMINANT FEEDSTUFF II. PRESERVATION AND ACCEPTABILITY OF WET EXCRETA BY SHEEP

University of Guelph, Guelph, Ontario, Canada
E. Evans, E T. Moran, Jr., G K Macleod and E M Turner, Jr
Journal of Animal Science, V. 46, No. 2, p. 527-534, Feb., 1978. 9 tab., 18 ref.

Keywords: Poultry wastes, Refeeding, Sheep, Preservatives, Propionic acid, Molasses, Nitrogen losses.

For experiment 1, fresh excreta from hens receiving a high plane of nutrition diet was sun-dried to final dry matter (DM) levels of approximately 50, 70 and 80 percent. Aliquots from each DM level were treated with 0, 1.0, 1.5 or 2 percent propionic acid (w/w, as is basis). Analysis at 30-day intervals revealed progressive nitrogen losses in samples not containing the preservative and in all samples at 50 percent DM. For experiment 2, two 6 x 6 latin square design trials were conducted to estimate the effects of composition and the effects of additives on the acceptability of hen excreta by sheep. In trial 1, ewes were offered fresh, unprocessed excreta from hens receiving high (HPN-excreta) or low plane of nutrition (LPN-excreta) diets which was untreated, or treated by adding 1 percent propionic acid or 2 percent molasses (w/w). In trial 2, wethers were offered the same six variations of excreta that had been processed by freeze drying. In both trials, sheep were given separate access to corn silage in excess of their energy maintenance requirement. Results from trial 1 indicated that the ewes preferred the unprocessed LPN over the HPN-excreta, and that intakes of both sources of waste were stimulated by the addition of molasses and propionic acid, with propionic acid being the most effective. Trials 2 results showed that sheep had no preference due to the source of manure after freeze drying. The molasses additive was effective in increasing intake, and the propionic acid was not. Intakes from both trials for all treatments provided crude protein and minerals in excess of stated requirements. (Evans-University of Guelph)

4881-A8, B5, C2, E2
WINTER-APPLIED MANURE: EFFECTS ON ANNUAL RUNOFF, EROSION, AND NUTRIENT MOVEMENT

Agricultural Research Service, U.S. Department of Agriculture, Morris, Minnesota 56267
R. A Young and R. F. Holt
Journal of Soil and Water Conservation, V. 32, No. 5, p. 219-221, Sept.-Oct., 1977. 1 fig., 5 tab , 9 ref.

Keywords: Agricultural runoff, Livestock wastes, Land application, Erosion, Nutrient movement, Crop response.

We measured runoff and soil losses from rainfall and snowmelt for 3 years on plots receiving applications of dairy manure in winter Periodic samples gave us chemical and physical determinations Soil and nutrient losses from the manured plots were less than we expected. The effects of winter manuring extended into the growing season, reducing soil loss, runoff, and nutrient movement and increasing crop yields. (Young-ARS)

4882-B2, B3, B4, C2, D3, E2
A COMPUTER SIMULATION OF BIOLOGICAL TREATMENT, STORAGE, AND LAND DISPOSAL OF SWINE WASTE

C. R. Mote
Ph.D. Dissertation, Department of Agricultural Engineering, Ohio State University, 1974, 205 p. 45 fig., 13 tab., 50 ref.

Keywords: Computer models, System design, Biological treatment, Waste storage, Land disposal, Swine wastes, Confinement pens, Feasibility studies.

A computer simulation was developed to aid in system design by simulating the operation of a biological treatment and field disposal system for wastes from a confinement swine production operation. Although the program was built for swine units, provisions were made for its ready adaptation to other types of operations. Development of the computer simulation program is described. Conclusions drawn from this study include the following: (1) The rainfall and soil trafficability simulation technique used in the computer simulation program functioned to provide a simulated field access schedule comparable with real field access data. (2) The animal population simulation procedure used in the computer simulation program produced population variations similar to variations observed in a real population. (3) Microbial kinetic parameters developed from the laboratory bench scale treatment system and the theoretically determined design concepts enabled the computer simulation program to calculate reactor volumes that compared favorably with volumes determined from conventional design criteria. (4) A study made with the computer simulation program indicates that, for a given waste stream, if the effluent COD is kept constant the mass of mixed liquor VSS in the reactor remains constant for all reactor volumes. This indicates that too small a reactor will lead to a high mixed liquor suspended solids concentration that will cause plant operating difficulties. (5) Studies with the computer simulation program also indicate that it is economically feasible to empty a liquid manure storage tank of moderate volume more frequently than it is to provide larger storage volumes. It is recommended that as a research application the computer program be used in a comprehensive investigation to develop a series of graphs that describe the relationship between the design and operating parameters for a range of situations (Merryman - East Central)

4883-A11, B2, E2
DIRECT INJECTION OF SLURRY INTO SOIL TO AVOID HERBAGE REJECTION

National Institute for Research in Dairying, Shinfield, Reading, Berkshire, RG2, 9AT, England
B. B Pain, L. S. Hodgson Jones, and D. M. Broom
Animal Production, V. 22, No. 1, p. 160-161, 1975

Keywords: Cattle wastes, Slurries, Surface spreading, Soil injection, Herbage rejection.

The herbage intake of cattle grazing pasture tainted by cow slurry may be reduced. An investigation has been made of the value of new machinery for the direct injection of slurry into the soil, as a means of overcoming this problem. In Spring eighty-one Friesian cows were divided into three groups and strip-grazed on paddocks which were either injected with slurry at 25 t/ha (≡ 60 kg available nitrogen/ha) eight weeks previously; or had slurry spread on the surface at the same rate and time; or received ammonium nitrate at 60 kg N/ha as a control. Available herbage averaged over the nine days of the trial was 19.9, 21.1 and 24.1 kg dry matter (DM)/cow per day. Animal intakes were 11.3 and 12.3 kg DM/cow per day on the injected slurry and control paddocks, but only 8.4 kg DM/cow per day where slurry was spread on the surface. When cattle first entered a paddock, and ample grass was available, the treatments did not affect the time spent grazing in daily 2-hour observation periods. During the second feed on a paddock, when less herbage was available, cattle on the surface-spread slurry treatment spent longer grazing, even though their intakes were smaller. In a second trial, paddocks which were either injected at 25 t slurry/ha in June and August, or received only inorganic fertilizer, were grazed by all the cows at 28-day intervals. Injecting slurry had no effect on animal intake or behavior. (Pain-National Institute for Research in Dairying) (Abstract only)

4884-B1, F2
ANIMAL WASTE DISPOSAL LEGISLATION AND ITS IMPACT ON DAIRY FARMS IN TWO REGIONS DOMINATED BY DIFFERENT KINDS OF SOILS (OCHRAQUALFS AND HAPLUDALFS), AS ESTIMATED WITH A MATHEMATICAL MODEL

D. R. Coote
Ph.D. Dissertation, Cornell University, Aug., 1973, 280 p. 39 fig., 5 tab., 142 ref.

Keywords: Model studies, Mathematical models, Legislation, Waste disposal, Dairy industry, Soils.

This thesis contains three major sections. The first section gives a detailed discussion on the types of legislation and the objectives of such legislation. Emphasis is placed on the literature concerning manure related pollution problems, and proposed laws and guidelines designed to control them. The second section describes the development of a mathematical model at a New York dairy farm, designed to enable estimates to be obtained of certain parameters of interest. The object is to obtain estimates of the likely changes in selected parameters which result from hypothetical legislation. The third section presents the results of linear programming procedures designed to maximize the income of a farmer, subject to constraints imposed on his operation by hypothetical legislation. The conclusions presented are in terms of the data generated by the modelling phase of the study. (Merryman - East Central)

4885-A11, B2, B3, C2, D1, E3
A NUTRITIONAL EVALUATION OF RECYCLED SWINE WASTE

D. E. Orr, Jr.
Ph.D. Dissertation, Department of Animal Husbandry, Michigan State University, 1974, 104 p. 20 tab., 156 ref.

Keywords: Refeeding, Dried swine wastes, Dried poultry wastes, Oxidation ditch liquor, Nutrients, Digestibility, Swine finisher diets, Performance.

Seven experiments, five feeding trials and two digestion trials, were conducted to evaluate dried swine feces (DSF), dried poultry waste (DPW), and oxidation ditch liquor (ODL) as sources of nutrients in swine finisher diets. Study results indicated the following: (1) Finishing pigs consumed corn-soy rations containing up to 22 percent DSF at 90 to 95 percent of full appetite. (2) Rate and efficiency of gain were depressed by the incorporation of DSF into corn-soy ratios to replace the soybean meal. (3) A depression of apparent digestibility and retention of dry matter, nitrogen, energy, and most minerals resulted from the incorporation of DSF into a finisher diet. (4) The addition of supplemental amino acids to the DSF diets significantly improved apparent digestibility of nitrogen, energy, and several minerals. (5) Elevated calcium levels, reduced amino acid availability, and reduced energy digestibility of DSF and DPW appeared to be the prime factors affecting their utilization in swine diets. It was found that addition of supplemental energy to diets containing DSF to restore the concentration of digestible energy should improve pig performance. (6) No improvement in pig performance was observed for pigs receiving ODL in their diet and lower apparent digestibility coefficients for dry matter, protein, energy and minerals were obtained in balance trials utilizing ODL. (Merryman-East Central)

4886-B3, E3, F1
PRORICH CASHES IN ON FEED MARKET WITH DPW

G. Richardson
Western Livestock Journal, V. 56, No. 18, p. 16, Feb. 13, 1978. 1 fig.

Keywords: Dried Poultry Wastes, Refeeding, ProRich Feeds, Protein, Costs.

ProRich Feeds, a division of Richlawn Turf Farms, Inc., Denver, was the first to successfully use Dried Poultry Waste (DPW) as a feed ingredient. Because of its high protein content, which averages 30 percent, DPW is a valuable ingredient. ProRich has a guarantee of 23 percent protein and is sold for $95 per ton. This makes the product $25-30 under the cost of many competing feeds of comparable values. The product can be fed on the ground, in bulk or in a feed bunk. (Rowe - East Central)

4887-A6, A8, B3, C1, C2, C3, D3, E2
COMPOSTING AS A MANURE MANAGEMENT SYSTEM

R. Thompson
Compost Science, V. 18, No. 6, p. 18-19, Nov./Dec., 1977. 2 fig.

Keywords: Farm wastes, Composting, Odor control, Moisture content, Carbon-nitrogen ratio, Temperature, Land application, Crop response.

According to Richard Thompson, composting is a sensible, practical, economical way to deal with animal wastes on a farm. Moisture content for composting should be from 40-60 percent. The carbon-nitrogen ratios should be 20-30 parts carbon to one part nitrogen. The windrows need to be turned until temperature stays below 100 . When composting starts the

odor changes to a musty smell and is not noticeable over 40 rods away from windrows. When the temperature starts to rise, the fly problem is eliminated. These temperatures will kill weed seeds and harmful pathogenic organisms. The yield response from compost was very encouraging, producing a strong 100 bushels per acre in a dry year. On the farm, composting is a way of turning a liability into an asset. (Rowe-East Central)

4888-A11, B3, C1, C2, D1, D2, E3, F1
COMPOSITION AND DIGESTIBILITY OF UNTREATED AND SODIUM HYDROXIDE TREATED FECAL WASTE FROM CATTLE FED HIGH OR LOW ROUGHAGE RATIONS

D. M. Lucas
Ph.D. Dissertation, Department of Animal Science, Virginia Polytechnic Institute and State University, Sept., 1976, 100 p. 17 tab., 98 ref.

Keywords: Cattle wastes, Refeeding, Sodium hydroxide treatment, Sheep, Performance, Roughage level, Drying, *In vitro* dry matter digestibility, Economics.

Experiments were conducted to evaluate the nutritive value of untreated and NaOH treated dried fecal waste from cattle fed a high- or low-roughage ration. Experimental objectives were: (1) To investigate the effect of two different drying methods or *in vitro* dry matter digestibility of cattle fecal waste. (2) To study the effect of NaOH treatment of cattle fecal waste on *in vitro* dry matter digestibility. (3) To determine the effect of different roughage levels in cattle diets on the nutritive value of fecal waste when fed to sheep. (4) To investigate the effect of NaOH treatment of fecal waste from cattle fed different roughage levels on its nutritive value when fed to sheep. All three factors (roughage level, drying method, and NaOH treatment) affected *in vitro* dry matter digestibility of cattle fecal wastes. Apparent digestion coefficients for untreated low-roughage waste were much higher than those for untreated high-roughage waste. Untreated high-roughage waste appeared to be of limited protein and energy value for refeeding to ruminants. However, untreated low-roughage waste appeared to have considerable refeeding value. NaOH treatment of high- and low-roughage cattle fecal wastes resulted in a significant increase in apparent digestibility of most components studied. Addition of the high level of NaOH used in this study may not be economically feasible. But addition of lower levels, as have been used in treatment of other low quality roughages, may result in sufficient improvement in nutritive value to be economically feasible. (Stiles-East Central)

4889-A11, B3, E3
REPLACEMENT OF GROUNDNUT CAKE BY DRIED POULTRY MANURE IN THE DIETS OF LAYING HENS

Department of Animal Science, University of Ibadan, Nigeria
B. K. Ogunmodede and S. O. Afolabi
British Poultry Science, V. 19, No. 2, p. 143-147, March, 1978. 5 tab., 9 ref.

Keywords: Refeeding, Dried poultry manure, Diets, Laying hens, Performance.

1. The effect on food consumption by pullets when dried poultry manure (DPM) replaced part of dietary groundnut cake depended on the strain of the birds: in two of the three hybrids food consumption was not affected when up to 100 g DPM/kg was fed. 2. Increases in food consumption were accompanied by increases in egg production. 3. The food required per dozen eggs was improved by up to 100 g dietary DPM/kg and variation in the sizes of eggs laid depended on the hybrid. 4. Concentrations of DPM up to 100 g/kg did not affect the water-soluble nitrogen content of the egg but the crude albumen nitrogen content was depressed at concentrations of 80g/kg or above. 5. Feeding DPM to laying pullets depressed body weight. (Ogunmodede-University of Ibadan)

4890-A11, B3, E3
UTILISATION OF DRIED POULTRY MANURE BY GROWING CHICKENS FED ON A PRACTICAL DIET

University of Ibadan, Nigeria
B. K. Ogunmodede and A. J. Aninge
British Poultry Science, V. 19, No. 2, p. 137-141, March, 1978. 3 tab., 8 ref.

Keywords: Dried poultry manure, Refeeding, Growing chickens, Diets, Food conversion, Carcass quality.

1. Dried poultry manure (DPM) has been tested as a replacement for groundnut cake in poultry diets. 2. Body weight gain, and the efficiency of food conversion were improved when the diet contained 50 g DPM/kg but higher rates of inclusion (100 or 150 g/kg) depressed growth. 3 Birds fed on diets containing 50 g DPM/kg yielded meat of comparable quality to those fed on the control diet whereas those fed on diets containing more DPM yielded meat contalning more fat and less water. 4. The percentage moisture in the meat was inversely related to the lipid content. 5. Nitrogen retention was comparable in all groups. (Ogunmodede-University of Ibadan)

4891-A6, B2, B3, B4, C1, C2, D3, E2
AN INTEGRATED SEPARATION, AEROBIC TREATMENT AND SLUDGE DE-WATERING SYSTEM FOR PIG SLURRY

Farm Buildings Department, National Institute of Agricultural Engineering Research, Wrest Park, Silsoe, Bedford, England
L E. Osborne, R. Q. Hepherd, and R. W. Sneath
Journal of Agricultural Engineering Research, V. 21, p. 109-120, 1976. 7 fig., 5 tab., 11 ref.

Keywords: Aerobic treatment, Separation techniques, Swine wastes, Sludge, Filtrate, Solids, Odor, Waste storage, Phosphorus, Potassium, Nitrogen.

The development of a complete treatment system for pig slurry including separation, high rate filtration and sludge de-watering is described and the results of pilot-scale experiments are given. Of the total slurry produced daily by approximately 400 pigs, 70 percent was converted into fibrous and sludge solids or lost by evaporation, the remaining 30 percent being filtrate from dewatering the sludge. The solids were easily stacked and handled as farmyard manure and the filtrate could be stored and pumped without difficulty through smallbore pipes. There was little smell from either solids or filtrate. A few analyses for plant nutrients indicated no loss of phosphorus and potassium but some loss of total nitrogen compared with untreated slurry. The complete system was automatic in operation, required little labour and, if installed in a piggery, had the potential of producing an output that was almost entirely in the form of a solid by evaporating most of the surplus liquid. (Osborne-N.I.A.E.)

4892-B3, D1
MECHANICAL MANURE HARVESTING FROM FEEDLOTS

Agricultural Engineering Department, Colorado State University, Fort Collins, Colorado
J. D. Kellerby and J. L. Smith
Transactions of the ASAE, V. 20, No. 6, p. 1033-1036, Nov.-Dec., 1977. 11 fig., 1 tab., 2 ref.

Keywords: Feedlot wastes, Equipment, Manure harvester, Design, Pulverizing, Loading, Transporting, Unloading.

A manure harvester was constructed which incorporated the functions of pulverizing, loading, transporting and unloading. It was towed by a medium-sized tractor and powered hydraulically. In tests on wood paste and beef feedlot manure, power requirements were less than 10 kW to load material 5 cm deep at forward speeds of 1 to 2 km/hr. Approximately 40 m^3/hr were loaded. Harvesting and handling beef manure from a feedlot surface to the user or processor is an important feature of any utilization scheme. Current harvesting and handling methods usually involve collection and loading into a truck spreader using a tractor front loader. A mechanical manure harvester was constructed at Colorado State University. It incorporated the functions of pulverizing, loading, transporting and unloading. The machine was designed for use on concrete and on graded, packed soil surface lots. Increased operating efficiency and capability for working with a variety of manure conditions will become increasingly important as management practices require more frequent harvesting. Stone et al (1975) showed the chemical and physical properties of manure changed significantly during the first 3 wk of aging. This suggests that manure may be more valuable and easier to process if it is harvested more frequently. The manure harvester described in this paper is efficient and capable of handling different volumes of material under a variety of conditions. (Kellerby-Colorado State University)

4893-A6, B2, C1, C2, D1, D3
THE EFFECT OF MIXING ON AN ANAEROBIC LAGOON

Agricultural Engineering Department, Oklahoma State University, Stillwater, Oklahoma
C. E Rice
Transactions of the ASAE, V. 20, No. 6, p. 1119-1122, 1128, Nov.-Dec., 1977. 4 fig., 10 ref.

Keywords: Swine wastes, Waste treatment, Lagoons, Pumps, Mixing, Odor, Chemical oxygen demand, pH, Temperature, Conductivity.

A low-energy, high-volume propeller pump was placed in a lagoon receiving swine manure to evaluate its effect upon the odors from the lagoon. Another lagoon of the same size (0.405 ha surface area by 2.2 m deep), subject to similar conditions, was close by and provided a comparison of a treated (lagoon with pump) system with an untreated (lagoon without pump) system. The lagoons were anaerobic, very turbid and had no dissolved oxygen. The pump could completely mix the lagoon liquid about every four hours and it was operated from July 17, 1975 through January 6, 1976. Odor levels, pH, temperature, conductivity and general observations were obtained on a weekly basis beginning four weeks before startup of the pump and through May, 1976. The forced mixing reduced the odor production from the lagoon from odor levels of zero to 31 to zero to seven dilutions to threshold. The observed results on the water parameters for the treated and untreated systems followed the same pattern. This indicated that the pump did not have a significant effect on the water parameters of the lagoon. The boiling-type activity of the treated lagoon was reduced significantly compared to the untreated lagoon. (Rice-Oklahoma State University)

4894-B2, B4, C1, D3, E3
TWO-PHASE ANAEROBIC DIGESTION OF SWINE WASTE

Agricultural Engineering Department, University of Georgia, Athens, Georgia
R. E. Smith, M J. Reed, and J. T. Kiker
Transactions of the ASAE, V. 20, No. 6, p. 1123-1128, Nov.-Dec., 1977. 4 fig., 3 tab.

Keywords: Swine wastes, Anaerobic digestion, Design, Volatile acid digester, Up-flow anaerobic filter, Waste storage, Methane.

Design and operating information is given for the two phases of anaerobic digestion of animal wastes, the volatile acid digester and the up-flow anaerobic filter for methane gas production. The appeal of the two-phase digestion system is discussed including the potential for the intermediate storage of concentrated volatile acids. The capability of the anaerobic filter for periodic operation is contrasted with that of the conventional methane digester. Kinetic reaction constants were evaluated for the methane digester and used to present a prediction equation for the specific volumetric gas production rate to be expected. (Smith - University of Georgia)

4895-A11, B2, C2, E3
NUTRITIONAL EVALUATION WITH RATS OF ALGAE (CHLORELLA) GROWN ON SWINE MANURE

Department of Animal Science, Oregon State University, Corvallis, Oregon 97331
P. R. Cheeke, E. Gasper, L. Boersma, and J. E. Oldfield
Nutrition Reports International, V. 16, No. 5, p. 579-585, Nov., 1977. 5 tab., 10 ref.

Keywords: Liquid wastes, Swine wastes, Substrates, Algae, Proteins, Feeds, Rats, Performance.

Algae (*Chlorella vulgaris*) grown on a substrate of liquid swine manure were evaluated as a protein source with rats. Raw freeze-dried algae had a low protein efficiency ratio (PER) of .84 which was improved by autoclaving to a PER of 1.31. PER values for soybean meal, cottonseed meal and fish meal were 2.35, 1.45 and 2.33, respectively. With a corn-based diet, autoclaved algae produced lower ($P < .01$) average daily gains than did fishmeal or soybean meal at equivalent levels of protein supplementation. Amino acid supplementation of an autoclaved algae-corn diet indicated that lysine was the first-limiting amino acid. Algae plus .3 percent lysine gave a growth rate exceeding that with corn-soybean meal diet at the same protein level. The digestibility of crude protein was 59 percent in raw algae, 68 percent in autoclaved algae, and 85 percent in soybean meal. Low protein digestibility and low lysine availability appear to be major factors limiting the nutritional value of this algae preparation. (Cheeke-Oregon State University)

4896-B2, B3, C1, D1
DEWATERING A SWINE MANURE SLURRY BY EXPRESSION

Agricultural Engineering Department, Michigan State University, East Lansing, Michigan 48824
J. F. Steffe, and J. B. Gerrish
Paper No 77-4577, American Society of Agricultural Engineers, Chicago, Illinois, Dec 13-17, 1977, 21 p. 8 fig., 3 ref.

Keywords: Separation techniques, Swine wastes, Slurries, Dewatering, Filtration, Solids.

A cylinder with a porous piston was used to express liquid from a swine manure slurry. Swine feces are found to consist of large fibrous solids and fine solids. The fine material separates readily from the fibrous solids by the addition of water and subsequent mixing. Final removal is accomplished by allowing the fibrous solids to settle and conveying the excess liquid (with fines in suspension) away from the settled material. A filtration experiment was conducted that explained why liquid is easily expressed from the fibrous solids once the fine material has been removed. Expression is a viable method of dewatering swine manure if the fine solids are properly managed. (Steffe-Michigan State University)

4897-B2, B5, C2, E2
MANURE CAN SLICE FERTILIZER NEEDS

Anonymous
Wallaces Farmer, V 103, No. 7, p. 94, April 8, 1978. 1 fig

Keywords: Swine wastes, Fertilizers, Land application, Application rates, Corn

The type of ration fed; method of manure collection and storage; amount of feed, bedding and/or water in the manure; and time and method of application are factors affecting the nutrient value of manure. Hog manure should be applied to the land at such a rate that the amount of available nutrients does not greatly exceed the amount removed by the growing crop. Proper manure application rate on 150-lb. corn land would be 9773 gal/acre/year, if the manure is used as a complete fertilizer. If applying the manure to maximize its fertilizer value, an additional 108 lb. of N and 150 lb. of K_2O are needed per acre to meet corn nutrient requirements. (Rowe East Central)

4898-A3, B2, B4, C1, C2, E2
CHARACTERISTICS OF RUNOFF FROM DISPOSAL OF CATTLE FEEDLOT WASTES ON LAND

M. E. Harris
M.S. Thesis, Department of Civil Engineering, Kansas State University, 1974, 88 p. 15 fig., 31 tab., 67 ref.

Keywords: Cattle wastes, Liquid wastes, Land disposal, Agricultural runoff, Irrigation tailwater, Nutrients, Storage lagoon effluent.

A study was carried out on plots of gently sloping, fine sandy loam soil with an infiltration rate of 0.1 inch/hour at the Pratt (Kansas) Feedlot. Researchers hoped to determine oxygen demanding properties, nutritional components, and other factors that might help characterize the stormwater runoff and irrigation tailwater in this situation. Samples of rainfall runoff and clearwater irrigation tailwater were collected. Storage lagoon effluent was applied during the growing season as follows: E-1, 0 inches; E-2, 16 inches; E-3, 8 inches; E-4, 4 inches; and E-5, 2 inches. Manure was applied in the autumn as follows: M-1, 0 tons/acre; M-2, 10 tons/acre; M-3, 20 tons/acre, M-4, 40 tons/acre; M-5, 80 tons/acre; M-7, 160 tons/acre; M-9, 320 tons/acre; and every other year to M-6, 80 tons/acre; M-8, 160 tons/acre; and M-10, 320 tons/acre. Water was provided by furrow irrigation of well water. Two trends were indicated: (1) Increasing manure applications increased the values for the pollution parameters. (2) Total-N and Total-P were related to COD. Study conclusions were: (1) Land disposal achieves a high degree of treatment of feedlot wastes. (2) Pollution parameters had high enough concentrations from rainfall runoff that the quality of the water was doubtful for direct release to surface waters. (3) For rainfall runoff, increasing manure applications inferred increasing values for the pollution parameters. (4) Irrigation runoff had much lower concentrations of the pollution parameters than rainfall runoff yet, possessed a pollution potential that may not be suitable for direct release to surface waters. (5) No definite trends could be determined for the values of the pollution parameters from irrigation runoff. (6) Values for both concentrations and total losses were usually higher than those found in the literature for lands with and without manure application. (7) Oxygen demanding material in the runoff may not be a problem since it is mostly COD. Suspended solids and nutrients have the potential to be problems throughout the year. (Stiles - East Central)

4899-B2, B5, E2, F1
LOW-LABOR FLUSH SYSTEM CLEANS MILKING AREAS IN MINUTES

Anonymous
Progressive Farmer, V. 93, No. 4, p. 75, April, 1978. 3 fig.

Keywords: Liquid wastes, Dairy wastes, Flushing, Underground pit, Irrigation, Coastal bermudagrass, Costs.

It takes less than one hour a day for Lawrence Hancock, Stephenville, Texas to clean up his milking barn and holding areas and dispose of wastes. After milking, Hancock hooks up a 50-foot, 1½-inch-diameter rubber hose and turns on a 3-horsepower pump. The pump forces water from a 1,000-gallon tank through a hose and out through a high-pressure nozzle at 35 to 40 pounds per square inch. Force of the water blows manure into a 22,000-gallon underground pit. The barn and holding pen are flushed in less than 20 min. The holding pit is 23 x 26 x 8 feet and is covered with concrete slats. A tractor pto-driven liquid manure pump moves the liquified wastes through the irrigation pipe to a sprinkler gun which sprays the material onto 12 acres of Coastal bermudagrass. It takes less than 40 minutes to empty the pit. The system costs about $5,000 for pump, hose, nozzle, irrigation pipe, and sprinkler gun. (Rowe - East Central)

4900-A1, B1, B5, C1, C2, C3, D1, D2, D3, E2, E3, F1, F2, F4
SOILS FOR MANAGEMENT OF ORGANIC WASTES AND WATERS

R. C. Dinauer, Managing Editor
Soils for Management of Organic Wastes and Waste Waters, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Madison, 1977, 650 p.

Keywords: Organic wastes, Soils, Land Disposal, Recycling, Solid wastes, Liquid wastes, Physical properties, Chemical properties, Biological properties, Soil-water-plant relationships, Site selection, Design, Management, Transportation, Climates, Pollution, Regulation, Economics.

This publication is a compilation of symposium papers concerning land utilization and disposal of organic wastes that were presented by scientists having a wide diversity of training and experience. The first chapter gives a brief resume of sources and quantities of organic wastes, present and potential future regulations, and economic and social implications of utilization and disposal on agricultural lands. The next chapters concern: (1) properties of wastes and waste waters, (2) chemical, physical, and biological properties of soils, (3) effect of waste application on nutrient cycles, (4) site selection, design, and transportation, (5) special utilization and disposal problems occurring within various climatic regions, and (6) special environmental considerations (odors, pathogens, etc.). The last chapter deals with the future direction of waste utilization. (Merryman-East Central)

4901-A6, B1, C1, C2, C3
PROPERTIES OF AGRICULTURAL AND MUNICIPAL WASTES

Metropolitan Sanitary District of Greater Chicago, Chicago, Illinois
T. M. McCalla, J. R. Peterson, and C. Lue-Hing
Soils for Management of Organic Wastes and Waste Waters, Chapter 2, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Madison, Wisconsin, 1977, p. 10-43. 23 tab., 46 ref.

Keywords: Animal wastes, Crop wastes, Forest wastes, Industrial wastes, Sewage sludge, Municipal refuse, Physical properties, Chemical properties, Biological properties, Odor.

This chapter discusses the physical, chemical, and biological properties of agricultural and municipal wastes as they relate to land application. Major sources of animal wastes are beef feedlots and confined housing for dairy cattle, chickens, and swine. The mean and range of chemical analyses of samples taken from 23 outdoor beef cattle feedlots in Texas are given. Concentrations of plant nutrient elements are highly variable, depending upon ration, collection, storage, and handling. The total amount of all mineral elements, except C and N will remain constant with time. As the manure decomposes, part of the C is given off as CO_2 and some N is mineralized. Of all nuisances related to manures, odor is the most readily noticeable but least definable and most difficult to control. Microorganisms associated with animal wastes may also constitute a problem. Besides the large number of saprophytic organisms that may occur in animal wastes, several disease organisms may be present and transmitted by animal waste material. Composting manure may raise the temperature sufficiently for pasteurization to occur. It has been determined that about 70 percent of typical feedlot manure particles are greater than 2 μm. The shrinkage limit of high roughage ration (HRR) feces has been established in one study to occur at a moisture content 1.5 times greater than that of high-concentrate ration (HCR) feces. Particle and wet bulk densities of the feces were not affected by ration. A linear regression equation was developed for estimating slump (S) as a function of total solids content (TS) wet-weight basis. The equations were S = 85.98 - 2.40 TS for the HCR feces and S = 62.60 3.23 TS for the HRR feces. The equation for HRR feces was linear within the range of 14 to 18 percent total solid content. The liquid limit was 78.1 percent (wet basis) for the HRR feces and 69.9 percent (wet basis) for the HCR feces, similar to organic clays and highly elastic silts and silty clays. The properties of crop plant wastes, forest wastes, industrial processing wastes, sewage sludge, and municipal refuse are also discussed. (Merryman-East Central)

4902-A2, A3, B2, C1, C2, D1, D3
PROPERTIES OF WASTE WATERS

Robert S. Kerr Water Research Center, EPA, Ada, Oklahoma
R. Thomas and J. P. Law
Soils for Management of Organic Wastes and Waste waters, Chapter 3, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Madison, Wisconsin, 1977, p. 46-72. 13 tab., 37 ref.

Keywords: Waste water management, Physical properties, Chemical properties, Physical treatment, Biological treatment, Municipal waste waters, Irrigation return flows, Feedlot waste waters, Agricultural runoff.

The purpose of this chapter is to provide information on waste water properties which will be of value to those planning and designing waste water management projects. Waste water sources which are considered include municipalities, animal feedlots, and irrigation return flows. Selected quantitative data in combination with other information to depict ways for assessing factors which have strong influence on project planning, design, and management are presented. Waste water flow rates and changes in properties induced by treatment processes are addressed separately for each source. The treatment processes covered include primary processes and conventional biological processes referred to as secondary treatment processes. (Merryman - East Central)

4903-A8, B2, B3, C2, E2
RECYCLING ELEMENTS IN WASTES THROUGH SOIL-PLANT SYSTEMS

Pennsylvania State University, University Park, Pennsylvania
L. T. Kardos, C. E. Scarsbrook, and V. V. Volk
Soils for Management of Organic Wastes and Waste Waters, Chapter 12, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Madison, Wisconsin, 1977, p. 300-324. 13 tab., 51 ref.

Keywords: Land application, Municipal wastes, Food processing wastes, Industrial wastes, Agricultural wastes, Nutrients, Soil mechanics.

Chapter emphasis is on the use of the plant and soil as vehicles whereby chemical elements in municipal waste waters, sewage sludges, municipal solid wastes, food processing wastes, industrial wastes and agricultural wastes may be recycled in agricultural production. The extent of elemental recycling through the soil-plant system after application of organic wastes to soils varies widely. After application of a waste product to the soil, chemical and physical reactions begin to change elemental availability. In the case of animal wastes, nitrogen can be recycled through the soil-plant system. Nitrogen in liquid waste becomes available to plants readily whereas the organically combined N in the solid animal waste becomes available more slowly and may remain as a N reserve in the soil. Nitrogen can serve as an effective parameter to determine waste application to soils, assuming that salt concentration, odor, insect, solids accumulations, and sociological effects of the waste application on neighboring communities do not present problems. Application of animal wastes to supply N will often eliminate micro-nutrient deficiencies of Zn or Fe and add considerable P and K to the soil. Before applying wastes to the land, one should know the chemical, physical, and microbiological properties of the material; topographical and climatological features of the area; soil chemical and physical properties, long range land use, cropping plans; crop nutrient requirements and elemental sensitivities; and public reaction or sentiment. This information will help facilitate management systems that optimize elemental recycling. (Merryman-East Central)

4904-B2, B3, B5, E2
SPECIAL OPPORTUNITIES AND PROBLEMS IN USING FOREST

SOILS FOR ORGANIC WASTE APPLICATION

University of Florida, Gainesville, Florida
W. H. Smith and J. O. Evans
Soils for Management of Organic Wastes and Waste Waters, Chapter 16, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Madison, Wisconsin, 1977, p. 428-459. 14 tab., 63 ref.

Keywords: Land application, Municipal wastes, Recreational area wastes, Animal wastes, Agricultural wastes, Industrial wastes, Forest management.

Distribution of wastes on forest lands is discussed in terms of: (1) forest soil, site, and stand characteristics affecting use, (2) characteristics of wastes -- municipal sewage effluents, rural sewage effluents (including animal wastes), industrial effluents, sludges, and solid wastes -- affecting use in forests, (3) transport, distribution, logistics, and engineering factors, and (4) forest management alternatives and utilization strategies. Research indicates that waste application to forests and tree plants can contribute to renewing wood fiber resources and solving waste recycling problems provided proper tree species are selected; wastes are properly adjusted to the ecological requirements of the trees; distribution systems are designed to fit structural characteristics of forests; and the optimum tree production systems are selected, installed, and properly managed. (Merryman-East Central)

4905-A1, A5, A7, A8, B1, C1, C2, E2
LAND UTILIZATION AND DISPOSAL OF ORGANIC WASTES IN ARID REGIONS

University of Arizona, Tucson, Arizona
W. H. Fuller and T. C. Tucker
Soils for Management of Organic Wastes and Waste Waters, Chapter 17, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Madison, Wisconsin, 1977, p. 472-489. 6 tab., 31 ref.

Keywords: Animal wastes, Plant wastes, Municipal wastes, Industrial wastes, Land application, Arid lands, Environmental effects, Air pollution, Ground water pollution.

Aridity may be described as a comparison between water supply and water need. Water supply is relatively easy to measure. Water need, which refers primarily to potential evapotranspiration, is more difficult to evaluate. Chemically, arid land soils are neutral and alkaline in pH and high in salts. Animal manures in arid regions probably differ from those in humid regions more than other waste materials. Moisture content of wastes and also the leaching associated with rainfall are less prominent in arid than in humid lands. The custom of housing animals in exposed and unpaved corrals and feedlots results in the manures mixing with sand and soil. For manures to be beneficially used on soils in crop production, special management practices must be used to avoid the following problems: (1) excessive salt hazard, (2) high loading rates, (3) accumulation of unfavorable levels of trace and heavy metals, (4) potential disease problems, and (5) high levels of Na and K in proportion to Ca plus Mg. The nature of other wastes (including plant wastes, municipal solid wastes, sludges, city effluent, and industry waste streams) must also be taken into account in arid regions. At present, organic waste and waste water management in arid region soils of the United States is based on limited research. Water pollution and air pollution potential must be examined. While many of these wastes and waste waters may be beneficially applied to arid lands due to nutrient and moisture content, wise management systems must be utilized to avoid any detrimental conditions that may arise from such applications. (Merryman-East Central)

4906-A8, A11, A12, B1, B5, C3, E2
PATHOGEN CONSIDERATIONS FOR LAND APPLICATION OF HUMAN AND DOMESTIC ANIMAL WASTES

USDA-ARS, Beltsville, Maryland
J. D. Menzies
Soils for Management of Organic Wastes and Waste Waters, Chapter 22, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Madison, Wisconsin, 1977, p. 574-585. 17 ref.

Keywords: Land application, Animal wastes, Municipal wastes, Pathogenic bacteria, Animal health, Public health.

Recycling of animal manures directly in pasturing or by spreading manure from barns and feedlots on the land is an historically accepted practice. The land is also being used more and more for disposal of municipal wastes. Organic wastes from humans or domestic animals inevitably contain pathogens. Consequently, certain safeguards should be observed. Basic guidelines for application of municipal wastes are: (1) Present regulations protecting domestic water supplies should be maintained. (2) In using sewage sludges on land, properly operated anaerobic digestion, secondary activation, lagooning, or liming to pH 11.5 or above should be sufficient treatment for reducing pathogens to a safe level. Untreated raw sludges and raw effluent water should not be used in food crop production until we know more about this particular hazard. (4) Composted sludges should be considered to be sufficiently free of pathogens to be used for crop and food production. (5) Raw sewage effluent should be safe for sprinkling on land where public access is controlled and suitable buffer zones are provided to take care of aerosol drift. (6) Effluent from properly operated secondary treatment plants or lagoon systems should be done with reasonable precautions to prevent surface runoff into open water. In terms of land application of animal wastes, a number of studies have shown that it is a good precautionary practice to restrict animals from sprayed pastures for a week or 10 days of sunny weather after application. This exposure to heat, ultraviolet radiation, and drying is generally lethal to Salmonella, fecal coliforms, and probably viruses. A recent report prepared for the Council for Agricultural Science and Technology states "utilization of urban and animal wastes is probably impeded to a greater extent by the fear of disease than by the actual disease hazard involved. Information from field tests suggests that the hazards from pathogens are more imaginary than real. (Merryman-East Central)

4907-A1, A4, A5, A6, A12, B5, C2, C3, E2, E3
FUTURE DIRECTION OF WASTE UTILIZATION

University of California, Riverside, California
P. F. Pratt, M. D. Thorne, and F. Wiersma
Soils for Management of Organic wastes and Waste Waters, Chapter 25, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Madison, Wisconsin, 1977, p. 620-634. 6 ref.

Keywords: Municipal wastes, Animal wastes, Land disposal, Refeeding, Recycling, Groundwater recharge, Public health, Odor, Crop response, Water pollution, Groundwater pollution, Pathogenic bacteria, Nutrients.

About 6 million dry metric tons/year of sewage sludge is produced in the United States. About 310 million dry metric tons of manure from farm animals is produced. A report of the Council of Agricultural Science and Technology (CAST) dealing with use of sewage sludges and animal manures in agriculture summarized the problems that limit their use as follows: (1) Animal manures and sewage sludges are bulky low-grade fertilizers of variable composition. (2) These materials cannot be transported more than a few tens of miles before the costs of transportation exceed their fertilizer value. (3) Difficult on-farm management problems are created by their physical properties. (4) Animal manures and sewage sludges contain soluble salts that can limit their use in arid irrigated areas. (5) The undesirability of leaching of soluble salts may limit their use on some croplands. (6) Sewage sludges contain heavy metals that are retained in soils and might accumulate to the point where they are toxic to some plants. (7) Incompletely treated sewage sludges contain pathogenic bacteria, viruses, and parasites that represent a public health risk to farm workers and the public via the food chain. (8) Odors and associated nuisances create conflicts between urban and rural residents and the farmers of adjacent croplands where sludges and manures are used. (9) The use of sewage sludges on cropland is inhibited by sociological resistance. (10) Government agencies require monitoring of both crop and water quality if sewage sludges are to be used. (11) The practice of refeeding animal manures is inhibited by the concern for possible transmission of pathogens and undesirable organic residues into foods. (12) There are no meaningful guidelines, for using sewage sludges on cropland or manures as feed ingredients, that can be interpreted on a regional basis or in terms of local situations and needs. The CAST Report also outlined actions that can promote sewage sludge and animal manure use. Methods other than land spreading meriting consideration as a means of utilizing municipal and animal wastes include: (1) use of animal manure as feed, use of animal manure for energy or fuel, use of effluents in ground-water recharge and use of sewage sludge as a source of metals. Trends for the use of animal wastes and municipal wastes are predicted. (Merryman East Central)

4908-C2, D1, D2
CYCLONIC BURNER FOR PARTIAL COMBUSTION OF MANURE TO AMMONIA SYNTHESIS GAS

I. J. Natour
M.S. Thesis, Department of Chemical Engineering, Texas Tech University, Dec., 1974, 47 p. 11 fig., 5 tab., 29 ref.

Keywords: Cyclonic burners, Oxidation, Cattle wastes, Ammonia synthesis gas, Equipment, Design, Temperature, Hydrogen.

The major purpose of this thesis was to devise a laboratory scale, air-fired, cyclonic burner which would partially oxidize cattle manure without external heat or additional fuel. A secondary purpose was the extrapolation of the experimental data to a process that will ultimately produce synthesis gas suitable for the production of ammonia. Equipment and procedures are described. Conclusions drawn from the study included: (1) If sufficient heat transfer between entering and exiting streams is achieved, a cyclonic burner could partially oxidize manure, without external heat or added fuel, to produce synthesis gas that, if desulfurized and reformed, could be used for ammonia production. (2) Although the upper reactor temperature limit was not found, it was observed that the higher the temperature of the partial oxidation reactions, the greater the projected hydrogen yield for the temperature range investigated. (3) The capacity of the burner was not found, although 253 pounds of wet manure per cubic foot of reactor volume per hour was experienced. It was recommended that burners with different depths should be investigated to determine the optimum depth, thus fixing an L/D ratio for future scale-up operations. Experiments to characterize the condensate are needed in order to give more reliable energy balances. Studies of introducing an inert gas to sustain a whirling motion inside the burner would give more insight as to the air rate that must be supplied. (Rowe - East Central)

4909-A12, B2, C3
LIQUID MANURE CAN RELEASE DEADLY GASES

Anonymous
Wallaces Farmer, V. 103, No. 7, p. 44, April 8, 1978.

Keywords: Liquid wastes, Gases, Toxicity, Safety, Wisconsin.

While cleaning gutters inside a calf barn, a 16-year old Wisconsin farm youth died from inhalation of toxic gases. Preventive measures suggest, where liquid manure systems are used, that there should be adequate ventilation and that animals and workers should be evacuated from enclosed buildings when manure is agitating. (Rowe-East Central)

4910-A11, B1, C2
SULFA RESIDUES IN SWINE STILL A PROBLEM

Anonymous
Southern Hog Producer, V. 9, No. 1, p. 27, Feb., 1978.

Keywords: Swine, Sulfa, Residues, Withdrawal period, Swine wastes.

Hogs can recycle sulfa from manure which has accumulated in pens where sulfa was fed, according to research by the University of Illinois. In controlling the residue problem the first step is to make sure the feed doesn't contain any sulfa during a 15-day withdrawal period before slaughter. Producers also need to scrape pens clean and flush them with water to remove all manure that may contain sulfa. After 2-3 days of feeding non-medicated feed, move the hogs into a second clean pen so that manure from the first few days can't be recycled by the hogs and cause a residue violation. (Rowe - East Central)

4911-A11, B2, B3, C1, C2, C3, D1, E3
EFFECTS OF RUMEN CONTENTS OR FRACTIONS THEREOF ON PERFORMANCE OF BROILERS

Department of Animal Biology, School of Veterinary Medicine, Pahlavi University, Shiraz, Iran
B. Emmanuel
British Poultry Science, V. 19, No. 1, p. 13-16, Jan., 1978. 4 tab., 6 ref.

Keywords: Rumen contents, Refeeding, Cattle wastes, Sheep wastes, Diets, Broilers, Performance, Separation techniques.

1. Whole rumen contents did not affect growth and food conversion when included in the diets of broilers (1 to 21 d). 2. The microbial and liquid fractions of rumen contents improved food conversion while the solid fraction (100 g/kg diet) decreased food conversion efficiency. (Emmanuel-Pahlavi University)

4912-A11, B1, C1
INFLUENCE OF B-GLUCANASE ON FEEDING VALUE OF BARLEY FOR POULTRY AND MOISTURE CONTENT OF EXCRETA

Department of Animal Husbandry, Agricultural College of Sweden, S-750 07 Uppsala, Sweden
B. Gohl, S. Alden, K. Elwinger, and S. Thomke
British Poultry Science, V. 19, No. 1, p. 41-47, Jan., 1978. 3 fig., 2 tab., 16 ref.

Keywords: Poultry wastes, Viscosity, Diets, Performance, Barley, Water-treatment, Heat treatment, B-glucanase treatment.

1. The cause of the sticky droppings and poor performance that can occur when barley is fed to poultry was investigated. 2. The problems could be overcome by water-treatment of the barley or by addition of B-glucanase. 3. The problems appear to be caused by a viscous factor, which is hydrolysed by B-glucanase. Water-treatment allows hydrolysis by enzymes in the barley. 4. Heat-treatment of barley denatures hydrolytic enzymes and prevents reduction in viscosity. (Gohl-Agricultural College of Sweden)

4913-A11, B1, D3, E3, F1
WASTE AS A FEED EXTENDER

Department of Animal Science, The Texas Agricultural Experiment Station, The Texas A&M University System, College Station, Texas 77843
L. M. Schake
Texas Agricultural Progress, V. 24, No. 4, p. 23, Fall, 1977. 3 fig.

Keywords: Refeeding, Digestibility, Cattle, Performance, Waste reconstituted grain, Water reconstituted grain, Economics, Carcass quality.

Feeding more people for less money through increased efficiency and economy are consistent goals of agricultural research. One such research involves making animal foods more digestible, thus increasing animal feed efficiency. Water reconstitution of grain sorghum has been shown to increase liveweight cattle gain consistently. More complete digestion occurs because grain reconstitution in a controlled atmosphere starts the digestion process before it is fed. Additional predigestion is also possible by introducing digestive microbes and other waste from the animal's digestive system into the feed before feeding it. The Texas Agricultural Experiment Station did a recent research project demonstrating that this method could improve conversion of sorghum grain into beef by steers. A good source for these microbes is waste from the pits in slotted floor confinement barns. A series of experiments was conducted to study the use of concurrent refeeding and grain reconstitution. Waste reconstituted grain improved feed conversion and weight gain more than water reconstituted grain. Waste usage (1) improved steer performance, (2) reduced disposal of waste from confinement operations, (3) conserved much of the energy that would have been used to grow grain, and (4) further reduced the cost of feeding a steer by $5. Waste reconstituted grain had greater digestibility of dry matter, crude protein, and crude fiber. Taste panel scores showed no significant change from control carcasses, nor did 14 other measures of carcass values. (Stiles - East Central)

4914-B2, C1
EFFECTS OF RATION ROUGHAGE CONTENT ON VISCOSITY AND THEORETICAL HEAD LOSSES IN PIPE FLOW FOR BEEF CATTLE SLURRY

Agricultural Engineering Department, University of Nebraska, Lincoln, Nebraska
L. L. Bashford, C. B. Gilbertson, J. A. Nienaber, and D. Tietz
Transactions of the ASAE, V. 20, No. 6, p. 1106-1109, Nov.-Dec., 1977. 8 fig., 11 ref.

Keywords: Rations, Roughage content, Dilution, Viscosity, Cattle wastes, Slurries, Pipe flow, Head loss.

Study objectives were: (a) determine the viscosities of diluted feces from cattle fed at two levels of roughage feed, (b) determine the effect of removal of solids greater than 500 microns on manure slurry viscosity, and (c) determine the theoretical friction head loss (H_f) of diluted feces at solids concentrations of 5 to 15 percent in non-corrosive polyvinylchloride pipe. Manure feces and urine samples were collected from cattle fed in metabolism crates at the Animal Science Department, University of Nebraska. Half the animals were fed a high roughage (HR) ration (more than 18 percent crude fiber), the other half a low roughage (LR) ration (less than 10 percent crude fiber). Viscosity tests were conducted by diluting fecal samples with water. Measurements were made with an 8-speed Brookfield Synchro-Lectric model

RVT rotational viscometer using an optional set of five cylindrical spindles at speeds of 20, 50, and 100 rpm. Conclusions drawn from the study were: (1) Feces from cattle fed LR and HR rations are non-Newtonian and pseudoplastic in response. (2) Measurable differences exist in the viscosity of diluted (5-15 percent TS) feces from animals fed HR and LR rations. For a given TS concentration the viscosity and theoretical head loss of diluted HR feces are greater than those from LR feces, and increase with TS concentrations. (3) The estimated head loss for diluted feces with particles greater than those from LR feces, and increase with TS concentrations. (3) The estimated head loss for diluted feces with particles greater than 500 microns removed was about twice that of the head loss for diluted HR and LR feces when TS concentrations ranged from 2-6 percent, or from 6-15 percent. (Merryman-East Central)

4915-A3, A5, A6, A10, B2, B5, C2, C3, E2, F1
CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE

Colorado State University, Fort Collins, Colorado 80523
J. L. Smith, D. B. McWhorter, and R. C. Ward
Environmental Protection Agency Report EPA-600/2-77-117, June, 1977, 47 p. 11 fig., 15 tab., 4 ref.

Keywords: Liquid wastes, Dairy wastes, Fertilizers, Injection, Groundwater pollution, Nutrients, Salts, Heavy metals, Bacteria, Site selection, Odor, Insects, Agricultural runoff, Aesthetics, Economics.

The research has involved the development and evaluation of an efficient, economical, continuous subsurface injection machine. The application site was instrumented so the quality of water percolating beneath the injection zone could be measured. Wells located around the sites were used to monitor groundwater quality. Soil samples were taken periodically to determine nutrients, salts, heavy metal concentrations, and bacteria movement and survival. Major environmental problems were increased soil salinity and movement of fecal coliform to the groundwater. Both of these problems can be eliminated by proper management and site selection. Subsurface injection is economically feasible when compared with other methods of land application. Although capital costs are greater for subsurface injection, labor costs are significantly reduced. Other advantages of subsurface injection are elimination of odors, insects, and visual pollution and minimization of runoff pollution. (Smith-Colorado State University)

4916-B2, C2, D3, E3
METHANE PRODUCTION SYSTEMS FOR SWINE MANURE

U.S. Department of Agriculture, Science and Education Administration, North Central Region, Columbia, Missouri 65201
J. R. Fischer, E. L. Iannotti, D. M. Sievers, C. D. Fulhage, and N. F. Meador
Missouri Agricultural Experiment Station Journal Series Handout, 33 p. 15 fig., 9 tab., 6 ref.

Keywords: Swine wastes, Slurries, Confinement pens, Anaerobic digester, Methane, Settling basins, Gas production rates, Design.

Production of swine in confinement systems is becoming popular in the Midwest because of labor efficiency. Swine confinement systems, however, are energy intensive and problems with manure management occur. An anaerobic digester is a system that can process the manure and at the same time produce some energy. In 1973, research began on the digestion of swine manure for energy production at Columbia, Missouri. Since that time, loading rates, gas production potential, and numerous physical and chemical parameters associated with swine manure digestion have been defined. This research was accomplished with a 15 cubic foot model digester which has operated continuously since 1973. Approximately 50 percent of the solids entering the digester are converted to gas at a 15-day retention time. The gas composition is approximately 60 percent methane and 40 percent carbon dioxide. In 1975, design and construction of a full-scale swine farm digester at the University of Missouri-Columbia (UMC) Swine Farm began. The UMC Swine Farm is a 40-sow farrow-to-finish, totally confined system with farrowing occurring twice a year. The capacities of the various buildings are: farrowing house, 40 sows; nursery, 320 pigs; finishing house, 320 pigs; and gestation house, 160 sows. The manure is transported from the buildings to a centrally located settling basin. In the settling basin the correct concentration of solids and water is obtained before the manure slurry is pumped into the digester daily. The digester is a 140 cubic meter digester, 4.9 meters in height and 6.1 meters in diameter. The digester is constructed of a concrete stave silo surrounded by a grain bin exterior. The approximate 4 inches of space between the grain bin and silo is filled with 4 inches of ureathane insulation. To maintain digester temperature at 35°C, the gas produced during digestion is burned in a commercial water heater. Hot water is circulated through the boiler and then through the digester in 2-inch pipe. The pipes are arranged in six 7-foot diameter coils inside the digester. The unit was put into operation in September, 1976, and has operated successfully ever since. Twenty-five days after the digester was started, the gas was at its maximum methane content. Actual gas production rates from the unit are approximately 2,000 cubic feet per day. The unit is capable of producing 10,000 cubic feet of gas but due to low hog numbers in the buildings, the potential has not yet been obtained. For the winter of 1976-77, approximately 35 percent of the potential gas production of the digester was used to maintain digester temperature. One-half of the 35 percent of the gas consumed was needed to heat up the incoming mixture of manure and water. Electrical energy consumption at the digester was 10 to 15 kilowatt hours per day during January. Some problems that were encountered during construction operation of the digester were 1) sealing the digester structure of all gas leaks; 2) resuspension of the manure solids in the settling basin once they have settled; and 3) accurately recording gas production. (Fischer-USDA)

4917-B2, B3, C1, C2, D1, D3, E3, F1
THE CALORIFIC PROJECT. I. BACKGROUND AND DESIGN CRITERIA

Director of Systems Development, Thermonetics, Inc., Oklahoma City, Oklahome
G. W. Meckert, Jr.
Unpublished paper, 5 p.

Keywords: Recycling, Cattle wastes, Calorific Recovery Anaerobic Process, Feeds, Energy, Methane, Fertilizer, Separation techniques, Anaerobic digestion, Thermonetics Inc., Design, Economics.

The Calorific Recovery Anaerobic Process is a plant which selectively removes and makes available portions of the constituents of cattle manure at their highest economic value. While no one product totally justifies the entire undertaking, the step-by-step removal of feed, then energy, and finally fertilizer provides a favorable picture. Design of the process has incorporated some fundamental concepts which simplify handling, minimize energy consumption, maximize thermal efficiency and provide products in readily usable forms. Mechanical processing is utilized in preparation of the process slurry and in initial removal of feedstuff fibers. Anaerobic digestion of the smaller particulate matter releases the product methane-carbon dioxide gas mixture which is further processed to give pipeline quality gas. Finally, the digester effluent is centrifuged to remove a fine, fibrous sludge, high in protein and a liquid fertilizer, rich in nitrogen, phosphorus and potassium, which may be stored and pumped to adjacent crop lands as desired. To the best of our knowledge, this plant represents the first commercial endeavor to combine the three phases of feed, energy, and fertilizer recovery. Numerous efforts have been made and much background work has been done on combinations of two of the phases but these fall short in the economic optimization of the feedstock material. And, it is not too great a step to begin to speculate on such a process being utilized on feedstocks other than cattle manure. At present, Calorific's parent company, Thermonetics Inc., is looking at additional sites for construction of several more plants. This is testimony enough as to the viability of the process to turn a nuisance liability into an economic resource. (Meckert-Thermonetics, Inc.)

4918-A11, A12, B3, C2, C3, E3
FEEDING POULTRY WASTE TO RUMINANTS

Agricultural Research Council's Poultry Research Centre, King's Buildings, West Mains Road, Edinburgh, EH9 3JS, Scotland
W. Bolton
Vth European Poultry Conference, Malta, Sept. 5-11, 1976, 7 p.

Keywords: Refeeding, Dried poultry wastes, Dried poultry litter, Cattle, Protein, Minerals, Performance, Flavor, Animal health, Public health.

Broilers and layers can be housed in cages or on litter on the floor; there are therefore four products which can be dried and used as animal feedingstuffs. Of these dried battery manure from laying hens (DPM) and dried broiler manure from floor-reared birds (DPL) are the most important. Their major constituents are readily digested by ruminants. The wastes are low in available energy but rank as medium protein sources and are rich in minerals. Microbiological examinations have not revealed the presence of organisms harmful to stock or stockmen. DPW has successfully replaced soya bean meal in the production diets of dairy cows provided the level did not exceed 10 percent. DPW and

DPL have been included in diets for beef production at 17.5 percent in replacement of soya bean meal. The flavour of milk or beef was not affected by the presence of the materials in the diets. (Bolton-Agricultural Research Council's Poultry Research Centre)

4919-A11, B1, C2, E3
SOME ENERGY AND PROTEIN SOURCES OF THE FUTURE

Agricultural Research Council's Poultry Research Centre, King's Buildings, West Mains Road, Edinburgh EH9 3FS, Scotland
W. Bolton
4th European Poultry Conference, London, 1973, p. 391-395. 4 tab., 11 ref.

Keywords: Feeds, Poultry, Barley, Triticale, Dried potatoes, Microbial protein, Poultry processing by-products, Distillery by-products, Maize germ meal, Dried distillery dreg, *Performance*.

New sources of poultry food may arise from the work of plant breeders, from the development of new products and from the utilisation of by-products. Naked (glumeless) barley and triticale (a wheat x rye cross) have been developed recently by plant breeders. The ME value of naked barley has been found to be 3050 kcal/kg as compared with 2750 kcal/kg for normal barley. One new product is petroleum-grown yeast which is somewhat similar in composition to fish meal, except that it contains less of the sulphur-containing amino acids. Among industrial by-products are feather-blood-and-offal-meal, maize germ meal and dried distillery dreg. Feather-blood-and-offal-meal is comparable with fish meal in protein content but contains more fat. Maize germ meal has 14.4 percent protein and 22.7 percent fat compared with 10.5 percent protein and 3.8 percent fat in whole maize, but since it has a lower carbohydrate content than whole maize the ME value of the two products is similar. Dried dreg contained 29.1 percent protein, 7.9 percent fat and has a calculated ME content similar to that of decorticated sunflower meal (2125 kcal/kg). The effects of including these foods in poultry diets are described. (Bolton-Agricultural Research Council's Poultry Research Center)

4920-B1, B5, C2, E2
FERTILIZER VALUE OF SWINE MANURE

Purdue University
A. L. Sutton, D. H. Vanderholm and S. W. Melvin
Pork Industry Handbook Paper PIH-25, Cooperative Extension Service, University of Illinois, 6 p. 5 tab.

Keywords: Swine wastes, Fertilizers, Nutrients, Application rates, Waste storage, Management.

This fact sheet is intended to provide the swine producer with pertinent information on (1) the fertilizer nutrient content of swine manures available for land application, (2) how to determine manure application rates and the need for supplementary fertilizer for maximum crop production, and (3) related management techniques for maximizing the fertilizer potential of swine manure on the farm. Factors affecting nutrient value of manure are: type of ration fed to swine; method of manure collection and storage; amount of feed, bedding and/or water added; time and method of application; soil characteristics and type of crop to which the manure is applied; and climate. Routine soil tests and manure analysis are recommended to monitor the balance of nutrients in the soil, especially on land receiving heavy manure applications. Tabular material gives the following information: (1) Approximate nitrogen losses from swine manure as affected by handling and storing methods. (2) approximate nitrogen losses from swine manure to the air as affected by application method. (3) N, P_2O_5 and K_2O utilization by various crops. (4) Approximate average (and range) dry matter and fertilizer nutrient composition of swine manures at time applied to the land. (5) Approximate nutrient value of swine manure per animal unit (1,000-lb. average liveweight) per year. A worksheet is provided to help arrive at proper application rates. (Merryman - East Central)

4921-A8, B3, B5, C1, C2, E2
EFFECT OF BEEF CATTLE MANURE ON SOIL PROPERTIES AND CROP GROWTH

T. A. Ruehr
Ph.D. Dissertation, Colorado State University, Sept., 1976, 150 p. 9 fig., 48 tab., 59 ref.

Keywords: Cattle wastes, Land application, Application rates, Nutrients, Nitrates, Salinity, Bulk density, Soil investigations, Crop response.

Field, greenhouse and laboratory experiments using beef cattle feedlot manure were employed to develop guidelines for soil application rates and to elucidate the cause of seedling emergence inhibition on soils at Fort Collins, Colorado. Plant populations were reduced only following the year of manure application. Annual 112 metric-tons-per-hectare manure applications resulted in maximum dry matter production for 3 years. Corn grain production was more adversely affected by applied manure than was total corn dry matter production. As the manure application rate doubled, the percentage of manure nitrogen taken up by the crop was approximately halved. Nitrate accumulations in the 2.4 m soil profiles were 118, 140, 393, 688, and 1005 kg N/ha after three annual applications and 233, 317, 620, 484, and 1108 kg N/ha for the 56, 112, 224, 448, and 897 metric tons/ha of manure, respectively, 2 years after making a single residual manure application. The annual field biodegradable manure for the Nunn clay loam was equivalent to approximately 800 kg N/ha or about 90 metric tons of feedlot manure/ha. Manure applications in the greenhouse resulted in increasing the soil salinity, nitrate, phosphorus, potassium and sodium concentrations and the saturation paste moisture percentage while decreasing the bulk density to nearly 1.0 g/cm . Soil salinity was the single most important factor controlling seedling emergence and crop production. Sodium bicarbonate-extractable phosphorus increased approximately 0.6 ppm for each metric ton/ha. A relative plant emergence factor was determined and found to be linearly related to the electrical conductivity of the soil saturation extracts. Half lives determined for feces decomposition in the 1, 5 and 0 atmospheres at each of the manure application rates. (Published with permission of University Microfilms International, publishers of DISSERTATION ABSTRACTS INTERNATIONAL (copyright 1976 by University Microfilms International). May not be reproduced without their prior permission)

4922-A8, B3, B5, C2, E2
SOIL AS AN ANIMAL WASTES DISPOSAL SYSTEM

L. J. Sikora
Ph.D. Dissertation, University of Idaho Graduate School, Sept., 1973, 78 p. 18 fig., 13 tab., 68 ref.

Keywords: Cattle wastes, Dairy wastes, Land application, Soil analysis, Soil chemistry, Mineralization, Nitrification, Decomposition, Crop response.

Studies were performed on 40 ft by 80 ft (12.2 m by 24.4 m) plots amended with single treatments of cattle feedlot wastes or dairy wastes at levels of 0, 40, 80, and 120 tons per acre (t/a). Crop yields indicated that beef cattle feedlot wastes stimulated bean yields at 80 t/a level of application, but inhibited at 120 t/a. Soil analyses showed high salts levels to be the probable reason for inhibition. Dairy wastes stimulated corn silage yields up to and including 120 t/a application. Chemical *analyses of bean plot soil samples showed* increase in electrical conductivity, estimated sodium percentage, and chlorides in wastes amended plots, but not to levels which would cause the soils to be classified as saline or alkali. Indications were that organic matter from the wastes increased soil permeability which led to more efficient salts leaching from the bean plots. Corn plot soil analyses showed stepwise increases in salt levels with increasing amendment, but levels attained were only moderate and were decreased by irrigation. Inorganic nitrogen level trends were similar in bean and corn plot soil samples with the only difference being much lower nitrogen levels in corn plots. Data indicated active mineralization and nitrification processes with an inorganic nitrogen peak at ten weeks after wastes application. Highest levels obtained were approximately 100 ppm inorganic nitrogen in bean plot soil samples. These levels were not considered excessively high and did not present an environmental problem in the first year. Plots receiving higher wastes amendments had larger carbon:nitrogen ratios. These ratios tended toward equilibrium as decomposition proceeded in the field plots. Analysis of fresh animal wastes decomposition showed a Phase I decomposition of short duration and high activity, followed by a long Phase II decomposition with considerably lower activity. During Phase I, readily oxidizable carbon compounds were decomposed and during Phase II more refractory materials were decomposed. Organic matter decomposition studies performed on soil samples from beef cattle feedlot wastes amended plots and dairy wastes amended plots showed similar results. Phase I and Phase II decompositions were observed in both instances and carbon dioxide evolution values were roughly proportional to waste amendment levels. Results showed that decomposition of livestock wastes organic matter in soil approximates a first order reaction and first order equations can be utilized to predict half lives of livestock wastes in soil. (Published with permission of University Microfilms International, publishers of DISSERTATION ABSTRACTS INTERNATIONAL (copyright c 1974 by University Microfilms International. May not be reproduced without their prior permission.)

4923-A11, B3, C1, C2, D1, E3, F1
POULTRY EXCRETA DEHYDRATION AND UTILIZATION: SYSTEM DEVELOPMENT AND DEMONSTRATION

Michigan State University, East Lansing, Michigan 48824
H. C. Zindel, T. S. Chang, C. J. Flegal, D. Polin, C. C. Sheppard, B. A. Stout, J. E. Dixon, M. L. Esmay, and J. B. Gerrish
Environmental Protection Agency Report EPA-600/2-77-221, Nov., 1977, 162 p. 26 fig., 43 tab., 70 ref.

Keywords: Poultry wastes, Drying, Dehydration, Design, Microorganisms, Nutrients, Moisture content, Economics, Refeeding, Performance, Poultry, Cattle.

A manure handling and drying system involving caged layers with daily manure collection, air drying, and dehydration in a flash-type dryer has been studied. Objectives of the study were to: (1) develop a complete manure handling system to maximize pollution control; (2) determine optimum operating conditions; (3) minimize energy required of the system; (4) determine certain microbial and nutritional qualities of the dried product; (5) be adaptable to commercial poultry operations; and (6) determine the economics of the system. The microbial content of the dried anaphage was as low or lower than that found in commercial feeds. The anaphage can be fed to chickens up to 12.5 percent of the ration, but it has a very low metabolizable energy content. Up to 75 percent of the excreta moisture can be removed by use of the ventilation air. Little odor could be detected coming from the system. The cost of drying fresh (75 percent to 80 percent moisture) caged layer excreta may be high; however, by utilizing optimum in-house drying techniques, this cost can be reduced by 80 percent, thus making dehydration a viable pollution control alternative for the commercial poultry production industry. (Zindle-Michigan State University)

4924-B1, C2, D1, D3, E2, E3, F1 POULTRY WASTE MANAGEMENT ALTERNATIVES: A DESIGN AND APPLICATION MANUAL

Department of Agricultural Engineering, Cornell University, Ithaca, New York 14853
J. H. Martin and R. C. Loehr
Environmental Protection Agency Report EPA-600/2-77-204, Oct., 1977, 202 p. 72 fig., 39 tab., 18 ref.

Keywords: Poultry wastes, Management, Design, High-rise, Undercage drying, Oxidation ditch, Odor control, Biological oxidation, Waste stabilization, Economics, Fertilizers, Refeeding.

Changes in the egg production industry during the past 20-30 years have produced waste management problems which threaten both water and air quality. Results from a number of research studies have identified two processes -- aerobic biological stabilization and drying -- that provide both odor control and the reduction of the water pollution potential of these wastes. In this manual, the theoretical concepts underlying each poultry waste management approach are discussed, and process design methodologies are presented. Included are design examples to illustrate the application of design methodologies. A discussion of the impact of design decisions on performance characteristics and computer programs to assist in the process design for each alternative are also presented. Both high-rise, undercage drying and aeration systems are compared to identify relative merits and provide economic projections. Odor control and plant nutrient conservation capabilities as well as refeeding potential for both alternatives are discussed. (Martin-Cornell)

4925-A1, A3, A8, A9, B1, C2 MODELING PESTICIDES AND NUTRIENTS ON AGRICULTURAL LANDS

Hydrocomp, Incorporated, Palo Alto, California 94304
A. S. Donigian, Jr. and N. H. Crawford
Environmental Protection Agency Report EPA-600/2-76-043, Feb., 1976, 318 p. 52 fig., 36 tab., 54 ref.

Keywords: Agricultural Runoff Management Model, Watersheds, Hydrologic modeling, Agricultural runoff, Pollutant pathways, Simulation, Soil erosion, Nitrogen, Phosphorus, Pesticides.

Modifications, testing, and further development of the Pesticide Transport and Runoff (PTR) Model have produced the Agricultural Runoff Management (ARM) Model. The ARM Model simulates runoff, snow accumulation and melt, sediment loss, pesticide-soil interactions, and soil nutrient transformations on small agricultural watersheds. The report discusses the major modifications to and differences between the PTR and ARM Models. An energy-balance method of snow simulation, and a first-order transformation approach to nutrient modeling are included. Due to lack of data, the nutrient model was not tested with observed data; testing and refinement are expected to begin in the near future. Instrumented watersheds in Georgia provided data for testing and refinement of the runoff, sediment and pesticide portions of the ARM Model. Comparison of simulated and recorded values indicated good agreement for runoff and sediment loss, and fair to good agreement for pesticide loss. Pesticides transported only by sediment particles were simulated considerably better than pesticides that move both in solution and on sediment. A sensitivity analysis of the ARM Model parameters demonstrated that soil moisture and infiltration, land surface sediment transport, pesticide-soil interactions, and pesticide degradation are the critical mechanisms in simulating pesticide loss from agricultural watersheds. (Donigian-Hydrocomp, Inc.)

4926-A1, B1, E1, F4 ENVIRONMENTAL IMPLICATIONS OF TRENDS IN AGRICULTURAL AND SILVICULTURE. VOLUME I: TREND IDENTIFICATION AND EVALUATION

Development Planning and Research Associates, Inc., Manhattan, Kansas 66502
S. G. Unger and The Tuolumne Corporation
Environmental Protection Agency Report EPA-600/3-77-121, Oct., 1977, 210 p. 55 ref.

Keywords: Environmental effects, Agriculture, Crop production, Feedlot management, Range management, Pasture management, Silviculture.

Current and emerging trends in U.S. agriculture and silviculture that will have the most significant environmental implications in both the short term (1985) and the long term (2010) are determined and assessed. Five major subsectors of agriculture and silviculture were included in the analysis: (1) nonirrigated crop production, (2) irrigated crop production, (3) feedlot production, (4) range and pasture management, (5) silviculture and harvest management. Within each subsector, numerous trends and developments were identified and defined by the contractor. Thereafter, an evaluation workshop comprised of subsector professionals, from throughout the nation, evaluated, rated and rank-ordered the most significant environmentally related trends. (Unger-Development Planning and Research Associates, Inc.)

4927-A1, A3, A8, A9, B1, C2 AGRICULTURE RUNOFF MANAGEMENT (ARM) MODEL - VERSION II. REFINEMENT AND TESTING

Hydrocomp, Incorporated, Palo Alto, California 94304
A. S. Donigian Jr., D. C. Beyerlein, H. H. Davis, Jr. and N. H. Crawford
Environmental Protection Agency Report EPA 600/3-77-098, Aug., 1977, 294 p. 84 fig., 17 tab., 28 ref.

Keywords: Agricultural runoff management model, Model studies, Nonpoint pollution, Simulation, Water quality, Land use, Watersheds, Sediment production, Pesticides, Nutrients.

The Agricultural Runoff Management (ARM) Model has been refined and tested on small agricultural watersheds in Georgia and Michigan. The ARM Model simulates the hydrologic, sediment production, pesticide, and nutrient processes on the land surface and in the soil profile that determine the quantity and quality of agricultural runoff. This report discusses the research and model refinements related to soil moisture and temperature simulation, pesticide degradations, nutrient transformations, and plant nutrient uptake. The goal is to evaluate and improve the pesticide and nutrient simulation capabilities of the ARM Model. However, the runoff and sediment modeling is also analyzed since these are the critical transport mechanisms of agricultural chemicals. In general, comparison of simulated and recorded values indicates that the ARM Model can represent the major processes affecting agricultural runoff and can be a useful tool for planning and analysis. However, discrepancies do exist and point out the need for more testing and research in specific areas. (Donigian-Hydrocomp, Inc.)

4928-A11, B2, C2, E3 ORGANIC AND INORGANIC NUTRIENT ENRICHMENT AND THE LIVING CONDITIONS OF CARP FRY IN FIRST REARING PONDS. PHYSICO-CHEMICAL FACTORS AND THE ZOOPLANKTON

M. Lewkowicz and S. Lewkowicz
Acta Hydrobiologica, V. 18, No. 3, p. 235-257, 1976. 9 fig., 4 tab., 37 ref.

Keywords: Fish farming, Farm wastes, Liquid wastes, Oxygen content, Zooplankton, First rearing ponds, Physical properties, Chemical properties.

The effect of organic and inorganic nutrient enrichment on the increase in carp fry in first rearing ponds were compared. Doses of liquid farmyard manure released into the ponds every 5 to 6 days influenced the number and biomass of the plankton *Crustacea*. After inorganic manuring greater fluctuations in oxygen content were observed than after organic manuring. The weight increase of fish in organically manured ponds was similar to that when high inorganic enrichment was applied. (Lewkowicz-Poland)

4929-B2, B3, C2, D1, D3, F1
A ROTATING FLIGHTED CYLINDER FOR BIOLOGICAL WASTE TREATMENT

Agricultural Engineering Department, Oregon State University, Corvallis, Oregon
J. R. Miner and L. B. Hansen
Transactions of the ASAE, V. 21, No. 1, p. 136-141, Jan.-Feb., 1978. 7 fig., 9 tab., 8 ref.

Keywords: Rotating flighted cylinder, Separation techniques, Biological treatment, Slurries, Effluents, Design, Economics, Chemical properties.

The rotating flighted cylinder was tested as both a solid-liquid separator and as a biological waste treatment device. As a solid-liquid separator, it was demonstrated to be effective in removing settleable particles from a dilute slurry and concentrating them into a low volume concentrated stream. As a biological waste treatment device, it effectively combined primary and secondary waste treatment into a single unit and produced an effluent comparable to that obtained from conventional secondary sewage treatment devices. The main advantages of this device are its mechanical simplicity, low power consumption, and trouble-free operation. (Miner-Oregon State University)

4930-B2, B4, E2, F1
MODELING THE EFFECT OF MANAGEMENT POLICIES ON CATTLE FEEDLOT POLLUTION CONTROL COSTS

Agricultural Engineering Department, Oregon State University, Corvallis, Oregon
R. M. McDowell, R. B. Wensink, and J. R. Miner
Transactions of the ASAE, V. 21, No. 1, p. 153-160, Jan.-Feb., 1978. 11 tab., 7 ref.

Keywords: Computer models, Economics, Runoff control, Feedlots, Design, Irrigation.

A computerized economic model was developed and used to estimate the cost of open feedlot runoff control systems. The model required market prices of equipment, service, land, and taxes, and the following basic engineering design parameters: feedlot area, design pumping rate, required storage volume, annual pumping days, total disposal land area, and single day's disposal area. The model generated investment and annual operating costs for standardized runoff control systems. Charges were estimated for hand move, side roll, big gun, and traveling big gun systems with five different pumping rates, seven management alternatives (with respect to the timing of disposal), and two disposal policies on 0.405, 4.05, and 40.5 ha feedlots (symbolizing 200, 2,000, and 20,000 animal feedlots, respectively). Results indicate that economics of feedlot size exist in controlling runoff and that pumping capacity could not economically substitute for reservoir volume. At most locations, the all-year pumping policy produced the lowest cost; however, the additional cost associated with more restrictive management policies was not significant. The hand move irrigation system was the least expensive disposal system; big gun was second, followed by side roll and traveling big gun. At many locations the cost differences were not significant for larger feedlot operations. Costs varied widely between geographic regions in the U.S., with the humid areas (Midwest and Southeast) costing more for runoff control than the more arid locations. (Lubbock, TX; Pendleton, OR; and Bozeman, MT). (McDowell-Oregon State University)

4931-A12, B2, E3
FARMING IN WASTE WATER MAY AID DEVELOPING NATIONS

Anonymous
Feedstuffs, V. 50, No. 16, p. 42, April 24, 1978.

Keywords: Aquaculture, Wastewater reuse, Israel, Kenya, Malaysia, Peru, Thailand, Fish farming, Public health.

Current investigations supported by the International Development Research Centre, Ottawa, Canada, will focus on the operating characteristics of combined treatment and aquaculture pond systems under a variety of conditions, and will pay particular attention to public health concerns for blocking transmission of disease-causing organisms through the ponds by the fish raised in them. Institutions in Israel, Kenya, Malaysia, Peru, and Thailand will investigate fish production and waste treatment capabilities of stabilization ponds (shallow rectangular lakes or lagoons that exploit the natural action of bacteria and algae to remove human and industrial wastes from water). A properly operated stabilization pond system can remove more than 98 percent of the fecal coliform bacteria in wastewater. Fish are not known to be susceptible to infection by the disease-causing organisms present in the wastes of warm blooded humans and animals. However, they may transmit these pathogens on their scales or as undigested material in the gut. Furthermore, little is known about the accumulation and possible transfer to consumers of heavy metals or pesticides in the flesh of fish fed on industrial or agricultural wastes that may contain these pollutants. Specific studies to be conducted in the various countries are outlined. (Merryman-East Central)

4932-A11, B3, C1, C2, E3
UTILISATION OF RATIONS CONTAINING POULTRY MANURE AS A PROTEIN SOURCE

Departement Kleinveekunde, Universiteit van die Oranje-Vrystaat, Bloemfontein, New Zealand
H. J. van der Merwe, P. S. Pretorius, and J. E. J. du Toit
South African Journal of Animal Science, V. 5, No. 1, p. 17-21, 1975. 4 tab., 20 ref.

Keywords: Rations, Sheep, Refeeding, Dried poultry wastes, Performance.

Poultry manure (22.5 percent crude protein on dry basis) obtained from a battery\ operation was included in rations consisting of lucerne hay, maize meal and molasses. The control ration contained no manure. In three experimental rations, poultry manure replaced the nitrogen equivalent of lucerne hay in the control ration to an extent of 33.0, 66.0, and 100 percent resulting in rations containing 14.0, 29.0, and 47.0 percent poultry manure respectively. From metabolism studies conducted on 28 Merino wethers it was found that: (a) The voluntary intake of dry matter and organic matter, with the exception of the 100 percent replacement of the nitrogen equivalent of the lucerne hay in the control ration by poultry manure showed no statistical significant differences between the remaining rations. (b) The daily intake of gross energy decreased significantly ($p < 0.01$) as the percentage of manure in the ration increased from 14 to 47 percent. No significant differences in energy intake occurred between the control ration and the ration which contained 14 percent manure. (c) No significant differences occurred among the various treatments for the dry matter digestibility of the rations, although the digestibility of the organic matter, crude-protein, ether extract, nitrogen-free extract, fibre as well as gross energy increased with increasing levels of poultry manure. (d) With increasing levels of poultry manure, the digestible fibre content tended to decrease and together with the higher ash content of the poultry manure rations explained most of the observed decrease in total digestible nutrient and digestible energy values of rations with an increased level of poultry manure. (e) No significant differences occurred in the nitrogen balance of wethers on any of the treatments. (f) The results indicate that the most effective levels of poultry manure included in ration for purposes of production may lie between 14 and 29 percent. (van der Merwe-Universiteit van die Oranje-Vrystaat) (Article in German)

4933-A11, C2, D2, D3, E3
PROCESS MANURE FOR REFEEDING

University of Illinois
D. L. Day and E. E. Hatfield
Prairie Farmer, V. 149, No. 19, p. 12-13, 1977.

Keywords: Refeeding, Animal wastes, Nutrients, Ensiling, Chemical treatment, Cattle, Performance.

Refeeding of animal wastes seems to be the most valuable of the methods for utilizing animal wastes because pollution problems are eased, feed costs are decreased, and available nitrogen sources are increased. Animal wastes must be harvested frequently to reduce nutrient losses through nitrogen volatilization and leaching. The manure must be processed to increase palatability, destroy pathogens, and reduce odors. Ensiling and chemical treatment are the best methods for preparing wastes for cattle feeding. Both waste treatment methods have advantages and disadvantages. Manure should be for-

mulated into animal diets on the basis of nutritive content. Feeder cattle can tolerate only about 50 percent of the total manure they produce as processed waste in their ration. (Merryman-East Central)

4934-B2, C2, D3
A DYNAMIC MODEL FOR SIMULATION OF ANIMAL WASTE DIGESTION

University of Florida, Gainesville, Florida
D. T. Hill and C. L. Barth
Journal Water Pollution Control Federation, V. 49, No. 10, p. 2129-2143, Oct., 1977. 9 fig., 8 tab., 16 ref.

Keywords: Mathematical models, Design, Anaerobic digesters, Simulation, Volatile matter, Volatile acids, Ammonia, Temperature, Nitrogen conservation.

A dynamic model for simulation of animal waste digestion is presented. Mathematical model development was iterative, i.e., initial steps were developed and output compared to results of laboratory simulators (12 plexiglas reactors each containing 1.2 gals). Changes were made to the model in order to obtain results that compared more favorably with the simulators. A final verification of the model was performed with data collected from a 1,000 gal pilot scale unit. The final model produced the best fit with all real data. The model can predict general trends and may be semiquantitative or quantitative. Simulations within plus or minus 10 percent of actual data have been achieved on most parameters investigated. The model predicted failure of 4 of the 12 (1.2 gal) simulators. Simulation of quantitative data was satisfactory for volatile matter, volatile acids, and ammonium parameters. Simulation of the 1,000 gal pilot scale digester was also acceptable. The model is the first step in an evolutionary process of designing models of this kind. It will be useful for evaluation of current design techniques and refinements of effective operating procedures for digesters. (Solid Waste Information Retrieval System)

4935-A1, B2, B3, C1, C2, C3, D3, E3, F1
KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA

Anonymous
Calf News, V. 16, No. 1, p. 16, 18, March, 1978. 2 fig.

Keywords: Kaplan, Feedlots, Recycling, Refeeding, Protein fermentation product, Methane, Anaerobic digestion, Economics, Feasibility studies, Hamilton Standard, Department of Energy.

Don Kaplan, feedlot operator in Bartow, Florida, is on the verge of accomplishing a feedlot system which will: convert steer manure into a high-protein feed, produce from the manure the power to run his plant (with excess energy to sell), and provide an odorless, fly-free completely water-contained feedlot with no runoff. The technological input for this system is being provided to Hamilton Standard of Windsor Locks, Ct., a division of United Technologies, which has been studying the anaerobic fermentation process for seven years. The Department of Energy recently awarded a research grant of $938,000 to Hamilton Standard and Kaplan Industries to build the first full-scale conversion plant for 10,000 head of cattle at the Kaplan feedlot to produce a 25 percent protein feed supplement called protein fermentation product (PFP) and to produce methane gas. This first of three reports concerning this conversion plant discusses the PFP portion of the recycling system. In a single cell anaerobic fermentation system, the protein of the raw stock (manure) is upgraded from 10 percent to roughly 23-25 percent. If PFP is considered as having 60 percent of the protein content of cottonseed meal, it is worth about $80 per ton. One of the major reasons that the Department of Energy funded the system, besides proving it technologically feasible, was to prove the economic viability so that other feedlot operators will want such a system -- not only because it will make them environmentally secure, but because they can make a profit from it. The Hamilton Standard process costs about $100 per head. (Merryman-East Central)

4936-A6, A7, B2, F1
GRAVITY-DRAIN SYSTEM

D. J. Meyer
Confinement, V. 2, No. 10, p. 23, Nov.-Dec., 1977. 1 fig.

Keywords: Liquid wastes, Swine wastes, Odor, Air pollution, Gravity-drain systems, Design, Economics.

Three alternatives are available for removing liquid manure from farrowing and nursery units more frequently to prevent odor and pit-gas buildup. They are: dump-tank flush, mechanical scraper, and gravity-drain systems. The latter is simple to operate and competitive in price with the other 2 systems. It adapts well to new concept of multi-room operations. The shallow trenches located under partially slotted farrowing crates or partially slotted nursery pens are Y-shaped with a 12"-deep and 6"-wide gutter in the bottom. When the gutter is filled, a plug is pulled to let the manure drain to a sump, where it is pumped via a small-non-clog sewage pump to a storage unit, or it can be drained directly into the storage unit. Specific design parameters are given. A company has started prefabricating the trenches (gutter and side slope is 1 piece) out of 3/16" PVC plastic. Cost per linear ft is less than forming the trenches out of concrete. An advantage is the smooth sides and bottom, which are permanent. A disadvantage is the plastic trench can only be produced with a 32" depth. This means the maximum width of slotted area is 36". (Merryman-East Central)

4937-A4, A5, B1, C1, C2, C3, E2
ANIMAL WASTE MANAGEMENT AND OUR WATER QUALITY

Animal Science Department, Purdue University, West Lafayette, Indiana
A. L. Sutton
Journal Paper No. 6508, Department of Animal Sciences, Purdue Agricultural Experiment Station, 1977, p. 81-90. 24 ref.

Keywords: Water pollution, Groundwater pollution, Non-point sources, Feedlots, Agricultural runoff, Leaching, Pasture, Management, Nutrients, Bacteria.

Research concerning the potential effect of livestock production as a non-point source of water pollution is discussed. Results of research studied have been quite variable and sometimes conflicting. Livestock operations can contribute to non-point source water pollution by: runoff from manured land, leaching nutrients from manured land, leaching nutrients from earthen feedlots, and pasture management systems. Potential pollutants include nitrogen components, phosphorus, inorganic salts, solids, organic matter and certain bacterial organisms. Research has shown that applications of animal manure to frozen ground, to ground with vegetative cover or to rough plowed ground, in some cases, can affect the quality of surface runoff. Proper management practices and common sense can significantly reduce the threat of surface runoff contamination. If livestock manure is managed wisely with applications to cropped land at rates that the growing plants can utilize available nutrients, there will be minimal nutrient buildup and downward movement in the soil and minimum leaching into groundwater. Feedlot and soil type are important considerations in avoiding a possible leaching of nutrients into groundwater from earthen feedlots. Virtually no research has been conducted on the influence of pasture systems on non-point water pollution. Good management is the best insurance against pollution of water from pasture and range systems of livestock production. Very little research has been conducted in the Midwest under Indiana climatic and soil conditions. (Merryman - East Central)

4938-A1, B2, B4, E2
DESIGN AND OPERATION OF LIVESTOCK WASTE LAGOONS

Agricultural Engineering Department, Purdue University, West Lafayette, Indiana
D. D. Jones and A. L. Sutton
Cooperative Extension Service Publication ID-120, Purdue University, 1977, 14 p. 9 fig., 3 tab.

Keywords: Lagoons, Livestock wastes, Design, Construction, Operation, Dewatering.

Following are guidelines to help insure adequate design, proper construction, successful operation and problem-free dewatering of a livestock waste lagoon. Don't take short cuts! (1) Use gravel rip-rap around the water line on steep-sloped banks to prevent erosion and control weeds, since weeds around the water's edge are a potential mosquito breeding site. (2) Landscape the lagoon area and keep it neat to provide for an attractive farmstead. Seed the banks with low-growing, spreading grasses and keep them mowed. Sheep and goats can be grazed on slopes too steep to mow. (3) Fence the lagoon to keep out livestock, children and trespassers. Keep the gate locked and post warning signs. (4) Locate the lagoon inlet as far as possible from the overflow pipe in a two-stage facility or the irrigation intake in a single-stage structure. (5) Set markers on the interior lagoon bank to indicate: (a) bottom of the freeboard volume level and (b) top of the minimum design volume level. The first marker provides a gauge for the addition of dilution water and shows when to start dewatering; the second marker shows when to stop pumping at end of dewatering. (6) If possible, start up a new lagoon in the spring to permit a good bacterial culture to develop during the summer months. (7) Load the lagoon at least once a week but with only small amounts of waste at each loading. (8) Keep

copper and other feed additives toxic to bacteria out of the lagoon or at minimum levels. (9) Avoid lagoon overflow that might result in surface water pollution problems. This means dewatering when the water level reaches the bottom of freeboard. Then pump the lagoon down only to its minimum design volume so that some biological "seed" remains. (10) If odors are a problem, irrigate lagoon effluent in the fall after crop removal and in early spring before lagoon temperatures rise significantly. (11) Consider irrigation dewatering during dry periods to give the growing crops needed water as well as nutrients. Then after irrigating with the lagoon water, if possible, irrigate again with clean water to wash off the plants and to clean the irrigation equipment. (12) Don't irrigate during plant pollination, when soils are wet or in the hottest part of the day to prevent wilting. Also, don't irrigate during "still" weather when there is no breeze to carry odors away or if winds are blowing toward residences. (13) Size irrigation equipment so it will handle the effluent without danger of plugging and will fit in well with your particular labor situation. (14) Determine land application rates on the basis of nitrogen in the lagoon effluent and/or the water intake rate of the soil. (Jones-Purdue University; Merryman, ed.)

4939-A11, B3, C2, C3, E2
BROILER FERTILIZED FESCUE A MIXED BLESSING

Anonymous
Poultry Digest, V. 37, No. 433, p. 152, March, 1978.

Keywords. Broiler litter, Fertilizers, Pasture lands, Cattle, Grass tetany, Nematodes.

Fertilization of pasture lands with broiler litter may cause a grass tetany problem. Grass tetany in cattle grazing on fescue pasture heavily fertilized with broiler litter, occurs at a higher rate among cows lacking sufficient daily magnesium. The disease tends to occur during the cool season while the cow grazes fescue and other cool-season grasses such as rye and wheat. Grass tetany can be minimized by fertilizing fescue pastures with broiler litter at the rate of 9 metric tons or less per acre per year. This amount should be divided into 2 or more applications per year. In one study, calves grazing on broiler litter fertilized fescue had the lowest nematode egg count of calves on different pastures. This was attributed to the more lush growth which reduced the need for the animals to eat grass close to the ground. (Merryman-East Central)

4940-A1, B1, D1, D2, D3, E3, F1
COST EFFICIENCIES OF LARGE-SCALE INTEGRATED DAIRY PRODUCTION AND WASTE MANAGEMENT SYSTEMS

Department of Agricultural Economics, Washington State University
S. C. Matulich, H. F. Carman, and H. O. Carter
California Agriculture, V. 32, No. 3, p. 8-10, March, 1978. 2 fig., 1 tab.

Keywords: Regulation, Dairy industry, Chino Basin, Model studies, Economics, Composting, Anaerobic digestion, Refeeding, Incineration.

This report focuses on the impact of waste control regulations on the cost structure and future economic viability of dairies in the Chino Basin east of Los Angeles. Fourteen single-parlor dairies with capacities ranging from 375 to 1200 cows for two milking shifts were modeled. Short-run average costs were estimated for each of these model dairies. A combination of single-parlor dairies into multiple-parlor configurations yielded 15 more dairies in the 1200 to 3600 cow range. Four waste disposal treatment processes were analyzed as having "good" volume reduction, stabilization, and resource recovery capabilities. Three of these -- composting, anaerobic digestion, and refeeding -- are biological processes; the fourth, incineration, is a physical/chemical process. Both semi-automated milking systems and group-feeding programs offer potential efficiencies for large-scale dairies. The dry lot/incineration system was the least-cost dairy housing/waste disposal alternative considered. According to the analysis presented in this study, enforcement of environmental quality controls need not raise the costs of dairy production in the long run. (Merryman-East Central)

4941-A11, B3, C2, E3, F1
DRIED POULTRY MANURE BENEFITS DAIRY COWS

Anonymous
Feedstuffs, V. 50, No. 16, p. 12, April 17, 1978.

Keywords: Refeeding, Dehydrated poultry manure, Dairy cattle, Performance, Milk production, Nitrogen, Economics.

Dehydrated poultry manure, which is not registered for commercial use by the Food and Drug Administration, may provide a new source of dietary nitrogen for lactating dairy cattle. In tests performed by Dr. C. C. Calvert and Dr. R. L. King, four groups of six Holstein cows were fed diets consisting of a corn-soybean meal concentrate supplemented with either 2 percent urea, 17.2 percent dehydrated poultry excreta, 26 percent dehydrated poultry excreta or additional soybean meal. All diets contained 24 percent crude protein. The concentrates were mixed with corn silage. The concentrates and silage each provided 50 percent of the dry matter in the diet. All cows consumed about the same amount of feed. But those fed the 17.2 percent dried poultry excreta supplemented diet produced 8 percent more milk than cows on the urea supplemented diet and 7 percent more milk than cows on the 26 percent dried poultry excreta or soybean meal diet. Based on the cost of concentrate per kilogram of milk produced, the dehydrated poultry excreta diets were about 11 percent less expensive than either of the other two diets. (Merryman-East Central)

4942-A8, A11, B2, B3, C2, D3, E2
THE EFFECT OF APPLICATION OF POULTRY MANURE WHICH WAS SUBJECTED TO DIFFERENT WASTE MANAGEMENT SYSTEMS ON YIELD AND QUALITY OF FOUR GRASS SPECIES

C. J. Peter
M.S. Thesis, Cornell University, Jan., 1976, 222 p. 30 fig., 115 tab., 73 ref

Keywords: Poultry wastes, Land application, Fertilizers, Grasses, Crop response, Application rates, Raw wastes, Oxidation ditch wastes, High rise house wastes, Soil chemical properties, Ammonium, Phosphorus, Potassium, Magnesium, pH, Grass tetany, New York.

Study objectives were to evaluate the effect of different waste management systems (raw, oxidation ditch and high rise house) and commercial fertilizer on selected chemical characteristics of the soil, to determine the effects of the different treatments on crop yield and to evaluate the effects of treatments on crop quality. The experiment was conducted over a two year period. The grasses used in the study were bromegrass, orchardgrass, and timothy. Application rates varied from 0 to 400 pounds N per acre during the course of the experiment. Treatments were applied four times: in the spring of 1974, after the first cutting of 1974, in the fall of 1974, and in the spring of 1975. The treatments raised the ammonium and nitrate concentration of the soil for approximately one month. Soil phosphorus and potassium also increased. The higher the application rate, the greater the increase. The poultry manure treatments had no effect on soil pH. Commercial fertilizer gave significantly greater yields than did the poultry manure sources when applied at equivalent rates of nitrogen. Raw manure produced the highest yields of the three types of poultry manure used. No significant difference was found between the yields produced by plots receiving oxidation ditch or high rise house manure. The percent nitrogen and potassium in the grasses were increased by increasing the rate of application. Treatments had no effect on the percent phosphorus, calcium and magnesium. Increasing the rate of nitrogen applied decreased the total water soluble carbohydrate content of the forage. Indicators of grass tetany based on the chemical composition of the forage predicted grass tetany was possible at the time of the first harvest in 1974. However, the occurrence of grass tetany in New York will probably be minimal because most cattle receive feed supplements high in magnesium. The nitrate levels found in the forage were not considered hazardous to animal health. (Merryman-East Central)

4943-B1, B4, C2, E2, F1
DAIRY CHORE REDUCTION PROGRAM PROGRESS REPORT

Agricultural Engineering Department, Michigan State University, East Lansing, Michigan
R. L. Maddex, L. Shull, T. L. Loudon, and C. H. Shubert
Dairy Chore Reduction Conference, Cleveland, Ohio, March 14-16, 1977, 18 p 4 tab.

Keywords: Farm wastes, Management, Design, Waste collection, Waste storage, Waste transfer, Land application, Labor, Costs, Chemical properties.

Initial project efforts were focused on intensive observations and data collection on 15 to 20 farms where specific investments had been made for changing waste handling systems for pollution abatement or prevention. Design criteria used in system planning were examined. The second phase of the study concerned additional methods or components in waste handling. The third phase focused on operational aspects of on-farm waste handling systems. The fourth phase of the project has been laboratory analysis, bench tests on manure characteristics, library review of research reported, and follow-up on some of

the more specialized practices. Project personnel have visited more than 200 farms to observe waste handling systems in operation and to talk with farmers, equipment suppliers and various agency people about waste handling systems and operational practices. Design criteria findings were reported in progress reports in 1975 and 1976 at Dairy Chore Reduction Programs. This progress report focuses on phases 3 and 4 of the project. It was found that farm operators often evaluate and describe waste handling systems on an operational basis and associated waste handling systems with the type of equipment used to transfer manure to the field. Labor requirements and investment costs are prime factors in waste handling system selection. The medium size farm operation has been the largest purchaser of recently developed manure handling system components. There is a need to better describe and encourage total manure handling systems for the farm operator. (Merryman-East Central)

4944-B1, C2, D3, E3, F1
BIOGAS PRODUCTION FROM POULTRY MANURE

P. Vohra
California Agriculture, V. 32, No. 4, p. 12, April, 1978. 1 fig.

Keywords: Poultry wastes, Recycling, Anaerobic digestion, Methane, Economics.

Work is being conducted at the University of California to produce biogas from poultry manure. The digester being used has a 100 cubic foot capacity and consumes 70 to 210 pounds of organic matter weekly. Six to seven cubic feet of gas are produced per pound of organic matter. The product is 65 percent methane. While the mechanics of methane generation have been mastered, at present methane from poultry manure is not an economical energy source. Also, large volumes of liquid residue are created by the process which would cause disposal problems on any large-scale production system. A joint project with University of California agronomists to determine the fertilizer value of this liquid waste is being planned. (Merryman-East Central)

4945-A8, B2, B3, B5, C2, E2
EFFECTS OF SOLID AND LIQUID BEEF MANURE AND LIQUID HOG MANURE ON SOIL CHARACTERISTICS AND ON GROWTH, YIELD, AND COMPOSITION OF CORN

West Central Minnesota Experiment Station
S. D. Evans, P. R. Goodrich, R. C. Munter, and R. E. Smith
Journal of Environmental Quality, V. 6, No. 4, p. 361-368, Oct -Dec., 1977. 7 fig., 6 tab., 24 ref

Keywords: Land application, Cattle wastes, Swine wastes, Liquid wastes, Solid wastes, Corn, Crop response, Soil chemical properties, Sodium, Nitrogen, Phosphorus, Potassium, Magnesium, Manganese, Calcium.

Study objectives were: (1) to determine the effects of heavy applications of solid beef, liquid beef, and liquid hog manure on corn growth, plant and grain composition, and yield and (2) to determine the effects of the manure applications on soil properties. Solid beef, liquid beef, and liquid hog manures were applied at 224, 636, and 636 metric tons/ha (wet weight), respectively, for 2 successive years to a soil cropped to corn. Residual effects of the manure applications were studied for 2 additional years. Manure treatment effects were compared to effects of an inorganic fertilizer treatment and a check treatment. Corn grain yields were not significantly affected by high rates of solid beef, liquid beef, and liquid hog manures when compared to an inorganic fertilizer treatment. Yields on the manured plots were maintained at a high level for 2 additional years without inorganic fertilizer applications. All 3 manure treatments increased levels of N, P, and K and decreased levels of Ca and Mg in the corn. P, K, and Mn concentrations in the ear leaves were at an "excess: level in some instances. The NO_3^--N from the manure decomposition and ammonium nitrification moved rapidly through the soil and was found below 150 cm by the end of the second cropping year. Additional downward movement occurred in the third cropping year. Sodium levels were increased by all manure treatments and the Na leached rapidly through the soil. P and K levels were increased by all manure treatments, but the increase was confined to the plow layer. The study indicated that 2 heavy annual applications of these 3 types of manure were excessive resulting in significant NO_3 movement below the rooting depth of corn. The salt levels were not high enough to decrease yields, but continued applications would probably do so. (Merryman-East Central)

4946-A5, B3, C2, E2
MANURE MANAGEMENT IN AN IRRIGATED BASIN RELATIVE TO SALT LEACHATE TO GROUND WATER

Department of Soil Science and Agricultural Engineering, University of California, Riverside, California 92521
P. F. Pratt, S. Davis, and A. E. Laag
Journal of Environmental Quality, V. 6, No. 4, p. 397-402, Oct.-Dec., 1977. 7 fig., 2 tab., 10 ref.

Keywords: Dairy wastes, Solid wastes, Irrigation, Leaching, Cations, Salts, Calcium, Potassium, Magnesium, Sodium.

Data from a four-year experiment with animal manures were extrapolated to a hypothetical irrigated basin to test the effects of (1) distribution of manure within the basin, (2) export of manure from the basin, and (3) water management on leaching of the salts added in irrigation waters and manures. The experimental plan had two parts. The first was a comparison of 6 treatments with animal manures, including a check treatment, each at 2 rates of application of irrigation water on Hanford soil. The second was a comparison of one manure treatment (79 metric tons of dairy manure on a dry weight basis per ha per year) on three soils at 2 irrigation rates. In all cases 3 replications were used. Plot size was 15 m by 15 m, with guard areas of the same size. The cropping sequence, consisting of barley in the winter and sudangrass in the summer, went through 4 complete cycles. Leachate volumes for the higher water treatment were about double those for the lower water treatment, except for the Hanford soil at the highest manure rate, where the difference between the 2 water treatments was only 25 percent. Also, the leaching volume was consistently lower for the Ramona and Domino soils than for the Hanford soils. Large amounts of Ca, K, and Mg were accumulated in the soil, but there was a net loss of Na. Practically no K moved beyond the 1.5 m depth. As the rate of manure increased, the percent leaching of the cations added in water and manures decreased. Extrapolation of the field data to a 18,200 ha irrigated basin and a production of 364,000 metric tons of dairy manure per year revealed that the amount of salt leached to groundwater in the basins could be reduced by applying the manure at relatively high rates on a fraction of the irrigated land and by export of manure from the basin. However, reductions were small in comparison to the effects of irrigation water management to obtain small leachate volumes. It might be viable to concentrate manure on soils having low water transmissivities which yield low leachate volumes with most irrigation systems. :Merryman-East Central)

4947-A11, B2, B3, C1, C2, D1, D3, E3
METHANE AND BIOMASS PRODUCTION SYSTEMS FOR BEEF CATTLE MANURE

U.S. Meat Animal Research Center, USDA-ARS, Clay Center, Nebraska 68933
A. G. Hashimoto, R. L. Prior, and Y. R. Chen
Great Plains Extension Seminar on Methane Production from Livestock Manure, Liberal, Kansas, Feb. 15, 1978, 25 p. 5 fig., 8 tab., 13 ref.

Keywords: Livestock wastes, Anaerobic digestion, Methane, Refeeding, Sheep, Performance, Model studies, Centrifugation, Ash, Amino acids.

This presentation has summarized the research being conducted at the U.S. Meat Animal Research Center to convert livestock manure into methane and a high protein feed ingredient by thermophilic anaerobic fermentation. The pilot scale fermentor is 5.7 m^3 with working volume between 5.1 to 5.4 m^3. Fermentation was started by adding fresh beef manure to previously heated tap water and maintaining the pH above 7. Gas production increased dramatically within nine days after start up, demonstrating the relative ease in initiating anaerobic fermentation of livestock manures. The fermentor was operated at 55°C; 20, 12, 6 and 3 days' retention times; and loading rates of 3.4, 5.2, 11.4 and 22 kg VS/m^3/day. The results showed that the total solids, volatile solids and COD reduction decreased as the retention time decreased; the fixed solids and total nitrogen were not lost during fermentation: and the total gas and methane production increased as the retention time decreased. Kinetic constants for the generalized substrate utilization model (Chen and Hashimoto, 1977) were determined and were in close agreement with previously reported results. Experimental results agreed well with values predicted by the model. High protein biomass from the fermentation is being recovered through centrifugation and by direct incorporation into the ration. Centrifugation recovers 45 to 51 percent of the suspended solids and 18 to 23 percent of the organic nitrogen. Further adjustments and studies are planned to increase the capture efficiency of the centrifuge. Advantages of direct incorporation of the effluent in the ration are 100 percent utilization of the effluent and nitrogen. Possible disadvantages are high ration moisture content and more feed production than the number of animals

needed to produce manure for the fermentation. Amino acid analysis shows that the fermentor effluent compares favorably with soybeans and that the centrifuged cake compares favorably with alfalfa hay. Lysine and methionine are relatively abundant essential amino acids in the fermentor effluent, but histidine may be a limiting amino acid. Feeding trials using dried centrifuge cake showed that the digestibility of dry matter, organic matter, and nitrogen tended to decrease slightly as the amount of cake in the ration increased. The greatest change was in the ash digestibility, which decreased from 59.5 percent in the control to 28.4 percent in the ration containing 20 percent cake. The relatively inefficient utilization of the ash may present one of the major problems in effectively utilizing the biomass as a feedstuff. Preliminary results of the feeding trial using fermentor effluent mixed with corn and hay show that the fermentor effluent is utilized as well as soybean protein. (Hashimoto-U.S. Meat Animal Research Center)

4948-A11, B3, C2, E3
VOLUNTARY INTAKE AND NUTRITIVE VALUE OF SILAGE MADE OF POULTRY DROPPINGS AND GREEN MAIZE

Animal Nutrition Survey Sheme in Assam, Assam Agricultural University, Gauhati, India
N. N. Pathak, D. V. G. Krishna Mohan and S. K. Ranjhan
Indian Journal of Animal Sciences, V. 45, No. 12, p. 934-937, Dec., 1975. 5 tab., 12 ref.

Keywords: Poultry wastes, Refeeding, Cattle, Nutrients, Performance

An attempt was made to find out the voluntary intake and nutritive value of silage prepared using poultry droppings, green maize and molasses. The silage was prepared by mixing 40 parts of poultry droppings, 50 parts of chaffed green maize and 10 parts of molasses on fresh basis and allowed for 6 weeks autofermentation in sealed metallic cylinders. The silage was fed *ad lib.* to 3 cross-bred male calves for 5 weeks. A metabolism trial was conducted after 4 weeks of feeding to determine the nutritive value of silage. The crude protein content of the silage was 15.5 percent and gross energy/g was 4.16 Kcal on dry basis. Average voluntary consumption of dry matter from silage was 2.76 kg/100 kg live weight. Average digestibility coefficients of dry matter, crude protein, ether extract, crude fibre, nitrogen-free extract and total carbohydrates were 52.4, 53.2, 77.7, 55.4, and 58.5, and 57.8 respectively. The digestibility and metabolizability of energy were 55.6 and 47.4 percent respectively. The DCP and TDN contents of silage were 8.24 and 44.41 percent respectively, on dry-matter basis. The concentration of DE and ME per kilogram of dry matter of silage was 2.32 and 1.98 Mcal respectively. The body weight of the calves remained constant at the beginning and at the end of the experimental period of 5 weeks. (Pathak, Assam Agricultural University)

4949-A9, B3, C2
RESIDUE CONTENT OF BEEF FEEDLOT MANURE AFTER FEEDING DIETHYLSTILBESTROL, CHLORTETRACYCLINE AND RONNEL AND THE USE OF STIROFOS TO REDUCE POPULATION OF FLY LARVAE IN FEEDLOT MANURE

U.S. Department of Agriculture, Beltsville, Maryland 20705
T. S. Rumsey, R. W. Miller, and D. A. Dinius
Archives of Environmental Contamination and Toxicology, V. 6, No. 2-3, p. 203-212, 1977. 7 tab., 22 ref.

Keywords: Fly control, Feedlots, Cattle wastes, Feed additives, Diethylstilbestrol, Chlortetracycline, Ronnel, Stirofos, Larvicides, Residues

Two beef cattle feedlot experiments were conducted to determine the amount of certain agricultural chemicals that are likely to be found in both fresh and stored feedlot manure and to investigate fly control in this manure. In experiment 1, diethylstilbestrol (DES), chlortetracycline (CTC), and ronnel were used as feed additives. Fresh manure, stored manure, runoff water, manure weathered on pasture, and soil from pasture fertilized with manure were analyzed for these additives. Stirofos was added to fresh manure as a larvicide for fly control. In experiment 2, the residue aspects of DES and CTC were repeated. In this experiment, stirofos instead of ronnel was fed with DES and CTC. Sixty-eight percent of the DES fed to cattle appeared in fresh manure and 52 percent in manure stored for 12 weeks. Comparable percentage values were 17 and 11 percent for CTC and 13 and 3 percent for ronnel; somewhat less DES and CTC were found when a concentrate diet was fed. Detectable amounts of DES, CTC, and ronnel were not found in runoff water, weathered manure, or soil. Adding an emulsifiable concentrate formulation of stirofos directly to manure at a rate of approximately 45 ppm of wet manure completely controlled the larvae of house fly (Musca domestica L.) whereas feeding stirofos at a rate of 1.5 mg per kg of body weight daily reduced larval counts 82 percent in manure from forage-fed heifers and 63 percent in manure from concentrate-fed heifers. Stirofos was not detected in runoff water, weathered waste, or soil. (Rumsey-USDA)

4950-A3, A8, B3, C2, E2
MANURE EFFECTS ON WATER RUNOFF QUALITY FROM IRRIGATED GRAIN SORGHUM PLOTS

USDA Southwestern Great Plains Research Center, Bushland, Texas 79012
A.C. Mathers, B.A. Stewart, and J.D. Thomas
Soil Science Society of America Journal, V. 41, No. 4, p. 782-785, 1977. 1 fig., 8 tab., 13 ref.

Keywords: Feedlots, Farm wastes, Land application, Crop response, Irrigation, Water intake rates, Soil-water-plant relationships, Agricultural runoff, Nutrients, Grain sorghum

Study objectives were to determine the effect of manure on: (1) the advance and intake of furrow-applied irrigation water, (2) crop yield, and (3) the quality of runoff water. Feedlot manure treatments of 0, 22, and 67 tons/ha (wet weight basis) were applied annually on Feb. 16, 1972, May 16, 1973, and Feb. 14, 1974 to Pullman clay loam. Additional treatments were 67 metric tons manure/ha manure applied the first year only and 224-kg N/ha/year as anhydrous ammonia. Grain sorghum was grown in two 30-cm spaced rows on each bed for 3 years. Irrigation water was applied at equal rates (38 liters/min.) to each furrow. During the first year manure rates had little effect on irrigation water advance. However, water advance decreased as the manure rates increased the second and third years. Water intake and grain yields were higher on manure- than on ammonia-treated plots. Incorporating manure into soil did not significantly increase NO_3-N or Cl in runoff except when rain fell on nearly saturated soil. Phosphorus was low in all runoff samples. (Merryman-East Central)

4951-A3, A4, B1, C2, C3, F4
ENVIRONMENTAL IMPACT RESULTING FROM UNCONFINED ANIMAL PRODUCTION

Department of Agricultural Engineering, Louisiana Tech University, Ruston, Louisiana 71272
J. W. D. Robbins
Environmental Protection Agency Report EPA-600/2-78-046, Feb., 1978. 34 p. 10 tab., 34 ref.

Keywords: Environmental effects, Unconfined animal production, Cattle wastes, Sheep wastes, Swine wastes, Pasture, Range, Nonpoint sources, Water pollution, Agricultural runoff

This report outlines and evaluates current knowledge related to environmental effects of unconfined animal production. Animal species directly addressed include cattle, sheep, and hogs. All available data indicate that pollutant yields from pasture and rangeland operations are not directly related to the number of animals or amount of wastes involved. Rather, these nonpoint source problems are intimately related to hydrogeological and management factors and are best described as the results of the erosion/sediment phenomenon. Unconfined livestock production can cause changes in vegetative cover and soil physical properties that may result in increased rainfall runoff and pollutant transport to surface waters. The most common stream water quality result is elevated counts of indicator bacteria. Increased levels of inorganic and organic sediments with associated plant nutrients and oxygen demands may result from problem areas. These areas are usually only a small portion of the total production system and are readily identified by observation. Generally the pollutant levels from the remainder of the production site are not discernible from background levels. If other changes, such as those affecting groundwater quality, occur, they are of no environmental consequence. A major challenge remaining is to demonstrate cost-effective routes toward achievement of various levels of pollution control from unconfined animal production. (Robbins-Louisiana Tech University)

4952-B3, C2, D1, D2, D3, E3
CONVERSION OF CATTLE FEEDLOT MANURE TO ETHYLENE AND AMMONIA SYNTHESIS GAS

Texas Tech University, Lubbock, Texas 70409
W. J. Huffman, J. E. Halligan, and R. L. Peterson
Environmental Protection Agency Report EPA-600/2-78-026, Feb., 1978, 63 p. 10 fig., 8 tab., 52 ref.

Keywords: Feedlots, Cattle wastes, Recycling, Energy, Agricultural wastes, Organic wastes, Fluidized bed processors, Chemical reactors, Ammonia, Ethylene.

An investigation was undertaken to scale-up a partial oxidation reactor to evaluate the potential for producing an ammonia synthesis gas from cattle feedlot residue. The synthesis gas from the reactor can be further processed to produce ammonia using existing, commercial technology. During this phase of the study, a 2.5 meter long, falling-bed reactor was designed, constructed, and operated along with supporting feed and recovery equipment; manure feed rates to the reactor ranged from 7.7 to 23.6 kilograms per hour. The results show that significant yields of an ammonia synthesis gas and ethylene can be produced in the same reactor when the system is fed with a mixture of air, steam, and manure. This study and earlier bench-scale experiments (EPA-660/2-74-090) show that the product gases are compatible with both ethylene and ammonia synthesis gas production. (Huffman-Texas Tech University)

4953-A9, B1, D2
SELECTIVE MORTALITY OF INSECTS IN MANURE FROM CATTLE FED RABON® AND DIMILIN®

Department of Agricultural Biology, The University of Tennessee, Knoxville, Tennessee 37901
C. W. Cook and R. R. Gerhardt
Environmental Entomology, V. 6, No. 4, p. 589-590, 1977. 1 tab., 4 ref.

Keywords: Insect control, Insecticides, Feed additives, Cattle wastes.

Rabon® and the insect growth regulator, Dimilin®, were fed to pastured beef cattle in Tennessee. Manure pats were sampled biweekly from Apr.-Sept. Twenty-four species of insects were recovered. Of the 16 species that were analyzed, only 3 [*Musca autumnalis* DeGeer, *Ravinia* sp and *Sphaeridium scarabaeoides* (L.)) were reduced in manure from treated cattle. One species, *Ataenius* sp. increased in Rabon treated manure pats. Manure pats from Rabon and Dimilin treated cattle were slower to decompose than pats from untreated cattle, but all pats had decomposed after 8 wk. Tunneling by *S. scarabaeoides* was significantly reduced by both treatments (Cook-University of Tennessee)

4954-B3, C1, C2
CHEMICAL COMPOSITION OF FEEDLOT MANURE

Colorado State University, Fort Collins, Colorado 80523
G. M. Ward, T. V. Muscato, D. A. Hill, and R. W. Hansen
Journal of Environmental Quality, V. 7, No. 2, p. 159-164, April-June, 1978. 4 tab , 23 ref.

Keywords: Cattle wastes, Unsurfaced feedlots, Concrete feedlots, Chemical properties, Residence time.

This paper describes chemical composition of feedlot manure collected over short time periods in order to simulate the effects of frequent collection for industrial uses of manure. Manure samples were collected during a 10-month period from a feedlot with conventional pens and pens in which about one-half the surface was covered with concrete. Samples were collected from the front, middle, and rear of each pen. Average percentages of 139 samples on a dry matter basis were: dry matter, 58.5; ash, 37.0; total N, 2.32; neutral detergent fiber, 45.9; acid detergent fiber, 39.7; hemicellulose, 6.29; cellulose, 9.78; lignin, 7.67; and ADF insoluble ash, 25.3. Average pH was 7.09. Average percentages on a dry matter basis for 63 manure samples were: Na, 0.51; P, 0.54; and K, 1.35. Ash content of samples collected from concrete surfaces were 12.2 percent lower than the other samples because of less mixing with soil. Residence time of manure in the feedlot did not have a predictable effect upon manure composition. (Merryman-East Central)

4955-A8, B3, C2, E2
NITRIFICATION AND DENITRIFICATION IN CATTLE MANURE-AMENDED SOIL

USDA, P.O. Box E, Fort Collins, Colorado 80522
W. D. Guenzi, W. E. Beard, E. S. Watanabe, S. R. Olsen, and L. K. Porter
Journal of Environmental Quality, V. 7, No. 2, p. 196-202, April-June, 1978. 7 tab., 34 ref.

Keywords: Land application, Cattle wastes, Nitrification, Denitrification, Application rates, Sorghum, Soil chemistry.

This 39-day greenhouse study was designed to add $^{15}NO_3^-$ and $^{15}NH_4^+$ to soil as a tracer with and without manure amendments to provide information on (I) the influence of the micro-environment on nitrification and denitrification by analysis of O_2, N_2O, and ^{15}N enriched N , and (ii) N recovered from a cropped and uncropped soil. The two fertilizer N sources ($^{15}(NH_4)_2SO_4$ (28.31 percent ^{15}N) and $K^{15}NO_3$ (28.16 percent ^{15}N) at 200 ug N/g of soil, and cattle manure at rates of 45 and 90 metric tons/ha (dry weight) were utilized. One set of treatments was uncropped and the other set was seeded with sorghum. Denitrification products were detected in the soil gases from the NO_3^- and NH_4^+ treatments at manure levels of 45 and 90 metric tons/ha. Except for the initial detection of N_2O immediately after wetting the soil in all manure treatments, only the NO_3^- treatment showed N_2O production with time. Recovery of total N from cropped and uncropped soil without manure ranged from 92 to 105 percent, with no significant difference between fertilizers for each treatment. There was significantly more N recovered from the cropped than the uncropped treatment. In the manure treatments, more N was recovered from the 45 than from the 90-metric ton/ha treatment. Study results suggest that gaseous loss of N by denitrification could occur after large amounts of manure are applied to field soils. (Merryman-East Central)

4956-A9, B2, C2, D2, D3
RESPONSE OF COLIFORM POPULATIONS IN POULTRY WASTE DIGESTERS TO THREE INSECTICIDES

Department of Agronomy and Soils, Clemson University, Clemson, South Carolina 29631
P. E. Ballington, H. D. Skipper, and R. O. Hegg
Journal of Environmental Quality, V. 7, No. 2, p. 262-264, April-June 1978. 2 fig., 10 ref.

Keywords: Pest control, Insecticides, Carbaryl, Dimethoate, Dichlorvos, Poultry wastes, Digesters, *E. coli*, Enteric coliforms, Die-offs.

This study was performed to determine if carbaryl, dimethoate, and dichlorvos could be responsible for die-offs of *E. coli* in poultry waste digesters. A pure culture and a digester effluent slurry system were used to test several concentrations of these insecticides against *E. coli* and other enteric coliforms. In the pure culture study, carbaryl at 1 or 40 ppmv showed no significant effect on *E. coli* population levels when compared with the control flasks. Consequently carbaryl was used only in this experiment. Results did indicate that residues of organophosphate insecticides (dimethoate and dichlorvos) used for fly control in layer houses can significantly reduce the enteric coliforms which are essential in the conversion of organic-N to inorganic N in poultry waste effluent. (Merryman-East Central)

4957-B2, C1, C2, D1, D3
ANAEROBIC LAGOONING OF MANURES AND MILKING PARLOR WASTEWATER

Clemson University, Clemson, South Carolina
C. L. Barth and R. O. Hegg
Paper No. 77-4537, American Society of Agricultural Engineers, 1977 Winter Meeting, Chicago, Illinois, Dec. 13-16, 1977, 21 p. 11 fig., 5 tab., 9 ref.

Keywords: Dairy wastes, Aerobic treatment, Anaerobic treatment, Lagoons, Southeast U.S., Physical properties, Chemical properties, Volatile solids degradation, Sludge accumulation rates, Separation.

This study was undertaken to increase the knowledge of the character of wastes from the dairy operation, to determine the compatability of dairy wastes to lagoon treatment, and to compare results of laboratory lagoon simulators to lagoons in a field situation. Results of aerobic and anaerobic lagooning of dairy manure and parlor waste water under laboratory conditions were evaluated and compared with results of field studies on full-scale anaerobic dairy lagoons. It was determined that: (1) Of the total flow of wastewater from the milking parlor, about ⅓ is produced from the milking operation, ½ from the cleanup after milking, and 1/6 from the washing of the bulk tank. (2) In the common dairy management scheme described in this report, about 40 percent of the manure falls on the pasture or exercise paddock, 45 percent on the cow feed yard, 12 percent in the holding area, and 2 percent in the milking parlor. (3) Laboratory simulators of anaerobic lagoons have limited usefulness in predicting the VS degradation and sludge accumulation rates to be anticipated with dairy manure under field conditions. The major shortcoming is the relatively short period of operation of the simulators in the laboratory compared to

field operations. (4) Increasing milking parlor wastewater detention time to 100 days significantly increases the VS degradation rate and decreases the sludge accumulation rate. (5) Sludge accumulation rates in anaerobic dairy lagoons in the Southeast are about 2.5 to 3.3 cc/g TS or about 5.6 to 8.5 m^3 (200 to 300 ft^3) per 590 kg (1300 lb.) cow per year. (6) Addition of solids separation of dairy wastewater processing will greatly increase the life expectancy of a new lagoon or extend the life expectancy of an existing lagoon. (Bates-East Central)

4958-A1, B2, D1, D2, D3, E4, F1
HARVESTING ALGAE FROM LAGOON EFFLUENT

Agricultural Engineering Department, University of Florida, Gainesville, Florida
E. P. Lincoln, D. T. Hill, and R. A. Nordstedt
Agricultural Engineering, V. 59, No. 5, p. 16-17, May, 1978. 5 fig.

Keywords: Farm wastes, Lagoons, Waste treatment, Flocculants, By-product recovery, Algae, Settling, Drying, Economics

At the University of Florida Swine Research Unit, algae are grown in 4 unlined parallel earthen channels which lie at the foot of a low south-facing slope. The channels are connected by culverts at alternate ends to form a single continuous course 160 m long. Each day 8000 L of anaerobic lagoon effluent is gravity-fed into the first channel. The incoming medium requires at least 4 days to travel the channels to the harvest point. The culture is semi-continuous and operates essentially as a plug-flow reactor with the harvest occurring at the downstream end. To harvest the algae, a 2.5 hp centrifugal pump draws off surface water from the last channel at 400 L/min. American Cyanimid's Magnifloc 509-C, a chemical flocculating agent, is then fed into the intake line; the pump action achieves a thorough mixing. The mixture is discharged into a cylindrical tank 4 m in diameter by 1 m deep with a cement floor sloping to a conical center well. Separation is accomplished by autofloatation. After the algal slurry is collected in a second settling tank, it is either acidified to remove the flocculant and then resettled or it is pumped directly onto the drying tables. The slurry may take one to six days to dry to a 12 to 15 percent mc, depending on thickness of the slurry, type of flocculant, and air temperature and humidity. The final product consists of hard green flakes which are odorless and essentially tasteless. They can be stored indefinitely at normal room temperatures and are easily ground to any texture. Amino acid content is very similar to that of soybean meal. The producer who now feeds 70 percent more protein nitrogen than he markets might, with such a recycling scheme, recoup some of his feeding expense while reducing pollution potential of the animal wastes. (Merryman-East Central)

4959-A1, B3, D2, D3, F1
A GRAPHICAL ANALYSIS OF LIVESTOCK PRODUCTION AND WASTE MANAGEMENT SYSTEMS

Department of Agricultural Engineering, University of Illinois, Urbana-Champaign, Illinois
H. C. Kim, W. Mayeda, and D. L. Day
Paper No. 77-4031, American Society of Agricultural Engineers, Raleigh, North Carolina, June 26-29, 1977, 18 p. 9 fig., 7 ref.

Keywords: Graphical analysis, System analysis, Signal flow graph, Farm flow graph, Mason formula, Equations, Chemical treatment, Formalin, Biological treatment, Wastelage, Odor control, Pathogenic bacteria, Palatability, Nutrients, Economics

This study deals with a graphic technique in a theoretical system analysis by introducing a signal flow graph. A chemical treatment and wastelage process are used to describe this method. Chemical treatment is a process in which formalin is added to raw manure (Hatfield, 1974). The wastelage process is a biological treatment in which hay is added to raw manure and then ensiled (Anthony, 1969). Both processes are aimed at controlling odors, killing pathogens, increasing palatability, and providing nutrients. A topological technique gives a simple method of comparing the energy expense of wastelage and chemical treatment. (Kim-University of Illinois)

4960-A4, A7, B1, F2
FEEDLOT POLLUTION CONTROL GUIDELINES

Extension Agricultural Engineer, The Texas A&M University System, College Station, Texas
J. M. Sweeten
Feedlot Pollution Control Guidelines, Texas Agricultural Extension Service, Texas A&M University, 1974, 12 p. 4 fig.

Keywords: Feedlots, Texas, Permits, Regulation, Water pollution, Air pollution, Management, Guidelines

The state and federal requirements for water pollution control and solid waste management for feedlot operations are discussed. Also presented are some guidelines to use in obtaining necessary permits for feedlot operation, which include the following: (1) With engineering assistance, prepare preliminary plans for the feedlot and waste handling system. (2) Arrange an on-site meeting involving agency representatives, your engineer and yourself to decide what controls are needed. (3) Prepare final plans for the feedlot waste management system, incorporating decisions and agreements reached in step 2. (4) Submit application forms and documents to the regulatory agencies. (5) Publicize public hearings on each application as desired. (6) Attend public hearings, represented by attorney and engineer. (7) Accompanied by legal and technical representatives, attend state board meetings at which applications are considered for adoption. (8) Initiate construction in accordance with terms and conditions of permits. In general, feedlots with over 1000-head capacity must obtain permits prior to construction. Air pollution control guidelines are also enclosed. (Bates-East Central University)

4961-B2, D3
VEGETATIVE FILTER TREATMENT OF FEEDLOT RUNOFF

Department of Agricultural Engineering, University of Illinois, Urbana-Champaign, Illinois
E. C. Dickey, D. H. Vanderholm, J. A. Jackobs, and S. L. Spahr
Paper No. 77-4581, American Society of Agricultural Engineers, 1977 Winter Meeting, Chicago, Illinois, Dec. 13-16, 1977, 13 p. 6 fig., 3 tab., 10 ref.

Keywords: Vegetative filter systems, Feedlots, Agricultural runoff, Dairy wastes, Cattle wastes, Swine wastes, Corn Belt, Design, Overland flow, Graded terrace, Channelized flow

A study was conducted in Illinois in 1975 to evaluate 4 vegetative filter systems designed to treat feedlot runoff. One of the systems was installed on the University of Illinois dairy farm, where construction and management could be carefully controlled and monitored. The other 3 systems were being used at commercial beef and swine production facilities. Research objectives were to: (1) Determine whether vegetative filters represent a feasible way of managing feedlot runoff in the Corn Belt. (2) Identify the configuration most likely to be successful for the range of conditions encountered. (3) Develop design standards and management recommendations for the successful use of vegetative filter systems. At all four locations used, the basic system consisted of a settling facility, a distribution component, and the vegetative filter area. The 2 types of vegetative filters used were broad overland flow and graded terrace (serpentine-waterway) both of which combine infiltration, dilution, and filtration to produce an effluent suitable for discharge. Pollutant reduction and design criteria for overland flow systems are presented. Channelized flow systems appear to be less effective than overland flow systems, requiring much greater flow length for a similar degree of treatment. Design criteria for channelized flow systems will be developed later. (Bates-East Central)

4962-B3, C2, E3
FEEDING POULTRY WASTE TO RUMINANTS

Agricultural Research Council's Poultry Research Centre, King's Buildings, West Mains Road, Edinburgh, EH9, 3JS, Scotland
W. Bolton
Proceedings 5th European Conference, Malta, 1976, p. 533-538 9 ref.

Keywords: Poultry wastes, Refeeding, Ruminants, Dried poultry wastes, Dried poultry litter

Poultry are maintained under three systems of management: open range, on litter and in cages. Caged birds produce undiluted manure. Manure from birds on litter is diluted by the litter. Manure from birds on range can be collected only from the area used for roosting. It may or may not be diluted. Birds in cages and on litter may be growing chickens or laying hens. There are therefore 4 products which can be dried and used as feedstuffs for animals. Of these, caged layer manure (DPW) and floor-reared-broiler manure (DPL) are produced in the largest amounts. DPW and DPL compositions are variable and depend upon the diet fed, the rate of production, and the length of time between excretion and drying. Poultry wastes have been determined to be suitable for feedstuffs for ruminant animals. Ruminants can obtain protein and energy from DPW and DPL and the inclusion of DPW and to a slightly smaller extent DPL, in ruminant diets permits reductions in the amounts of vegetable protein used. Such inclusion in diets for dairy cows or beef cattle

does not impart an adverse flavor to the product marketed. There remains, therefore, the question of acceptibility by the farmer and consumer. Resistance at present is of 2 kinds: the material offered is very variable in composition, therefore reformulation is necessary for each parcel; and the names are wrong. (Merryman-East Central)

4963-A11, B3, C2, C3, E3, F1 THE USE OF DRIED POULTRY WASTES AS FEEDINGSTUFFS

ARC Poultry Research Centre, West Mains Road, Edinburgh, Scotland
W. Bolton
ADAS Poultry Quarterly Journal, p. 25-37, March, 1975. 10 tab.

Keywords: Dried poultry wastes, Refeeding, Animal health, Bacteria, Drugs, Feed additives, Ruminants, Performance, Economics.

The refeeding potential of dried poultry wastes is examined. Provided the process is properly carried out and that recontamination with fresh material does not occur, there should not be any risk of spreading disease. Harmful bacteria do not seem to be a very big threat. A more serious hazard could be the presence of residues of drugs or growth-promoting substances. To counter this, it is essential that the operator of a drier accepts only DPW that comes from birds which are not offered diets containing such substances. When litter is dried the number of hazards increases. Hazard due to the presence of wood splinters that can perforate the gut, hazard from growth-promoter or anti-coccidial drug residues, and hazard from residues in the wood must be taken into account. Refeeding of poultry wastes to ruminants would seem to merit consideration. In terms of dairy cattle, experiments have indicated: (1) DPW increased the milk yield when it was included in the diet at 10 percent but it reduced it when the level of inclusion was 20 percent. (2) Milk quality, whether assessed by chemical composition, odor or taste was not affected by levels as high as 20 percent. (3) DPW was an economical ingredient at the 10 percent level. Refeeding to beef cattle would also seem feasible. Reaction from the general public should be assessed. Thus, the name under which the product is marketed is very important. (Merryman-East Central)

4964-A6, A7, B1, C2, F4 DETECTING AND MEASURING MALODORS FROM ANIMAL WASTES

ARS, USDA, Pullman, Washington
L. F. Elliott, J. W. Doran, and T. A. Travis
Scientific Paper No. 4713, Nebraska Agricultural Experiment Station, Lincoln, Nebraska in cooperation with Soil, Water and Animal Waste Management Research Unit, North Central Region, Agricultural Research Service, U.S. Department of Agriculture, 1976, 21 p., 2 tab. 31 ref.

Keywords: Farm wastes, Odor, Measurement, Wet chemistry, Gas chromatography, Analysis, Chemical compounds

This paper describes odor-measurement technology, methods of approach, and areas where cure research is needed. The nose, wet chemistry, and gas chromatographic detection methods have been used to measure odors and gaseous emissions. Olfactory evaluation is widely used for detection and evaluation of odors but is neither quantitative nor selective in determining odor components. Most wet-chemical techniques suffer from a lack of detection sensitivity and specificity. Gas chromatographic (GC) techniques can be used to detect much lower ambient concentrations of odor compounds. All olfactory and analytical odor measurements have limitations and presently, none are simultaneously rapid, simple, inexpensive and reproducible. Direct aerial evaluation of emissions with odor correlations warrants further investigation. Success may be gained through measurement of total aerial N, S, NH_3 and/or non-NH_3-N levels. Specific absorbents may provide promising approaches. The use of cloth strips or similar techniques combined with GC analysis provides interesting possibilities. If chemical or instrumental methods are developed into a workable system, measurements taken must be conducted under strictly controlled and measured conditions, and must be correlated with odor panels. (Bates-East Central)

4965-B2, C2, D3, E3, F1 THE LAMAR BIO-CONVERSION PLANT DESIGN

Bio-gas of Colorado, 342 E. Third Street, Loveland, Colorado 80537
J. Burford, Jr. and F. T. Verani
Energy Potential Through Bio-conversion of Agricultural Wastes, Four Corners Regional Commission, 1976, 25 p. 7 fig.

Keywords: Bio-conversion, Anaerobic digestion, Cattle wastes, Recycling, Methane, Refeeding, By-product recovery, Algae, Wastewater reuse, Economics.

This paper addresses the evolution of design and present status of a large-scale anaerobic digestion facility proposed for the city of Lamar, Colorado to provide methane gas to the city's electric utility plant and cattle feedstuff to area feedlots. This is the second phase of research funded by the Four Corners Regional Commission designed to demonstrate the viability of a bio-conversion industry. The project has yielded positive results in all areas of concern. The conversion of organic matter to methane gas has been documented for cattle waste from the site area at an average yield of 3.54 standard cu. ft. of methane/lb. of organic matter (volatile solids). The bid on construction of the Lamar plant is $9,842,000. Algae research accomplished during Phase II has definitely established the ability of the proposed algae ponds to reduce dissolved solids concentration in digestor effluent from a level of approximately 10,000 mg/l to 3000 mg/l or below, enabling the plant process water to be recycled. A significant achievement during this phase of the work has been the development of the anaerobic residue as a cattle feed material. The pricing range being considered for the residue is $66 to $75/ton of dry matter. The financial analysis of the plant's operation (1977 cost basis) indicated that if residue is sold at a price of $66/ton and in the amount of 31,700 tons/year, then the Lamar power plant can be provided with a net 296,750 MCF/year gas supply at a cost of $0.98/MCF. A positive impact on business activity in the Lamar area as a result of the bio-conversion plant is predicted. (Bates-East Central)

4966-A6, A7, B2, C2, D3 EFFECT OF SURFACE AERATION ON GASES EVOLVED BY A SWINE-WASTE ANAEROBIC LAGOON

Iowa State University, Ames, Iowa
B. Parker and R. J. Smith
Paper No. MC-77 704, American Society of Agricultural Engineers, Mid-Central Regional Meeting, St. Joseph, Missouri, March 25-26, 1977, 19 p. 7 fig., 5 tab., 7 ref.

Keywords: Swine wastes, Lagoons, Anaerobic conditions, Aerobic conditions, Odor, Hydrogen sulfide, Ammonia, Temperature, Gas production, Aeration.

A study was conducted to measure the major components of the gases given off by a swine-waste anaerobic lagoon, including two potential odor compounds, H_2S and NH_3. An attempt was made to determine the effect of minimum surface aeration on these gases, especially the odor indicators. In order to trap gases without covering the entire lagoon, an 8-ft diameter stock tank was inverted and floated near the center of the lagoon. Polyethylene tubes were attached to 2 gas ports on the tank. One of the tubes was connected to a wet-test meter, and quantitative gas measurement began. Lagoon and air temperatures were monitored by single daily readings with a hand-held thermometer. Lagoon liquor was recycled from beneath the cover, through a pump, and back underneath the cover. Air was introduced through a controlled inlet on the suction side of the pump. Pressure under the tank cover and in the line was something less than ¼ inch of water pressure above atmospheric. Gas production varied from 0.25 to 2.15 ft^3/day. Gas-production rate was rising when measuring started on April 1, 1976. The rate increased rapidly until the end of the third week in April. It then started to decline rapidly leveling off somewhat during June. During July and August, it stayed relatively constant, beginning to decline again in late September and dropping off rapidly in October. By November, the gas production was barely detectable. Average lagoon temperature during the summer months when the gas production was relatively constant was about 78° F. Average animal-waste loading into this lagoon during the summer months of May, June, and July came from approximately 535 pigs of an average weight of the 125 lb. Though the power requirements of the aeration equipment were relatively high, the oxygen-transfer efficiency was around 75 percent. Under steady-state conditions, odors could be significantly decreased using surface-aeration techniques. (Merryman-East Central)

4967-B3, C2, E2, F1 FEEDLOT MANURE CAN BOOST IRRIGATED ALFALFA YIELDS

Anonymous
Beef, V. 14, No. 9, May, 1978.

Keywords: Feedlot wastes, Land application, Alfalfa, Crop response, Fertilizers, Phosphorus, Economics.

Spending $15 to $20 per acre annually for commercial fertilizer or manure to get $275 worth of alfalfa has been found to be a profitable swap. Without adequate phosphorus, weedy grasses which thrive on the nitrogen produced by the alfalfa begin to take over. Greenhouse experiments have revealed that phosphorus in manure produces more

alfalfa than the same amount of phosphorus in superphosphate. Feedlot manure contains 1.4 to 1.8 percent phosphate as P_2O_5. Don Goss, USDA Soil Scientist, says that if treble superphosphate (0-46-0), the most commonly used phosphate fertilizer, is $140 a ton or 15 cents a pound for phosphate, 120 pounds of phosphate plus one dollar per acre application for a six-ton alfalfa crop costs $19 a year. Cost for 3 years will be $57. Eleven tons of manure will do the same job better. If manure can be applied at $5 a ton or less, it is the best buy. (Merryman-East Central)

4968-A11, B3, C2, E3
LAYERS IMPROVE WITH DPW

Anonymous
Poultry Industry, p. 15, July, 1976. 3 tab.

Keywords: Refeeding, Poultry, Dried poultry wastes, Performance, Egg quality.

Studies conducted at the Agricultural Research Council's Poultry Research Centre, Edinburgh, Scotland, indicate that lower mortality and improved egg production can be obtained when dried poultry waste is refed at up to 20 percent inclusion. However, shell weight and thickness decreases as the level of dried poultry wastes in the diet increases. (Merryman-East Central)

4969-A11, B1
FLOOR MATERIALS FOR SHEEP HOUSING

Department of Animal Science, University of Illinois, Urbana-Champaign, Illinois
J. M. Lewis, M. H. Wallace, A. J. Muehling, and F. C. Hinds
Update 77: A Research Report of the Dixon Springs Agricultural Center, DSAC 5, Jan., 1977, p. 157-162. 7 fig., 2 tab., 3 ref.

Keywords: Slotted floors, Sheep, Confinement pens, Flooring materials, Cleaning ability, Appearance, Animal health, Aluminum, Stainless steel, Plastic.

A pole type shed 20 ft x 108 ft was remodeled in 1975 to be used as a lamb feeding unit. Spaces were constructed to accommodate sixteen 8 ft x 10 ft elevated portable floor units. Different flooring materials were evaluated for use as slotted floors in confinement rearing systems for sheep. Floors were compared for cleaning ability, effects on animal mobility, injuries, and appearance. Types of floors compared included: (1) high profile aluminum serrated slat 3-½ inches wide, (2) low profile aluminum ribbed slat 3-½ inches wide, (3) industrial grating (grid) with ½ inch x 3 inch openings (4) Safe-T-Mesh with 3/4 inch openings (5) stainless steel full slat plank, and (6) plastic slats. Study results indicated that the diet has a major influence on the cleaning ability of some floors. The wider slats (3½ to 5 inches) can be used but may accumulate objectionable amounts of waste. Flooring material does not seem to affect animal gain. Aluminum floors cleaned well when used by lambs receiving a high haylage diet, indicating that these floors may work well when the feed is mostly forages. The high profile slat with the serrated surface and the low profile slat with the ribbed surface both accumulated objectionable amounts of waste when used by lambs receiving more concentrate in their diets. The grid floor also accumulated some waste but cleaned well under the prevailing conditions. Under most conditions, the stainless steel floor cleaned well when animal concentrations were near optimum. The low profile aluminum floor did not clean as well as the Safe-T-Mesh floor. The 5 inch plastic slat did not clean adequately. (Merryman-East Central)

4970-A8, B3, E2
EFFECTS OF BEEF CATTLE MANURE ON WATER-STABILITY OF SOIL AGGREGATES

Department of Agronomy, University of Nebraska, Lincoln, Nebraska
A. P. Mazurak, L. Chesnin, and A. A. Thijeel
Soil Science Society of America Journal, V. 41, No. 3,p. 613-615, 1977. 1 fig., 1 tab., 6 ref.

Keywords: Cattle wastes, Land application, Soil cores, Soil aggregates, Dispersion analysis.

A study was conducted to determine the effect of recent addition of varying amounts of manure on (1) the size of distribution of water-stable aggregates and (2) the resistance of soil aggregates from manured and nonmanured plots to dispersion in water during prolonged shaking periods. Plots selected for determining the stability of aggregates in water were treated with manure at rates of 0, 180, and 360 metric tons/ha/year and tilled to a depth of 0 to 10 cm. Sorghum-sudangrass hybrid was planted in the first year. Corn was planted for 2 successive years. A year after the third manure application, six soil cores were taken in each plot from a depth of 0 to 10 cm. The cores were composited, passed through a sieve with 9,440 μm openings, and air dried. A 15-g sample of aggregates 4,760-9,440 μm in diameter was wetted under vacuum. Aggregates were shaken in water for 2, 20, and 200 minutes. The aggregates were in water for 220 minutes. A combination of sieves, elutriators, and pipette was used to measure the size distribution of aggregates in water. It was found that increased rates of manure application increased the percentage of water-stable aggregates $>$ 295 μm in diameter and decreased the percentage in size groups 18.5-295 μm and $<$ 18.5 μm in diameter after 2-and 20-minute shaking periods. Distribution of aggregates present after 200 minutes of shaking was not affected by levels of manure application to the field plots. The large amounts of manure added during this experiment did not have sufficient time to produce soil aggregates that were very water stable. The inherent water stability of soil aggregates is associated with a long-time conversion of organic matter to humus. (Merryman-East Central)

4971-B3, C1, C2, D2, D3, F1
A STUDY ON THE INTERACTIONS OF ENZYMES WITH MANURES AND SLUDGES

School of Biology, Chemistry and Ecology, State University of New York, College of Environmental Science and Forestry, Syracuse, New York
L. Theoret, R. Hartenstein, and J. J. Mitchell
Compost Science, V. 19, No. 1, p. 29-32, Jan.-Feb , 1978. 1 fig., 2 tab., 7 ref.

Keywords: Cattle wastes, Horse wastes, Sludges, Waste treatment, Enzymes, Economics.

The practicability of using enzymes in manures and sludges was examined. Samples of an aerobic sludge digest, anaerobic sludge digest, cow manure, and horse manure were reacted with either cellulase, or lipase, or papain (a protein), or horseradish peroxidase plus methyl hydrogen peroxide, or a marketed worm media amendment which reportedly contained cellulase, amylase, protease, and lipase. The following conclusions were drawn: (1) No preparation exhibited an increase in rate of oxygen uptake strictly as a function of enzyme catalysis. (2) Whenever an enzyme stimulated oxygen uptake, it did this regardless of whether the enzyme was intact (active to begin with) or denatured. (3) Significant quantities of protease, lipase and peroxidase were inactivated or destroyed in the course of interacting with the sludges and manures. (4) Significant quantities of cellulase remained active in the course of interaction. It was concluded that perhaps most freely soluble extracellular enzymes which are added to compost material are rapidly destroyed, and that the application of these preparations to worm beds is economically unsound, since they can only provide a nutritional benefit. (Merryman-East Central)

4972-B1, C2, D3, E3, E4, F1
KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA: PART TWO

Anonymous
Calf News, V. 16, No. 4, p. 4, 6, April, 1978. 2 fig.

Keywords: Feedlots, Cattle wastes, Recycling, Methane, Carbon dioxide, Dry ice, Electricity, Energy, Economics.

The second step of Hamilton Standard's recycling process which is being used at Don Kaplan's feedlot is conversion of the diluted cattle waste into a gas which is 60 percent methane and 40 percent carbon dioxide. Two 320,000 gallon tanks will be built at the facility to handle the waste from 10,000 head of cattle. The bio-conversion process will be kept at 120 degrees on a 24-hour basis. As the organic matter ferments, the evolving gases will be tapped off. The gas will replace 88 percent of Kaplan's fuel needs. Eventually Kaplan should have surplus energy to sell to Bartow, Florida. After the conversion plant (funded by the Department of Energy) is built and has operated successfully for one year, the plant will become the property of Don Kaplan. At that time, Kaplan will consider the process to purify the methane gas by removing the carbon dioxide. The methane will be more acceptable as a saleable product and the carbon dioxide will have more value than the methane for the production of dry ice which the packing plant needs and the Florida citrus industry would be glad to buy. Another idea is to use the methane to generate electricity, a process which wouldn't be too expensive and which would make a better energy source for Kaplan and for resale. Hamilton Standard suggests that lots with less than 4,000 head of cattle would not find this management system economically viable. (Merryman-East Central)

4973-B2, C2, D3, E3
KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA: PART THREE

Anonymous
Calf News, V. 16, No. 5, p. 1, 36, May, 1978. 2 fig

Keywords: Liquid wastes, Wastewater treatment, Wastewater reuse, Lagoons, Aerobic treatment, Anaerobic treatment, Algae, Fish farming, Tilapia.

The liquid fraction from the anaerobic fermentation process being utilized at Don Kaplan's feedlot and up to 400,000 gallons a day of wastewater from the packing house is piped into a series of anaerobic and aerobic lagoons made from the holes left by phosphate miners. It is all gravity moved from the first lagoon on through the series. The first of six anaerobic ponds has scum on it. The next five are algae farms. After the water goes through the six ponds, it goes by gravity through 75 acres of very shallow ponds which are aerobic. Thus, the water is totally purified except for the algae and some dissolved nitrogen and phosphorus which can't be removed in this manner. Much of the water is recycled to the cattle as drinking water. It is chlorinated. The remainder of the water is spray irrigated over 100 acres of cropland. Three aerated ponds are used for raising a type of fish known as tilapia. As the algae floats through the system by gravity and comes to the ponds where the fish are, the fish eat the algae thereby harvesting it from the water. Once a year, commercial fishermen come in with nets and net out the fish. Twenty brood fish are thrown back to restock the ponds. The fishermen filet the fish, sell the filets for human consumption, and then give back the bones and residue which goes to Kaplan's rendering plant at the packing house. The remains are thus converted into fish meal protein supplement which is fed back to the cattle. (Merryman-East Central)

4974-A6, B2, B3, D3, E2
EUROPEAN COMPOSTING METHODS: TREATMENT AND USE OF FARM YARD MANURE AND SLURRY

Research Institute of Biological Husbandry, Oberwil, Switzerland
H. Vogtmann and J. B. Besson
Compost Science, V. 19, No. 1, p. 15-19, Jan.-Feb., 1978. 4 fig., 7 tab., 19 ref.

Keywords: Farmyard manure, Slurries, Fertilizers, Waste treatment, Aerobic conditions, Anaerobic conditions, Composting, Temperature, Odor.

In every kind of farming system, farm-produced fertilizers should be the most important product for maintenance of good soil fertility. The literature is reviewed for methods for handling farmyard manure and slurries. All methods of preparation of farmyard manure lead to loss in nitrogen, which occurs as ammonia due to evaporation or leaching. Loss of nitrogen varies considerably depending on kind of treatment. The differences between anaerobic and aerobic treatment (composting) or partial aerobic treatment have been found to be about 15-25 percent as compared to 20-35 percent. The influence of composted farmyard manure on crop yield has not been examined extensively. Compost has a number of positive effects, which are usually not taken into consideration, because the main concern is generally given to macro- and micro-nutrient. These effects include improvement of physical soil structure, reduction of leaching of nutrients, and reduced soil erosion. At present, on most European farms, slurry is collected and stored in closed underground tanks. Aeration of slurry at temperatures of approximately 30-40°C is gaining ground in the farming community. Methods include: (1) surface aeration - slurry is thrown in the air in fine bubbles for saturation with oxygen, (2) sucking aeration - sucking air into the slurry and mixing both with speed propellers, and (3) injector aeration slurry is pumped in pipes to a certain height and when falling down it sucks air through a valve, which is then mixed with the slurry in the pipe by certain devices. Such aerobic treatment reduces bad odors during storage and application of slurry. Factors conducive to optimum aeration of slurry are: (1) Sufficient organic matter in the slurry and therefore an optimum C/N-ratio for good bacterial growth. (2) Optimum aeration with air in small bubbles to allow maximum solution of oxygen in the slurry, utilizing a minimum input of energy, and (3) Optimum shape of slurry tank to eliminate danger of anaerobic zones (round tank). (Merryman-East Central)

4975-B2, B4, C2, F1
MANURE CONTAINMENT: SLURRY WITH THE CRUST ON TOP

Associate Editor, *Confinement*
J. Dawson
Confinement, V. 3, No. 4, p. 8-9, April, 1978. 1 fig.

Keywords: Livestock wastes, Slurries, Waste storage, Covered storage, Nitrogen loss, Economics.

According to Conrad Gilbertson, "livestock residues stored at 60 percent to 70 percent moisture are practically odorless. At 88 percent to 90 percent, they're putrid." Nevertheless, economics seem to dictate that the wastes be handled as a liquid. The problem is that by the time the wastes are pumped out of the average anaerobic lagoon, livestock residues have lost 75 percent to 80 percent of their nitrogen through degradation and volatilization. Consequently, pressures are mounting on all sides to improve methods of residue removal and storage. One option is covered storage -- above ground, above-and-below, or below the surface. Three general types of covered storage in Canada are concrete stave (which isn't durable enough), monolithic concrete, and steel. Whether above-ground storage is concrete or steel, the basics are the same -- collection, storage, and disposal. For collection there is a below-ground pit into which the slurry is scraped or slushed and from which it is pumped to a storage tank. The tank may be either top- or bottom-loading, though the latter is becoming more popular, especially in colder climates where freezing can be a problem. None of the above-ground tanks are roofed, but a crust does form on top, effectively sealing in gases. Descriptions are given of the Slurrystores of glass-coated steel produced by A. O. Smith of Arlington Heights, Illinois and of a radically different type of sealed storage which is produced by Environmetics of Bridgeview, Illinois. The latter is rather like a gigantic plastic bag lying in a rectangular pit 7 feet deep with 2-1 slopes. (Merryman-East Central)

4976-A6, A10, B3, E3
THE POTENTIAL OF BROILER LITTER AS FUEL

T. R. C. Rokeby and R. D. Mayo
Arkansas Farm Research, V. 27, No. 2, p. 14, March-April, 1978. 1 fig., 1 tab.

Keywords: Broiler litter, Fuel, Incineration, Heating, Brood houses, Odor, Flies.

A possible source of heat for brood houses is the direct burning of poultry litter. In 1976, a study was made to determine the fuel heat value of poultry litter. Samples were taken from 12 broiler houses and heat values were analyzed by using "Standard Methods for Laboratory Sampling and Analysis of Coal and Coke". The average value of all samples tested was 5032 BTU/lb. Assuming a conservative production of 1.5 tons of litter/1000 birds, a 15,000-bird house would produce 22.5 tons of litter at 30 percent moisture content/flock, or 15.75 tons oven-dry weight. If burned at 50 percent efficiency, this would produce 79.2 million BTU/flock or 396 million BTU/year (5 flocks a year). According to heating requirement estimates, 396 million BTU/year would be more that sufficient to heat a broiler house for a year. Two obstacles must be overcome in order for this system to become a reality: (1) A burner system must be developed that will burn litter cleanly and efficiently. (2) A system must be developed for collecting, drying, and storing the litter without significant energy loss and without creating odor and fly nuisances. (Bates-East Central)

4977-A6, A11, B2, B4, C2, F1
QUESTIONS AND ANSWERS ABOUT MANURE FLUSHING SYSTEMS FOR SWINE BUILDINGS

Anonymous
Confinement, V. 3, No. 4, p. 24, April, 1978.

Keywords: Swine wastes, Confinement pens, Flushing, Open gutter flushing, Under-slat flushing, Wastewater reuse, Lagoons, Odor, Economics.

Two types of manure flushing systems are being used in swine facilities -- the open gutter flushing system and the under-slat flushing system. The open-gutter system uses a sloped, shallow gutter that is flushed periodically to remove the wastes from the building to a lagoon. The under-slat system utilizes a shallow pit under slotted floors which is flushed, washing wastes to a lagoon. Advantages of flushing systems are: (1) less costly, (2) reduce odor, (3) require less frequent waste disposal, (4) accommodate irrigation or wastes, and (5) adapt to building conversion. Disadvantages of such systems are: (1) greater nutrient loss from manure, (2) larger land area requirements, (3) lagoon odor, (4) subject to mechanical problems, and (5) possibility of disease transmission with an open-gutter system. Most flushing systems reuse flushing water because too much fresh water would be required. Under-slat flushing systems are recommended for farrowing and nursery buildings. Either open-gutter or under-slat systems may be used in growing-finishing and sow gestation facilities. Normal slope of a gutter floor is 1 to 2 percent or a drop of 1-2 feet in 100 feet. Open gutters require about 40 gallons of water per foot of width of gutter for every flush. Flushing under slats requires a minimum of 60 gallons per foot of width of gutter. A constant-width, constant-sloped gutter works well up to more than 100 feet long. Gutters that are tapered and have variable slope clean better when longer than 125 feet. For gutters much longer than 150 feet, slope should be from both ends

so that it can be flushed toward the middle. The two most common types of flush tanks available are the automatic siphon tank and the tipping bucket tank. (Merryman East Central)

4978-A8, B2, B4, C2, E2
GEORGIA FARMERS CUT COSTS WITH CORNLAGE

Anonymous
Southern Hog Producer, V. 9, No. 1, p. 18-20, Feb., 1978. 4 fig

Keywords: Swine wastes, Confinement pens, Slurries, Cornlage, Waste storage, Land application, Crop response.

Danny and Norman Hardy of Eastman, Georgia built new swine facilities two years ago which utilize a 2078 Harvestore system to handle the chore of processing cornlage and a 6115 A. O. Smith Harvestore Slurrystore system with an above-ground tank that holds nearly 300,000 gallons of liquid manure. The use of the cornlage (high-moisture corn) for finishing swine has yielded the following advantages: (1) earlier harvest, (2) easier handling, (3) elimination of feed grinding, (4) increased palatability of the corn for the swine, (5) hogs reach market maturity 10 to 14 days earlier, and improved cuttability of carcasses has resulted in higher grading, yielding an average of 3 cents more per pound. All manure and wastewater generated in the Hardy's three hog buildings is passed through an 8-inch diameter PVC underground pipe into a small concrete-lined reception pit adjacent to the Slurrystore system, which is located at the farmstead's lowest point. From the pit, the manure is pumped into the tank which the Hardys estimate can contain all the manure produced by their animals in 4-6 months. In 1976 the Hardys, by applying slurry to their corn area acreage, reduced their commercial fertilizer requirements by more than half. Their yields increased by 52 percent on the slurry fertilizer land. (Merryman-East Central)

4979-A11, B2, B3, E2, E3
NOW LOOK WHAT THEY'RE MAKING FROM MANURE

B. Johnson
Progressive Farmer, V. 93, No. 4, p. 74, April, 1978. 1 fig

Keywords: Dairy wastes, Recycling, Irrigation, Fertilizers, Bedding, Pressboard, Soil amendments.

In a project at North Carolina State University's Randleigh Farm, scientists have been collecting the solids from dairy cattle manure and experimenting with ways to use them. The liquids are screened off into a holding tank for later use as irrigation-fertilizer on crops. The screened manure solids (SMS) were used as bedding materials in free stalls. The researchers call this experiment a total success in terms of herd health and comfort. They estimate that it saves $1.50/100 cows each day. The research team, headed by Dr. W. L. Johnson, has also incorporated SMS into mixed feed rations as a high fiber ingredient. This method has also shown great success. In another experiment, the SMS was made into pressboard that is almost as strong as that made from wood fiber. SMS may also be used as an extender for peat moss and potting soil for greenhouses. (Bates-East Central)

4980-A6, B1
PROCEDURE FOR MEASURING ODOR CONCENTRATION IN AIR AND GASES

The Proctor and Gamble Company, Cincinnati, Ohio
E. A. Fox and V. E. Gex
Journal of the Air Pollution Control Association, V. 7, No. 1, p. 60-61, May, 1957.

Keywords: Odor, Measurement.

A procedure is described that can be used to measure the odor concentration from animal waste. A summary of the method is as follows: "A sample of the atmosphere or gas where odor is to be measured is diluted with odor-free air until a dilution is achieved in which the odor can barely be perceived. The rates of the total volume of this diluted sample (sample volume plus volume of diluting air) to the volume of original sample in the diluted sample is a measure of the concentration of odor in the original sample." The following are discussed: definitions of units used in calculations, interferences with the test, apparatus and reagents used, detailed sampling and procedural steps, and the necessary calculations. The precision and accuracy of this method depends on the number, physical condition, experience, and skill of the observer (s). Any single observer should be able to attain results which are reproducible within 50 percent, on any given day. Where greater accuracy is desired, for any given test, more observers should be used, and their results averaged. (Bates-East Central)

4981-B1, C1
TOO MUCH MAGNESIUM MAKES WETTER DROPPINGS

Anonymous
Poultry Digest, V. 37, No. 433, p. 151, March, 1978.

Keywords: Diets, Poultry, Feed additives, Magnesium, Albumen, Negative effects.

Producers are warned to be aware of the negative effects of adding higher levels of magnesium to the diet of older birds to improve the quality of egg albumen. This change in the diet can weaken shells and make poultry manure more liquid. Producers should consider these factors in assessing the value of additional magnesium in the diet of their older birds. (Bates-East Central)

4982-A6, B2, C1, C2
PURPLE SULFUR BACTERIA IN LAGOONS IN THE MIDWEST

Department of Agricultural Engineering, Michigan State University, East Lansing, Michigan 48823
T. J. M. vanLotringen and J. B. Gerrish
Research Report 343, Michigan State University, Agricultural Experiment Station, 1977, 6 p. 2 fig., 1 tab., 4 ref.

Keywords: Swine wastes, Lagoons, Odor, Midwest U.S., Purple sulfur bacteria, Chemical properties, Iron, Physical properties.

A survey was made in several midwestern states in the summer of 1976 to find out what environmental conditions influence the occurrence of purple sulfur bacteria. These bacteria are thought to be an aid in reducing odors. Samples taken in the field were measured for light penetration, temperature, and pH. Estimates were made of odor and color. Also recorded were the dimensions, age, and management of the lagoon, and the approximate number and weight of pigs whose waste was loading the lagoon. Laboratory samples were measured for conductivity, chemical oxygen demand, total solids, volatile solids, iron and phosphates. It was concluded that all purple lagoons had a very mild odor. A convincing relationship between purple lagoons and volatile solids (VS) was obtained. Purple lagoons were most likely to occur at a VS concentration between 1200 and 1800 ppm. Low concentrations of purple sulfur bacteria are often present in lagoons which are not obviously purple. As with other biological processes, shock-loading causes problems. A shortage of iron will not restrict purple sulfur bacteria in anaerobic lagoons receiving animal waste. (Bates-East Central)

4983-B2, B3, C2, E2
TURKEY MANURE AS FERTILIZER

Anonymous
Poultry Digest, V. 37, No. 433, p. 155, March, 1978.

Keywords: Turkey wastes, Nutrients, Fertilizers, Phosphorus, Potassium, Nitrogen.

Turkey manure is a valuable source of phosphorus, potassium, and nitrogen. Analysis of 100 samples of turkey manure showed that solid manure with litter having a moisture content of 13.4 percent contained 2.39 percent N, 5.84 percent P, and 3.31 percent K, and was worth about $30.73/ton, while liquid manure with a moisture content of 77.8 percent contained 0.38 percent N, 1.68 percent P, and 0.72 percent K and had a value of $7.29/ton. Under most conditions, it was suggested that solid turkey manure could be applied at the rate of 2 tons/acre, while liquid turkey manure should be applied at the rate of 4-5 tons (1000) acre. (Bates-East Central)

4984-B1, D1, D3
SPECIALIZED EQUIPMENT FOR COMPOSTING MANURE

Anonymous
Compost Science, V. 18, No. 6, p. 16-17, Nov./Dec., 1977. 4 fig.

Keywords: Equipment, Composting, Manure, Organic wastes.

Presented are six firms which manufacture equipment to compost volumes of manure and other organic wastes. (1) The Brown Bear integral auger tractor can mechanically aerate 3000 cu. yd./hr.--working directly into and parallel with the windrow. The Brown Bear is manufactured by the Roscoe Brown Corp., P. O. Box 48, Lenox, Iowa 50851. (2) Wuebben turning mechanism is a home-built compost

turning device. An auger is used to aerate, break up, and mix the pile. Afterwards a tractor loader is used to replie the materials. This machine was built by Edgar Wuebben of Cedar County, Nebraska. (3) The Easy Over, developed by Elton Schaeffer of Menno, South Dakota, has knives that lift material up and back into the windrow. One-half of a windrow is taken with each pass of the machine. The Easy Over is distributed by General Compost Corp., 3225 16th St., Philadelphia, Pennsylvania 19102. (4) The Cobey Composter is a diesel-powered, self-propelled machine which straddles the windrows. The manufacturer is the Eagle Crusher Co., Inc., Rt. 2, Box 72, Galion, Ohio 44833. (5) A tractor-powered turning machine built by Mehlaf Machine and Manufacturing Co. of Freeman, South Dakota, is used to turn compost at the rate of 400-500 tons/hr. (6) The Scarab aerates windrowed manure and was developed by Fletcher Sims of Canyon, Texas. Instead of manure being a nuisance, it is becoming a valuable resource. (Bates-East Central)

4985-B2, B5, C2, E2, F1
INJECTING LIQUID MANURE REDUCES NITROGEN LOSS

Anonymous
Prairie Farmer, V. 149, No. 16, p. 22, Aug. 20, 1977.

Keywords: Liquid wastes, Land application, Soil injection, Costs, Economics, Odor control, Nitrogen.

A study at the University of Illinois shows that injecting manure more than compensates for higher investment and operating costs by reducing nitrogen loss. Injector systems cost more than surface application systems because injectors have a higher purchase price and need more power to pull injector chisels. However, on a cost comparison basis, using 500,000 gallons of manure, an injection system would cost $490/year. But surface applications of the wastes loses $775/year, through volatilization of nitrogen. The annual savings through reduced nitrogen loss would be $285. Another advantage of the injection system is reduced odor. It is difficult to put a dollar figure on odor control, but odor control measures may be mandatory for livestock farmers so this is definitely a benefit. (Bates-East Central)

4986-B2, B3, C2
VARIATIONS BETWEEN FARMS IN N, P, K, Mg AND DRY MATTER COMPOSITION OF CATTLE, PIG AND POULTRY MANURES

An Foras Taluntais, Johnstown Castle Research Centre, Wexford, Ireland
H. Tunney and S. Molloy
Irish Journal of Agricultural Research, V. 14, p. 71-79, 1975. 1 fig., 4 tab., 9 ref.

Keywords: Cattle wastes, Swine wastes, Poultry wastes, Sampling, Nitrogen, Phosphorus, Potassium, Magnesium, Fertilizers.

Samples of animal manures were collected from 34 cattle, 20 pig and 16 poultry farms in County Wexford. The manures were analyzed for dry matter, nitrogen, phosphorus, potassium, and magnesium. There were wide variations in composition of all manures tested with poultry manure being the most consistent of all samples analyzed. There was a significant correlation between percentage dry matter and nitrogen, phosphorus and magnesium contents in the pig slurry. The wide variations in compositions, particularly for pig slurry, indicate that individual chemical analyses of manures are necessary to provide an accurate estimation of their fertilizer value. (Bates-East Central)

4987-A6, B1, C2
QUANTITATION OF INDOLE AND SKATOLE IN A HOUSED SWINE UNIT

Agricultural Research Service, U.S. Department of Agriculture, Lincoln, Nebraska
T. A. Travis and L. F. Elliott
Journal of Environmental Quality, V. 6, No. 4, p. 407-410, Oct.-Dec., 1977. 5 fig., 1 tab., 13 ref.

Keywords: Swine, Confinement pens, Odor measurement, Indole, Skatole, Chromatography.

The purpose of this study was to provide quantitative data describing the source and air concentration of indole and skatole in an enclosed, swine-finishing unit. To determine the possibility of contribution to odor, the two alkaloids were measured quantitatively in fresh manure, in anaerobic pit liquor, in dust, and in air extracts from the swine unit. Gas, thin-layer, and column chromatography were used to measure the concentrations and to verify the presence of skatole and indole. Both indole and skatole were found in the fresh manure and anaerobic pit liquor extracts. Only skatole was found in the dust extracts. Neither of the two alkaloids could be detected in the air of the swine unit above the detection limits of the gas chromatograph (2.5×10^{-11} g/ml air). Since the odor threshold values of skatole and indole (1×10^{-9} g/ml air) are approximately 1000 times higher than detectable limits in the air, it appears that neither indole or skatole is an important odor constituent of swine waste. Two unknown compounds and p-cresol were separated by column chromatography and may prove useful in evaluating swine odor. (Bates-East Central)

4988-B2, F1
PIGGERY UNDER-SLAT SCRAPER SYSTEM

Scottish Farm Investigations Unit
A. M. Robertson
Farm Building Progress, V. 35, p. 15-16, Jan., 1974. 1 fig.

Keywords: Swine wastes, Confinement housing, Slurries, Waste management, Under-slat scraper system, Economics.

A different approach to slurry handling has been taken by Strathearn Pig Producers in their breeding and fattening unit at Crieff. In both dry sow and farrowing house, a relatively shallow below-slat channel has been substituted for the more conventional deeper channel. Removal of the manure is by scrapers similar to those found in byres. Scraping of the channels takes place twice weekly and requires no labor. The system has been free of mechanical problems so far and the owners consider that by removing fresh manure from the below-slat channels a healthier environment for the stock has been created. This system is more expensive than conventional storage and removal, although the cost of the scrapers and associated equipment has been to some extent offset by savings as a result of reduced depth of the below-slat channels. (Bates-East Central)

4989-A1, A11, A12, B1, C3, D1, D2, D3
STUDIES ON MICROBIOLOGICAL CONTROL OF LIQUID MANURE HANDLING

G. Tamasi
Water, Air and Soil Pollution, V. 8, No. 2, p. 165-170, 1977. 5 tab., 5 ref.

Keywords: Liquid wastes, Waste treatment, Microorganisms, Filtration, Homogenation, Animal health, Public health.

Samples were taken from several types of manure handling methods that are widely used in Hungary and were cultured to determine the extent of contamination of the environment with microorganisms. It was found that without some type of special equipment or procedure liquid manure can contaminate the environment with microbes. Filtration of liquid manure through straw bales, a common practice, does not appreciably reduce microbial populations, however homogenization can markedly reduce them. Combined chemical, physical and biological handling methods were highly effective in reducing contamination and were also characterized by low germ counts in the product. Testing of microbial survival times in sterile liquid manure showed that coliform, staphylococci and echoviruses deteriorate rapidly, salmonellas, and aerobic spore-formers survive longer, and lactobacillus survival is intermediate between the two extremes. (Bates-East Central)

4990-A5, A6, B2, B4, B5, C2, D3, E2, F1
ENGINEERS OUTLINE WASTE DESIGN FACTORS

R. J. Smith, T. E. Hazen, and G. B. Parker
National Hog Farmer, p. 4-6, Jan., 1974. 1 fig.

Keywords: Swine wastes, Waste management, Design, Slatted floors, Waste storage, Oxidation ditch, Lagoons, Aerobic conditions, Anaerobic conditions, Odor, Groundwater *pollution, Land disposal, Crop response*, Nutrients, Copper, Costs.

This article gives design factors for different manure handling systems. There are four main elements in an integrated manure handling system -- transport, treatment, storage, and land application. Three types of manure management systems are presented: (1) Slatted floor with underfloor pit storage. Advantages are: (a) simple, fairly low investment cost, (b) high retention of fertilizer nutrients, (c) suitability for small operators using batch farrowing. Disadvantages are: (a) difficult to pump out, (b) odor, (c) danger of gas poisoning during pre-pump agitation, (d) tank contents must be hauled. (2) Slatted floor with underfloor oxidation ditch. Advantages

are: (a) low odor levels, (b) manure rendered sufficiently liquid to allow pumping, (c) ventilation requirements lower in winter, (d) possibilities of refeeding. Disadvantages are (a) external storage required to handle overflow, (b) continual maintenance and power cost, (c) less suitable for batch loadings. (3) Gutter flushing with treated effluent from an aerobic lagoon. Advantages are: (a) simple floor construction, (b) low power input, (c) good odor control in the building. Disadvantages are: (a) anaerobic lagoon may be odorous for 4-6 weeks/year, (b) salt deposition in recycle line needs periodic removal, (c) possibility of disease transmission. Presently there are five areas of concern in relation to land disposal and nutrient loading: nitrate leaching into groundwater, excessive phosphorus and the effects on reed germination, high soil copper levels and plant uptake, excess potassium and magnesium deficient plants, and salt buildup in the soil. No swine producer should consider new facilities without first calculating how much ground is required for his final disposal area. Treated effluents are like fertilizers, and any big operator should maintain records of the amount of liquid pumped out of his system and the cumulative amounts of N, P, and K in the soil. It's anticipated that the state may require such data in the future. Based on the design criteria presented, the investment costs for a manure handling system can be estimated. (Bates-East Central)

4991-A11, B1

EFFECT OF SLATTED AND DEEP LITTER FLOORS ON THE PRODUCTIVE PERFORMANCE AND ENERGY UTILIZATION OF TURKEYS

Department of Nutrition and Department of Animal and Poultry Science, University of Guelph, Guelph, Ontario, Canada N1G 2W1
S. J. Slinger, S. Leeson, and J. D. Summers
Poultry Science, V. 56, No. 4, p. 1259-1264, July, 1977. 5 tab., 12 ref.

Keywords: Management, Slatted floors, Deep litter floors, Turkeys, Confinement pens, Performance

A series of experiments was conducted to determine the relative performance of turkeys reared on slatted or deep-litter floors from 8 through 24 weeks of age. Birds were offered mash and cereal grains free choice or fed all pelleted diets. Male, but not female turkeys were found to achieve significantly ($P \leq .05$) heavier weights at 24 weeks of age when on litter. Irrespective of sex, all birds reared on litter floors showed superior feed efficiency values. From a consideration of the quantities of mash and cereal grain consumed, it is proposed that slatted floor-reared birds have an increased energy requirement, and that an extra 850 to 1,000 kcals. dietary metabolizable energy is required for the production of each kilogram gain in body weight when compared to litter-reared birds; this was confirmed using only pellets and a restricted feeding regime. This increased energy requirement may be related to stress imposed by an unnatural floor environment. Extrapolation of these findings to other animals housed on slatted floors, such as swine and cattle, should be considered. (Slinger-University of Guelph)

4992-A11, B2, D3, E3, F1

IOWA BEEF TESTS SHOW PROFIT FOR FEEDING DITCH EFFLUENT

Anonymous (Based on Gerald Frankl)
Beef, V. 8, p. 20-21, Aug., 1972.

Keywords: Oxidation ditch effluent, PAB, Refeeding, Cattle rations, Performance, Economics

Gerald Frankl, of the Iowa Beef Processors, reports on the use of oxidation ditch effluent in cattle rations. This effluent, which has been labelled PAB (processed animal by-products) is a relatively high protein mixture consisting mostly of microorganisms that have been grown in the ditch and used to break down animal wastes. Two tests were initiated to explore the acceptance of PAB by cattle and then to compare PAB-fed cattle to those on regular rations. Feed costs were cut by $1.22 per hundred pounds of gain, and profits were raised to slightly over $3 per head. PAB-fed cattle ate more feed and had more efficient conversion than those on the standard control ration. Part of the protein supplement normally in the control ration was replaced by PAB, which accounts for part of the savings in feed costs. Frankl calculated that if the entire 550 head building had been on PAB, a $5,443.00 advantage over cattle fed normal rations would have been gained in one year. This advantage offsets costs of operating an oxidation ditch and still leaves a profit. (Keel-East Central)

4993-B2, C2, D2, D3, E3

BIOGASIFICATION USING NaOH TREATED PIG FAECES

School of Agriculture and Forestry, University of Melbourne, Parkville, Victoria, Australia
M. F. Ngian, K. F. Ngian, S. H. Lin, and G. R. Pearce
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, V. 103, No. EE6, p. 1131-1133, Dec., 1977. 1 fig., 5 tab., 5 ref.

Keywords: Liquid wastes, Swine wastes, Chemical treatment, Sodium hydroxide, Anaerobic digestion, Toxicity, Carbon dioxide, Rumen liquor

The extent to which treatment with sodium hydroxide (NaOH) might influence gas production from anaerobic fermentation of pig feces is the main focus of this research. Samples of fresh pig feces were subjected to various levels of NaOH treatment [0, 3, 7, 9, and 12g NaOH/100 g Dry Matter (DM)] using equal weights of NaOH solution and dry feces. Rumen liquor was used as the inoculum. NaOH treatments from 7-9 percent caused progressive increases in the total volumes of gas produced, but the 12 percent treatment caused a marked reduction. The total volume of gas produced from the 7 percent treatment was 33 percent higher than that obtained from the untreated material. The maximum rate of gas production, from the 9 percent level, was 1.74 times the rate from untreated feces. Subsequent studies suggested that the lower gas production from the 12 percent treatment was due to sodium toxicity. The carbon dioxide (CO_2) content of the gas produced ranged from 61-65 percent. It was assumed that the balance (35-39 percent) was methane. The use of rumen liquor as the inoculum probably accounts for the high proportion of CO_2 in the gases. Later studies using anaerobic digestor mixed liquor inoculum resulted in markedly lower CO_2 production. It is predicted that use of NaOH may be of significance in methane production from large-scale anaerobic digestors. (Bates-East Central)

4994-A4, B1, F2

IMPACT OF STATE LAWS AND REGULATIONS ON ANIMAL WASTE DISPOSAL PRACTICES

Department of Civil Engineering, Texas Tech University, Lubbock, Texas 79409
G. A. Whetstone, D. M. Wells, and B. M. Kramer
Proceedings of the ASCE Irrigation and Drainage Division Specialty Conference, Reno, Nevada, July 20-22, 1977, p. 117-120.

Keywords: Regulation, Waste management, Water pollution

Livestock producers have complied well with the requirements of environmental legislation -- often at a heavy cost and with little direct benefit to themselves. In most states they have been represented on advisory boards, and the standards arrived at tend to be those of the organizations the stockman has learned to trust and respect. If present policies are continued, animal wastes should not constitute a serious source of pollution; overfastidious demands on the other hand, could destroy the livestock industry. Existing law is generally vague enough to allow either. (Whetstone-Texas Tech University)

4995-A9, A11, B1, C3

EFFECTS OF RESIDUES OF CERTAIN ANTHELMINTICS IN BOVINE MANURE ON *ONTHOPHAGUS GAZELLA*, A NON-TARGET ORGANISM

Veterinary Toxicology and Entomology Research Laboratory, Agricultural Research Service, USDA, College Station, Texas 77840
R. R. Blume, R. L. Younger, A. Aga, and C. J. Myers
The Southwestern Entomologist, V. 1, No. 2, p. 100-103, June, 1976. 1 tab., 13 ref.

Keywords: Parasites, Anthelmintics, Cattle wastes, *Onthophagus Gazella*

Residues of 5 anthelmintics (phenothiazine, dichlorvos, coumaphos, ruelene, and piperazine) in bovine manure had deleterious effects on *Onthophagus gazella* F. in the order given. Thiabendazole and levamisole hydrochloride (Tramisol R; 2, 3, 5, 6-tetrahydro-6-phenylimidazo[2, 1-b]thiazole monohydrochloride), 2 other materials tested, has negligible effects. (Blume-USDA)

4996-B2, B4, E2

STUDY CONTROL OPTIONS FOR FEEDLOT RUNOFF SYSTEMS

Anonymous
Kansas Farmer, V. 116, No. 3, p. 32F, Feb. 4, 1978.

Keywords: Feedlots, Debris basins, Holding ponds, Design, Agricultural runoff, Irrigation

A 3-year study identifies the pros and cons of placing the debris basin of a runoff control system either inside or outside the feedlot. Locating the debris basin inside the pen uses land efficiently and cattle can use berms of the basin to avoid muddy lots in extended wet

periods. Basins inside the pens dry faster in dry weather and the basins are easily cleaned. On the negative side, debris basins inside pens are damp longer in cool, wet weather than those outside and inside basins also have repeated drainage problems in summer and winter. Berms of inside basins must occasionally be rebuilt. Debris basins located outside pens are generally drier and easier to manage. Mud slurry conditions usually are limited to winter time and drain plugging of risers is limited. Problems with basins outside the pens are: (1) Extreme snowmelt slurry runoff can bury fence lines. (2) Solids may accumulate at the fence line. (3) Weed control on side slopes of the basin is difficult. (4) Mounds inside the pen are needed in wet weather. Pen length of 180, 200, or 360 ft. above debris basins do not affect amount of settled solids removed. Shallow basins (3½ ft.) are preferable to deeper basins (8 ft.). Holding ponds located next to basins are preferred because runoff from storms will overflow directly into holding ponds and the basin can be smaller. A center-pivot irrigation system has performed satisfactorily in disposing of liquid runoff from holding ponds after removal of solids. The disposal system should be designed for use whenever the holding pond must be emptied rather than just for irrigating cropland in the disposal area. (Bates-East Central)

4997-A4, B1, C2
MOVEMENT OF NITRATES AND OTHER DISSOLVED SALTS FROM A FISHPOND INTO LAKE KINNERET

Department of Soil Science, The Hebrew University, Jerusalem, Israel
B. Parnas and N. Lahav
Bamidgeh, V. 24, No. 4, p. 99-113, 197?. 4 fig., 4 tab., 14 ref.

Keywords: Water pollution, Nitrates, Dissolved salts, Fish ponds, Lake Kinneret, Israel, Seepage.

Observations were made during two seasons in a fishpond near Kibbutz Ein-Gev and on waters seeping into the Kinneret. The ionic composition of the pond seepage waters was analyzed and the amount of feeds and fertilizers added to the ponds. The nitrogen balance of the pond was estimated, assuming that nitrogen fixation from the atmosphere did not take place. (1) The total amount of salts in the seepage waters of the pond was 20-50 percent higher than that of the pond water. The magnesium, sodium and chloride ion contents of the seepage water was higher than that of the pond water. The calcium ion content of the seepage water fluctuated, and was generally lower than in the pond water. The potassium ion content was lower in the seepage water compared with the pond water. (2) The principal source of nitrogen to the pond was in the form of supplementary feeds and fertilizers (pellets, sorghum, chicken manure and ammonium sulfate). (3) The amount of nitrogen removed from the pond in the form of fish harvested, surface waters and seepage waters was 40-50 percent of the total nitrogen input. At least part of the nitrogen remained bound as organic matter in the bottom soil. The degree of denitrification was not measured. (4) The nitrate content of the pond water was similar to that of the Kinneret water. The nitrate content of the seepage water was considerably higher than that of the pond water, but usually was relatively stable in comparison to the nitrate content of the pond water, which fluctuated tremendously. The amount of nitrate nitrogen removed by the seepage water was estimated at several kilograms per ha. for both seasons of observations. (5) As expected, there is a considerable accumulation of salts and organic matter in the fishpond soils. (Parnas-The Hebrew University)

4998-B1, E2
NOBODY LAUGHED ABOUT "ORGANIC FARMING" AFTER SEEING THE HAUGHLEY EXPERIMENT

O. Long
Kansas Farmer, V. 116, No. 6, p. 20-20-B, March 18, 1978. 1 fig.

Keywords: Haughley experiment, England, Organic farming, Fertilizers.

This article is about the conflict between organic versus chemical or conventional farming. Specifically the Haughley Experiment is described. This experiment was started in 1939 in Haughley, England on 216 acres, which has since been expanded to 300 acres. The intent was to begin a long-term experiment, on a full farming scale, to compare and contrast the nutritional effects on successive generations of farm animals nurtured under different systems of soil treatment, and adjoining units of land of similar soil types, and under the same management. The original 216 acre farm was divided into three self-contained farms -- "Organic Section: (a closed system that used no chemical fertilizers and pesticides), the "Mixed Section" (a system in which chemical fertilizers and pesticides were used to supplement the animal manure and crop wastes, and the "Stockless Section" (a section without livestock where only chemical fertilizer and crop residues were used). A useful record of field observations was kept from the start, along with an extensive range of soil and crop analyses made on all three farms made every month for over 10 years. An important discovery derived from this experiment is that the levels of available minerals in the soil fluctuate according to the season. These fluctuations were far more marked on the "Organic Section" than on the other two. Milk production has been higher on the "Organic Section" than on the "Mixed Section". The culling rate for the "Mixed Section" herd was higher than for the "Organic Section". The author feels that organic farming is a workable alternative to chemical farming and one that will help conserve our dwindling resources. (Bates East Central)

4999-A4, B2, D3
VEGETATIVE FILTER SYSTEM CLEANS FEEDLOT RUNOFF

Anonymous
Feedstuffs, V. 50, No. 18, p. 16, May 1, 1976.

Keywords: Agricultural runoff, Feedlots, Waste treatment, Design, Water pollution, Overland flow, Serpentine terrace system, Feasibility.

Agricultural engineers at the University of Illinois have been testing a system to direct feedlot runoff to a vegetated area where the runoff is treated by settling, dilution, absorption and infiltration. Studies were designed to determine whether such a system could adequately control feedlot runoff to avoid violation of water quality standards in the case of storm runoff. Two basic vegetative filter system designs were used in the studies: an overland flow system and a serpentine terrace system. "Vegetative filters can effectively remove nutrients, solids and other pollutants from runoff before it's discharged," according to Dale Vanderholm and Elbert Dickey, University agricultural engineers. Critical elements of the design include the flow distance, the ratio of filter area to feedlot area and the size of the settling basin needed. The concept and the vegetative filter systems tested appear favorable, but pollution control agencies must approve specific design criteria before such systems can be recommended and used widely. (Bates-East Central)

5000-A6, A10, B3, D1
IN-HOUSE MANURE DRYING IN THE DEEP-PIT (HIGH-RISE) SYSTEM

Agricultural Development and Advisory Service, Shardlow Hall, Shardlow, Derby, DE7 2GN, England
H. A. Elson
Proceedings 5th WPSA, European Poultry Conference, Malta, 1976. 3 tab., 4 ref.

Keywords: Drying, Deep-pit systems, Poultry wastes, Slat system, Slot system, United Kingdom, Odor control, Fly control.

This paper reports and discusses the development of 2 in-house drying systems in the United Kingdom. The slat system is an economical method of drying manure to about 15 to 20 percent moisture by the end of the year. The technique is to collect manure falling from laying stock directly onto slats at 2 levels which retain it in columns so that warm ventilation air passes over the manure before being exhausted. The slot system is in operation with 4 tier vertical cages, and dries manure to about 25-30 percent moisture by the end of the year. The manure is scraped daily from under the cages through a narrow slot into the pit area and builds up in steep sided heaps on the pit floor. In-house manure drying systems can be of benefit in deep pit poultry buildings for several reasons: (a) They reduce the moisture content of the manure, thus reducing its weight, rendering it easier to handle, and enhancing its value. (b) The problems associated with wet pits (ammonia, odors, flies) are avoided. (c) A more amendable environment is provided for staff and stock. (d) Odor emmission from buildings is reduced. Also presented are the results on effectiveness of drying that other researchers have achieved using various systems. (Bates-East Central)

5001-A11, B2, E2, F1
SCRAPING AWAY WASTE

Staff Editor, *Feedlot Management*
S. Aldrich
Feedlot Management, V. 20, No. 4, p. 18-21, April, 1978. 7 fig.

Keywords: Cattle wastes, Feedlots, Design, Scraping, Storage pit, Land application, Costs, Performance.

This article is about the confinement lot that the Fassler brothers of Sterling, Illinois designed themselves. The lot is roofless with

concrete floors and is combined with an automatic manure scraping system. The configuration is that of a freestall dairy barn floor without the stalls. Manure flows into either of two sloped manure alleys that run the length of the feeding floor. A scraper blade then pushes the wastes into a manure storage pit on an automatic basis. The liquid manure is knifed into the ground in the fall. This yields a savings of approximately $40/acre in fertilizer bills. This 800 head capacity open confinement lot helped the Fasslers cut costs without cutting cattle performance. (Bates East Central)

5002-A4, A6, B2, B3, E2, F1
SELECTING A SWINE WASTE MANAGEMENT SYSTEM

Agricultural Engineering Department, Purdue University, West Lafayette, Indiana
J. C. Nye, D. D. Jones, D. Bache, and A. L. Sutton
Publication ID-107, Cooperative Extension Service, Purdue University, Sept., 1975, 15 p. 4 fig., 6 tab.

Keywords: Swine wastes, Management, Floors, Design, Waste storage, Waste transport, Irrigation, Costs, Odor control, Water pollution.

This paper has been developed to help the swine producer choose from the various types of waste management facilities and equipment. The producer will then be able to develop a waste management plan that is suited to his particular swine and crop production system. Four commonly-used waste management systems are illustrated. They are: (1) Totally slotted-slotted floor over a manure tank with liquid manure transport. (2) Partially slotted-slotted floor over a shallow pit with an overflow to a lagoon which is irrigated to cropland. (3) Concrete Feeding Floor - a solid floor where the solid manure is scraped and hauled to farm land and the runoff is contained in a earthen holding pond and pumped to cropland through an irrigation system. (4) Open Gutter Flushing - a solid floor with an open gutter that is flushed to a two-stage lagoon with irrigation to farmland. Both cost and non-cost factors must be considered when choosing one of these systems or developing a new one. The cost factors include cost of operation and ownership, and returns from the fertilizer value of swine waste. Some of the non-cost factors are odor control, water pollution, management requirements, operational and expansion ease. The non-cost factors must be evaluated by the individual as to the importance associated with each factor. After a system is selected, a waste management plan should be developed. How, where, and when will the swine waste be handled? What are the labor, management and equipment demands of the selected waste management system? When the alternative systems have been compared and a waste management plan developed, the producer should be able to pick the system *which most suits his needs.* (Bates-East Central)

5003-B1, F1
MANURE HANDLING EQUIPMENT EXEMPT FROM PROPERTY TAX

P. Queck
Wallaces Farmer, V. 103, No. 7, p. 29, April 8, 1978.

Keywords: Iowa, Regulation, Pollution control, Property tax exemptions, Department of Environmental Quality.

The state of Iowa has a program to grant property tax exemptions for pollution control property. To obtain the exemption, property must meet state eligibility requirements. Some common exemptions are: waste storage or collection pits, slatted floors, gutter systems, pumps and piping whose sole purpose is transporting sewage, Slurrystore systems, manure spreaders, and sloped concrete feedlots (provided they drain to some type of collection system). For property to be eligible, state law requires that it must have been installed or constructed after September 23, 1970. To apply, an application must be obtained from the county assessor. Then the completed form is sent to the Iowa Department of Environmental Quality (DEQ) where it is received for certification. After certification, the DEQ sends two copies of the certification to the applicant. It is then the applicant's responsibility to get one copy to his county assessor. Once certified, property does not have to be certified for 10 years, however, property owners must still submit a short form each year to their assessor. (Bates-East Central)

5004-C2, D3, E3, F1
A MARTINI IN YOUR TANK?

D. E. Carr
Country Journal, p. 45-46, 105, 109-110, Oct., 1977.

Keywords: Recycling, Organic wastes, Livestock wastes, Ethyl alcohol, Fermentation, *Trichoderma Viride*, Costs.

Given certain breaks and reasonable extrapolations, there is every reason to believe that within a couple of decades ethyl alcohol in this country could displace petroleum gasoline as the staple motor fuel. Advantages of ethyl alcohol that make it a desirable fuel are: (1) Complete miscibility with water, so that water in tanks or distribution systems has little effect on engine operation. (2) Alcohol has a very high octane number without the addition of tetracthyl lead. Higher compression ratios in car engines can be used, with resultant increase in efficiency and mileage. (3) Alcohol can be operated at very lean conditions with the result that no air pollutants are formed. (4) Alcohol is a renewable source of energy. Among the ways to make ethyl alcohol are: (1) the fermentation of sugars or starches (in Brazil, sugar cane and cassava are used) or (2) by using a fungus *Trichoderma viride* to digest cellulose to glucose which could then be fermented to ethyl alcohol. A large source of waste cellulose in the United States is livestock manure -- about 800 million tons of manure is collected a year. This can be converted to about 200 million gallons of alcohol a day -- a substantial part of the 300 million gallons of gasoline used daily in 1973! By streamlining the collection processes of raw and waste cellulose, it is estimated that more than 600 billion gallons of motor alcohol could be produced per year at an overall cost of less than 40¢/gal. (Bates-East Central)

5005-B2, C2, D3, E3
EXPERIENCES IN BUILDING AND OPERATING A FIELD SCALE ANAEROBIC DIGESTER

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P. R. Goodrich, S. M. Kalis, W. J. Horvath, and J. D. Nielsen
Paper No. NCR 76-402, American Society of Agricultural Engineers, 1976 Annual Meeting, Winnipeg, Manitoba, 1976. 6 fig., 1 ref.

Keywords: Anaerobic digesters, Design, Operation, Performance, Swine wastes, Oxidation-reduction potential, Methane.

This is the report on a field anaerobic digester project in Minnesota. The objectives of the project were: (1) To design a system simple enough for the average farmer to maintain with a minimal amount of daily time. (2) To determine how an anaerobic digester should be fitted into a swine waste management system to provide flexibility and reliability. (3) To determine how surplus materials may be incorporated in developing a digester. (4) To reduce the capital costs that have been associated with digesters built to sewage treatment plant standards. (5) To search for a parameter that can be monitored easily without wet chemical tests as an indication of performance in the digester. The digester tank was a recycled oil tank that was retrofitted with PVC pipe. There were no moving parts of piping within the tank. All component parts are exterior to the tank for ease of maintenance. The digester efficiency was quite low during the first year of operation but increased dramatically with further operation. The gas content of the present time is about 65 percent methane. The oxidation-reduction potential (ORP) was investigated as an indicator of the performance of the biological culture in the digester. The digester ORP is holding constant at 400 milliwatts. (Bates-East Central)

5006-A8, B2, C2, E2, F1
IS ALL THIS PHOSPHATE ON GRASSLAND REALLY NECESSARY

S. N. Adams
Agriculture in Northern Ireland, V. 49, p. 215-216, 1974. 1 fig.

Keywords: Northern Ireland, Fertilizers, Phosphates, Grassland, Economics.

Fertilizer costs have taken a staggering rise in Northern Ireland. It has been projected that in 1975 farmers will pay about 5 million pounds for phosphate, most of which was imported from foreign sources. Most phosphate in Northern Ireland is put on grassland. Animal manures are a useful source of phosphate for grass and cut down on the need for fertilizer. A useful approach to a phosphate policy can be made by working out how many units of phosphate is being put on the grass, and *comparing it with the Province's average* dressing of just under 20 units/acre/year. (Merryman-East Central)

5007-A9, A11, B1, C2
RETENTION AND EXCRETION OF POLYCHLORINATED BIPHENYL RESIDUES BY LAYING HENS

U.S. Department of Agriculture, Agricultural Research Service, Beltsville, Maryland 20705
G. F. Fries, R. J. Lillie. H. C. Cecil, and J. Bitman
Poultry Science, V. 56, No. 4, p. 1275-1280, July, 1977. 3 fig., 3 tab., 22 ref.

Keywords: Polychlorinated biphenyls, Poultry, Feed contamination, Performance, Residues, Body fat retention, Excreta.

Commercial polychlorinated biphenyl (PCB) mixtures with 21, 32, 42, 48, 54, and 68 percent chlorine were fed to caged White Leghorn hens at 20 p.p.m. for nine weeks. The 42, 48, and 54 percent mixtures were also fed at 2 p.p.m. Residues in egg at nine weeks were 0.7, 2.4, 14.4, 9.3, 11.4, and 21.5 p.p.m. for the 21, 32, 42, 48, 54, and 68 percent chlorine PCBs, respectively. Corresponding values in body fat were 24.0, 51.1, 89.3, 90.5, 124.5, and 42.4 p.p.m., respectively. Levels in eggs and body fat of groups fed 2 p.p.m. were approximately one-tenth the levels in the 20 p.p.m. group. After seven weeks of control feed, the values for the 20 p.p.m. groups were 0.7, 1.8, 2.8, 3.0, 7.2, and 1.8 for eggs and 8.1, 22.4, 26.4, 39.8, 91.7, and 43.6 for body fat. Estimated recovery of consumed PCBs increased from 8 percent to 55 percent as chlorine increased from 21 to 68 percent. Residues in excreta was about 10 percent of intake for all chlorine PCB, about the same for 54 percent and much less for the 68 percent chlorine PCB. The ration of egg fat residue in contaminated birds was .084:1. (Fries-USDA)

5008-A11, B2, C2, E3
RECYCLING OXIDATION DITCH MIXED LIQUOR TO LAYING HENS

Department of Animal Science, University of Illinois at Urbana-Champaign, Urbana, Illinois, 61801
H. S. Johnson, D. L. Day, C. S. Byerly, and S. Prawirokusumo
Poultry Science, V. 56, No. 4, p. 1339-1341, July, 1977. 1 tab., 4 ref.

Keywords: Refeeding, Oxidation ditch mixed liquor, Poultry, Performance, Egg production, Nitrates.

Laying hens were provided with oxidation ditch mixed liquor (ODML) as their only source of drinking water. Egg production dropped sharply when the dissolved oxygen content of the ODML rose from .47 to 6.0 p.p.m. and the nitrate level increased from 210 p.p.m. subjected to these levels, or slightly lower ones, for several weeks. (Johnson-University of Illinois)

5009-B2, B3, E2
EARTHEN WASTE BASIN

Anonymous
Confinement, V. 3, No. 5, p. 20, May, 1978. 1 fig.

Keywords: Livestock wastes, Waste storage, Hauling, Earthen manure storage basin, Picket dam, Detention pond, Manure spreading

Livestock producers can use an earthen manure storage basin with concrete bottom and unloading ramp for a twice-a-year hauling of manure on an "as-is" basis when a vertical picket dam is used for draining off rainwater into a detention pond, according to the Jamesway Division of Butler Manufacturing Company, Fort Atkinson, Wisconsin. Key advantages of the picket-dam manure-storage-basin system are: (1) semi-annual (rather than daily) hauling and (2) use of conventional manure-spreading equipment, without further investment in liquid-manure-storage basins. Details on picket-dam manure storage basins and on complete manure-handling systems for dairy, beef and hogs are available from Jamesway Power Choring dealers. (Bates-East Central)

5010-B2, C1
SCALE MODEL OF AN UNDER-SLAT FLUSHING SYSTEM

Agricultural Engineering Department, Michigan State University, East Lansing, Michigan 48823
R. J. Ballard, J. B. Gerrish, and T. L. Loudon In Research Report 343, Michigan State University Agricultural Experiment Station, p. 136-139. 1 fig., 1 tab., 5 ref.

Keywords: Model studies, Flushing, Design, Slopes, Flush volume.

A small scale iconic model was constructed in hopes of establishing the design criteria for flushing systems. A distorted model was used in which the vertical and horizontal scales are unequal. The parameters evaluated were length, height (to dump tank), width, particle apparent density, particle size, time, slope, velocity, flush volume water depth, Re at IM/S, Fr at 1 M/S, viscosity, Manning's "N", and surface tension. To measure the effectiveness of manure transport, simulated turds of the proper specific gravity for scale down were made. The results of the experiment, so far, are : the crest height seems to be independent of slope, velocity varies with the slope, effectiveness of cleaning seems to be better at high slope (as evidenced with preliminary studies with simulated turds), and reduced flush volumes are less effective in cleaning. The results point to the existence of a trade-off between slope and flush volume. The tipping tank should be as close as possible to the wall but probably no closer than 15 cm. Tank axis alignment is critical. In continuation of the study, qualification of the interrelationships between slope, tank volume, roughness and flushed length is expected as is an answer to how to avoid solids deposits along sidewalls. (Bates-East Central)

5011-A7, A12, B1, C2
TOXIC GASES KILL WORKER

Anonymous
Confinement, V 3, No. 4, p. 10, April, 1978.

Keywords: Air pollution, Public health, Confinement pens, Wisconsin, Cattle wastes, Gases, Toxicity, Hydrogen sulfide, Safety, Ventilation.

Death of a 16-year-old Wisconsin farmworker from inhalation of toxic gases while steam-cleaning gutters inside a calf barn prompts a warning by a South Dakota State University microbiologist to producers with liquid-manure systems for confined animals. Christopher P. Sword suggests preventive measures where liquid-manure systems are used. They are: adequate ventilation and evacuation of animals and workers from enclosed farm buildings while manure is being agitated. Sword notes that the Public Health Services "Morbidity and Mortality Weekly Report" cites apparent cause of the youth's death as inhalation of toxic gases, with hydrogen sulfide as the probable major agent. The MMWR cites several instances where deaths in swine, beef and dairy animals have been associated with confinement systems. Sword quotes from the Public Health Service publication several factors that should be avoided for safety reasons. The manure tank was full, and contents had been agitating longer than usual before pumping began. The barn was inadequately ventilated that day with only 1 of its 5 fans in intermittent use. Additionally, the calves high protein diet made formation of hydrogen sulfide more likely. (Bates-East Central)

5012-B2, E2
NON-STOP FLUSHING KEEPS BARN CLEAN

H. Ernst
Missouri Ruralist, V. 119, No. 9, p. 18-19, May 13, 1978. 3 fig.

Keywords: Confinement pens, Cattle, Flushing, Lagoons, Irrigation, Fertilizers, Design.

Leonard Stoll has recently completed a new confinement beef finishing building. The 240-head barn takes advantage of the gutter flush concept, but rather than intermittent flushing, water flows continuously in four, floor-level gutters. Stoll expects a 10 percent increase in feed efficiency in the building compared to outside lots. The water used is recycled from a lagoon into a 24-ft. wide, by 3-foot deep holding tank. Four adjustable outlets control the rate and volume of flow from the tank into the gutter. Adjustment is simple. As more water is needed, the vertical plastic pipe risers are rotated lower into the water. Waste water from each of the four gutters drains into a common open gutter to the east of the barn. A 6-inch pipe carries wastes and runoff from the building's roof into the lagoon. Stoll expects to pump the lagoon once a year. Value of the fertilizer should help offset cost of irrigation pump rental. If the lagoon were pumped twice a year, it would be large enough for 50 percent more stock. Stoll credits area extension specialists Ed Schwitzky and Lyle Ellis with much of the planning for the beef barn. (Bates-East Central)

5013-A4, A6, A7, B1, F2, F4
ANIMAL FEEDING FACTORIES AND THE ENVIRONMENT: A SUMMARY OF FEEDLOT POLLUTION, FEDERAL CONTROLS, AND OKLAHOMA LAW

Paula M. Recker
Southwestern Law Journal, V. 30, p. 556-584, 1976.

Keywords: Regulation, Legal aspects, Odor, Air pollution, Water pollution, Feedlots, Oklahoma law, Nuisance suits, Environmental Protection Agency, National Pollutant Discharge Elimination System.

This article surveys the odor and water pollution problems caused by feedlots and provides a comprehensive summary of the law

that has developed to deal with these problems. Primary emphasis is placed upon the state of Oklahoma, with limited reference to the air and water pollution laws of other states. Odor pollution is impossible to control or eliminate completely under current technology, and only very recently have a few areas developed odor pollution standards. A nuisance action, either private or public, is the only effective remedy in the area of odor pollution. The two major types of nuisance actions are injunctive (relief requested may be either to halt or to modify a feedlot operation), and damages (where the plaintiff may be entitled to seek both actual and punitive damages for an odor nuisance created by a feedlot operation). Important trends include, "coming to the nuisance" suits, legal acceptance of odor measurement techniques, and zoning laws. Water pollution caused by feedlots is easier than odor to control and eliminate, and stringent regulations have been promulgated and proposed to regulate this area further. In Oklahoma, acts or agencies that are concerned with water pollution include: The Oklahoma Feed Yards Act, The Oklahoma Water Pollution Act, The Oklahoma Solid Waste Management Act, the Oklahoma Pollution Control Coordinating Act of 1968, and the nuisance laws of Oklahoma. Nationally there is the Federal Water Pollution Control Act for which the Environmental Protection Agency (EPA) is the regulatory mechanism. The basic control for feedlots is the National Pollutant Discharge Elimination System (NPDES) in which every discharger of pollutants must obtain a permit from the EPA. To obtain this permit the discharger must meet federal water quality guidelines. Feedlot pollution is a rapidly developing area of law in the United States. (Bates-East Central)

5014-B2
FLUSHING PIGGERY WASTES

N. E. Reinbott
Queensland Agricultural Journal, V. 103, No. 1, p. 3-8, Jan.-Feb., 1977. 12 fig., 1 tab.

Keywords: Flushing, Swine wastes, Design, Effluent.

A system for flushing piggery wastes out of the building is described. It has many advantages over conventional pits which store wastes in water for days, resulting in odors, unhealthy rearing conditions, and constant attention to pit emptying frequencies. The flushing system consists of a tank which automatically and regularly dumps water into a sloped trench under the slatted piggery floor. The water's force flushes out the manure. The tank, which has a sloping side, is slowly filled with water until the water's weight alters the balance and tips the tank, dumping water into the trench. Dumping frequency can be controlled by regulating water flow into the tank. Tank and trench dimensions and construction information are noted. Effluent can be flushed about 100 ft by this method. Less water is used than with a conventional pit. (Solid Waste Information Retrieval System.)

5015-A6, C2, F3, F4
A REVIEW OF ANALYTICAL METHODS FOR DETECTING AND MEASURING MALODORS FROM ANIMAL WASTES

Microbiologist, USDA-ARS, Washington State University, Pullman, Washington
L. R. Elliott
Transactions of the ASAE, V. 21, No. 1, p. 130-135, Jan.-Feb., 1978. 1 fig., 2 tab., 33 ref.

Keywords: Odor measurement, Chemical properties, Wet chemistry, Gas chromatography, Organoleptic properties, Technology.

The purpose of this paper is to describe odor-measurement technology, methods of approach, and areas where future research is needed. The nose, wet chemistry, and gas chromatographic detection are methods that are used to measure odors and gaseous emissions. Olfactory evaluation is widely used, but is not selective in determining odor components and reproducibility is low. Both wet-chemical and instrumental methods are used to separate, identify, and quantify odor compounds. Most wet-chemical techniques suffer from a lack of detection sensitivity and specificity. In contrast, gas-chromatographic (GC) techniques can be used to detect much lower ambient concentrations of odor compounds. All olfactory and analytical odor measurements have limitations, and presently, none are simultaneously rapid, simple, inexpensive, and reproducible. Future research is needed for direct aerial evaluation of emissions with odor correlations. Odor measurements must be conducted under strictly controlled and measured conditions, and must be correlated with odor panels. The relationship between odor intensity, distance, air movement, and relative humidity must be considered too. Quick and economical means of measuring odors from waste management system must be developed in order to expand odor contact technology. (Bates-East Central)

5016-B1, C1, C2, C3, D1, D2, D3, E3, E4
PROTEIN PRODUCTION FROM FEEDLOT WASTE

Department of Microbiology, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, Colorado 80523
S. M. Morrison, G. K. Elmund, D. W. Grant, and V. J. Smith
Development in Industrial Microbiology, V. 18, p. 145-155, 1977. 2 fig., 4 tab., 35 ref.

Keywords: Feedlots, Cattle wastes, Refeeding, Substrates, Physical treatment, Chemical treatment, Biological treatment, Proteins, *Trichoderma viride, Candida utilis*.

Procedures are described for the extraction and recovery of a protein-enriched fraction from beef feedlot waste. Approximately half of the manure proteins (250 mg/g) solubilized in 0.1 N NaOH are recovered by precipitation with sodium or ammonium sulfate. Protein analyses on sieve fractionated manure and direct microscopic counts indicate that 45 percent of the total protein is of microbial origin. The suitability of the protein-extracted fiber residue as a substrate for *Trichoderma viride* QM 9414 biomass production is enhanced by prior hydrolysis with cellulase. The following treatments, in order of effectiveness, increased the susceptibility of manure fibers to cellulase: ball-milling, alkali-treating, grinding. The sugars released during enzymatic hydrolysis can serve as a carbon source for the growth of *Candida utilis*. The theoretical protein yield from extracted and fermented fresh manure is approximately 350 mg/g. (Morrison-Colorado State University)

5017-B1, C1, C2, D1
MECHANICAL LIQUID-SOLID SEPARATION OF BEEF, DAIRY AND SWINE WASTE SLURRIES

Agricultural Engineering Department, Clemson University, Clemson, North Carolina 29631
R. O. Hegg, R. E. Larson, and J. A. Moore
Paper presented at American Society of Agricultural Engineers, 67th Annual Meeting, Oklahoma State University, June 23-26, 1974. 20 p. 3 fig., 7 tab., 6 ref.

Keywords: Separation techniques, Cattle wastes, Dairy wastes, Swine wastes, Screen separators, Chemical oxygen demand removal, Dry matter removal.

The objective of this research project was to determine the potential amounts of dry matter (DM) removable from beef, dairy and swine waste slurries by screening, using three types of commercially available, liquid-solid screen separators. The three screens were (1) rotating, (2) vibrating, and (3) stationary, sloping screens. The test facility used for the rotating and vibrating screen was a closed-system. The sloping screen was evaluated in a field oxidation ditch. The DM removal rates, using the rotating screens, were generally quite low, except for the 2.95 percent DM dairy slurry. The COD removals were higher than the DM removal rates. In the stationary, sloping screen, the average screened solids removed ranged from 0.88 to 14.84 percent, indicating that an average 7.75 percent of the solids were removed from the beef waste slurry where influent solids concentrations ranged from 0.97 to 4.41 percent DM. The screened solids ranged from 13.27 to 22.5 percent DM. The vibrating screen results showed that for beef slurry the percent DM removed from the influent to effluent was less than 16 percent, and COD removed was less than 7 percent. Dairy waste slurries ranged in concentrations from 0.95 percent to 1.90 percent DM. DM removed ranged from 8-15 percent, and COD removed were generally below 10 percent. For swine slurries, the percent DM removed ranged from 3 percent on 12-mesh-screens to 26 percent on 30-mesh screen. Study conclusions were: (1) Mechanical liquid-solid screen separators with screen sizes ranging from 12 to 30 mesh will remove 5 to 15 percent DM and COD. (2) Mechanical liquid-solid screen separators generally produced screened solids of 10 to 15 percent DM. (3) For the screen sizes used in this study (12, 20, 22, and 30 mesh) the screened solids from swine waste had higher DM contents than beef or dairy solids. (4) Screen sizes of 20 to 40 mesh retained the highest percentage of DM from the waste slurries tested. (5) More than 50 percent of the DM removed from beef, dairy and swine waste solids are retained on a 20 mesh screen. (Bates-East Central)

5018-B2, B5, C2, E2
COW SLURRY MANAGEMENT WITH PARTICULAR REFERENCE TO BRIDGET'S

Bridget's Experimental Husbandry Farm, Martyr Worthy, Hants, England
M. Appleton and S. J. Richardson
ADAS Quarterly Review, V. 23, p 294-305, 1976. 2 fig., 5 tab., 20 ref.

Keywords: Cattle wastes, Slurries, Land application, Crop response, Application rates, Waste disposal alternatives, Nutrients.

This is a report on experiments concerning cow slurry management at Bridget's Experimental Husbandry Farm where slurry is washed from a confinement dairy building through a chopper pump and then stored in a 181,000 liter below-ground, concrete pit. The diluted slurry water is then recirculated for cubicle washing. The winter slurry from the dairy unit mainly is applied to 8 ha of land that is subsequently cropped with maize, potatoes or kale. Some slurry is applied to grassland when necessary. Studies have been conducted to determine the effects of different levels of application to potatoes, grass and winter wheat. It is possible to apply 450,000 liters (winter slurry from 60 cows applied to 1 ha in 10 applications over the winter) without problems to the land subsequently cropped to potatoes. The potato crop gave higher yields than a normally fertilized crop. Winter wheat yields showed a big response to the residual effects of slurry applied to the previous potato crop. The response increased as the level of slurry application increased. The application of slurry from 40 cows to 1 ha (286,000 liters in 10 applications) did not produce any grass kill. In another study, the levels of slurry application were supplemented with inorganic fertilizers to meet the crop nutrient requirements. Also mentioned in the report are some alternative methods of slurry disposal. They are: discharge to sewer, off-farm disposal, biological treatment, and land disposal. (Bates-East Central)

5019-B1, B2, B3, C2, D1, D3, E2, F1
HANDLING OF MANURE FROM DIFFERENT ANIMALS AND MANAGEMENT SYSTEMS

Agricultural Engineering Department, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801
D. H. Vanderholm
Paper presented at the American Society of Animal Science Symposium on Alternatives in Animal Waste Utilization, Madison, Wisconsin, July 27, 1977, 20 p. 8 tab.

Keywords: Waste management, Feedlots, Confinement pens, Liquid wastes, Solid wastes, Fertilizers, Nutrients, Costs, Anaerobic lagoons, Land spreading, Sprinkler irrigation

Data and discussion are presented which indicate the relative importance of fertilizer value to manure management system costs. Liquid manure systems and bedded manure systems tend to minimize nitrogen (N) losses and maximize fertilizer value. In contrast, anaerobic lagoons tend to lose large quantities of nutrients, which may even be an advantage if the land area available for spreading is limited. All the systems were compared on a similar basis in terms of spreading, that is, incorporation soon after spreading was assumed in every case. If rapid incorporation is not accomplished, N losses from ammonia volatilization can be very large and this one aspect can be far more important than any handling or storage losses up to that point. Ammonia N losses during sprinkler irrigation of liquid wastes can also be large. Liquid manure systems tend to be more expensive than the other systems compared. The fertilizer value is also usually greater from liquid manure systems, but the additional return is not large enough to overcome the extra cost. However, selection of a manure management system must be based on many factors. Fertilizer value is only one aspect and many other considerations such as cost of gain, system flexibility, odor potential, labor requirements, operator preference and other cost and non-cost factors are also important. The costs and values shown will not be completely accurate for a given point in time, but they can be used to compare the relative costs and returns. This aspect as well as the others mentioned can be used to help select the best manure management and production system for a given situation. (Vanderholm-University of Illinois)

5020-A11, C2
STUDIES WITH HORSES COMPARING 4N-HC1 INSOLUBLE ASH AS AN INDEX MATERIAL WITH TOTAL FECAL COLLECTION IN THE DETERMINATION OF APPARENT DIGESTIBILITIES

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E. I. Sutton
Canadian Journal of Animal Science, V. 57, No. 3, p. 543-550, Sept., 1977. 4 tab., 17 ref.

Keywords: Horse manure, Digestibility, Collection methods, 4N-HC1 insoluble ash indication method, Grab samples, Apparent digestible nitrogen, Digestible energy

Three series of digestibility experiments with mature geldings indicated no significant differences between the 4N-HC1 insoluble ash indicator and the total collection methods for determination of apparent digestible nitrogen and digestible energy. There were significant differences ($P < 0.05$) between animals for the insoluble ash method in two of the three trials. No significant differences were found when the number of sampling days involved was reduced from 7 to 4 days and random grab samples of feces were used for insoluble ash determinations. Random grab samples taken for 1, 2, 3, or 4 days did not give significantly different digestion coefficients using the insoluble ash indicator method. Period differences in the insoluble ash method were observed when 3-day collections during five successive periods were taken from four individual geldings by the grab method. A study with four geldings during the two test periods using cotton strips as indicators showed mean rate of passage of digesta to be 70.2 h. The overall results suggest that random grab fecal samples using the 4N-HC1 insoluble ash method has potential for use in the determination of digestibility coefficients for horses. (Sutton-University of Alberta)

5021-A11, B1, C3
TRICHOSTRONGYLE INFESTATIONS IN AUTUMN ON PASTURES GRAZED EXCLUSIVELY BY COWS OR BY CALVES

Institut fur Parasitologie, Tierarztliche Hochschule, Hannover, Federal Republic of Germany
H. J. Burger
Veterinary Parasitology, V. 1, No. 4, p. 359-366, June, 1976. 1 fig., 1 tab., 21 ref.

Keywords Cattle wastes, Pastures, Herbage samples, Trichostrongyle infestations, Larvae

Larval counts were made on herbage samples collected from 14 calf pastures and 14 cow pastures at each of three different localities in Lower Saxony, western Germany, in September, 1974. Significantly higher numbers of larvae of the genera *Ostertagia, Cooperia* and *Nematodirus* were demostrated on calf pastures than on cow pastures in all three areas. The results suggest that, in the absence of available "clean" pasture, improved control of trichostrongyle infection during late summer and autumn might be achieved by the transfer of calves to cow pastures at that time. (Burger-Institut fur Parasitologie)

5022-A8, B3, C2, E2
RECOVERY AND REACTIONS OF AMPROLIUM FROM POULTRY MANURE ADDED TO SOIL

Department of Land Resource Science, University of Guelph, Guelph, Ontario, Canada NIG 2 W1
P. R. Warman, R. L. Thomas, C. T. Corke and E. T. Moran
Soil Biology and Biochemistry, V. 9, No. 4, p. 267-270, 1977. 3 fig., 3 tab., 6 ref.

Keywords: Poultry wastes, Land application, Amprolium, Feed additives, Soil biochemistry, Respiration, Microflora

Amprolium, a coccidiostat added to poultry feed, occurs in excreta at concentrations of 204 $\mu g\ g^{-1}$ and investigations were made of the effect of this quatity of amprolium on the biochemistry of soil to which manure had been applied. Greenhouse experiements showed that 0.8 $\mu g\ g^{-1}$ amprolium was found in the soil pots 80 days after treatment with manure at the equivalent of 56.1 t ha^{-1} and was detectable 20 days following treatment at the equivalent of 11.2 ha^{-1}. Laboratory experiments indicated that amprolium was differentially adsorbed to two complexing media, soil and manure. Since amprolium was a constituent of treated manure, it was expected that the amprolium manure-soil system would offer various sites for adsorption of amprolium. Mixing amprolium with soil and with soil plus untreated manure yielded approximately the same effect on amprolium adsorption based on recoveries in water solution, and as methanol extractable. However, total recovery of amprolium from treated manure added to soil was only a fraction of the above, indicating the high complexing capacity of the manure. No effect on soil respiration was observed by either pure amprolium or amprolium as a constituent of treated manure. The higher rate of manure application caused greater respiration due to the presence of more readily oxidizable organic matter, but the respiration pattern attributed to the manure component was not unlike the respiration pattern of Guelph loam soil. (Warman-University of Guelph)

5023-A3, A4, A8, B3, C2, E2
ULTIMATE DISPOSAL OF BEEF FEEDLOT WASTES ONTO LAND

Kansas State University, Manhattan, Kansas 66506
L. Manges, S. Murphy, L. Powers, and A. Schmid
Environmental Protection Agency Report EPA-600/2-78-045, March, 1978, 54 p. 2 fig., 23 tab., 24 ref.

Keywords: Feedlots, Cattle wastes, Land disposal, Crop response, Soil chemistry, Agricultural runoff, Chemical properties, Water pollution

A study was conducted to determine the effects of beef feedlot manure application rate on corn forage yield, properties of soil, and quality of surface runoff from irrigation and precipitation. The project was located at a commercial beef feedlot in southcentral Kansas. Laboratory and field studies were made on a proportional sampler for sampling runoff. The principle of the sampler which uses orifices for dividing the flow appeared sound. However, additional development is necessary before the sampler can be considered operational. Quality of runoff from land receiving annual applications of manure did not correlate with manure application rate. Concentration of pollutants varied greatly between runoff events and concentrations in runoff from land receiving no manure was relatively high. Corn forage yields increased as manure application rate increased up to rates of about 100 metric tons per hectare per year Annual manure applications of up to 50 metric tons per hectare did not lead to harmful levels of nitrogen, phosphorus, potassium, sodium, or magnesium. Concentrations of calcium decreased regardless of manure application rate. (H. L. Manges-Kansas State University)

5024-A8, B1, C2, E2
INTENSIVE FARMING AND POLLUTION

J. S. V. McAllister
Agriculture in North Ireland, V. 47, p. 360-362, 1973.

Keywords. Northern Ireland, Farm wastes, Land application, Fertilizers, Nutrients, Soils, Chemical analysis

Consideration is given to the effects of intensive farming in Northern Ireland. It has been calculated that in Northern Ireland the nutrients in the excreta from housed animals on today's fertilizer values are worth over 6,000,000 pounds each year. Consequently, efficient use should be made of these manures. A chart is given which lists estimated values of nitrogen, potash, and phosphate in farmyard manure, cow slurry, pig slurry, and hen slurry. Animal excreta should be returned to fields which need it most, ie. more slurry should be given to arable crops or to cut grass than to pastures. Soil analyses at intervals of 4-5 years should provide a check on the effectiveness of this system in controlling nutrient levels. A simple method for a farmer to work out his own nutrient balance is by adding the nutrients purchased in fertilizers to those available in excreta from housed animals. This involves the use of standard annual amounts in the excreta from each type of stock with an adjustment for losses in storage. (Merryman-East Central)

5025-A6, A7, B1, C2, D1, D2, D3, F2
CONTROL OF ANIMAL PRODUCTION ODORS: THE STATE-OF-THE-ART

Robert S. Kerr Environmental Research Laboratory, P. O. Box 1198, Ada Oklahoma 74820
R D Kreis
Environmental Protection Agency Report EPA-600/2-78-083, April, 1978, 94 p. 3 fig., 11 tab., 141 ref

Keywords: Air pollution, Odor control, Gases, Dust, Chemical properties, Odor measurement, Regulation, Legal aspects

Odors emanating from animal production facilities are the primary environmental cause for complaint resulting in great corrective expense and, in many instances, facility closure. The current state-of-the-art of odor control technology ranges from intensive waste management and good housekeeping practices to chemical treatment and facility isolation. These controls at best only limit the generation and/or quality of animal production odors. The most effective odor limiting technologies are the most cost intensive. Therefore, the methods used are dependent upon the seriousness of the situation and the cost-benefit that may be derived from their use. Original facility design and site selection considerations are of great importance to the existence of confined animal feeding enterprises with a non-farm population which is encroaching at increasinig rates into rural areas. Land use planning and zoning restrictions for agricultural animal feeding purposes may well be the ultimate odor control tool of the future for newly instituted facilities. Extensive basic and applied research is required to provide adequate technology for use by existing facilities. (Kreis-Robert S. Kerr Environmental Research Laboratory)

5026-B3, C1, C2, C3, D2, D3, E2, E3, F1
BIOLOGICAL RECLAMATION OF SOLID WASTES

G. Golueke
Biological Reclamation of Solid Wastes. Rodale Press, Emmaus, Pennsylvania, 1977. 249 p 31 fig., 18 tab ., 175 ref.

Keywords: Recycling, Solid wastes, Municipal wastes, Industrial wastes, Crop residues, Livestock wastes, Composting, Anaerobic digestion, Hydrolysis, Fermentation, Photosynthetic fermentation, Algae, Land disposal, Economics, Design

BIOLOGICAL RECLAMATION OF SOLID WASTES is a fairly comprehensive guide to the biological processes for reclaiming the resources in solid wastes, including municipal and industrial refuse, animal manures, and crop residues. The book is not intended as a handbook. Emphasis is on principles rather than specific details of individual processes. Topics covered include: (1) Composting, including principles of the actual process, the technology used, uses of the product, special applications, and the economics and status of composting as a waste treatment process, (2) Land disposal of primary and secondary domestic sewage sludges, including characteristics of sludge, and extensive look at the pros and cons of disposing of sewage sludge on the land, and other disposal methods; (3) Anaerobic digestion, including principles, system parameters, residues and their disposal, and an evaluation of the process; (4) Conversion of organic wastes into yeast and ethanol, including the processes of hydrolysis, fermentation and direct production; and (5) Photosynthetic reclamation of agricultural wastes through algal culture, including principles, design specifications, and reference to specific agricultural wastes. Forty-nine drawings, charts, diagrams and tables illustrate the many techniques and pieces of equipment used in the biological treatment and application of solid waste materials. (Bates-East Central)

5027-A8, B1, E2
EFFECT OF QUALITY OF IRRIGATION WATER, LEACHING LEVELS AND FARMYARD MANURE ON THE PERFORMANCE OF WHEAT AND PEARL-MILLET

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S.R. Poonia, L R. Johorar, J. Nath, and S.S. Khanna
Indian Journal of Agricultural Science, V. 44, No 12, p. 854-859, Dec., 1974. 2 tab., 3 ref.

Keywords: Farmyard manure, Irrigation water, Leaching, Crop response

To study the effect of the quality of irrigation water, leaching levels and farmyard manure on wheat (*Triticum aestivum L.*) and pearl-millet (*Pennisetum typhoides*(Burm. f.) Stapf & C.E. Hubb.) an experiment was conducted on a sandy-loam soil of Hissar, with 2 qualities of irrigation waters (canal and 8 mmhos/cm ECiw), 3 levels of leaching (0, 25, 50%) and 2 levels of farmyard manure (0 and 50 tonnes/ha). When saline water was used for irrigation, wheat performed better in the first year and as good as with canal irrigation in the second year. But in both the years pearl-millet showed a significant decrease in the yield when irrigated with saline water. The levels of leaching did not have much effect on both the crops. Farmyard manure proved more beneficial to pearl-millet than to wheat. The quality of irrigation water, leaching levels and farmyard manure did not have much effect on Ca, Mg, Na and K contents in the wheat grain. But the use of saline water resulted in an increase in the content of Ca for 13.9 to 16.8 snf 18.4 to 20 9 meq, Mg from 7.9 to 13.1 and 9.2 to 12.0 meq and Na from 20.7 to 33.3 and 15.7 to 62.7 meq/100 g of wheat straw in 1971-72 and 1972-73, respectively. Farmyard manure increased the K and P contents and decreased the Na content in the straw (Poonia-Haryana Agricultural University)

5028-A2, A4, A11
INTERNALIZATION IN A STOCHASTIC POLLUTION MODEL

Department of Economics, Tel Aviv University, Tel Aviv, Israel
E. Hochman, D. Zilberman, and R Just
Water Resources Research, V. 13, No 6, p. 877-881, Dec., 1977. 6 fig., 10 ref.

Keywords: Model studies, Stochastic models, Agricultural runoff, Dairies, Water pollution, San Francisco Bay, Shellfish harvest

This paper develops and applies a stochastic model for internalizing pollution externalities. Pollution occurs or does not, depending on factors related to a stochastic environment and human error But the probability of pollution can be altered by adopting various technologies. The model is applied to the problem of effluent runoff from dairies near the San Francisco Bay, which can prevent shellfish harvest in the bay. With runoff holding areas, pollution occurs if a rainstorm is severe enough to cause overflow. Standards rather than taxes are used as policy instruments in the model Results generally indicate that an accurate approximation of stochastic distribution is a necessity. Specific implications for the dairy problem are that present regulations are too lenient. (Zilberman-Tel Aviv University)

5029-A8, B3, C1, C2, E2
EFFECT OF ORGANIC AMENDMENTS ON THE NODULATION AND NITROGEN FIXATION BY SOYBEAN

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S. P. Dev and K. V. B. R. Tilak
Indian Journal of Agricultural Science, V. 46, No. 6, p. 252-256, 1976. 3 tab., 10 ref.

Keywords: Organic wastes, Land application, Crop response, Soybeans, Indian, Nodulation, Nitrogen fixation

Field experiments were conducted in the rainy seasons of 1972 and 1973 to study the effect of various organic amendments to soil on the yield, nodulation and nitrogen fixation by soybean variety "Bragg". The soil was amended with manures (farmyard manure and poultry manure) and cakes (linseed cake and Indian mustard cake) separately at the rates of 2.5, 5.0 and 7.5 tonnes/ha. Soils amended with manure recorded better nodulation, more leghaemoglobin synthesis and consequently higher nitrogen fixation than the unamended soils and the cakes-amended soils. Application of cakes beyond 2.5 tonnes/ha to the soil impaired the nitrogen fixation because of poor nodulation. The manurial treatments brought about a significant increase in bean yield when compared with cakes-amended soils, but the number of pods/plant was significantly more from the cakes-amended soil. (Dev-Govind Ballabh Pant University of Agriculture and Technology)

5030-A11, B3, C1, C2, E3
GROWTH PERFORMANCE OF BROILERS FED VARIOUS POULTRY WASTES

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R. Blair, A. G. Downing, and K. M. Herron
Poultry Science, V 55, No 5, p. 2010, Sept., 1976.

Keywords. Refeeding, Dried poultry wastes, Feed additives, Performance

2200 Ross I broiler chickens, housed in floor pens, were fed from day-old on a control diet or on a diet containing 10% dehydrated broiler litter (DPL), in-house dried battery waste from a deep-pit house (IHDW) or dehydrated poultry battery waste (DPW). Two samples of DPL were used, one from birds fed 3-nitro and containing 31 p.p.m. arsenic (DPLX) and the other from birds fed no 3-nitro and containing 4 p.p.m. arsenic (DPLY). Moisture (%), crude protein (%) and determined metabolizable energy values (kcal./kg) of the DPL, IHDW and DPW respectively, 9.7, 35.3, 12.8, and 1150; 13.8, 27.5, 12.7 and 1050; and 10.5, 28.0, 10.5 and 950. All diets were calculated to be isoenergetic, and isonitrogenous in terms of true protein. Mean live weights (g.) at 8 weeks of age of birds fed the control, 10 DPLX, 10% DPLY, 10% IHDW and 10% DPW were, respectively, 1966, 2100, 2139, 2029 and 1961, and feed per live weight gain over the 0-8 week period was 2.16, 2.15, 2.14, 2.26 and 2.23, respectively. Pathogenic organisms and mycotoxins were not detected in the wastes and the health and gradings of the birds were excellent (Copyright 1976 - Poultry Science) (Abstract Only)

5031-B3, C2, D3, E3
BARK BROILER LITTER AS A POTENTIAL FEEDSTUFF FOR RUMINANTS

Department of Forestry, Clemson University, Clemson, South Carolina 29631
P. Labosky, Jr., J. W. Dick, and D. L. Cross
Poultry Science, V. 56, No. 6, p. 2064-2069, Nov., 1977. 3 tab., 21 ref.

Keywords: Litters, Refeeding, Ruminants, Softwood bark broiler litter, Hardwood bark broiler litter

To assess the potential use of both softwood and hardwood bark broiler litters as a feedstuff for ruminants, the nutrient composition and *in vitro* digestibility for both raw and ensiled bark litters were chemically evaluated and compared to softwood planer shavings broiler litter. Each bark type was either processed or used directly as it came from the rosserhead debarker. Ensiling studies showed the lactic acid content was higher for hardwood bark litters than for softwood planer shavings. Softwood bark litter contained the least amount of lactic acid after fermentation in mini-silos. *In vitro* dry matter digestibility was higher for hardwood bark litters than for softwood bark litters or softwood planer shavings. No difference in *in vitro* dry matter digestibility was observed between raw and ensiled bark litter. No differences in ash, phosphorous, ether extract, nitrogen, total energy, and acid detergent fiber content were observed among the litters tested. The pH of ensiled hardwood bark was lower than ensiled softwood bark. Results indicate that from a nutritive standpoint, bark litters are potentially useful as a ruminant feed. Hardwood bark litter also appears to ensile better and to be more digestible and possibly more nutritious than softwood bark and softwood planer shavings litter. (Labosky-Clemson University)

5032-A7, B3, C3, E3
LITTER REUSE EFFECTS ON SELECTED TURKEY PRODUCTION AND PROCESSING PARAMETERS

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F. A. Golan and F. A. Gardner
Poultry Science, V. 56, No. 5, p. 1717-1718, Sept., 1977.

Keywords: Litters, Turkeys, Recycling, Bacteria, Air pollution, Molds, Yeasts

As a result of the economic potential involved in using litter more than once, combined with the need for more information concerning the microbiological concepts of litter reuse, the Texas Agricultural Experiment Station working with a Texas turkey producer initiated a cooperative research program. Specific objectives of the program were: (1) characterize litter and air environment of the turkey, (2) evaluate turkey litter reuse and develop quality control concepts, (3) develop management recognition of microbiological parameters. Data from the microbiological samples revealed that mesophilic bacterial concentrations were maintained at a level of 1 billion bacteria/gram after 2 weeks in both new and recycled brooder house litter. A maximum of 1 million coliform per gram of litter is present in new or recycled brooder house litter after 2 weeks. The brooder house air environments contained approximately 1000 airborne mesophilic bacteria per cubic foot of air after 2 weeks of age, and 100 airborne mold and yeast per cubic foot of air. A significant correlation exists between mesoplilic bacteria in the brooder litter and brooder airborne mesophilic bacteria. (Golan-Texas Agricultural Experiment Station) (Abstract only)

5033-A6, A9, A10, B1, C3, D1, D2, D3
MECHANICAL ROTAVATION OF POULTRY MANURE AS A METHOD OF FLY CONTROL

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C. F. Hinton
Poultry Science, V. 56, No. 5, p. 1717-1718, Sept. 1977.

Keywords: Fly control, Poultry wastes, Mechanical rotavation, Odor, Insecticides, Biological control, Florida, Moisture content

The Tampa Bay's annual production of poultry manure exceeds a quarter of a million tons. Florida's warm weather, horizontal summer rains and open poultry houses allow for wet manure and its resultant flies and odors. This problem is accentuated by high land costs which do not allow producers to adequately buffer themselves for the vast number of urban-oriented retirees who want to settle next to a farm without the annoying by-products of agricultural production. Producers are also faced with rising insecticide costs and their reduced effectiveness as larval resistance to pesticides increases. Many have turned to biological control. However, under Florida conditions, biological control often allows a rapid buildup of soldier flies. These wasp-like insects are beneficial, but their larval stage mechanically breaks down coned manure. This reduces air exposure, raises moisture and promotes an aerobic bacterial action. Over the years, producers have found that mechanically rotavating manure reduces its moisture content and breaks the fly cycle. An added fringe benefit is that the resultant manure is a more valuable and versatile product. Currently almost half of Tampa Bay's nearly two hundred producers are utilizing mechanical rotavation in lieu of insecticides as a means of controlling fly larval development. (Hinton-University of Florida) (Abstract only)

5034-B2, B3, C1, D1, D2, E1
A METHOD OF MANURE DISPOSAL FOR A BEEF PACKING OPERATION: FIRST INTERIM TECHNICAL REPORT

Procedyne Corporation, 221 Somerset Street, New Brunswick, New Jersey 08903
R. Ricci
Environmental Protection Agency Report EPA-600/2-77-103, June, 1977, 63 p. 17 fig., 6 tab., 11 ref

Keywords: Meat packing industry, Paunch manure disposal, Fluid bed incineration, Waste treatment, Filtration, Screening, Design

The report contains the preliminary studies, process development, process calculations, and process design for a system to successfully handle the paunch manure in a beef slaughtering operation. These studies resulted in a system in which the paunch manure is collected from the slaughtering operation and is fed to a screening device which separates the coarse solids. The screenings are dewatered to a solids content of 37 percent. This dewatered material is then sent to a fluid bed incinerator via a screw conveyer. The liquid stream from the screening is fed to a settler and is combined with the liquid stream from the dewaterer prior to sand filtering. The filter cake is fed to the incinerator using screw conveyor. The filtrate is recycled back to the settler. (Ricci-Procedyne Corporation)

5035-A7, B1, C1, C2
SOURCE ASSESSMENT: BEEF CATTLE FEEDLOTS

Monsanto Research Corporation, 1515 Nicholas Road, Dayton, Ohio 45407
J. A. Peters and T. R. Blackwood
Environmental Protection Agency Report EPA-600/2-77-107, June, 1977, 101 p. 20 fig., 19 tab., 52 ref.

Keywords: Air pollution, Cattle, Dusts, Gases, Ammonia, Thiols, Air pollution control, Stationary sources, Feedlots, Source assessment, Particulates, Sulfides, Source severity

The report describes a study of atmospheric emissions of fugitive dusts and volatile products from beef cattle feedlots. Total particulate emissions are affected by feedlot area, cattle density in pens, wind speed, and the regional precipitation-evaporation index. The predominant volatile product, ammonia, constitutes 70% to 90% of the total gaseous emissions. Emissions from the beef cattle feeding industry constitute 0.35 % of the national emissions of total particulates. Eight states have emissions of total dust which exceed 1.0 % of the state total particulate emissions burden. Source severity for total particulate is 0.069 (+or - 0.017); for ammonia, 0.88 (+ or 0.42); and for sulfide and mercaptan gas, 0.395 (+or - 0.19); with all errors stated at the 95 % confidence level. (Source severity is defined as the ratio of the maximum ground level concentration of an emission to the ambient air quality standard for criteria pollutants or to a hazard potential for noncriteria pollutants.) (Peters-Monsanto Research Corporation)

5036-A8, B3, C2
ASKOV 1894: FERTILIZERS AND MANURE ON SANDY AND LOAMY SOILS

Askov Forsogsstation, 6600 Vejen, Denmark
A. D. Kofoed and O. Nemming
Annales Agronomiques, V. 27, No. 56, p. 583-610, 1976. 4 fig., 30 tab., 31 ref.

Keywords: Farmyard manure, Fertilizers, Crop response, Soils, Denmark, Nutrients

Experiments on sandy loam and light sandy soil in Askov 1894-1972, comparing the effect of farmyard manure (F.Y.M.) and artificial fertilizer (NPK), have shown a better yield effect of NPK than of F.Y.M., when the same amount of plant nutrients were supplied from the two types of fertilizer. Depletion plots showed the necessity of supplying all three nutrients N, P and K to get maximum yields. Yield was always limited by the absence of added N. In its presence, P was limiting in the loam field and K in the same field. Soil analyses of the depletion plots gave increasing phosphorus and potassium indices while yields declined. The humus content in soil evidently decreased during the years, especially in the sand field. The explanation could be a dilution with soil following increasing intensity, especially in regard to depth of soil cultivation. (Kofoed-Askov Forsogsstation)

5037-B1, C2
METHODS OF FECAL COLLECTION AND NUTRIENT LEACHING IN DIGESTIBILITY STUDIES

Department of Environmental, Population, and Organismic Biology, University of Colorado, Boulder, Colorado 80309
J. T. Windell, J. W. Foltz, and J. A. Sarokon
The Progressive Fish Culturist, V. 40, No. 2, p. 51-55, April, 1978. 3 tab., 24 ref.

Keywords: Fish feces, Fecal collection, Nutrients, Leaching, Digestibility, Chemical properties

Quantitative data are presented on nutrient leaching from fish feces remaining in water for varying periods. Rainbow trout (*Salmo gairdneri*) were fed a multicomponent diet and feces produced were collected from the trough sediment with a fine-mesh net after 1, 4, 8, and 16 h. Removal of fecal samples from the lowest 2.5 cm of the intestine followed by 1 h water immersion gave digestibility coefficients comparable to those of feces netted from trough sediment at 1-h intervals. This relation suggested that absorption of nutrients was completed before the materials moved into the lower 2.5 cm of intestine. Most leaching of nutrients from feces occurred during the first hour in water.Storage of feces in trough water for 1 h increased digestibility estimates for dry matter, protein, and lipid by 11.5, 10.0, and 3.7 percentage points, respectively. A gradual increase in leaching of nutrients continued up to 4 h, but little or no leaching occurred between 4 and 16 h after defecation. In a second experiment, four methods of fecal collection were compared after rainbow trout were fed pelleted herring meal. Collection of the lowermost fecal pellet by intestinal dissection of anal suction gave equivalent digestibility coefficient values for dry matter, crude protein, and crude lipid. Netting of fecal sediment up to 1 h after defecation gave values for dry matter and protein that were elevated by about 5%, whereas samples collected by the stripping technique gave values 5% lower than those for samples collected by intestinal dissection and anal suction (Windell-University of Colorado)

5038-B1, C1
COMPARISON OF PROBE HAY MOISTURE DETECTOR AND CONVENTIONAL METHOD FOR DETERMINING POULTRY LITTER MOISTURE

Agricultural Engineering Department, Oregon State University, Corvallis, Oregon 97331
J. K. Koelliker and R. Dieker
Poultry Science, V. 57, No. 4, p. 858-859, July, 1978. 1 fig.

Keywords: Poultry litter, Moisture content, Probe hay moisture detector, Drying

Rapid measurement of poultry litter moisture content with a probe hay moisture detector was compared with conventional oven drying at 50°C. An average of six detector readings together with a calibration curve can be used to estimate moisture content within ± 5 % (wb) with 90 % confidence over moisture contents from 15 to 45 %. Total time required to make such a determination was about two minutes. Below 15 %, the detector is insensitive, above 45 , the detector scale divisions are too small to read precisely. When a quick estimate of moisture content is needed, this detector should be useful as a management tool. (Koelliker-Oregon State University)

5039-A11, B3, C2, D1, D2, E3
NUTRITIONAL QUALITY OF PROCESSED POULTRY WASTE FOR BROILERS

Department of Animal Sciences, Washington State Universtiy, Pullman, Washington 99164
C. N. Coon, J. P. Nordheim, D. C. McFarland, and D. E. Gould
Poultry Science, V. 57, No. 4, p. 1002-1007, July, 1978. 1 fig., 7 tab., 13 ref.

Keywords: Dried poultry wastes, Chemcal treatment, Potassium hydroxide, Refeeding, Performance, Poultry, Metabolizable energy, Lysine

Processed poultry waste (PPW), previously dried in a forced air oven and chemically extracted with potassium hydroxide to remove uric acid, was fed to broiler chicks to determine the metabolizable energy, available lysine, and the replacement value of PPW for corn in thick rations. Feed efficiency, feed consumption, and weight gain of chicks receiving 2.5, 5.0, and 7.5. PPW for 14 days was not significantly different from chicks receiving the control corn diets. The metabolizable energy and available lysine of PPW was 1225 kcal/kg and .25 % respectively. The available lysine in PPW represented 67% of the total lysine. (Coon-Washington State University)

5040-A11, B3, C2, D3, E3
NUTRITIONAL EVALUATION OF A SINGLE CELL PROTEIN FROM POULTRY MANURE

Department of Poultry Science, Cornell University, Ithaca, New York 14853
A. E. Henry, R. E. Austic, M. L. Shuler, F. Kargi, H. W. Seeley, Jr., and R. Vashon
Poultry Science, V. 57, No. 4, p. 1144, July, 1978.

Keywords: Refeeding, Poultry manure, Fermentation, Aerobic conditions, Quail, Poultry, Performance

Studies were conducted to evaluate the nutritional quality of a single cell protein (SCP) produced from poultry manure. The

material was generated by a two-stage, continuous aerobic fermentation process. The process design and composition of the fermentation product is described in a companion abstract (Austic et. al.). Young Japanese quail were fed a practical diet containing 10, 20, or 30% lyophilized SCP for one week after hatching. Normal growth occurred at the 10% level but the 20 White Leghorn chicks were fed purified diets containing 10, 20, 30% lyophilized product between the 5th and 12th days of age with only the 10% level being accomodated without depressed performance. No gross or histopathological symptoms were observed in chicks fed the highest level of SCP. In subsequent trials chicks were fed SCP oven-dried at 75C. Oven-dried product was included in the diet up to the 20% level without adverse effects on growth, feed consumption, or efficiency of feed utilization. The metabolizable energy of the SCP was determined to be 3.61 kcal/g. These nutritional studies indicate that the SCP has value for feeding to poultry. (Henry-Cornell University) (Abstract only)

5041-A9, A10, B1, D2
USE OF THIOCARBAMIDE TO CONTROL HOUSE FLIES IN CAGED LAYER HOUSES

Department of Poultry Husbandry, University of Missouri, Columbia, Missouri 65201
W.Jaynes and J. M. Vandepopuliere
Poultry Science, V. 57, No. 4, p. 1147, July, 1978.

Keywords:Fly control, Thiocarbamide, Poultry manure additives

A field study was conducted to evaluate the efficacy of thiocarbamide (thiourea) as a poultry manure additive in decreasing house fly population in caged layer houses. Manure in houses containing 6,000, 7,200, and 12,000 hens, located on three separate commercial egg farms, was treated weekly for eight weeks. One house of similar size on each farm was used as a control. All houses were cleaned prior to initiating the study. Weekly house treatment consisted of dissolving .26 g thiourea per hen in 40 gallons of water and spraying the solution directly on the manure. Five manure samples (1.5 liter) were taken randomly from each house on a weekly basis and placed in Dixie #T10-09 plastic buckets. The buckets were covered with a Lily #10T1-165 ounce ice cream container with screened bottom and stored for two weeks. Estimates of adult fly numbers were made weekly. After two weeks storage adult flies were killed using a commercial fly bomb and total numbers for each sample recorded. Manure samples from the thiourea treated houses contained 68, 76, and 94 percent fewer adult flies for the 6,000, 7,200, and 12,000 bird houses respectively than the comparative samples from the untreated houses. (Jaynes-University of Missouri) (Abstract only)

5042-A11, B3, E3
EFFECT OF FEEDING RAW AND COOKED SOYBEANS AND KIDNEY BEANS AND DRIED POULTRY WASTE IN CORN AND RICE-BASED DIETS TO LAYING CHICKENS

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N. P. Johnston and A. C. Wagner
Poultry Science, V. 57, No. 4, p. 1148, July, 1978.

Keywords: Poultry, Diets, Soybeans, Kidney beans, Dried poultry wastes, Refeeding, Performance, Egg production, Egg weight

Single Comb White Leghorn caged laying chickens were fed corn and rice-based diets supplemented with raw or extruded soybeans and raw or cooked (25 min at 134C) kidney beans. In some rations dried poultry waste was a constituent as well. The kidney beans, soybeans, and corn were fed both whole and ground. Observations were made of the dietary effects on egg production and egg weights. When comparing the results of chickens fed soybeans to those fed a corn-soybean meal control diet (control) the following was observed: (1) there were no significant ($P<.01$) differences in egg production when extruded beans were incorporated in ground corn diets and rice diets with and without DPW; (2) when extruded beans were added to whole corn diets there was a significant ($P<.01$) drop in egg production; (3) feeding raw beans in whole and ground corn diets with and without DPW significantly reduced egg production; and (4) egg weights were not affected by any of the raw or extruded soybean diets. When comparing the results of the control diet to those from kidney beans it was found that cooked and raw kidney beans with ground or whole corn or with rice significantly lowered ($P<.01$) egg production. By the second week all kidney bean treatments were at less than 15% production. Generally all kidney bean treatments resulted in reduced egg weights with some significantly lower. Egg production was superior from soybean diets (raw and cooked). Rice-based diets yielded similar production and egg weights as corn based diets. (Johnston-Brigham Young University) (Abstract only)

5043-A9, A10, B1, D2
THIOCARBAMIDE AS AN INSECTICIDE WHEN APPLIED TO CAGE LAYING HEN FECES

Department of Poultry Husbandry, University of Missouri, Columbia, Missouri 65201
J. J.Lyons and J. M. Vandepopuliere
Poultry Science, V. 57, No. 4, p. 1152, 1153, July, 1978.

Keywords: Fly control, Litters, Chemical treatment, Thiocarbamide

A laboratory procedure was established to study the effect of thiocarbamide on the development of house flies (*Musca domestica, L.*) in the manure of caged laying hens. Eight welded wire cages (30 cm x 40 cm) were designed to house 24 mature white Leghorn laying hens, 3 hens per cage. Each cage was suspended in the upper portion of a 40 cm x 50 cm x 80 cm screen wire covered frame. A screened 40 cm x 80 cm door allowed access to the cage. A cloth tube 38 cm in diameter and 50 cm long was installed in each door for removal and litter treatment. Water was supplied by Hart cups to each cage and feed was delivered through a covered opening on the top of each structure. Plastic goggles (Peepers) were placed on each hen to prevent consumption of the flies. Laboratory-reared wild-strain house flies were released in each cage periodically throughout a twelve week experiment. The feces from the hens were treated weekly with thiocarbamide levels of .00, .08. .16, .24, .32, .48, .64, 1.28 g/bird per week. Fecal samples were removed from each cage, placed in a covered container and incubated for two weeks. No flies emerged from the manure samples treated with thiocarbamide levels of .24 g or greater. (Lyons-University of Missouri) (Abstract only)

5044-A7, B1
MICROFLORA OF AIR SAMPLES FROM POULTRY HOUSES

Animal Sciences Department, University of Idaho, Moscow, Idaho 83843
C. F. Peterson, E. A Sauter, J. F. Parkinson, J. E.Dixon, and R. C. Stroh
Poultry Science, V. 57, No. 4, p. 1180, July, 1978.

Keywords: Poultry houses, Air quality, Microorganisms, Sampling, Bacteria, Molds

Studies were conducted to determine microbial numbers in air samples from poultry houses. Birds were housed at .42 and .84 m^3 / bird at temperatures of 15.6 and 26.7C. Air samples were taken weekly using a New Brunswick STA 200 microbiological air sampler. Plate counts were used to determine total numbers of aerobic and anaerobic, and coliform bacteria and molds. Numbers of *Escherichia coli* and *Staphylococcus aureus* were determined using MPN procedures Other microorganisms were identified and their numbers estimated by picking representative colonies from plates. Bacterial numbers averaged 1.9×10^4 /m^3 for the higher density and 4.0×10^3/m^3 in pens with lower density housing. These differences were highly significant ($P<.01$). There was also a significant ($P<.05$) buildup with time in microbial counts from high density pens; in contrast, increases in samples from low density pens were nonsignificant. Mold counts ranged from <10 to 4.1×10^4/m^3 of air. Twelve genera of bacteria representing 24 species were identified. Two genera, *Pseudomonas* and *Micrococcus*, represented about half the isolates. Seven genera of molds were identified with *Aspergillus* and *Penicillium* being the most common. (Peterson-University of Idaho) (Abstract only)

5045-A7, A11, B1
EFFECT OF ATMOSPHERIC AMMONIA AND STRESS ON BROILER MALES

Department of Animal Sciences, Colorado State University, Fort Collins, Colorado 80523
C. L. Quarles and D. D. Caveny
Poultry Science, V. 57, No. 4, p. 1181, July, 1978.

Keywords: Air pollution, Ammonia, Poultry, Performance, Animal health, Airsacculitis

Ammonia at levels of 0, 24, and 50 ppm was introduced into 12 environmentally controlled chambers that contained broiler male chicks. The gas was injected into the test chambers from 4 to 10 weeks of age. Ammonia was withdrawn from some of the rooms from 8 to 10 weeks of age. Average body weights, feed efficiencies, and air sac scores were measured at 4, 6, 8, and 10 weeks of age. Average body weights and feed efficiencies were reduced in the chambers receiving ammonia. Average

body weights at 10 weeks of age did not differ on those birds not receiving ammonia from 8 to 10 weeks of age. Total air sac scores were higher for those chambers receiving ammonia whether or not it was withdrawn during the period 8 to 10 weeks of age. The results indicate that ammonia gas at levels of 25 or 50 ppm with infectious bronchitis vaccination stress may affect chicken performance and the incidence of airsacculitis. (Quarles-Colorado State University) (Abstract only)

5046-A6, B1, C2, D2
ORGANOLEPTIC EVALUATION OF POULTRY EXCRETA FROM HENS CONSUMING FEED TREATED WITH AN ODOR SUPPRESSANT

Poultry Science Department, Michigan State University, East Lansing, Michigan 48824
R. D. Reynnels and C. J. Flegal
Poultry Science, V. 57, No. 4, p. 1182, July, 1978.

Keywords: Poultry excreta, Odor control, Feed additives, Ammonia

Single Comb White Leghorn laying hens were used to determine the effectiveness of a commercially available (H&D brand) excreta odor suppressant as a feed additive. Duration of the trial was the first five months (1-5) of lay. There were two pullets per cage in all four replicates in each of five treatments. Treatments were: (A) H&D 12.3 parts per thousand; (B) 24.4 parts per thousand; (C) 37.5 parts per thousand; (D) 44.8 parts per thousand; and (E) 0 parts per thousand in the feed. All diets were isocaloric and isotrogenous. Every 28 days a randomly selected panel ranked composite excreta from each treatment. All possible treatment pairs were scored using a one when the odor of that member of the pair was more objectionable, or a two if the odor was less objectionable. Contingency tables were constructed for each month's data and for comparisons within the separate months. The Bonferoni Chi-square test was used to evaluate data within the months with significant (Chi-square) treatment differences. The control sample (E) odor was more objectionable than the (D) sample for months two through four. Treatments B or C vs. E for month four, and B vs. E for month two indicated that the control sample was more objectionable than treated samples. All other comparisons were not significant . Fourth month excreta samples were evaluated for NH_3 concentration, which was not different among the treatments. Apparently the H&D function is to mask odor, rather than change th NH_3 concentration In general, higher level of H&D favorably altered the odor of hen house stored excreta. (Reynnells-Michigan State University)

5047-B1, F1
EPA/SBA LOANS FOR WATER POLLUTION CONTROL

Anonymous
Agricultural Engineering Newsletter, V 3, No 2, p 1, 2, Feb , 1977

Keywords: Water pollution abatement, Finance, Small Business Administration, Environmental Protection Agency

The Small Business Administration (SBA) is now authorized to grant loans to farmers and non-custom livestock feeders in order to build water pollution abatement facilities. This is an extension of an existing SBA loan program to assist farmers in controlling erosion, chemical pesticide and fertilizer runoff, or discharge of animal wastes. Farmers or feedlot operations can borrow any necessary amount at 6 5/8% interest for 30 years, providing a farmer's gross sales doesn't exceed $275,000 annually. Under new regulations issued February 8, loans will be made by the SBA following issuance of a written statement from the EPA regional office that the proposed abatement steps are necessary and adequate to comply with local, state or federal water pollution abatement requirements. This loan program is expected to remove important barriers implementing nonpoint source pollution control plans now being developed by areawide (Section 208) water quality planning agencies. More information on the EPA/SBA program can be obtained from the SBA or the coordinator of EPA's Small Business Loan Program (WH-586). Other programs available to farmers to obtain pollution control funds include the USDA Agricultural Conservation Program and the Farmers Home Administration, under the Rural Development Act of 1972. (Bates-East Central)

5048-A11, B3, E3
MANURE REFEEDING TO BEEF CATTLE

Anonymous
Agricultural Engineering Newsletter, V. 3, No 2, p. 3, Feb., 1977.

Keywords: Cattle wastes, Excrement-reconstituted grain, Refeeding, Cattle, Performance

Cattle manure can be reconstituted with grain to extend the available feed supply by 20% according to researchers at Texas A&M University. Fresh, whole excrement was mixed with grain sorghum to achieve 30% moisture, and mixture was reconstituted in oxygen-limiting structures for 15 to 30 days Excrement-reconstituted grain increased feed conversion in steers by 13% as compared to dry rolled grain. Flavor and carcass qualities were equal or superior with the manure-reconstituted grain ration Manure-reconstituted grain proved 13% more digestible than dry grain and 7% more digestible than water-reconstituted grain. (Bates-East Central)

5049-B2, B3, C1, C2, D1, D3, E3
REFEEDING WASTES TO DAIRY CATTLE

Anonymous
Agricultural Engineering Newsletter, V. 3, No. 2, p 2, 3, Feb . 1977

Keywords Dairy wastes, Separation techniques, Dehydration, Ensiling, Refeeding, Flushing, Irrigation, Lagoons

Three commonly used procedures for refeeding cattle wastes are: (1) Screen separation of liquid manure and direct refeeding of fibrous fraction; slurry irrigation or lagoon treatment of liquid fraction and recirculation of lagoon effluent for flush water. (2) Screen separation and ensiling of fibrous fraction with other feedstuffs; irrigation or lagooning/recirculation of liquids. (3) Daily scraping and ensiling all manure with other feedstuffs (wastelage method). Three methods used to prepare poultry litter or caged layer manure for refeeding are: (1) Dehydration, (2) Ensiling, (3) Ensiling broiler litter alone. Besides the potential economic benefits of nutrient recovery, refeeding is viewed as an energy conservation method in that it reduces the amount of energy otherwise needed to produce feedstuffs. Refeeding encourages frequent (daily) collection to preserve protein; this assists odor and fly control efforts. (Bates-East Central)

5050-B2, C1, C2, D1, D3, E3
IT'S NO BULL! COLORADO TOWN TO CONVERT COW MANURE TO NATURAL GAS

Anonymous
CH2M Hill Reports Fourth Quarter, 1977, p 10-11 1 fig.

Keywords: Cattle wastes, Bioconversion, Recycling, Physical treatment, Biological treatment, Algae, Feeds, Fertilizers, Energy, Lamar Power Plant, Colorado

In Lamar, Colorado construction of a large scale bio-conversion facility to produce methane gas from raw manure is planned for early 1978. The facility will cost approximately $14 million to build and will be capable of processing manure from 50,000 feedlot cattle. The Lamar plant will have four major components: mixing and grit removal facilities to produce a manure slurry and remove sand particles; a digestion complex to process the slurry and produce the methane gas, a degasification tower and centrifuges to process sludge from the digestors for cattle feed; and algal ponds to treat the effluent from the centrifuges. The bio-conversion plant will have several economical design features. Waste solids will be sold as fertilizer or as a supplement to cattle feed. Algae will be used to purify effluent water and then will be harvested and sold as a protein source, along with the waste solids. The treated water will be recycled within the system. Warm condensate from the Lamar Power Plant will be used to heat the digestors and algae ponds and to provide makeup water for the mix tanks. The balance will be returned to the power plant for reheating and recirculating. Bio-gas from the digestors will be compressed for use by the City of Lamar Power Plant. Carbon dioxide will be removed from the gas and will be used to control pH in the algal ponds (Bates-East Central)

5051-B3, E4
AN ATTEMPT TO MECHANIZE NUTRIENT RECOVERY FROM ANIMAL EXCRETA

Animal Physiology and Genetics Institute, Feed Energy Conservation Lab , USDA-ARS, Beltsville, Maryland
H J. Eby and W. L Dendy
Transcations of the ASAE, V 21, No. 2, p 395-398, March-April, 1978. 7 fig , 5 ref

Keywords Poultry wastes, Substrate, Fly

larvae, Refeeding

A mechanized system was developed to determine the feasibility of using fly larvae to extract nutrients from animal wastes and of recovering the larvae for ultimate use as a feedstuff on a large scale. The system was not sufficiently efficient to justify further development at the present time. Environmental conditions conducive for growth of larvae in the batch incubator were not adequately maintained. Components of the system, however, should be useful in the technology for mass rearing of insects. The larvae screen separator satisfactorily attained a 90 percent separation efficiency. (Eby-Feed Energy Conservation Lab.)

5052-B2, C2, E2
QUALITY VARIATION OF STORED FEEDLOT RUNOFF

U.S. Department of Agriculture, Agricultural Research Service, University of Nebraska, Lincoln, Nebraska
C. L. Linderman and J. R. Ellis
Transactions of the ASAE, V. 21, No. 2, p. 337-341, March-April, 1978. 7 fig., 2 tab., 13 ref.

Keywords: Feedlot wastes, Waste storage, Agricultural runoff, Effluents, Chemical analysis, Irrigation, Nitrogen, Salinity, Electrical conductivity

This study showed that composition of stored effluent changes considerably with time. Therefore, decisions based on effluent analysis should consider the number and timing of samples. For example, samples taken only once at the start of an irrigation season may show higher rates of nitrogen and lower rates of total salt application than actually results during the season, Effluent analyses for the first irrigation each season are compared with the average values for that season. Usually, the first effluent analysis of the irrigation season satisfactorily approximated the average V.S. for the season. The N and NH_4-N, however, decreased during the season, and the first N measurement was usually much larger than the season average. The first P measurement was larger than the season average at site 1, but lower than the season average at site 2 where P increased with time because of increasing T.S. concentration. The first K measurements were near the season average for all years. The E.C. was relatively low at site 1 and irrigation rates based on the first measurement of the season would approximate the season's average. At site 2, however, the average E. C. was 2.5 times the values measured at the first irrigation in 1971 and 1973 and was a very high salinity hazard based on E.C. (U.S. Salinity Laboratory, 1954). Therefore, the relatively simple measurement of feedlot effluent E. C. and soil soluble salts should be checked frequently if large amounts are applied to the soil. without sampling, it is nearly impossible to determine what amounts of each nutrient are being applied to the soil in effluent and how much is readily available to the crop. Periodic analyses of effluent quality should be combined with soil analyses to monitor salt accumulation and the nutrient status. Then, future fertilizer and effluent applications can be adjusted accordingly. (Linderman-USDA; Merryman, ed.)

5053-A7, A11, A12, B1, C3
AEROSOL CONCENTRATION IN A TURKEY BARN ENVIRONMENT

Agricultural Engineering Department, University of Minnesota, St. Paul, Minnesota
L. D. Jacobson and K. A. Jordan
Transactions of the ASAE, V. 21, No. 2, p. 325-328, March-April, 1978. 7 fig., 10 ref.

Keywords: Air pollution, Bacteria, Turkeys, Humidity, Ventilation, Litter management, Animal health, Public health

Bacterial concentrations were higher in a turkey house environment than in other contaminated areas. These levels were greater at turkey level than at human mouth level. No airborne *E. Coli* bacteria were found in the turkey barn. Particulate concentrations in a turkey house environment exceed those found in other environments. They do not surpass OSHA limits on inert or nuisance dust but these limits are approached. These levels increased when turkey activity increased. There was no evidence of a relationship between bacterial and particulate concentrations in this experiment. Also no correlation existed between data collected by number counting instruments (Bausch and Lamb) and mass counting instruments (Lundgren Impactor) since they respond to different segments of the dust spectrum. Thus, no single instrument was found which characterizes both bacterial and particles concentrations within a turkey house environment. Bacterial and particulate concentrations in a turkey house are affected by environmental conditions. The 50 percent relative humidity level appeared to surpass bacterial survival. It was also observed that dry litter conditions increased particulate concentrations. It has been established that high concentrations of bacteria and particulates have been found in turkey house environments. The reduction of these levels may improve turkey health as well as the health of people who work in these facilities. Research is needed from veterinarians and public health personnel to answer these concerns. If these bacterial and particulate concentrations are shown to be damaging, then engineers need to find effective measures of reducing them. This may be accomplished by increasing ventilation rates, experimenting with different litter management techniques, or changing relative humidity levels. (Jacobson-University of Minnesota)

5054-A11, A12, C3, E2
FATE OF PATHOGENS IN SOILS RECEIVING ANIMAL WASTES -- A REVIEW

U.S. Department of Agriculture, Agricultural Research Service, Lincoln, Nebraska
J. R. Ellis, and T. M. McCalla
Transactions of the ASAE, V. 21, No. 2, p. 309-313, March-April, 1978. 4 tab., 54 ref.

Keywords: Animal wastes, Land application, Pathogenic bacteria, Animal health, Public health

Pathogenic organisms have long been associated with animals and their wastes. Many studies have shown, however, that pathogens in animal waste are not as numerous, nor do they cover as broad a spectrum, as those in human waste. A number of pathogenic organisms are identified with disease transmitted in animal wastes: *Salmonella, Mycobacterium, Erysipelothrix, Leptospira, Clostridium, Bacillus anthracis* (food-and-mount-disease virus) (FMD virus), enteroviruses, and helminths. Most pathogens cannot survive outside the host, and those that do seldom multiply. Factors influencing pathogen survival in waste material and soil include waste treatment, moisture, sunlight, pH, temperature, antibiotics, toxic substances, competitive organisms, available nutrients, organic matter, and soil type. Researchers have concluded that proper application of animal waste to land rarely causes a health problem for animals or humans: in fact, it is a safe method of waste decontamination. (Ellis-USDA)

5055-A5, A8, B2, C2, E2
SWINE LAGOON EFFLUENT ON A SOIL-PLANT ENVIRONMENT: AN IMPACT ASSESSMENT

Department of Agricultural Engineering, Virginia Polytechnic Institute & State University, Blacksburg, Virginia
E. R. Collins, Jr., E. T. Kornegay, and D. C. Martens
Bulletin 110, Virginia Water Resources Center, Blacksburg, Virginia, Jan., 1978, 38 p. 1 fig., 34 tab., 12 ref.

Keywords: Swine wastes, Effluents, Biological treatment, Aerobic treatment, Anaerobic treatment, Land disposal, Irrigation, Crop response, Soil contamination, Leaching, Heavy metals, Nutrients

Two biological treatment units for a swine production unit were evaluated. One unit was maintained as an anaerobic system, the other as a mixed aerated unit by means of a floating mechanical aerator. Wastes were flushed into each unit by recirculation of effluent. Analysis of the supernatant of both systems showed that, with time, accumulations of heavy metals and other elements increased. Effluent from both treatment systems was irrigated on fescue plots, and effects on soil, soil water, and plant tissue were determined. While no visible deleterious effects were noted over a period of one and one half years, accumulation or high uptake of Na, Cu, and Zn was recorded in both plant tissue and soils; over extended periods, these effects could be serious if not controlled. Nitrate leaching from plots was minimal. Other waste constituents measured did not appear to be limiting factors in land disposal of swine lagoon effluent. (Collins-Virginia Polytechnic Institute and State University)

5056-B2, E3, F1
FLUSHING SLAT WASTE HANDLING SYSTEM

Agricultural Engineering Department, University of California, Davis, California
B. Horsfield and W. Shupe
Transactions of the ASAE, V. 21, No. 2, p. 329-331, 336, March-April, 1978. 1 tab., 9 ref.

Keywords: Swine wastes, Liquid wastes, Flushing, Gutter slat method, Design, Economics, Waste storage, Lagoons, Waste water reuse

Two floor designs for concrete slats placed on a concrete floor for flushing were built, tested and compared. Both floors had 6 in. wide slat surfaces constructed with marine grade aluminum 1/16 in. thick. In both cases, the gap between the slats was 1 in. Both floors were 10 ft. long. The slope of both floors was maintained at 1.2 percent throughout the tests. A flush tank and distribution box were located at the upper end of the slope to distribute the flush flow to each of the gutters.

critical, but it was determined that flush tank size, distribution box cross-section, and orifice size must be carefully designed. Advantages of the flushing slat system include the following: (1) The flushing gutter slat waste handling system does not require concrete pit construction, nor does it store liquid manure in the building. (2) The installation of this concept requires little preparation and can be installed after the building is completed. (3) The only permanent features of this waste handling system are the collection sump, lagoon system, and necessary piping to transfer liquid both to and from the building. (4) Because the slats can be simply placed on graded earth or sand, they are continuously supported, allowing use of a cheaper (less strong) aluminum than is used in conventional aluminum slats spanning a pit. (5) Since the flushing slat system is so easily installed, it is also easily removed. (6) Because of the way the flushing gutter slat system is installed, it may be possible for the owner to treat these elements as equipment for tax purposes. (7) Converting older buildings to less labor-intensive waste handling methods can be easily accomplished with the flushing gutter slat method. (8) The lagoon system necessary for recycling flushing liquid can be built at a fraction of the cost of the concrete pit used with conventional liquid handling methods. (Merryman-East Central)

5057-A4, B2, C1, C2
EFFLUENTS FROM CATFISH PONDS DURING FISH HARVEST

Department of Fisheries and Allied Aquacultures, Auburn University, Auburn, Alabama 36830
C. E. Boyd
Journal of Environmental Quality, V. 7, No. 1, p. 59-62, Jan-Mar., 1978. 2 fig., 2 tab., 13 ref.

Keywords: Fish farming, Effluent quality, Catfish, Chemical properties, Nitrates, Chemical oxygen demand, Biochemical oxygen demand, Phosphorus, Settleable solids, Seining, Draining, Water pollution

Data on effluent quality during catfish harvest were obtained from ponds on Fisheries Research Unit, Auburn University Agricultural Experiment Station, Auburn, Alabama, during the fall of 1976. Settleable mattr concentrations never exceeded the suggested instantaneous maximum level (3.3. ml/liter) during the draining phase of fish harvest. Concentrations of other water quality parameters in effluents during this time were typical of those found in catfish ponds in autumn. BOD, COD, and total phosphorus levels were lower in waters of catfish ponds during th fall than the summer, but concentrations of most measured parameters, including settleable matter, in effluents were higher that corresponding levels in small streams draining agricultural or forested watersheds near Auburn, Alabama. Although water quality is poor in catfish ponds during summer months, Alabama ponds seldom lose appreciable quantities of overflow water during the summer. It was found that water quality deteriorated greatly during the seining phase of fish harvest. Settleable matter values usually exceeded the suggested maximum. Rates of discharge of pollutants other than nitrates were proportionally greater during the seining phase. Considerable reduction of pollutants could be implemented by not releasing water during the seining phase. (Merryman-East Central)

5058-A3, A4, B1, E2
CONTROL OF NONPOINT WATER POLLUTION FROM AGRICULTURE: SOME CONCEPTS

Agricultural Research Service, U. S. Department of Agriculture, Chickasha, Oklahoma 73018
M. H. Frere, D. A. Woolhiser, J. H. Caro, B. A. Stewart, and W. H. Wischmeier
Journal of Soil and Water Conservation, V. 32, No. 6, p. 260-264, Nov.-Dec., 1977. 6 fig., 13 ref.

Keywords: Federal Water Pollution Control Act Amendments of 1972, Non-point sources, Flow charts, Management, Erosion, Leaching, Agricultural runoff, Pesticide, Fertilizers

The Federal Water Pollution Control Act Amendments of 1972 require the control of non-point as well as point sources of pollution. Non-point sources are not discrete and identifiable. The best way of controlling pollution from these sources is not by means of a treatment plant; rather it is by land management. Methods of control can be classified into two groups: (1) methods applicable to broad areas, including education incentives, taxation, and legal penalties, and (2) farming practices that are site-specific because of climate, topography, economics etc. A set of flow charts has been developed which assesses erosion problems and control over large areas; evaluates erosion problems and selects physically feasible control practices for field-sized areas; assesses potential nutrient pollution from fertilizer or animal wastes, leaching, runoff, and erosion; and assesses potential pollution from pesticides. A master flow chart shows the general procedure to be followed. The scheme depends on answers to a set of sequential questions in the other flow charts. The flow charts should help users select farming practices to reduce nonpoint pollution and evaluate their consequences (Bates-East Central)

5059-B1
WELL BUILT MOUNDS MANAGE THEMSELVES

Editor, Feedlot Management
G. Ashfield
Feedlot Management, V. 20, No. 6, p. 14-17, June, 1978. 4 fig.

Keywords: Open feedlots, Mounds, Confinement pens, Design, Slopes, Winds, Waste management

Raymond Riddlestine of Wisconsin combined open lot dirt mounds with shed confinement and mechanized feeding on concrete to build a one of a kind, personally tailored feeding facility that he and his son could live with for a long time. The mounds, which were built from the shale dug up during feedlot excavation, were constructed parallel to the prevailing slope and were built large enough to provide 50 sq. ft. of space per animal. Mounds should be at least 6-8 ft high and should have 4:1 or 5:1 side slope. During mound construction all earth should be placed in shallow lifts and compacted into place. The barn was built with its back to the wind. Weather permitting, the concrete areas of the feedlot may be scraped clean once a month. Once a year the entire lot can be cleaned, scraping the dirt areas as well and hauling the collected wastes to nearby fields for spreading. With shale as a base the mounds are hard and durable. Riddlestine indicates that what makes the whole system a success is the way the winds work with the building and the mounds to keep the cattle comfortable and to control pests. (Merryman-East Central)

5060-B2, B3, C2, D1
DISSOLVED ORGANIC AND INORGANIC PHOSPHORUS COMPOUNDS IN PIG SLURRY: EFFECT OF DRYING

Institute for Soil Fertility, Haren, The Netherlands
R. G. Gerritse and R. Eksteen
Journal of Agricultural Science, V. 90, No. 1, p. 39-45, 1978. 4 fig., 3 tab., 17 ref.

Keywords: Swine wastes, Slurries, Drying, Temperature, Organic phosphorus, Inorganic phosphorus, Calcium, Copper, Solubility

From gel filtration studies it has been found that more than 50 % of organic phosphorus dissolved in pig slurry is contained in compounds of high molecular weight. Various ions, e.g. calcium, copper, orthophosphate, are bound by these compounds. From the purine and pyrimidine base composition and resistance to acid and alkali treatment it follows that these organic compounds probably are complexes derived from polydeoxyribonucleotides (DNA). The effect of drying pig slurry at various temperatures (0-100 ° C) on the solubility of phosphorus, calcium and copper after redispersion of the dried slurry was investigated. The solubility of organic phosphorus was not affected by drying and redispersion in water, but the amount of phosphorus contained in dissolved organic molecules of high molecular weight decreased on drying at higher temperatures. The solubility of copper was also not affected by heat treatment. The solubility of inorganic phophorus is mainly related to the solubility constants of mineral phosphates. On the other hand, the total solubility of the cations involved is determined by complex formation. (Gerritse-Institute for Soil Fertility)

5061-B3, C2, C3, D3, E3
CHARACTERISTICS OF AEROBIC, SOLID SUBSTRATE FERMENTATION OF SWINE WASTE-CORN MIXTURES

Northern Regional Research Center, Agricultural Research Service, U. S. Department of Agriculture, Peoria, Illinois 61604
B. A. Weiner
European Journal of Applied Microbiology, V. 4, No. 1, p. 51-57, 1977. 3 fig., 2 tab., 11 ref.

Keywords: Swine wastes, Fresh wastes, Stored wastes, Fermentation, Aerobic conditons, Refeeding, Lactic Acid, Fatty acids, Fecal coliforms

A solid substrate form of aerobic fermentation for fresh and stored swine wastes combined with corn is described. Acid production and pH in corn-waste culture with either of these wastes were comparable up to 35 h. However, ammonium ion levels were four-fold higher with stored waste-corn fermentation than with fresh waste-corn cultures. Significant differences in microbial pattern were found in

fermentations of fresh or stored waste mixed with corn. Total viable flora and lactobacilli fraction were ten-fold higher in fermentations of fresh waste-corn compared to stored waste-corn probably due to diminished availability of nutrients in old waste. The main acid component with stored waste-corn was lactic acid, whereas fresh waste-corn fermentation produced both lactic and homologous fatty acids from acetic through valeric acid. Both types of waste plus corn provided a silage-like fermentation product with diminished disease potential which could be used in animal feed formulations. (Merryman-East Central)

5062-B3, C2, D3, E3
FERMENTATION OF SWINE WASTE-CORN MIXTURES FOR ANIMAL FEED: PILOT-PLANT STUDIES

Northern Regional Research Center, Agricultural Research Service, U. S. Department of Agriculture, Peoria, Illinois 61604
B. A. Weiner
European Journal of Applied Microbiology, V. 4, No. 1, p. 59-65, 1977. 1 fig., 3 tab., 15 ref.

Keywords: Swine wastes, Refeeding, Fermentation, Bacteria, Odor control, Sheep, Poultry, Swine, Performance, Lactic acids, Fatty acids, Amino acid

Aerobic cultures of cracked corn tumbled with fresh swine waste at 35-44% molsture levels and at temperatures of 18 to 24°C provided an acid fermentation with flexible operating parameters. Lactic acid organisms were present initially as less than 3 % of all organisms in fresh feedlot waste, but this group of organisms completely dominated the culture by 24 h. Coliform organisms, present at 0.1% or less of initial total flora persisted with fresh waste-corn at levels of 10^6 per dry gram of fermentation product Pilot-scale fermentation produced a product with 21 to 39 more methionine than corn but was still limiting for this amino acid as well as lysine for young pigs. The fermentation product from the fresh waste-corn cultures was fed as the major dietary component to young pigs, hens, and sheep. Gains and gain/feed for pigs diminished by one-third in 13-day trial. Laying hens performed comparably to controls in a 21-day test, and sheep did not discriminate against the products. (Merryman-East Central)

5063-A2, B3, C2, E2
ALTERNATE METHODS OF MANURE HANDLING

Agricultural Experiment Station, University of Vermont, Burlington, Vermont 05401
F. R. Magdoff, G. D. Wells, A. E. Smith, S. Golberg, and J. Amadon
Environmental Protection Agency Report EPA-600/2-78-078, April, 1978, 38 p. 5 fig., 11 tab., 10 ref.

Keywords: Waste storage, Dairy wastes, Agricultural runoff, Vermont, Lagoons, Irrigation

The objectives of this research project were to (a) construct an inexpensive storage facility for solid dairy cow manure, (b) evaluate its performance and the extent of pollutants in runoff from storage facilities, and (c) determine current manure handling practices in Vermont and dairy farmers' attitudes and expectations with regard to possible future regulations on manure handling. A storage facility was constructed at the University of Vermont (UVM), Animal Sciences Research Center (Spear Street Farm) and runoff from the site was channeled through sampling huts. A second site was established on a dairy farm in North Hero, Vermont. Runoff from the stacked manure was sampled weekly. The quality and quantity of runoff from the storage sites indicate a substantial potential to pollute. Runoff from open stacks of manure should, therefore, be contained in a lagoon and irrigated on cropland. Alternately, runoff could be eliminated by covering the manure. A survey of Vermont commercial dairy farmers (20 or more milking cows) indicated that most felt they could not afford the cost of changing manure handling systems. Only three percent of all dairymen definitely intended to change manure handling systems. However, most felt that saving the fertilizer value of manure would be a more important reason for them to change systems than would be reduced chore time. (Magdoff-University of Vermont)

5064-A9, A10, B1, D2
EFFICACY OF METHOPRENE (ALTOSID® IGR), AGAINST THE HORN FLY, WHEN FED TO CATTLE IN MINERAL SUPPLEMENTS

Department of Entomology and Economic Zoology, Clemson University, Clemson, South Carolina 29631
J. T. Paysinger and T. R. Adkins, Jr.
Journal of the Georgia Entomological Society, V. 12, No.3, p. 255-260, 1977. 2 fig., 2 tab., 5 ref.

Keywords: Feed supplements, Fly control, Methoprene, Cattle wastes

During the spring, summer, and fall of 1974, an experiment was conducted at Clemson University to determine it the life cycle of the horn fly, *Haematobia irritans* (L.) in feces would be interrupted while cattle were receiving methoprene (Altosid® IGR), which had been incorporated into mineral supplements. Four herds of cattle were utilized in the experiment. One herd was maintained as a control while the other three herds were each fed different formulations of methoprene Adult horn fly counts were taken once per week on the cattle. Twice a week ca. 24-h old fecal samples were collected in the field and placed in containers to be taken to the laboratory where normal larvae, pupa, and adult development could take place. It was observed that not only adult horn fly counts on the cattle, but also adult emergence in fecal samples decreased in herds which had access to methoprene treated material. (Paysinger-Clemson University)

5065-B2, C2, D3, E3, F1
ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUE: POTENTIAL FOR IMPROVEMENT AND IMPLEMENTATION

New York State College of Agriculture and Life Sciences, Cornell University, Ithaca, New York 14853
W. J. Jewell, H. R. Capener, S. Dell'orto, K. J. Fanfoni, T. D. Hayes, A. P. Leuscher, T. L. Miller, D. F. Sherman, P. J. Van Soest, M. J. Wolin, and W. J. Wujcik
Final Report, Report EY-76-S-02-2981-7, Fuels From Biomass Systems Branch, U. S. Department of Energy, Jan., 1978. 2 fig., 1 tab.

Keywords: Fermentation, Anaerobic treatment, Agricultural wastes, Design, Recycling, Economics, Temperature, Nutrients

This report contains the results of one year of activity by a multi-disciplinary team at Cornell University that attempted to evaluate the potential of rapidly improving the technology of anaerobic fermentation of agricultural residues and methods of implementing it in existing agricultural operations. The main objectives of this study were to: identify simple and low cost anaerobic fermentor design criteria that would be appropriate in small agricultural operations, develop high rate fermentor concepts that would enable multiple product recovery from the reactor, expand the information base particularly in the area of temperature influence on the process, and to review sociological and economic issues relating to implementation of fermentation technology. This study has identified several major anaerobic fermentation concepts which illustrate that the technology may be rapidly improved. A simple reactor design utilizing an unmixed plug concept was shown to be comparable to the more complex completely mixed reactor when using dairy cow residue. This design should enable the use of low cost reactor materials for small scale agriculture. A high rate thermophilic reactor designed to encourage flotation of particulate solids illustrated that liquid, solid, and gaseous products can be generated within the anaerobic fermentor thus eliminating an additional dewatering unit process. A third reactor concept involved extension of the anaerobic attached microbial film expanded bed to the treatment of cow manure slurries. By concentrating the viable microbial mass in an attached film on small inert particles it was possible to operate this unit at much higher flow rates than would be possible with conventional processes. At a three hour hydraulic retention time, 35°C, with 2 percent total solids feed, the reactor was operating in a stable condition producing gas at a rate of 7 1/1 day with effluent volatile acids below 300 mg/1 as acetic acid. This is the highest rate of methane generation recorded for this type of substrate to date. Comprehensive thermophilic fermentation studies (60°C) indicated that the increased temperature resulted in little improvement in total quantity or the rate of yield of gas over that obtained with mesophilic fermentation with reactor retention periods greater than 10 days. A significant improvement was noted for reactor retention periods less than 5 days with feed total solids greater than 6 percent of the wet weight. Finally, other areas where preliminary data was obtained included: surveys to identify sociological issues, computer model economic comparison of the cost of anaerobic fermentation as compared to conventional residue treatment technology, microbiological examination of reactors operated, and nutrient analysis of dairy manure before and after anaerobic fermentation. (Jewell-Cornell University)

5066-A11, B3, C3, E3
BROILER LITTER REMOVED, COMPOSTED, AND USED AGAIN

Anonymous
Poultry Digest, V. 37, No. 435, p. 270, May, 1978.

Keywords: Litters, Composting, Recycling, Poultry, Performance

Ian Hughes, who operates a 100,000-bird unit in England, is experimenting with reused broiler litter. The end-of-crop litter is bulldozed out of the house and then left in a heap. New shavings are used for day-olds, but the rest of the house is littered down with the old material--not the stuff just removed from the house, but the material from the crop before that, which has been standing in a heap for 10 weeks. Piling the manure for 10 weeks causes a build-up of heat which is believed to kill harmful microorganisms. In the 2½ years that this litter reuse procedure has been followed. there have been no obvious problems and mortality levels have remained low. (Bates-East Central)

5067-A6, B2, B4, C2, F2 CATTLEMEN INFLUENCE ODOR CONTROL RULES

Anonymous
Wallaces Farmer, V. 11, No. 103, p. 32, June, 1978.

Keywords: Iowa Cattlemen's Association, Iowa Air Quality Commission, Sulfates, Odor control, Regulation, Lagoons, Anaerobic conditions, Waste storage

Sustained effort by the Iowa Cattlemen's Association (ICA) has apparently had its influence on Iowa Air Quality Commission regulatory decisions regarding anaerobic lagoons The commission staff had originally proposed banning the use of high sulfate water "for any purpose in livestock operations using an anaerobic lagoon" for orgainc waste storage. The ICA, in testimony at a January, 1978 public hearing, stated that none of the engineering bulletins on animal lagoons reviewed by the advisory committee specified criteria for sulfate levels, and there is no data available to specify tolerable concentrations. The Air Quality Commission finally agreed that no sulfate standard should be required, and recoginized that regulations should not be adopted until scientific evidence is well established. (Bates-East Central)

5068-B1, C2, D1, D3, E3 PROCEEDINGS OF SYMPOSIUM ON THE CONVERSION OF POULTRY WASTE TO ENERGY, FEED, OR FERTILIZER

Pennsylvania State University
Proceedings of Symposium on the Conversion of Poultry Waste to Energy, Feed, or Fertilizer, Pennsylvania State University, Nov. 3-4, 1976, 33 p

Keywords: Recycling, Poultry wastes, Energy, Refeeding, Fertilizers, Waste treatment, Heavy metals, Marketing, Dehydrations, Ensiling

A symposium was held at the Pennsylvania State University, College of Agriculture on November 3 and 4, 1976 to discuss conversion of poultry waste to energy, feed, or fertilizers. The topics presented included: "Ensiling Poultry Litter and Subsequent Feeding," "Using Poultry Manure for Vegetables and Hydroseeding," Significance of Heavy Metals in DPW for Feeding," "Marketing of Converted Poultry Wastes," "Progress Report from the First Year of Operation of the Penn State Anaerobic Digester," "Poultry Manure Fed to Lambs," "Conversion Chart from Customary to Metric and Vice Versa," "Agronomy Lab. Chem.-Testing of Turkey Feed and Products," "Marketing Manure," "Companies thru which Dehydrators Are Available." Also included is an evaluation of the poultry waste symposium and a list of references from *Poultry Science* and other sources. (Bates-East Central)

5069-A11, B3, C2, D3, E3 ENSILING POULTRY LITTER AND SUBSEQUENT FEEDING

Harvestore Company
O. Owens
Proceedings of Symposium on the Conversion of Poultry Waste to Energy, Feed, Fertilizer, Pennsylvania State University, Nov. 3-4, 1976, p. 1-6.

Keywords: Poultry litter, Ensiling, Refeeding, Fermentation, Nutrients, Performance

In this presentation a brief history of Harvestore structures and the effect on ensiling is given, along with 4 cases of farmers who refeed poultry manure. Three are about broiler litter refeeding operations and one is about a cage layer refeeding operation. Four areas of caution where refeeding is concerned are: (1) Never feed raw litter or litter without proper fermentation in structures, preferably 28 days for safety. Raw or partly fermented material will throw cattle off feed. (2) At this time, caution should be used when feeding to milking cows. In fact, some states forbid feeding to lactating cows. (3) Refeeding should be done by people with "cow sense," It will require management. (4) More engineering ideas in collecting, handling and mixing excreta from cage layer houses are needed. More and more researchers agree that poultry manure can be fed to ruminant animals efficiently. The general trend is toward ensiling in oxygen limiting storage. The reasons are: (1) Oxygen limiting fermentation produces a palatable feed with good acceptance by cattle. (2) Feed efficiency appears high with Harvestore structures. (3) Fermentation removes objectionable organisms, makes it safe. (4) Oxygen limiting maintains its feed value, especially to valuable protein (5) Greater opportunities are available for profit. (Bates-East Central)

5070-A7, A8, B2, C2, D1, D2, E2, E3, F1 USING POULTRY MANURE FOR VEGETABLES AND HYDROSEEDING

Professor of Plant Nutrition
The Pennsylvania State University, University Park, Pennsylvania 16802
E. Bergman
Proceedings of Symposium on the Conversion of Poultry Waste to Energy, Feed, or Fertilizer, Pennsylvania State University, Nov. 3-4, 1976, p 7-8.

Keywords. Poultry wastes, Chemical treatment, Ash, Drying, Air pollution, Land disposal, Fertilizers, Crop response, Nutrients,

Research on transforming fresh poultry manure into a useful product was initiated by Dr. Glenn Bressler of Pennsylvania State University's Poultry Science Department in the late sixties. At first manure was ashed. However, this process was abandoned because of air pollution problems, drying expenses, and soil salt accumulation. A two stage drying process was perfected by Dr. Bressler which yielded an excellent fertilizer from the poultry manure. The manure's content was guaranteed to contain 5% N, 2% available P_2O_5, and 2% soluble K_2O. This dried material was added to the soil, on the basis of Pennsylvania Soil Testing results, and crop yield was equal to that of any other commercial fertilizer. However, dried poultry manure should be applied on the basis of what the crop needs. Dried poultry manure also has been successfully used in the hydroseeding operation along highways and in reseeding of spoil banks located in the anthracite region. Pennslyvania State dried poultry manure, which is registered and sold under the name of "Penn Agro 2 SD Poultry Manure," has been added to mixes for bedding or vegetable plant production. It is also an excellent lawn fertilizer and does not smell. Presently the described material is costwise competitive with commercial fertilizers when the elemental content on a pound basis is compared. (Bates-East Central)

5071-B3, C2, E3 SIGNIFICANCE OF HEAVY METALS IN DPW FOR FEEDING

Professor of Poultry Science, The Pensylvania State University, University Park, Pennsylvania 16802
R. Leach
Proceedings of Symposium on the Conversion of Poultry Waste to Energy, Feed, or Fertilizer, Pennsylvania State University, Nov. 3-4, 1976, p. 9.

Keywords: Refeeding, Dried poultry wastes, Heavy metals, Toxiclty, Animal health, Feed additives

Until recently, little attention has been given to the heavy metal content of dried poultry waste. Now several research projects are investigating this matter. The metal content of wastes are 2-3 times greater than that found in feed, according to Drs. Baker and Shipp of the Pennsylvania State Agronomy department. Dr. Calvert at the USDA in Beltsville has been conducting long term feeding trials in which dried poultry waste was used as a protein supplement in a steer finishing ration. Results so far show significant increases in the zinc, copper and iron of the diet. Tissue analysis revealed increased copper content of the liver and iron content of the kidney and a reduction in the cadmium content of the kidney. At Pennsylvania State, research has been done to evaluate the effect of dietary cadmium on the composition of eggs and meat. Research so far has shown that muscle and eggs do not accumulate much cadmium even at levels many times that found in cadmium contaminated plants. Animal wastes from animals fed normal diets do not appear to contain dangerous levels of toxic elements. However, addition of excess metals to animal diets will result in waste with a substantially increased metal content. At the present time sewage sludge appears to provide more danger than animal wastes with respect to causing increases in the metal content of the food chain (Bates-East Central)

5072-B3, C1, C2, E3, F1
MARKETING OF CONVERTED POULTRY WASTE

Extension Poultry Specialist, The Pennsylvania State University, University Park, Pennsylvania 16802
H. C. Jordan
Proceedings of Symposium on the Conversion of Poultry Waste to Energy, Feed, or Fertilizer, Pennsylvania State University, Nov. 3-4, 1976, p. 10.

Keywords: Dried poultry wastes, Marketing, Economics, Recycling

A survey of eight producers of DPW in the period of 1973 through 1976 showed the following results: (1) Stage I Sales of 14,200 tons for 3-year period at an average price of $5.95/ton at the farm where it was produced. Prices ranged from $5-$9/ton. Cost of Stage I was about $20/ton final product. Another 14,000 tons was used on local fields owned or leased by producers. (2) Stage II Sales of 24,000 tons for a 3-year period at an average price of $62.62/ton for DPW sold. Prices ranged from $35 to $120/ton. Over half of all sales was bagged at the farm prior to retail sales. This price was bulk wholesale price and not retail price to consumer. Cost of Stage II was over $60/ton. Also, included are some statements made by those who were surveyed (Bates-East Central)

5073-B2, C1, D3
PROGRESS REPORT FROM THE FIRST YEAR OF OPERATION OF THE PENN STATE ANAEROBIC DIGESTER

Professor of Agricultural Engineering, The Pennsylvania State University, University Park, Pennsylvania 16802
S. Persson
Proceedings of Symposium on the Conversion of Poultry Wastes to Energy, Feed, or Fertilizer, Pennsylvania State University, Nov, 3-4, 1976, p. 11-17.

Keywords: Design, Anaerobic digesters, Slurries, Cattle wastes

The purpose of this Pennsylvania project was to determine the technical requirements for an anaerobic digestor to be used under actual farm conditions. This is a report on the first year of operation. The Pennsylvania State digester in its present form is a full scale manure processing plant consisting of a two-stage anaerobic digester which continuously processes the manure from a 50-cow stanchion-barn. The gas is heated to 35°C and agitated by gas recirculation. Fifty-two metric tons were digested during the first year. A typical daily charge, including 3200 L of added water, was 6200 L of slurry, with a solids content of 8.3%. Observations at the end of the test period indicated that no large amounts of materials had been permanently settled along the corners of the digester in spite of the flat floor. The weakest link of the slurry handling system was the liquid manure pump used to mix manure with water and to pump it up in the high feed tank from where it was fed to the digester As a general observation, it was found necessary that all parts of the slurry handling system be designed such that they would be reached by a mechanical cleaning device from the outside even when the digester was full. Another observation was related to the value of having alternate systems for moving the manure through the system. The main problem in the gas system was created by condensation of water. A number of design modifications have been made based on the experiences of operation: (1) A ram type manure pump will be used instead of the centrifigal manure pump. (2) A separation for the processed manure and for recirculation of some liquid to the input end of the system will be tried. (3) An alternative system for heating the water for the digester will be developed using the cooling water and the exhaust heat from an internal combustion engine instead of the broiler. (Bates-East Central)

5074-B3, C2, E3, F2
POULTRY MANURE FED TO LAMBS

Lancaster Farming
Proceedings of Symposium on the Conversion of Poultry Waste to Energy, Feed, or Fertilizer, Pennsylvania State University, Nov. 3-4, 1976, p. 18-19. 1 fig.

Keywords: Refeeding, Dehydrated poultry excreta, Sheep, Crude protein, Calcium, Phosphorus, Performance, Food and Drug Administration, Regulation

Dehydrated poultry excreta (DPE) is superior to alfalfa in its crude protein, calcium and phosphorus content and may one day be the preferred protein source for ruminants, according to Dr. Lewis Smith and Ivan Lindahl, Beltsville Agricultural Research Center scientists. In tests at the research center, lambs were fed diets supplemented with either dehydrated poultry excreta or alfalfa as the crude protein source. The supplements provided levels of 8 and 12 % dietary crude protein. Lambs fed the DPE consumed more feed and tended to convert feed to gain more efficiently than lambs fed the alfalfa. The cost pound of gain was 17% less in lambs fed DPE. Lambs fed the 12% protein diets consumed 22% more feed, gained 74% faster and were 39% more efficient in converting feed to grain than lambs on the 8% diet. Poultry excreta has not been approved as a feed for sheep by the FDA. (Bates-East Central)

5075-B3, C2, D1, E3, F1
MARKETING MANURE

H. C. Jordan
Proceedings of Symposium on the Conversion of Poultry Waste to Energy, Feed, or Fertilizer, Pennsylvania State University, Nov. 3-4, 1976, p. 21-25. 2 tab.

Keywords: Dried poultry manure, Drying, Nutrients, Fertilizers, Waste storage, Land application, Economics

"Whether you make tie tacks using quail manure, as does Frank Hill of Union, South Carolina, who sells it for 4 million dollars/ton, it is important that you sell or use manure, according to Herbert C. Jordan. Everyone still recognizes manure as a fertilizer if it is handled properly, so it is advisable to remove manure from storage and return it to the soil as soon as possible. If manure or litter is to be stored, store it under dry conditions. If manure is to be sold, then it must be air-dried as soon as possible after it is produced. Bagged manure business is poor to fair at best, but some producers sell as high as 40 tons/year in bags. Some commercial companies are now using poultry manure to supplement commercial fertilizer. Manure applied as a fertilizer should be turned into the soil immediately after it is applied to prevent odor and water pollution. This also allows crops to get maximum benefit of the plant nutrients. Apply 60 or more days before planting for best results. (Bates-East Central)

5076-B3, C1
COMPOSITION AND DEGRADATION OF JACKRABBIT AND COTTONTAIL FECAL PELLETS, TEXAS HIGH PLAINS

Wildlife and Range Resources Graduate Program, 407 WIDB, Brigham Young University, Provo, Utah 84602
J. T. Flinders and J. A. Crawford
Journal of Range Management, V. 130, No. 3, p. 217-220, May, 1977. 3 fig., 1 tab., 16 ref.

Keywords: Rabbits, Jackrabbits, Cottontails, Fecal pellets, Degradation rates, Humidity, Precipitation

Fecal pellets were taken from black-tailed jackrabbits and desert cottontail rabbits for studies of rates of natural degradation. Microscopic analysis of fecal samples showed a significant difference in the proportion of grasses, forbs, and woody plants ingested by the two leporid species sampled. Jackrabbits had ingested greater proportions of forb material. Degradation of fecal pellets was observed at regular intervals from 1972 to 1974. Time required for complete disappearance of pellets was estimated at 4.4 years for jackrabbits and 9.5 years for cottontails. Relative humidity and precipitation were strongly correlated ($r = -0.98$ and -0.95 for jackrabbits and cottontails, respectively), with disappearance of pellets. (Flinders-Brigham Young University)

5077-A8, B3, E2
EFFECTS OF HIGH RATES OF CHEMICAL FERTILIZER AND BARNYARD MANURE ON YIELD AND MOISTURE USE OF SIX SUCCESSIVE BARLEY CROPS GROWN ON THREE GRAY LUVISOLIC SOILS

Research Station, Agriculture Canada, Beaverlodge, Alberta TOH OCO, Canada
P. B. Hoyt and W. A. Rice
Canadian Journal of Soil Science, V. 57, No. 4, p. 425-435, Nov., 1977. 2 fig., 7 tab., 13 ref.

Keywords: Land application, Fertilizers, Barnyard manures, Barley, Crop response, Yields, Moisture use, Canada

High rates of chemcial fertilizer and barnyard manure were applied separately and together to barley)*Hordeum vulgare* L.) grown on three Gray Luvisolic solid for 6 successive yr. The fertilizers were applied annually with the N-P-K rates greater than 110-50-40 kg/ha. The manure was applied initially at 135 tonnes/ha and at 150 tonnes/ha before the fifth crop. Moisture use by the barley was measured for the last five crops. Average yields of barley were 1,530, 3,270 and 3,950

kg/ha for the nil, manure and fertilizer treatments, respectively. The manure fertilizer treatment gave little or no further increase in yield over the fertilizer treatment Efficiency of moisture use was generally more than doubled by the fertilizer and fertilizer + manure treatments. These treatments also greatly increased the use of soil moisture reserves, the greatest increase being for Beryl fine sandy loam, followed by Hazelmere loam and the least for Nampa clay loam. Soil moisture reserves at harvest time were depleted more under the fertility treatments than under the control plots. However, by the following spring, soil moisture reserves were nearly equal under the different plots having been replenished by fall and winter precipitation. These results show that on stubble land, moisture restricted yields much less than nutrients did and, on that basis, continuous cropping of Gray Luvisolic soils is discussed. (Hoyt-Agriculture Canada)

5078-A11, B1, C2
EXCESS AMMONIA CAUSES RESPIRATORY PROBLEMS

Anonymous
Animal Nutrition and Health, V. 33, No. 5, p. 9, June-July, 1978.

Keywords: Poultry management, 'Half-house brooding', Ammonia, Respiratory problems, Airsacculitis, Southeast United States

Respiratory problems and colibacillosis have been a major concern of most poultry operations in the Southeast in recent months. A factor that contributed significantly is ammonia. The problem has grown more intensive in recent years due to changes in management and brooding conditions. Broiler growers have gone to 'half-house brooding' which causes an excessive accumulation of moisture and fecal material resulting in ammonia concentration build-up. Ammonia detection begins at 20 ppm. At this concentration a decrease in body weight, elevation of feed conversion and a significant increase in airsacculitis condemnations and downgrading results. This level of ammonia will also increase the bird's susceptibility to Newcastle disease virus resulting in a more severe vaccination reaction which in many cases produces a complicated respiratory problem usually called colibacillosis. (Bates-East Central)

5079-A9, A11, A12, C2, C3, D1, D2, D3, E3
FEEDING ANIMAL WASTE

Council for Agricultural Science and Technology
Report No. 75, Council for Agricultural Science and Technology, June 22, 1978, 48 p. 2 tab., 162 ref.

Keywords: Refeeding, Nutrients, Safety, Animal health, Public health, Food & Drug Administration, Copper toxicity

The nutritional value of animal wastes is examined, citing poultry wastes to be the best refeeding source. Appropriate processing methods are important in treating animal wastes so that nutrient loss will be limited, palatability will be increased, and bacterial pathogens and parasites will be eliminated. Processing methods used include dehydration, ensiling alone or with other materials, composting, deep stacking, oxidation-ditch treatment, solids-liquid separation, chemical treatment, pelleting, and fumigation. Each of these processing methods is discussed. This report was developed in response to the statement, "Recycled Animal Waste," published by the Food and Drug Administration (FDA) in the December 27, 1977, issue of the *Federal Register* (V. 42, No. 248, p. 64662-64675). This FDA Statement summarized the present status of feeding animal wastes. The central issue in the FDA Statment and in this report is the safety of animals fed animal wastes and, more important, the safety of the human population consuming the animal products. There is no evidence that feeding of animal waste presents hazards to human health. The only documented evidence of a harmful effect on animal health from feeding waste has been copper toxicity in ewes fed broiler litter that was high in copper content as a result of feeding high copper sulfate levels to the birds. The main safety concerns about feeding animal wastes are the potential for harmful residues of pesticides, drugs, minerals, and other toxins, and the hazard of disease transmission. It is conceded that there is a need for study and documentation in these areas. (Merryman-East Central)

5080-A8, E2
EFFECT OF FERTILIZERS AND MANURE ON THE ROOT CATION EXCHANGE CAPACITY OF SOME RICE AND WHEAT VARIETIES

Department of Soil Science and Agricultural Chemistry, Banaras Hindu University, Varanasi, U. P. India
S. Singh and L. C. Ram
Journal of the Indian Society of Soil Science, V. 24, No. 4, p. 427-431, 1976. 2 tab., 8 ref.

Keywords: Fertilizers, Land application, Crop response, Root cation exchange, India

NPK fertilizers with organic matter generally increased the root cation exchange capacity of certain varieties of rice and wheat crops throughout their physiological growth stages. Organic matter alone also increased the root CEC of all the varieties of wheat after tillering stage of plant growth. Application of N in soil significantly increased the root CEC of wheat varieties and some varieties of rice throughout the plant growth. Phosphorus and potassium had little effect. (Singh-Banaras Hindu University)

5081-A8, C2, E2
EFFECT OF LONG TERM APPLICATION OF P, K AND FARMYARD MANURE ON THE ZINC CONTENT OF SOIL

Department of Soils, Punjab Agricultural University, Ludhiana, Punjab, India
K. N. Sharma and O. P. Meelu
Journal of the Indian Society of Soil Science, V. 23, No. 1, p. 76-82, 1975. 3 tab., 17 ref.

Keywords: Land application, Phosphorus, Potassium, Zinc, Crop response, Soil chemistry

The effect of P, K and farmyard manure and three phases of manuring on the zinc content of soil, zinc concentration uptake by maize and wheat crops are reported. Available zinc status of the soil was significantly increased and decreased with farmyard manure and P applications, respectively. Application of K did not significantly affect the available zinc in soil. Similar effect of farmyard manure P and K was obtained on the total zinc content of the soil. The application of P, in general, reduced zinc concentration in both maize and wheat crops. Uptake of zinc by wheat increased with P application. But in maize the uptake was decreased at 60 kg P_2O_5/ha level in all the manuring phases, though the differences were not significant. (Sharma-Punjab Agricultural University)

5082-A8, C2, E2
EFFECT OF CONTINUOUS USE OF CHEMICAL FERTILISERS AND MANURES ON SOIL PHYSICAL AND CHEMICAL PROPERTIES

Agricultural Chemistry Section, Durgapura, Jaipur, Rajasthan, India
P. D. Gattani, S. V Jain, and S. P. Seth
Journal of Indian Society of Soil Science, V. 24, No. 3, p. 284-289, 1976. 4 tab., 14 ref.

Keywords: Fertilizers, Land application, Soil properties, Crop response

Continuous use of FYM helped in maintaining and improving physical properties and organic matter content of the soil but failed to give higher yields in a permanent manurial experiment. On the contrary, the nitrogenous fertiliser slightly deteriorated soil physical properties but gave higher yield due to higher availability of N. The role of phosphatic fertilizers in improving soil physical properties is commendable. It has been concluded that if N fertiliser is used in combination with P and K plus FYM higher yields can be obtained without causing any deterioration of soil physical properties. (Gattani-Agricultural Chemistry Section, Durgapura)

5083-A4, B1, C2
NON-POINT SOURCES OF WATER POLLUTION

Department of Agricultural Engineering, Virginia Polytechnic Institute and State University, Blacksburg, Virginia
E. C. Collins, Jr.
Non-point Sources of Water Pollution, Proceedings of a Southeastern Regional Conference, May 1-2, 1975, p. 101-113. 2 fig., 5 tab., 7 ref.

Keywords: Water pollution, Non-point pollution, Agricultural runoff, Livestock wastes, Poultry wastes, Pollutant sources, Land application, Economics

The degree of control required for non-point pollution from animal wastes should be based on the relative importance of the various non-point sources in specific locations and on what is technically and logically controllable. In many cases it appears that it may be difficult to distinguish between pollution from farm animal wastes and natural, or "background," levels of pollution. So, even if significant effort were extended to absolutely

eliminate pollution from farm animal wastes, little or no change may be noted in stream quality. In many cases it can be argued as to whether or not all non-point sources can be controlled or eliminated. If collection and treatment is anticipated, it should be remembered that the costs associated with conventional waste-treatment systems are prohibitive, especially when compared with the economics of land disposal and nutrient utilization of animal wastes. (Collins-Virginia Polytechnic Institute and State University)

5084-B1, C2, E3
112 MILLION TONS OF MANURE PRODUCED IN 1974: USDA

Anonymous
Feedstuffs, V. 50, No. 28, p. 13, July 10, 1978.

Keywords: Livestock wastes, Poultry wastes, Nitrogen, Phosphorus, Potassium, Nutrient recovery

The U.S. Department of Agriculture estimated the livestock and poultry manure produced in the United States in 1974 to be about 112 million tons (dry basis). About 47% was produced by beef cattle on pasture and range, 23% from dairy cattle and 30% by other livestock and poultry (hogs 12; feeder cattle 9; sheep 3; laying hens 3; broilers 2; and turkeys 1%). The estimated amount of recoverable manure in 1974 was about 52 million tons (dry basis) or about 52% of the total livestock and poultry manure. The total nitrogen in the manure voided by livestock and poultry in 1974 was about 4.1 million tons, with about 2.6 million tons remaining after storage and handling losses. About one-third of the nitrogen originally voided was potentially available for collection and use other than at the point collected. The potassium voided was an estimated 2.4 million tons. About 52% of the potassium was economically recoverable. The phosphorus initially voided, that remaining after losses in handling, and that available for recovery were an estimated 1.0, 1.0, 0.5 million tons, respectively. (Merryman-East Central)

5085-A8, B2, C2, E2
THE EFFECT OF APPLYING LARGE QUANTITIES OF SLURRY TO GRASSLAND

Bridgets, Trawscoed and Great House Experimental Husbandry Farms
H.T H. Cromack, N.G. Lawrence and P. Smith
Journal of British Grassland Society, V. 28, p. 183, 1973.

Keywords: Land application, Slurries, Dairy Wastes, Swine wastes, Crop response, Grass production, Potassium

For the past three years, the effect of applying large quantities of slurry to grassland has been investigated at three experimental husbandry farms. 20,000 to 78,500 gal/ac of 3.5-4.0% DM dairy cow slurry was applied at Bridgets with 29,000 to 116,500 gal/ac being applied at Trawscoed in 7-10 dressings to perennial ryegrass swards during the winter. The highest rate of slurry application at Bridgets produced a yield better than that from a well-fertilized control. At Trawscoed the application of more than 29,000 ga./ac depressed production as compared to the well-fertilized control. Pig slurry of 1.7-2.3% DM was applied at rates ranging from 22,500 to 90,500 gal/ac at Great House and from 55,000 to 219,000 gal/ac at Trawscoed to grassland in 6-12 dressings during the winter. The application of more than 154,000 gal/ac depressed annual grass production, but first-cut yields were depressed by lower rates at Great House. The application of both types of slurry greatly increased the K content of the herbage. The rates of slurry application which depressed production significantly reduced the percentage of sown species in the sward. Large quantities of cow and pig slurry can be disposed of on grassland without adversely affecting its production, but the efficiency of utilization of the nutrients applied is low. (Bates-East Central)

5086-B1, C3, F4
WORLDWIDE SURVEY AND COMPARISON OF ADULT PREDATOR AND SCAVENGER INSECT POPULATIONS ASSOCIATED WITH DOMESTIC ANIMAL MANURE WHERE LIVESTOCK IS ARTIFICIALLY CONGREGATED

E.F. Legner and G.S. Olton
Hilgardia, V. 40, No. 9, p. 225-265, 1970.

Keywords: Predators, Diptera, Flies, Livestock wastes, Poultry wastes, Confinement, California, Geographical regions

This paper reports on the survey of fauna in artificial accumulations of animal manure from various geographical areas around the world, including the southwestern United States. Tables and graphs are used extensively to compare species and their distribution. Collection sites in the areas studied were restricted to animal manure that accumulated in dairies, poultry houses, horse and hog pens, and the like, in which the muscoid species under consideration naturally breed. The sample sites were nontreated accumulations of hen, bovine, horse, and hog manure that supported eggs, larvae or pupae on one or more of the following fly species: *Musca domestica* (L.), *Stomoxys calcitrans* (L.), *Fannia canicularis* (L.), *F. femoralis Stein, F. scalaris* (F.), and species of *Muscina, Ophyra, Phormia, Sarcophaga, and Phaenicia*. The samples taken in areas outside California were not extensive enough to warrant a critical discussion of regional differences. The data do suggest, however, a great similarity of species in the Holarctic and Australian regions, and a corresponding dissimilarity of the Ethiopian and Neotropical regions. To successfully establish a species outside its area of origin, it would seem important to seek a climate similar to the one where the species was found. The effects of such predators on the dipterous species developing in animal manure cannot be judged merely by their existence at a breeding site, however. (Merryman-East Central)

5087-A8, E2
EFFECT OF FARMYARD MANURE (FYM) ON THE YIELD, CHEMICAL COMPOSITION AND CALCIUM AVAILABILITY FROM GYPSUM AND CALCIUM CARBONATE TO BARLEY IN SALINE-ALKALI SOIL

Department of Soils, Haryana Agricultural University, Hissar, India
P.R. Poonia and D.R. Bhumbla
Journal of the Indian Society of Soil Science, V. 22, No. 4, p. 371-374, 1974.

Keywords: Land application, Farm wastes, Saline-alkali soils, Gypsum, Calcium carbonate, Calcium availability, Crop response

A preliminary study was conducted to determine the effect of farmyard manure on the availability of Ca from gypsum and calcium carbonate in a saline-sodic soil, using tagged $^{45}CaSO_4$, $2H_2O$, and $^{45}CaCO_3$. Study results indicated that application of farmyard manure was not of much use in increasing the availability of Ca from calcium carbonate or gypsum in such soils. Its useful effects on plant growth were indirect, i.e. physical and nutritional (other than Ca). The contribution of Ca from calcium carbonate seemed of no practical significance, although gypsum was very promising. Application of farmyard manure in such soils could be of much use, if applied along with some soluble source of Ca. (Merryman-East Central)

5088-B2, C1, C2, C3, D3, E2
FARM WASTE MANAGEMENT -- PIGS: 1. BIOLOGICAL FILTRATION TOWER -- TERRINGTON EHF REPORT OF PLANT OPERATION 1973-1974.

ADAS, Terrington EHF
R.H. Jarvis, E.J. Mundy, A.W. Armsby, G.E. Jones, D.A. Joyce, L V. Vaidyanathan, C. Baskervilie, R S. Cartmell, H. Mann, K.B.C. Jones, C.G. Chumbley, R.T. Brown
Farm Waste Management -- Pigs: 1 Biological Filtration Tower -- Terrington EHF Report of Plant Operation 1973-1974, Ministry of Agriculture Fisheries and Food, ADAS, May, 1977, 36 p. 12 fig., 16 tab., 3 ref.

Keywords: Swine wastes, Waste treatment, Effluents, Separation techniques, Biological Filtration Tower, Land application, Waste composition

A treatment system for pig effluent was investigated at Terrington EHF, Kings Lynn, Norfolk, from April 1973 to September 1974. Undiluted effluent from just over 200 fattening pigs was separated into solid and liquid fractions by a mechanical separator. The solid fraction was a stackable fairly friable product suitable for land spreading. The liquid fraction was treated in a biological filter tower containing a plastic medium, and after this was held in a settling tank, with re-circulation of the liquid through the filter tower. Sludge was removed almost daily from the settling tank. The system as a whole appeared to oxidize about 60% of the applied BOD and 25% of the COD. The large volume of wet sludge removed from the settling tank presented problems of disposal similar to that of raw slurry and this aspect requires further investigation. Smell in the vicinity of the treatment plant was not a problem. In the form tested at Terrington the system would not be suitable for commercial use but the development of a technique for the further treatment of the sludge offers some promise. With this addition, the system might be acceptable for the treatment of pig waste where the availability of land for spreading

raw slurry is limited. (Jarvis-ADAS)

5089-A8, C2, E2, F1
THE EFFECTIVENESS OF LIQUID MANURE OF CATTLE AND PIGS WITH PLOUGHED - IN STRAW IN THE CROP ROTATION

Research Institutes for Crop Production, Institute for Plant Nutrition, Praha-Ruzyne
M. Skarda
Rostlinna Vyroba, V. 20, No. 8, p. 883-894, 1974. 2 fig., 4 tab., 14 ref.

Keywords: Cattle wastes, Swine wastes, Liquid wastes, Land application, Straw, Crop response, Economics, Waste components

In the years 1968-1972, in a crop rotation with 50% of cereals on gray-brown podzolic and brown forest soil, we proved that, as regards the effect on enriching of the soil with organic substances, on an increasing of the gross production, on the productivity of the supplied N, and on the economic effectiveness of costs, an average annual dose of 14-20 tons of liquid manure per hectare together with 13-16 tons ha^{-1} of ploughed-in straw can substitute 10-15 t ha^{-1} of manure if applied alone and with mineral fertilization. Compared with manure, liquid manure with straw increased gross production on gray-brown podzolic soil on an average by 2 percent, and on brown forest soil by 10 percent. Liquid manure with straw increases the effectiveness of mineral fertilizers up to a dose of 100 kg N + PK ha^{-1} on gray-brown podzolic soil and up to a dose os 65 kg N + PK ha^{-1} on brown forest soil. The applied doses of liquid manure with straw enriched the soil in the annual average by 2.4-3.2 t ha^{-1} (manure by 1.8-2.0 t ha^{-1}) or organic substances. (Skarda-Institute for Plant Nutrition)

5090-B2, D3, E3, F1
BIOCONVERSION OF AGRICULTURAL WASTES FOR POLLUTION CONTROL AND ENERGY CONSERVATION

W. Jewell, H. Davis, W. Gunkel, D. Lathwell, H. Martin, Jr., T. McCarty, G. Morris, D. Price, D. Williams
Final Report, TID-21764, Cornell University, Sept., 1976, 10 p.

Keywords: Recycling, Fermentation, Anaerobic, Gas production, Methane, Economics, Agricultural wastes, Dairy wastes, Cattle wastes

The combination of concerns for energy shortages and pollution control has renewed interest in the possibility of generating energy from organic wastes This report is a comprehensive study of the feasibility of generating a substitute natural gas on U.S. dairies (40 and 100 cows) and beef feedlots (1000 head) using the anaerobic fermentation process. The feasibility in technical, economic and practical terms are estimated. Although anaerobic fermentation of wastes has been in use for over a hundred years, little advance in the understanding of the application to agricultural wastes has occurred since 1935. It is estimated that this clean renewable source of energy could supply a large fraction of the energy used in farming operations and that if marginal lands were used to produce biomass for fuels, the entire U.S. energy demand could be met. Excluding energy use in manufacturing of equipment and farm chemicals, the total energy on 40 and 100 cow dairies, and 1000 head feedlots were estimated to be $164x10^6$, and $307x10^6$, and $670x10^6$, kcal per year, respectively. The estimated maximum annual methane energy that could be generated on these operations were estimated as $216x10^6$, $473x10^6$, and $2280x10^6$ kcal, respectively. Thus, a dairy farm in northern New York could produce more energy than it consumes, and a feedlot could produce more than 3 times the quantity consumed. Additional concerns such as timing and type of energy required limit the replaceable fraction to about one-half the total on the dairy and only one-third on the feedlot. The estimated costs of generating methane on 40 and 100 cow dairies and on a 1000 head beef feedlot were $22.80, $13.40, and $4.50 per 10^6 kcal. Unfortunately, if only one-half the gas can be utilized, half will be wasted and production costs will double. Detailed analyses of the three operations estimated that the actual costs for utilization would increase to $80, $39, and $11 per 10^6 kcal for specific operations, respectively. The combined benefits of the energy, nutrient conservation and odor control would offset the cost on the dairies, and potentially produce an income on the feedlots. In smaller operations using liquid manure management where odor control and nutrient conservation are of concern, anaerobic fermentation may produce energy at a cost competitive with existing alternative energy sources. Farms with more than 100 cows can begin to consider the technology as an income producing operation. It is therefore, concluded that anaerobic fermentation of agricultural wastes has significant potential and should receive increased attention. (Jewell)

5091-A2, B2, C2, D1, D3, F1
SERPENTINE SYSTEM IS THE SOLUTION

S. Aldrich
Feedlot Management, V. 20, No. 6, p. 20, 22-23, June, 1978. 5 fig.

Keywords: Serpentine waterway, Feedlot runoff, Waste treatment, Costs

Research was conducted by the University of Nebraska and USDA on the effectiveness of serpentine or switch-back waterways to control runoff from feedlots. The experimental waterway was constructed on Harland Krambeck's feedlot near Gretna, Nebraska. It is 2600 ft. long and covers about 3 acres. There are seven hairpen turns on a 6% slope. The flat bottom of the channel is 14½ ft. wide and 1½ ft. deep at the top of the slope, spreading to 27 ft. wide at the bottom of the hill. Smooth brome and alfalfa are seeded for rowcrop production using eight, 40 in. rows on the waterway. Debris traps placed below the feedlot keep solids from entering the channel. Research findings show that 90% of the feedlot runoff is infiltrated into the waterway. The remaining 10% is diluted, filtered and aerated so the nitrogen and phosphorus contents are below that of normal field runoff. Also researchers found that it takes 5 to 6 hours after a major storm for runoff to chase around the full length of the waterway. E.A. Olson, extension agricultural engineer at the University of Nebraska, says that the serpentine waterways meet all federal and Nebraska state pollution control requirements. They may also be cost-shared when ASCS funds are available. (Bates-East Central)

5092-A4, B1, F1, F2
FEDERAL FUNDS AVAILABLE TO SOLVE WATER POLLUTION

Anonymous
Oklahoma Rural News, V. 28, No. 11, p. 9, June, 1978

Keywords: Water pollution, Legal aspects, Cost sharing, Rural Clean Water Program, Environmental Protection Agency, Department of Agriculture

Water pollution problems caused by agricultural activities, such as soil erosion, runoff of pesticides and fertilizers, and the contamination of waterways by animal wastes can now be solved by many farmers with federal cost-sharing assistance. An agreement on how to set up the new Rural Clean Water Program has been reached by the Environmental Protection Agency and the Department of Agriculture. Congress has authorized $200 million in fiscal 1979 and $400 million in FY 1980 for cost-sharing funds under the program. The Secretary of Agriculture has been authorized to enter into long-term contracts (between 5 and 10 years) with rural landowners and operators for the purpose of installing and maintaining best management practices to control agricultural "non-profit" source pollution and to improve water quality. This agreement on the essential elements of the Rural Clean Water Programs shows that environmental and agricultural interests are compatible, according to Thomas Jorling, EPA's Assistant Administrator for Water and Hazardous Materials and one of the agreement's signers on April 25, 1978. (Bates-East Central)

5093-A2, B2
MODEL TO EVALUATE FEEDLOT RUNOFF CONTROL SYSTEMS

Department of Civil Engineering, Kansas State University, Manhattan, Kansas
J.J. Zovne, T.A. Bean, J.K. Koelliker, and J.A. Anschutz
Journal of the Irrigation and Drainage Division, ASCE, V 103, No. IR1, p. 79-92, March, 1977. 2 fig., 1 tab., 35 ref.

Keywords: Model studies, Feedlot runoff

A computer simulation model has been developed to evaluate the performance of feedlot runoff control facilities on a site specific basis. The model not only examines performance for single point rainfalls, but evaluates total performance through extended wet periods. The model meets the following objectives: (1) It can simulate the percent of runoff controlled over an extended period of time using historical daily rainfall and temperature records which are widely available throughout the United States. (2) It can appraise the performance of control facilities when waste-water is disposed on land to irrigate feed crops. (3) It can be used to determine the feasibility of employing evaporation systems to control wastewater. (4) It can be transferred to any location in the United States with a minimum effort expended to obtain model soil and crop constants. (5) It is an efficient computational algorithm written in Fortran IV, which requires a relatively small amount of storage and computer time. The maximum core storage is 48k-bytes. Computer charges vary greatly relative to the system but by any standard of comparison, a cost of $6 for a 25-yr daily

simulation is minimal. Although the model has been programmed to be easily extendable to other livestock producing areas of the country, the adaptation and calibration process for these areas is not yet complete. Complete results and guidelines for all major livestock producing areas of the United States will be published at a later date. (Zovne-Kansas State University)

5094-A5, B1, C2
NATURAL SOIL NITRATE: THE CAUSE OF THE NITRATE CONTAMINATION OF GROUND WATER IN RUNNELS COUNTY, TEXAS

Bureau of Economic Geology, The University of Texas at Austin, Austin, Texas 78712
C.W. Kreitler and D.C. Jones
Ground Water, V. 13, No. 1, p. 53-62, Jan.-Feb., 1975. 11 fig., 1 tab., 13 ref.

Keywords: Groundwater pollution, Nitrates, Leaching, Pollutant sources

The ground waters of Runnels County, Texas, are highly contaminated with nitrate. The average nitrate concentration of 230 water samples was 250 mg/1 NO_3 . The natural variations of the stable nitrogen isotopes N^{14} and N^{15} identified natural soil nitrate as the predominant source. Nitrate from animal wastes was of minor importance. The 8 N^{15} range of natural soil nitrate was + 2 to + 8 0/00, whereas the 8 N^{15} range of animal waste nitrate was + 10 to + 20 0/00. (Atmospheric nitrogen was used as a standard for mass spectrometric analysis. Experimental error for sample preparation and isotopic analysis was 0/100.) More than 66 percent of the ground-water nitrates analyzed were in the 8 N^{15} range of natural soil nitrates. Dryland farming since 1900 has caused the oxidation of the organic nitrogen in the soil to nitrate. Minimal fertilizer has been used because of the lack of suitable water for irrigation. During the period 1900-1950, nitrate was leached below the root zone but not to the water table. Extensive terracing after the drought in the early 1950's has raised the water table approximately 6 meters and has leached the nitrate into the ground water. Tritium dates indicate that the ground water is less than 20 years old. (Kreitler-University of Texas at Austin)

5095-A11, B1
FRACTIONATION OF NITROGEN ISOPTOPES BY ANIMALS: A FURTHER COMPLICATION TO THE USE OF VARIATIONS IN THE NATURAL ABUNDANCE OF ^{15}N FOR TRACER STUDIES

University of Waikato, Hamilton, New Zealand
K.W. Steele and R.M. Daniel
Journal of Agricultural Science, V. 90, No. 1, p. 7-9, 1978. 4 tab., 16 ref.

Keywords: Cattle, Diets. Nitrogen isotopes, Fractionation

A study of the fractionation of nitrogen isotopes in the diet by cattle was conducted in order to determine the effect of animals on the isotopic composition of nitrogen. A selection of animals housed in indoor stalls was fed on a fixed diet for 21 days with complete collection of urine, feces, and milk over the final 7 days. Blood samples were also collected at the conclusion of the 7 day period. Analysis revealed that, compared with the diet, urine had a lower ratio of ^{15}N to ^{14}N, but feces, blood, and milk all had a higher ratio. It was concluded that rumen microflora are unlikely to be the sole source of the observed fractionation since preliminary evidence shows a similar fractionation in humans and pigs. Also the use of natural ^{15}N as a tracer in grazed ecosystems is more complicated than was first thought. (Bates-East Central)

5096-A11, B3, C2, E3
DRIED POULTRY MANURE AS A SOURCE OF PHOSPHORUS FOR SHEEP

Moredun Research Institute, Edinburgh EH 17 7JH, Scotland
A.C. Field, C.S. Munro and N.F. Suttle
Journal of Agricultural Science, V. 89, p. 599-604, Dec., 1977. 1 fig., 4 tab., 18 ref.

Keywords: Refeeding, Dried poultry wastes, Sheep, Performance, Phosphorus, Animal Health

This experiment was conducted to measure the absorption and utilization of the P in battery and broiler waste by growing lambs and to attempt to assess the risk of urolithiasis in lambs consuming diets high in poultry waste. Groups of six, 8-week-old Scottish Blackface lambs were given one of eight experimental diets containing barley and either 15, 30, 45, or 60 % of dried broiler or battery waste. Balance trials with ^{32}P were conducted on a sample of the female lambs from each dietary group after 12 weeks. The phosphorus intakes ranged from 4.6 to 15.9g/day. The proportion of dietary P absorbed by the lambs (A) ranged from 0.49 to 0.90 and was inversely related to the dietary intake of P (I). The relationship was A = 0.893-0.0219I. All lambs were in positive P balance (0.24-2.81g/day), but only the bones from the lambs consuming the diets containing 45 and 60% broiler waste were not osteoporotic. The absorbability of P in poultry waste was as good as that of inorganic P supplements commonly used in ruminant diets. All lambs absorbed more P than they retained. Uroliths of the magnesium ammonium phosphate type were found at post-mortems, mainly in diets containing 15% poultry waste, but no clinical cases of urolithiasis were seen. (Bates-East Central)

5097-B1, D3, E3
ANAEROBIC PROCESSES INCLUDING METHANE FROM FARM WASTES

The Rowett Research Institute, Bucksburn, Aberdeen AB2 9SB, Scotland
P. Hobson
Proceedings Society for General Microbiology, V. 111, p. 116, 1976.

Keywords: Anaerobic digestion, Farm wastes, Methane

Digestion has been used for many years as a sludge-treatment system and a source of power in domestic sewage works. Anaerobic digestion offers a means of reducing pollution of thick farm wastes with the possibility of energy recovery. Pilot-plant experiments have shown digestion to be possible and potentially useful, and large scale operations have been shown to be feasible. The overall possibilities of digestion in treatment of farm wastes depend , however, not on the microbiology but on many other factors, such as climatic conditions, labor and monetary costs, size of installation, power inputs, practical problems of handling thick sludges and so on. (Bates-East Central)

5098-A4, B1, F2
EPA/SBA WATER POLLUTION ABATEMENT LOANS FOR AGRIBUSINESS

J.M. Sweeten
Federal Register, Feb. 8, 1977.

Keywords: Pollution control, Water pollution abatement loans, Environmental Protection Agency

This report outlines requirements for EPA/SBA Water Pollution Abatement Loans for Agribusiness compiled by John Sweeten from the *Federal Register*. Operations that qualify for the loans are: (A) custom feedlots with less than $10 million annual sales; (B) farms or non-custom feeding operations with less than $275,000 annual sales; (C) processing plants with less than $2 million annual sales. Also in the report are items that must be included in the submission of application to the EPA. The EPA will then issue a "Written Statement" of eligibility or reasons for non-issuance within 45 working days. Exclusion to the EPA approval statements are also outlined. (Bates-East Central)

5099-B2, B3, D1, E3
RESEARCH DAIRY STUDIES CONFINEMENT & WASTE REUSE

University of Georgia
J.C. Johnson, Jr.
Dairy Herd Management, V. 14, No. 5, p. 68-69, April 1977. 1 fig.

Keywords: Dairy wastes, Slurries, Separation techniques, Recycling, Bedding, Irrigation

An experimental dairy is described in which cattle have been housed, fed, and milked for 1 year. The most unusual feature of the dairy is the handling and recycling of waste. The parlor, feeding, and housing areas are constructed on a sloping site with sloping floors which are flushed clean periodically. Waste water, carrying with it urine and feces, is collected in a tank pit where a chopper agitator centrifugal pump pumps the waste slurry over a sieve. Screened solids are odorless and are used for bedding. Liquid waste separated from the solids is pumped daily through underground irrigation lines to cropland. The facility houses 183 animals in close confinement. After a hot summer and a very cold winter, this facility has shown that it can maintain dairy cattle in close confinement and can control and recycle resultant waste. (Solid Waste Information Retrieval System)

5100-B3, C2, D3, E3
RECYCLING SWINE WASTE IN A GROWING-FINISHING RATION

University of Kentucky, Lexington, Kentucky 40506
D.G. Overhults, I.J. Ross, G.L. Cromwell, and J.L. Taraba
Paper 78-4007, American Society of Agricultural Engineers, 1978 Annual Meeting, Utah State University, June 27-30, 1978, 11 p. 3 fig., 4 tab., 8 ref.

Keywords: Refeeding, Swine wastes, Swine, Ensiling, Performance, Ash, Nitrogen, Ether extract, Waste component

A total of 24 pigs having initial weights ranging from 25 to 35 kg. (55 to 77 lb.) were continuously fed rations containing their own feces mixed with a basic corn-soybean meal ration. Both unprocessed and anaerobically fermented (ensiled) manure-feed mixtures were used with the feces comprising 15-18 percent of the total ration dry matter. A control group containing a total of 11 pigs was fed the basic corn-soybean meal ration with no manure added. Animal feed consumption and weight gain data were obtained. Samples of feed mixtures and manures were collected and analyzed to determine if chemical characteristics of manures and/or feeds were altered by recycling feces in the rations. Potential problems in continuous manure recycling research were identified. Although the data would not generally support precise cause and effect relationships, some conclusions from this study may be noted as follows: (1) Growing-finishing pigs readily accepted both an unprocessed and a fermented feed mixture containing their own feces; (2) Average daily gains for manure fed pigs were lower than for pigs receiving a basic corn-soybean meal ration; (3) The amount of basic corn-soybean meal ration required to produce a kilogram (lb.) of animal weight gain was substantially less for pigs fed the recycled manure rations; (4) Better feed efficiencies were achieved from feeding the anaerobically fermented mixture than from feeding the unprocessed mixture; (5) Recycled manure-feed mixtures contained higher ash contents than the control rations, but continuous recycling did not cause manure ash contents to increase; and (6) The anaerobic fermentations caused only a slight loss of nitrogen and an increase in ether extract. It would appear from this study that both the unprocessed and fermented recycled manure rations offer some advantage in feed efficiency but possibly at the expense of lower daily gains. Further investigation of the daily gain phenomena is needed. Of particular interest would be to determine if depressed daily gains were actually due to a lower total dry matter intake or to some other cause. The large feed efficiency advantage for the fermented treatment certainly suggests that further investigation of the fermentation itself would be useful. (Overhults-University of Kentucky)

5101-B2, B3, C1, C2, D1, D3, E3
ANAEROBIC FERMENTATION OF MANURE INTO SINGLE CELL PROTEIN

Colorado State University, Fort Collins, Colorado
J. Wallick, J.M. Harper, R.P. Tengerdy and V.G. Murphy
Paper No. 78-4009, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 17p. 3 fig., 7 tab., 20 ref.

Keywords: Refeeding, Feedlot wastes, Fractionation, Fermentation, Hydrolysis, Waste components

The need to begin a more rational approach to beef cattle feeding and waste disposal is evidenced by the presence of huge piles of manure at nearly every major feedlot. Refeeding is a possible solution to the problem, but FLW must be processed to reach its full potential as a feed. To gain maximum feed efficiency from the protein in FLW, a source of available carbohydrates is needed. Our work indicates that the fiber portion of the manure can be separated and partially hydrolyzed with steam at 170-210° C to increase its susceptibility to microbial enzymes. The concept of treating unfractionated FLW at high temperatures seems unrealistic because of the well known reactions of reducing sugars with amino compounds to form melanins or caramelization products, which are generally non-fermentable. Future experiments will determine whether it is preferable to ferment the treated fibers along with the soluble decomposition products or to separate the two. In the latter event, the soluble material could be routed to the energy deficient fermentation of the high protein filtrate obtained in the initial fractionation of the whole FLW. This seems attractive because results to date indicate that the soluble material can be fermented by acid forming bacteria and that removing it from the fibers might enhance their potential for gas production. (Wallick-Colorado State University)

5102-B1, C2, E3, F4
ESTIMATED INVENTORY OF LIVESTOCK AND POULTRY MANURE RESOURCES IN THE UNITED STATES

Economics, Statistics, and Cooperatives Service--USDA, Washington, D. C.
D. L. Van Dyne and C. B. Gilbertson
Paper No. 78-2057, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 12 p. 1 fig., 3 tab., 15 ref.

Keywords: Livestock wastes, Poultry wastes, Recycling, Fertilizers, Feeds, Energy, Waste storage, Waste handling, Nitrogen, Phosphorus, Potassium

Livestock and poultry manure is a valuable resource which may be effectively used to supplement or replace inorganic fertilizer, livestock feed or for energy production. Ineffective utilization may result in a wasted resource or pollution from improper storage and disposal. About 101 million metric tons of manure (dry basis) were estimated voided by livestock and poultry in the U.S. in 1974. About 47% was produced by beef cattle on range, 23 percent from dairy cattle, and 12 percent from hogs. The estimated amounts of nitrogen, phosphorus, and potassium voided with the manure are 3.7, 0.9, and 2.2 million metric tons, respectively. Significant changes often occur in the amounts of manure and nutrients after voiding when considering different lengths of storage time and different types of waste handling systems. The quantity of manure in 1974 decreased about 11 percent to 90 million metric tons resulting from these losses. Nitrogen decreased to 2.4 million tons. Approximately half the manure was estimated to have been produced in areas where economic collection was feasible. The remainder was voided by animals on range and pastureland. In 2,260 counties of the United States in 1974, at least 50 percent of the manure was produced by one commodity. In almost 70 percent of those counties, beef cattle on pasture or range produced the majority of the manure. Considering only the manure which is economically recoverable, in about 56 percent of the 2,168 counties dairy cattle was the major contributor followed by feeder cattle, hogs, and broilers in a decreasing order of importance. Estimated concentrations of manure on available cropland were highest in the New England region followed by Middle Atlantic, South Atlantic, and Pacific regions. The number of livestock and poultry could increase from one-third to about five times, depending on geographic region, and still not exceed the minimum agronomic loading rate. (Van Dyne-Utah State University)

5103-B2, C1, E2
CONTOUR FURROW IRRIGATION WITH LIQUID MANURE USING "MICROTUBING" FOR FLOW CONTROL

Department of Agricultural Engineering, The Pennsylvania State University, University Park, Pennsylvania 16802
W. R. DeTar
Paper No. 78-2027, American Society of Agricultural Engineers, 1978 Annual Meeting, Utah State University, June 27-30, 1978, 45 p. 15 fig., 9 tab., 4 ref.

Keywords: Trickle-furrow irrigation, Liquid wastes, Infiltration rate, Microtubing, Irrigation design, Equations, Friction loss

The trickle-furrow concept is introduced. The low infiltration rate of dilute liquid manure makes possible 100' lengths of run with only 9.3 gpm/furrow. Furrows can run 8 hrs/set. Proposed is a solid-set arrangement of 1000' of corrugated plastic tubing laterals descending 5-10% slopes with microtubing outlets at each furrow. Field experiment yields rate-of-advance curves. A prediction equation is given for length of run. Friction loss data are presented. Work is still in progress. (DeTar-Pennsylvania State University)

5104-B2
HIGH VOLUME FLUSH DEVICES FOR ANIMAL WASTE MANAGEMENT

Agricultural Engineering Associates, Inc.
J. A. George
Paper No. 78-4016, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 11 p. 2 fig., 5 ref.

Keywords: Flushing, Design, Water use efficiency

Although insufficient information and techniques have been developed to characterize exactly the most hydraulically efficient way to flush individual gutters, the following observations are pertinent. (1) Where applicable and adequate to do the job, tipping style tanks offer the most water efficient method of cleaning gutters since they impart a high energy level to the water which possesses a very high solids carrying capability for short lengths of gutters. This approach becomes limited, however, for longer gutters when the total quantity of water which can be held in a

tip tank becomes limiting. (2) For longer gutters and wider gutters where larger quantities of water are required to maintain a progressive wave front, siphon type tanks offer a viable alternative. The flush capabilities of these tanks are limited substantially only by the precision of our design capabilities. Water use efficiency is effected both by design and flush frequency or operation. Within reason the flatter the slope the easier it is to maintain reasonable flow depth and therefore channeling around waste build ups. Efficiency, however, can be enhanced by dividing long and wide channels, especially if the gutters are serving farrowing crates or farrowing stalls where the manure typically ends up in neat rows of plies down the gutter. (3) The current interest in zero slope gutters with a residual pool of water is predicated on two concepts. One being the ease of construction since no slope is provided. The other being the conceptual ease of flushing since the waste is never allowed to dry out. The residual pool of water, however, increases to some extent impediment to the progression of a flush wave and the lack of slope does not enhance the velocity of a hydraulic gradiant flow. To what extent the additional ease of construction and additional flushing ease due to maintaining the waste in a wet condition over-rides the hydraulic inefficiency of these type gutters is yet to be determined. (George-Utah State University)

5105-A8, C2
MODELING NITROGEN MOVEMENT IN AGRICULTURAL WATERSHEDS

Agricultural Engineering Department, University of Florida, Gainesville, Florida
K. L. Campbell and G. Sinai
Paper No. 78-2071, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 15 p. 1 fig., 22 ref.

Keywords: Model studies, Watershed Hydrology, Agricultural watersheds, Nitrogen movement

Techniques were developed to simulate nitrogen movement through agricultural watersheds. The USDAHS-74 model of watershed hydrology has several advantages that make it a good choice to provide the hydrologic information required to model nitrogen movement. Calibration of the model to the research watersheds was adequate, but not as good as expected. This was in part the result of the poor quality of some of the rainfall input data during the calibration period. The model should be modified in its sub-surface and return flow components to better stimulate the conditions of high lateral return flows with a shallow watertable, as encountered in this study. The ACTMO nitrate model provides a good framework for development of a more complete model of nitrogen transformations and movement. Simulating nitrogen transformations and movement through a watershed is a very difficult and complex problem. This nitrate model needs to be modified to include other nitrogen forms, Precipitation and organic matter decomposition are important nitrogen resources and denitrification is an important nitrogen sink. These factors need to be included if the model is to simulate conditions similar to those encountered in this study. Simulation models are an effective tool to assist in gaining a better understanding of the complex processes and interactions that occur in a watershed system. They can help in identifying which processes are most important in controlling nitrogen movement within a watershed. (Campbell-University of Florida)

5106-A3, C2, E2
WINTER AND SPRING RUNOFF FROM MANURE APPLICATION PLOTS

Agricultural Engineering Department, University of Minnesota, St. Paul, Minnesota
D. B. Thompson, T. L. Loudon, and J. B. Gerrish
Paper No. 78-2032, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 18 p. 3 fig., 7 tab., 11 ref.

Keywords: Land application, Agricultural runoff, Buffer strips, Water quality, Nutrients, Chemical oxygen demand, Ammonia, Nitrates, Phosphorus, Total Kjeldahl nitrogen

Literature is reviewed concerning the influence of buffer strips on runoff water quality where manure is applied to frozen or snow-covered soil. A two-year plot study was conducted in which dairy manure was spread on top of snow-covered, frozen Hillsdale sandy loam soil with a four-percent slope. Twelve plots were constructed on a south-facing slope. Three surface conditions were studied, each surface condition having two manure-treated and two control plots totaling four plots for each surface cover. A grass surface was selected to simulate effects of winter application on surfaces with continuous vegetative cover. Field corn was planted across the slope in preparation for the other two surface covers. Manure was applied to corn ground in the spring prior to tillage and planting at 34 m Tons/ha. In the fall, the corn was harvested for silage leaving about 20 cm of stubble. Four plots were left in this condition. The third surface condition was created by discing the remaining corn stubble. Study conditions led to the following conclusions: (1) Nutrient concentrations decrease as runoff water moves downslope from a manured area. (2) Nutrient concentrations contained in runoff leaving a manured area are greatly reduced as the water moves across a 12-meter buffer strip. In this study, this was equivalent to a buffer strip equal to one-half of the length of the manured area. The extent to which the buffer area would have to be lengthened for longer manured areas is uncertain. (3) On a sandy loam soil with a 4-percent slope, a buffer zone 36 meters long reduced nutrient concentrations in runoff from manured plots to levels equal to those in unmanured plot runoff. (4) The overall average nutrient concentration reduction for a buffer 12 meters long was 62 percent compared with a 73-percent overall reduction after a 36-meter buffer zone if background concentrations are not subtracted. (5) With background concentrations subtracted, buffer zones removed an average of 82 and 97 percent of the manure-contributed nutrients from winter runoff with a 12- and 36-meter buffer zone length. (6) Runoff volumes from manured areas have been shown to be less than from unmanured areas by past researchers. Based on the concentrations reported in this study and runoff volumes from manured areas less than, or equal to, those from unmanured areas, nutrient loading rates in winter runoff from manured areas followed by adequate buffer zones should not exceed those from unmanured areas. (7) The quality of winter runoff from unmanured areas was essentially the same for the three surface conditions observed in this study. (Merryman-East Central)

5107-A3, B1, C1, C2, C3, E2
BMP DEVELOPMENT FOR MANURE IN NEW YORK STATE

Department of Agricultural Engineering, Cornell University, Ithaca, New York
M. F. Walter, P. D. Robillard, R. Gilmour, and R. W. Hexem
Paper No. 78-2033, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 31 p. 6 fig., 8 tab., 21 ref.

Keywords: Federal Water Pollution Control Act Amendments, Nonpoint sources, Management, Land application, Dairy wastes, Waste properties

Current 208 planning efforts require control of pollutants generated from nonpoint agricultural sources. The availability, transport and yield of pollutants from cropland are usually unknown or cannot be accurately quantified. As a first step in reducing identified water quality degradation associated with agricultural activities effective, low cost, management intensive practices should be emphasized. In many instances good farm management practices will reduce the potential transport of crop nutrients, pesticides and manure to streams. Non structural manure management systems are good examples of such practices. By identifying fields where nutrient loading to streams is highest, practical spreading schedules can be developed which increase nutrient utilization by plants and reduce nutrient export to streams. The criteria used in ranking fields varies according to the soil adsorption characteristics of the pollutant in question. However, common parameters used in estimating gross soil erosion or overload flow are available to make such calculations. (Walter-Cornell)

5108-A7, B1
DUST REDUCTION IN THE BIRD RECEIVING AREA OF A POULTRY PROCESSING PLANT

Agricultural Engineering Department, Virginia Polytechnic Institute and State University, Blacksburg, Virginia
H. A. Hughes and R.L. Wesley
Paper No. 78-3016, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 10 p. 6 fig., 1 tab.

Keywords: Air pollution, Poultry processing plant, Dust control

Dust in the live handling area of a poultry processing plant comes from two primary sources: (1) the bird's feathers, skin and feed, and (2) the accumulated litter, fecal matter, feathers, and other materials typically found in the bottom of the coops used to transport the birds from the farm to the plant. This paper describes efforts made to devise precedures and equipment to produce a clean, comfortable environment for workers in the live handling area. Specific objectives were: (1) Examine methods of eliminating materials which contribute to the ambient dust load at a point ahead of the hanging area. (2) Evaluate one or more methods for collecting dust in the handling area, and (3) Develop a technique and equipment to ensure that a continuous supply of clean uncontaminated air is provided to the workers. Equipment arrangements for reducing dust are described. Reduction of material load, humidity control and controlled air flow were used as control measures. A reduction of 66% was achieved in one case. (Merryman-East Central)

5109-B2, B4, C1, C2, E3
EARTHEN PITS FOR MANURE

AND RECYCLED FLUSH-WATER STORAGE

Science & Education Administration, USDA, Lincoln, Nebraska
C. B. Gilbertson, J. A. Nienaber, and J. R. Ellis
Paper No. 78-4012, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 12 p. 5 fig., 1 tab., 10 ref.

Keywords: Manure pits, Waste storage, Recycling, Flushing, Waste water reuse, Land spreading, Cattle wastes, Waste composition

A study was conducted to determine the feasibility of using an earthen pit as a recyle flush-water storage system for a 1100-head-housed beef cattle feedlot. The earthen pit (8.3 m deep), with a volume of 11.7 m^3 /animal was operated successfully for 4 years. However, settled solids accumulation would prevent indefinite operation without cleanout. Solids (floating and settled) accumulated in the pit at an average rate of 1.56 m^3 /animal year, or 13.6 percent of the design volume from January, 1972 through March, 1975. It was estimated that if the lot were operated at full capacity, settled and floating solids would accumulate at 16 percent/year of the design volume. From January, 1972 through March, 1975, about 20 percent of the manure was pumped to field disposal. The remaining solids were contained in the floating mat (14 percent), in settled solids (46 percent), suspended in the effluent (9 percent), or lost through undetermined processes. Odor production was not an apparent problem when there was a floating manure mat, which seemed to be a major advantage of this system. The storage pit contained considerable quantities of the fertilizer elements, N, and P. An estimated 1,461 kg of N and 298 kg of P were contained in the effluent pumped from the pit to the disposal field. As of March, 1975, an additional 13,059 kg of N was estimated to be contained in the floating manure mat and settled solids. The low volume earthen pit has potential application for manure and recycled flush water storage provided that settled solids are removed at frequent intervals. Partial cost recovery of maintenance may be possible by utilizing the settled solids as fertilizer for crop use and recycling flush water in geographic locations where water supply is limited. (Merryman-East Central)

5110-B2, B4, E2
WASTE HANDLING ALTERNATIVES FOR FARROWING UNITS

Agricultural Engineering Department, University of Minnesota, St. Paul, Minnesota
J. A. Moore and L. D Jacobson
Paper No. 78-4013, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 15 p. 3 tab.

Keywords: Swine wastes, Waste storage, Liquid wastes, Odor, Land application, Labor

As new swine farrowing units are built or older units remodeled, the waste handling system is one of the very important factors in the operation. Eighteen farmsteads were visited and the many aspects of the waste handling systems studied. For purposes of this paper, the farrowing units are divided by storage facilities into three groups. The "no storage" units either mechanically or manually removed all the the waste from the building and stored, treated and/or disposed of it at some other location. The "all storage" group were primarily deep-pit operations. The third group had "partial storage" within the unit and intermittent removal. The "no storage" units used more daily labor, but this may be due to operator preference. These units were also the most odor-free. The "partial storage" farrowed and weaned the most pigs, with the "all storage" being lowest. There appears to be no advantage of one group over another relative to waste handling in the farrowing buildings. (Moore-University of Minnesota)

5111-B2, C1, D3, E3
METHANE PRODUCTION FROM ANAEROBIC FERMENTATION OF BEEF MANURE

Civil Engineering Department, School of Engineering and Technology, Tennessee State University, Nashville, Tennessee 37203
F. D. Shields and G. N. Tragitt
Paper No. 78-4010, American Scoiety of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 15 p. 5 fig., 4 tab., 14 ref.

Keywords: Cattle wastes, Recycling, Fermentation, Methane, Design

Two 7570-liter steel tanks were used as anaerobic fermentation reactors. Manure from a concrete-floor beef feedlot was used as a substrate. Gas production, temperature, and influent and effluent total and volatile solids were monitored for five different temperature-detention time concentrations. Loading rates ranged from 5.6 to 19.2 kgVS/m^3 day and gas production ranged from 1.25 to 3.6 m^3 gas/m^3 reaction volume per day. Methane production was hindered at the higher loadings. (Shields-Tennessee State University)

5112-B2, C1, C2, E2
DAIRY SHED EFFLUENT TREATMENT SYSTEMS IN NEW ZEALAND

Agricultural Engineering Department, Massey University, New Zealand
D. J. Warburton, R. M. Clarke, and H. Melcer
Paper No. 78-1017, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978. 18 p. 6 fig., 5 tab., 26 ref.

Keywords: Dairy wastes, Lagoons, New Zealand, Waste properties, Design, Irrigation equipment, Land application

The effluent discharge from New Zealand dairy sheds contains 0.8%TS, 1500 mg/1 BOD 210 mg/1 TN and 35 mg/1 TP. The large volume of dilution water used to attain these levels results in discharges in excess of 70 1/cow-d. The diluted effluent is applied to the land through spray irrigation equipment. The volumes involved make hydraulic application rates, not N levels, the limiting criteria and this reduces the potential fertilizer returns. Anaerobic/aerobic lagoons have gained in popularity, but the need to control discharges and minimize the land areas required has placed limitations on their use. Development of improved equipment designs for effluent spray disposal to land led to the use of bar screens and the development of a double sided impeller which reduced the maintenance requirements of centrifugal pumps. Investigation of anaerobic/aerobic treatment systems showed that lagoons could be loaded to 0.3 kg BOD/m^3 and 1.36 kg TS/m^3 without reducing the quality of the outlet. The main design criteria was considered to be TS loading rate. The sludge accumulation rate was 0.005 m^3 /kg TS-input. Aeration, using stone media trickling filters loaded at 0.18 kg BOD/m^3, was satisfactory. The combined anaerobic/aerobic treatment system provided approximately 90% BOD and TS removal. Total N and P were decreased by 49% and 32% respectvely, but the NO_3 -N rose 15-fold and the DIP rose 4-fold, during the aerobic phase. Possible future developments in dairy waste management are discussed. (Warburton-Massey University)

5113-A2, A4, C2
METHODOLOGIES AND PRELIMINARY RESULTS FOR EVALUATING SWINE DRYLOT RUNOFF IMPACT ON COASTAL PLAIN STREAMS

Department of Biological and Agricultural Engineering, North Carolina State University, Raleigh, North Carolina 27650
J. C. Barker, F.J. Humenik, M.R. Overcash, and S.W. Tedder
Paper No. 78-2048, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 23 p. 3 fig., 6 tab., 12 ref.

Keywords: Swine wastes, Feedlot runoff, Water pollution, Sampling methods, Chemical properties, Chemical oxygen demand, Phosphorus, Nitrogen, Chloride

A joint study was undertaken by educational and regulatory agencies to determine the impact of runoff from swine drylots on characteristic deep sands on the Coastal Plain receiving stream quality. Low flow and rainfall runoff samples were collected at sites above, adjacent to, and below the drylots for chemical constituent determinations. Flow, in-stream dissolved oxygen and biological surveys of the stream flora and fauna were also determined. Sampling methodologies are discussed and preliminary results presented indicate minimal impact on stream quality. (Barker-North Carolina University)

5114-A2, B2, E2, F1
OPTIMIZATION OF RUNOFF DETENTION FOR NONPOINT POLLUTION CONTROL

Agricultural Engineering Department, University of Florida, Gainesville, Florida
L B. Baldwin
Paper No. 78-2049, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 13 p. 1 fig., 3 tab., 7 ref.

Keywords: Nonpoint sources, Runoff control, Model studies, Wetland detention, Grazing, Florida, Economics

Interest in the utilization of wetlands to capture nutrients in agricultural drainage has

led to proposals that beef ranches in high water table soils in Florida preserve native wetland vegetation in lieu of planting improved pastures. While the effectiveness of wetland nutrient capture is not known, the economic impact of the proposed practice on ranching can be assessed. Linear programming has been used to optimize income under requirements for runoff detention. (Baldwin-University of Florida)

5115-A3, B2, C1, C2, C3, E2
SURFACE APPLICATION AND INJECTION OF LIQUID DAIRY MANURE

Agricultural Engineering Department, University of Kentucky, Lexington , Kentucky 40506.
I.J. Ross, S. Sizemore, J.P. Bowden and C.T. Haan
Paper No. 78-2051, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 19 p. 11 fig., 1 ref.

Keywords: Dairy wastes, Liquid wastes, Soil injection, Land application, Agricultural runoff, Pollution, Waste composition

Liquid dairy manure was injected on the soil contour to depths of 6 and 12 inches and applied to the surface of a Bluegrass sod and a bare tilled soil. Application rates of 9,250 gallons/acre were used. Runoff from 9-foot-square plots which were sprinkled at rates of 2.5 inches/hour on sod and 1.5 inches/hour on bare soil was collected and analyzed for pollution parameters including COD, N, TS, TSS, pH, DO, and fecal coliform The effects of pollutant yield in the runoff were determined for various treatments. Injection of the manure essentially eliminated any pollutant yield in the runoff from the test plots as compared to surface application. The depth of injection had essentially no effect on pollutant yield at the application rate used in these experiments. Injection tended to even the rate of pollutant loss in the runoff. About 55% of the total runoff was required to remove 80% of the total pollutant yield from the injected plots as compared with only 30% of the total runoff for surface application. The rate of runoff from injected plots was less than half the rate from surface-applied plots. Delay time between application of liquid manure and the simulated rainfall event had a significant effect on the yield of the pollution parameters in the runoff. A 1-day delay reduced rate of runoff by a factor of 12 as compared to no delay. Repeated yearly applications of manure on sod reduced pollutant concentration in the runoff from test plots. Injected plots receiving manure applications for 3 consecutive years produced no runoff during the last 2 years. Plots receiving surface applications produced runoff each of the 3 years, but the concentration of pollutants was reduced each consecutive year. Measurement of pH and DO in runoff from test plots indicated little or no change in these parameters as compared with the water-applied plots. Experimental results indicated that pollutant concentration in runoff from plots receiving surface applications is a function of the concentration of the pollutant in the manure and the total quantity of runoff from plots. Equations for predicting the percentage of the total pollutant load applied to the soil in each liter or runoff were determined as functions of the total runoff. These equations were found applicable to both sodded and bare soils where simulated rainfall was applied immediately following liquid manure application. (Merryman-East Central)

5116-B2, E2
DEVELOPMENT OF A SLURRY SPINNER

Department of Agricultural Engineering, Kansas State University, Manhattan, Kansas 66506
N. F. Koch, R. I. Lipper, and H. L. Manges
Paper No. 78-2056, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 11 p. 4 fig., 3 tab., 12 ref.

Keywords: Slurries, Land application, Irrigation equipment, Design

Research objectives were: (1) to determine experimentally the applicability of current spinner theory as applied to manure slurry disposal; (2) to determine relationships involved and required for the design of special vane configurations by expansion of spinner theory; and (3) to determine the feasibility of using a spinning disc to distribute swine wastes onto cropland. Feasibility of the operations was to be determined by measuring; (a) the flow rate onto the spinner; (b) power consumed by the spinner; (c) the spinner coefficient of uniformity; and (d) the spinners maximum diameter of coverage. A prototype slurry spinner was constructed in the Agricultural Engineering Department laboratory at Kansas State University. The spinner was designed to be simple, easy to handle, and capable of quick changes in the field. Water and slurry tests were conducted for three blades equipped with various vanes and vane configurations. Flow rates, power consumption, uniformity coefficients, and diameter of coverages are discussed. It was determined that a centrifugal slurry spreader may be feasible to operate if the farmer has a means of agitating the slurry and successfully pumping it to the spinner. The spinner would be powered by a small gas or diesel engine (approximately 10 hp) capable of operating the spinning disc as well as the drive wheels. This particular set-up would handle 200 to 300 gpm in the operating range of from 400 to 600 rpm. (Merryman-East Central)

5117-A11
DENITRIFICATION: I. USE OF ^{15}N FOR EVALUATION OF THE HYPOTHETICAL EXCRETION OF MOLECULAR NITROGEN BY ANIMALS. II. THE EFFECT OF NITROUS OXIDE ON GROWTH AND METABOLISM OF MICROCOCCUS DENITRIFICANS.

R. D. Brown, Jr
Ph.D. Dissertation, University of Wisconsin, 1968, 95 p. 11 fig., 9 tab., 94 ref.

Keywords: Denitrification, Nitrous oxide, *Micrococcus denitrificans*

The hypothetical production of molecular nitrogen by animals was evaluated by examination of N_2 found in the environment of rats which had been fed a ^{15}N-labelled diet. A fasted, adult rat in a closed respirometer system (volume = 1.5 liters) containing an oxygen-helium (20:80) atmosphere was fed a diet of ^{15}N-labelled yeast. Oxygen was supplied by an electrolytic generator and carbon dioxide was absorbed from the respirometer atmosphere in a circulating gas system. Gas samples from the respirometer were analyzed mass spectrometrically before and after removal of oxygen and helium. The N_2 content of the respirometer atmosphere was calculated from the data by a method which corrects for the effects of helium and oxygen on the mass 28 peak height. No ^{15}N-labelling was found in the N_2 present in the respirometer. From analyses of animal tissues, excreta, and gastrointestinal contents for ^{15}N-labelling, it was calculated that the hypothetical evolution of 1.5% of the ingested nitrogen would have been detected had the $^{15}N_2$ arisen from any source other that skeletal muscle; from the latter source evolution of 5% of the ingested nitrogen would have been detected. The report that nitrous oxide, a common product of microbial denitrification, can serve as a terminal electron acceptor during heterotrophic growth of the denitrifier. *Micrococcus denitrificans*, was investigated with batch cultures of the organism. When cultures in the presence of glucose were supplied with N_2O as the sole electron acceptor,the turbidity increased three to four fold in a nearly linear fashion. The turbidity then remained constant unless oxygen or nitrate was added as a terminal electron acceptor. Poly-B-hydroxybutyric acid (PHBA) increased nearly forty fold during the exposure to nitrous oxide, whereas cellular nitrogen increased by less than 50%. The increase in turbidity which has been reported as growth on N_2O probably can be attributed to storage of PHBA. (Brown-University of Wisconsin; "The dissertation titles and abstracts contained here are published with permission of University Microfilms International, publishers of DISSERTATION ABSTRACTS INTERNATIONAL (Copyright 1968 by University Microfilms International), and may not be reproduced without their prior permission".)

5118-A8, B2, C2, E2
THE EFFECTS OF CATTLE SLURRY AND INORGAINC FERTILISER NITROGEN ON THE YIELD AND MINERAL COMPOSITION OF FORAGE MAIZE. RESULTS OF PRELIMINARY EXPERIMENT.

National Institute for Research in Dairying, Shinfield, Reading, Berkshire, England
B. F. Pain, R. H. Phipps, and S. J. Richardson
Journal of the Science of Food and Agriculture, V. 28, p. 694-698, 1977. 3 tab., 10 ref.

Keywords: Land application, Cattle wastes, Slurries, Forages, Crop response, Soil chemistry, Phosphorus, Potassium, Nitrogen, Magnesium, Zinc, Waste composition, trace minerals

Four rates of cow slurry (0, 35, 70, and 105 t/ha) and inorganic nitrogen (0, 40, 80 and 120 gk/ha) were applied in a factorial arrangement to forage maize plots on a sandy loam soil (Hurst Series). The response of maize DM yield to inorganic N was small above 40 kg N/ha. Slurry alone gave satisfactory yields and up to 70 t/ha improved the response to inorganic N. Slurry at 105 t/ha tended to delay crop maturity and reduced yields when more than 40 kg inorganic N/ha was applied. The percentage N, P, and K in the soil before drilling and in the crop at the silage stage were positively related to the amount of slurry applied. Appreciable amounts of P, K, and Mg remained in a "plant available" state in the soil after the maize harvest. (Pain-National Institute for Research in Dairying)

5119-A8, B2, C2, E2
EFFECT OF THE APPLICATION OF COW SLURRY TO GRASSLAND ON THE COMPOSITION OF THE SOIL ATMOSPHERE

Department of Soil Science, University of Reading, Berks, England
J. R. Burford
Journal of the Science of Food and Agriculture, V. 27, p. 115-126, 1976. 7 fig., 46 ref.

Keywords: Land application, Cattle wastes, Slurries, Soil chemistry, Soil gas, Nitrogen transformations, Denitrification

The effect of a heavy application (550 tonnes/ha) of unamended cow slurry to grassland in early spring (March) on the composition of the soil atmosphere was examined by analysing the gaseous phase under adjacent treated and untreated areas for a 12-month period. Restricted aeration and products of intense reducing activity were observed in the slurry layer for 3 weeks, and in the underlying surface soil for several months, after the application; oxygen contents of the atmosphere to a depth of 80 cm were decreased and carbon dioxide contents increased, for 12 months. Although the slurry and soil never became completely anaerobic (minimum oxygen contents observed were 8% (v/v) in the slurry and 3.5% in the soil), high methane concentrations (6% in the slurry and 1.7% in the soil) indicated that a large proportion of the slurry and surface soil volumes were occupied by anaerobic volumes shortly after the application. Other hydrocarbon gases (ethane, ethylene, propane) were evolved, but did not accumulate to concentrations greater than 7 parts/10^6. Nitrous oxide evolution indicated a pattern of gaseous N loss from the soil and slurry, presumably due to denitrification. Major evolution occurred in the slurry in May, June and July, and in the surface soil at the 10-cm depth in July-August. Nitrous oxide was detected continuously in the winter and in concentrations as high as 680 parts/10^6, at a depth of 40 cm below the soil surface of the treated grassland after nitrate had been leached to this depth by autumn and winter rains. Nitrous oxide was detected continuously at 80 cm below the soil surface in spring and early summer, and again in the following winter, under treated as well as untreated areas. The observed consequences of the slurry application are attributed to physical effects in restricting aeration, in association with the effect of the organic substrates on soil respiratory activity. (Burford-University of Reading)

5120-A8, B2, C2, E2
EFFECT OF THE APPLICATION OF COW SLURRY TO GRASSLAND ON NITRATE LEVELS IN SOIL AND SOIL WATER CONTENTS

Department of Soil Science, University of Reading, Reading, Berks, England
A. A.Thijeel and J. R. Burford
Journal of the Science of Food and Agriculture, V. 26, p. 1203-1213, 1975. 2 fig., 3 tab., 20 ref.

Keywords: Land application, Cattle wastes, Slurries, Soil chemistry, Soil profile, Soil water, Nitrates, Moisture content

The effect of a single heavy dressing of unamended cow slurry, applied to grassland in early spring (March), on nitrate levels and moisture contents in the soil profile have been examined for a 12 month period after the application. The slurry was allowed to remain on the soil surface until late autumn, when it was cultivated and a pasture re-established. Nitrate accumulated in the slurry and surface soil over spring, summer and autumn: the amount found in the slurry and 0-20 cm depth of soil in October (172 kg N/ha) accounted for 9% of the total-N originally added in the slurry. Significant leaching of nitrate into the subsoil did not occur until the soil was subsequently rewetted to field capacity in late autumn and winter. The layer of slurry on the soil surface restricted moisture losses from the soil during summer to less than one half of those under untreated grassland. Restricted aeration under the slurry is considered to be an important factor in delaying nitrification and stimulating anaerobic activity in the soil so that deep leaching of nitrate may not be likely for several months after a heavy application. (University of Reading)

5121-A11, B1, C2, E3, F1
POULTRY WASTES IN THE DIET OF ISRAELI CARP

Marine Advisory Program, University of Alaska, Anchorage, Alaska
C. L. Kerns and E. W. Roelofs
Bamidgeh, V. 29, No. 4, p. 125-135, Dec., 1977. 7 tab., 34 ref.

Keywords: Refeeding, Poultry wastes, Fish, Performance, Economics

A ten-week laboratory feeding trial was conducted at Michigan State University using three levels of fresh poultry waste in the diet of Israeli carp (Cyprinus Carpio). Non-protein nitrogen (NPN) has been demonstrated to be sparing of protein-nitrogen in the diet of ruminants; the results of feeding NPN to fish have been inconclusive. In this experiment, growth rate and feed conversion were found to be inversely related to the level of poultry waste in the diet. The feed cost per unit of biomass and protein fixed varied directly with dietary levels of poultry waste; the control diet produced the most economical weight gain. Direct inclusion of poultry waste in the diet of fish does not appear to be a promising means of reducing the amount of animal protein required in fish rations. (Kerns-University of Alaska)

5122-A8, B3, C2, E2
NITROGEN AND PHOSPHORUS MOVEMENT FROM SURFACE APPLIED MANURE

USDA-SEA-FR
R. E. Muck and D. C. Ludington
Paper No. 78-2047, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 27 p. 8 fig., 3 tab., 26 ref.

Keywords Model studies, Leaching, Land application, Dried poultry manure, Nitrogen, Phosphorus, Ion diffusion, Nutrient losses

The purpose of this study was to develop a model to describe the leaching of nitrogen and phosphorus from a dry, aggregated manure typical of that originating from high-rise poultry houses and to evaluate this model with laboratory leaching data. The model measured nutrient movement within the manure aggregate by ion diffusion. The leaching experiments performed two purposes: to determine the diffusion coefficients for the nitrogen and phosphorus through the manure and to perform leaching runs at a variety of flow rates in order to test the proposed model's ability to predict the nutrient losses from the manure. Effective diffusion coefficients were obtained for ammonia, organic N, and orthophosphates, however, no results were presented for nitrate N because only trace amounts existed. Soluble orthophosphate losses were predicted reasonably, but predictions by the model could be improved possibly by considering phosphorus solubility and adsorption capacity of the manure. (Bates-East Central)

5123-A4, A5, A6, A7, B1, C1, C2, C3, D1, D2, D3, E2, E3, F2
POLLUTION CONTROL FOR AGRICULTURE

R. C. Loehr
Pollution Control for Agriculture, Academic Press Inc., New York, 1977, 383 p.

Keywords: Agricultural wastes, Animal wastes, Waste treatment, Recycling, Land application, Legal aspects, Water pollution, Groundwater pollution, Air pollution, Fish kills, Waste composition, Nitrogen control, Aerobic, Anaerobic, Lagoons, Ponds, Oxygen transfer

A summary of the processes and approaches applicable to agricultural waste management problems is presented. Agricultural wastes are defined as the excesses and residues from the growing and first processing of raw agricultural products, i.e., fruits, vegetables, meat, poultry, fish, and dairy products. Implication and possible management systems for crop production are discussed as well. Emphasis is placed on processes that seem most adaptable to the treatment, disposal, and management of agricultural wastes. Fundamental concepts are followed by details describing the use of processes and management approaches. Examples in which the processes or approaches were used with agricultural wastes are included. Topics considered in this book include: constraints, changing practices, environmental impact, waste characteristics, biological treatment fundamentals, ponds and lagoons, oxygen transfer, aerobic treatment, anaerobic treatment, utilization of agricultural wastes, land disposal of wastes, nitrogen control, physical and chemical treatment, and management. While chemical characterization data is discussed with considerable emphasis on nitrogen management, very few comments relate to trace element problems which may be associated with agricultural waste. (Merryman-East Central)

5124-B3, E3, F1
BROILER GROWERS WITH CATTLE CAN MAKE BEST USE OF LITTER

Anonymous
Poultry Digest, V. 37, No. 437, p. 373, July, 1978.

Keywords: Poultry litter, Recycling, Refeeding, Cattle, Fertilizers, Deep stacking, Economics

Broiler litter which has been processed by deep stacking may be mixed with corn and fed to brood cows (80% litter and 20% corn, plus vitamin A) or to stocker calves (⅔ litter and ⅓ corn, plus vitamin A). It may also be used as a protein feed ingredient in growing and finishing cattle for slaughter. G. Chris Lance, University of Georiga Agricultural Economist, estimates that the feed value of 138 tons of litter from 75,000 broilers would be about $6,900. The litter also has value as a fertilizer. With an estimated $25/ton fertilizer replacement value, litter from 75,000 broilers would equal $3,450 within a year. (Stiles-East Central)

5125-A8, B3, C2, E2, F1
AGRICULTURAL RESIDUES, INCLUDING FEEDLOT WASTES

Northern Regional Laboratory, Agricultural Research Service, U. S. Department of Agriculture, Peoria, Illinois 61604
J. H. Sloneker
Biotechnology and Bioengineering Symposium No. 6, p. 235-250, 1976. 6 fig., 5 tab., 14 ref.

Keywords: Agricultural residues, Feedlot wastes, Waste storage, Land application, Fertilizers, Reclamation, Economics, Cellulose, Hemicellulase, Waste composition

The kinds, quantities, and composition of residues produced by the agricultural industry are examined. The economics of collecting and storing these residues and potential problems of residue removal on soil productivity are also discussed. Significant accumulations of residues are confined to those areas where intensive cropping occurs. The major components in agricultural residues are the structural cell wall polysaccharides, primarily cellulose and hemicellulose. Composition of several agricultural residues and their total digestible nutrients are tabulated. The digestibility levels show that energy release is too slow to allow growth by ruminants. The U.S. animal industry generates 250 million dry tons of wastes each year which contain 25 to 30% carbohydrate and up to 20% crude protein. The equipment used for harvesting corn refuse, silage, and hay for animals can be readily used for collecting and hauling plant residues to a central location for processing. Harvesting costs for stacking, baling, hauling, etc. are noted. Properly incorporated into the soil, crop residues increase soil tilth and water sorption and reduce soil erosion. The impact of continuous residue removal on soil fertility remains to be examined. (Solid Waste Information Retrieval System)

5126-B3, C1, C2, E3
FEED AND FERTILIZER VALUE OF BROILER LITTER VARIES

Anonymous
Poultry Digest, V. 37, No. 437, p. 362-363, July, 1978.

Keywords: Poultry litter, Recycling, Waste composition, Fertilizers, Refeeding, Crude fiber, Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sulfur

In a study conducted in cooperation with the Tennessee Valley Authority, litter samples were collected from 27 commercial broiler firms having a grow-out capacity of 985,000 broilers. According to Charles Thomas, Alabama Extension Poultry Scientist, broiler litter composition is so variable that its nutrient content should be analyzed before using it as a fertilizer or cattle feedstuff. Variations in composition are said to be due to temperatures, environmental conditions, amount of litter placed in the house, amount of soil removed with the manure, the number of batches of broilers produced on the litter, and a number of other management practices. The study found that the number of broods grown per litter did not significantly influence protein levels. Failure to show increases in protein content was attributed to high average temperatures and dilution of the nutrient content by producers adding from ⅓ to ⅔ initial amount of litter before each batch. Average non-protein nitrogen (20% of the total crude protein) was lower than some publications have shown (40 to 50% of the total crude protein). The study found a crude fiber level of 26.8%. This was probably due to the amount of shavings being used in Alabama broiler houses. As a feed for cattle, the litter was found to have low energy content. Average Total Digestive Nutrient value was 55%. (Stiles-East Central)

5127-B2, C2, D2, D3, E3, F1
ALTERNATE MANURE RECYCLING SYSTEMS FOR ENERGY RECOVERY

Battelle, Columbus Laboratories
W. J. Huffman
Methane Production From Livestock Manure, Proceedings of Great Plains, Extension, Seminar and Tour, Liberal, Kansas and Hooker, Oklahoma, Feb. 15, 1978, p. 3-19. 5 fig., 7 tab., 10 ref.

Keywords: Recycling, Gas production, Anaerobic digestion, Pyrolysis, Waste treatment, Economics

A brief summary and comparison of biological and thermochemical processes for the conversion of feedlot manure to more useful products is given. A comparison of anaerobic digestion and pyrolysis processing concepts for cattle feedlots is presented. The point is made that marketings aspects would or could largely determine the type of process to be selected. A brief description of a pyrolysis process under development at Texas Tech University is included. In addition, definitions of biomass conversion, bioconversion and thermochemical conversion and a list of thermochemical processes are presented. (Bates-East Central)

5128-B1, C2, E2
DEVELOPING A LIVESTOCK WASTE MANAGEMENT PLAN

Agricultural Engineering Department, Purdue University, West Lafayette, Indiana
J. C. Nye
Paper No. 78-4014, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 20 p.

Keywords: Waste management, Land application, Planning, Waste production, Nitrogen

The waste management plan does identify critical areas before the problems are cast in concrete and/or steel. The decision to make modifications can be made when alternatives are possible. In order to help make these modifications and finalize the plans there are several publications available at your local Cooperative Extension Service Offices which can help you design the selected system or systems.
ID114 - Runoff Control System for Open Livestock Feedlots
PIH21 - Systems for Runoff Control
ID107 - Selecting a Swine Waste Management System
ID120 - Livestock Waste Lagoons
ID101 - Utilizing Animal Waste as a Fertilizer
ID88 - Irrigation for Land Application of Animal Waste
AE87 - Gutter Flushing Systems for Swine
MWPS18 - Livestock Waste Facilities Handbook
MWPS7 Dairy Housing & Equipment Handbook
MWPS6 Beef Housing & Equipment Handbook
MWPW8 Swine Housing & Equipment Handbook
With these related publications you can now complete the waste management plan. You may need to contact a local contractor, soil conservation service or private consulting engineer if you need to develop plans to construct or modify your livestock buildings and/or waste management facilities. You may need to contact an equipment dealer to purchase different manure handling equipment. Or you may only need to change your cropping program in the land application area. Whatever decision you make will be based on a complete evaluation of the impact of your livestock waste management practices on your total farm enterprise. The waste management plan will help you develop the best waste management system for your farm. (Nye-Purdue University)

5129-B2, B4, C2, E2, F1
RECYCLING AGRICULTURE RUNOFF

P. N. Walker and W. D. Lembke
University of Illinois Water Resources Center Report UILU-WRC-77-0119, Jan., 1977, 88 p. 11 fig., 6 tab., 68 ref.

Keywords: Model studies, Agricultural runoff, Waste storage, Irrigation, Land application, Crop response, Drainage, Economics

Recycling agricultural runoff is not an economically acceptable practice for corn in the claypan regions of Illinois under present conditions. The cost of building, maintaining, and operating a reservoir and irrigation system are greater than the benefit of expected yield increase. Exceptions to this would be where topographic features make the construction cost of a reservoir much less than normal. One acre-ft. of storage is required for each acre irrigated. The nonincidental recycling of pesticides and nutrients causes only negligible costs and benefits. The low concentration of these chemicals have very little effect on field crops. The recycling system also helps keep these chemicals out of other parts of the environment where even low concentrations may cause considerable change in a delicately balanced ecosystem. However, there are no estimates of the economic benefit, if any, of preventing this ecological change. Irrigation is possible only with a recycling reservoir as a water supply. Therefore, an economic analysis of irrigation alone is no different from that of a complete

recycling system. In 1976 irrigation increased yield in claypan regions of Illinois by 103 bu./acre. However, 1976 was an exceptional year and normal expected increases in yield are 50 bu./acre with a 103 bu./acre increase in yield corn prices would have to be $2.28/bu. to break even. Drainage can be installed and evaluated independently of a recycling system. This study was not conclusive as to what degree of drainage was most economical. No estimates of the interactive effect between irrigation and drainage were found in the literature. The model developed in this study to find this effect was not successful. Future research should be centered around determining what degree of drainage is most economical and determining the interactive effect between irrigation and drainage. (Walker-University of Illinois Water Resources Center) (Microfiche only)

5130-B1, C1, D3, E3, F1
ANAEROBIC FERMENTATION OF AGRICULTURAL RESIDUES INTO BIOGAS

Department of Agricultural Engineering, Cornell University, Ithaca, New York
W.J. Jewell
New York's Food & Life Sciences, V. 11, No. 1, p. 15, 1978.

Keywords: Anaerobic, Digesters, Recycling, Fermentation, Biogas, Gas production, Economics, Agricultural wastes, Cattle wastes, Methane

The Department of Agricultural Engineering at Cornell University and the Department of Energy have been researching anaerobic fermentation. This study involved three principal projects: a comprehensive study of the total technology as it applies to dairy farms and beef feedlots, defining the potential for improvement and implementation of the anaerobic fermentation systems in agriculture and a full-scale demonstration of a low-cost reactor for small farms. Some advantages of treating animal manure could be: less odor, less waste-handling labor, and nutrient conservation. Both the technical and economic feasibility of potential systems were evaluated by the research group which modeled several for specific agricultural operations and estimated their capital and operating costs. Three types of cow-manure anaerobic fermentors were built; conventional, batch-load, and plug-flow digestion. The evaluation of these three systems in long-term laboratory tests included measuring gas production. Anaerobic fermentation of agricultural wastes and other organics seems to be an attractive alternative source of renewable, clean energy since it can supply a significant amount of energy and at the same time provide pollution control and allow valuable plant nutrients to be recycled. Manure and other agricultural residues seem to be a rare phenomenon, an energy source with good instead of bad side effects. By the year 2020, about ¼ of our total energy needs could be derived from renewable sources, and a significant portion of this type of energy could by provided by biomass. (Stiles-East Central)

5131-A4, A6, B1, C2, E2, F1
A MANUAL ON: EVALUATION AND ECONOMIC ANALYSIS OF LIVESTOCK WASTE MANAGEMENT SYSTEMS

The Ohio Agricultural Research and Development Center. Wooster. Ohio 44691
R.K. White and D.L. Forster
Environmental Protection Agency Report EPA-600/2-78-102, May, 1978, 303 p. 57 fig., 62 tab., 42 ref.

Keywords: Livestock wastes, Poultry wastes, Waste management, Water pollution, Odor control, Land application, Economics, Feedlots, Confinement pens, Floors, Design, Climate, Waste composition

This manual was developed to describe and evaluate alternative systems and/or technologies currently used to handle wastes from livestock facilities of less than 1,000 animal units. The systems are evaluated with regard to controlling water pollution and odor nuisance. An economic analysis of alternative livestock waste management systems for dairy, beef, swine, sheep and poultry facilities is provided. The economic impact of water pollution control technologies is discussed. This manual is intended to be used by environmental planners, regulatory personnel, and livestock producers. The discussion and evaluation of waste management systems are related to the regional concentration of livestock species and to climate constraints. The economic analysis of alternative waste systems is done for each species separately and considers fertilizer nutrient return as a benefit. Detailed economic analysis of waste management options are provided in the Appendices for each species. All cost data are in 1977 dollars. (White-Ohio Agricultural Research and Development Center)

5132-B3, E2, F1
GRASS . . . A BY-PRODUCT OF POULTRY

D. Dailey
Missouri Ruralist, V. 119, No. 6, p. 32-33, March 25, 1978.

Keywords: Poultry litter, Land disposal, Fertilizers, Fescues, Crop response, Economics

Don and Vera Littlefield of McDonald County, Missouri raise 120,000 started laying pullets a year. All chicken litter goes on pastures. The Littlefields get three crops from their fescue: seed, baled hay, and winter pasture. The hay and pasture support a herd of nearly 200 beef cows. But, the major cash return is from the seed. The Littlefields apply the litter at a rate of 3 to 4 tons to the acre. To maintain a fertility balance, they also apply potash and lime. The secret of a good seed crop is to graze fescue into the ground during winter. (Stiles-East Central)

5133-B1, E1, E2
BETTER DISPOSAL OF FARM WASTES

Public Health Engineer, Ministry of Works
I. W. Gunn and J. O. Brasell
Journal of Agriculture, V. 110, p. 362-365, May, 1965. 6 fig.

Keywords: Farm wastes, Land application, Irrigation, Equipment-irrigation, Oxidation ponds, Settlement banks, Waste disposal

Alternatives for disposing of farm wastes are given. They include: (1) Treat and purify the waste before disposal into a watercourse. (2) Discharge wastes into a public sewer. (3) Discharge wastes on to land as a fertilizer. The latter is the most efficient and practical method of disposal. Spreading by a tanker is probably the most suitable method for small dairy farms, though spread is at a heavy rate and is inefficient. Spray irrigation, which delivers a thin layer of dilute waste material over a large area may also be used. This results in the effluent being broken down quickly by bacteria and rapid return of nutrients to the soil. Equipment for spray irrigation is described. Descriptions of two spray systems in use on farms are provided. Settlement tanks and oxidation ponds are also discussed. (Stiles-East Central)

5134-A11, B3, C2, E2
BROILER LITTER FOR FERTILIZER

Anonymous
Progressive Farmer, V. 93, No. 8, p. 56, Aug., 1978.

Keywords: Land application, Poultry litter, Pastures, Animal health, Grass tetany, Necrosis, Parasitism, Nitrate

The Science and Education Administration and University of Georgia scientists recommend that broiler litter applications to fescue pastures be limited to 9 tons or less to prevent problems with grass tetany, fat necrosis, parasitism, and nitrate toxicity. They also recommend that broiler litter be applied to pastures in 2 or more applications. (Stiles-East Central)

5135-B2, C2, C3, D3, E4
CONTINUOUS CULTIVATION OF *CHLORELLA EMERSONII* ON PIG MANURE

Department of Microbiology, University College, Galway, Ireland
M. Wilson and J.A. Houghton
Irish Journal of Agricultural Research, V. 16, p. 21-33, 1977. 7 fig., 3 tab., 20 ref.

Keywords: Swine wastes, Waste treatment, Algae, By-product recovery, Aerobic, Dilution rate, Illumination, Dissolved oxygen

The continuous cultivation of a strain of *Chlorella emersonii*, isolated from a pig waste lagoon, on 10% pig manure was investigated using the optimum conditions of temperature, pig manure concentration and light intensity established in a previous study on algal growth. The effects on algal growth of dilution rate and the use of continuous and diurnal illumination were studied; and the respiratory relationships of a symbiotic association between *C. emersonii* and the bacterial flora of the manure were also investigated. The continuous culture of algae and bacteria on pig manure was quite successful and achieved a reasonable degree of waste purification. The dissolved oxygen levels maintained at most of the dilution rates indicated that the symbiosis was working efficiently and the culture remained aerobic. (Wilson-University College)

5136-B3, C1, D1
DRYING CHARACTERISTICS OF BROILER WASTE ON A HEATED CONCRETE SLAB

Agricultural Engineering Department, University of Georgia, Athens, Georgia
B.D. McLendon and H.C.Gillespie
Transactions of the ASAE, V. 21, No. 3, p. 553-556, 560, 1978. 6 fig., 3 tab., 10 ref.

Keywords: Dehydration, Poultry wastes, Floors, Vapor diffusion coefficient, Temperature, Humidity

A study was conducted to determine the average vapor diffusion coefficient of poultry waste, and to determine the effect that the floor temperature, air temperature and air humidity has upon the drying rate of poultry waste using a heated concrete floor. The information would be used to develop an equation to predict the moisture content of poultry waste at a given time during the drying process. Study conclusions were: (1) The diffusion coefficient for the broiler waste is dependent upon its temperature. (2) The drying process for broiler waste cannot be adequately described using the equation presented by Young (1969). The form of the equation $MC = At^{B}$ when used with the appropriate coefficients adequately describes the drying process as performed in these tests. Stirring of the broiler waste material can significantly decrease the time required for drying of the material to a satisfactory moisture content (Merryman-East Central)

5137-A8, B3, E2
EFFECT OF SULFUR AND FYM APPLICATION ON THE EFFICIENCY OF ROCKPHOSPHATE FOR WHEAT

Sheila Dhar Institute of Soil Science, University of, Allahabad, India
K.C. Swarankar, O.P. Singh, and M.M. Verma
Journal of the Indian Society of Soil Science, V. 25, No. 4, p. 442-443, 1977. 1 tab.

Keywords: Sulfur, Farm wastes, Land application, Rockphosphate, Crop response

Greenhouse and laboratory experiments with wheat as the test plant were designed to determine the effect of sulfur with and without organic matter (animal dung and rotten leaf) on the effectiveness of rockphosphate. The organic matter was added at the rate of 6 tons/ha. Sulfur was incorporated into the soil in 4 different doses (0, 3, 5, 70 and 140 kg/ha) in the form of calcium sulphate. Uptake of sulfur in plants was found to increase with the increase in sulfur application up to 70 kg/ha. Response in sulfur uptake with farmyard manure along with 35 kg S/ha application was found equally effective as 70 kg S/ha or more of sulfur application without organic matter. Application of sulfur increased the phosphate content of wheat, thereby affecting P/S ratio and S application without farmyard manure was 0.783 and with farmyard manure it was 0.866 showing higher P/S ratio of plants due to the combined influence of S and organic matter. F test of the dry matter showed that the data were significant at 5% level. Various interactions were observed between sulfur and organic matter levels resulting in increased dry matter yield and uptakes of S and P. Application of organic matter along with S proved better as compared to the application of either organic matter or sulfur alone. (Merryman-East Central)

5138-E3, F1

AGRICULTURAL AND FORESTRY WASTES AS AN ENERGY RESOURCE

Stanford Research Institute, Menlo Park, California 94025
J.A. Alich, Jr. and J.G. Witwer
Solar Energy, V. 19, p. 625-629, 1977. 13 tab., 3 ref.

Keywords: Agricultural wastes, Forestry wastes, Energy, Economics, Biomass, Recycling

An evaluation is made of the feasibility of converting agricultural and forestry residues into energy on the basis of a county-by-county inventory for the contiguous United States. The SRI energy model was used to evaluate the potential of biomass for production of energy in the United States. Biomass resource limits, biomass conversion economics, a biomass forecast, and an aggregate energy supply forecast are tabulated. By far the largest consumption of biomass is the production of synthetic natural gas representing 83 percent of the 2000 consumption and 75 percent of the 2020 consumption. In the year 2000, the total biomass consumption forecast can be easily met with returned and wasted residues in Region 4-8 (KY, TN, MS, AL, MI, OH, IN, IL, WI, OK, AR, TX, LA, MN, IA, MO, KS, NB, SD, ND, MT, ID, WY, NV, UT, CO, AZ, NM, WA, OR, CA) with energy crops required in Region 1 (ME, NH, VT, MA, CT, RI) and probably required in Regions 2 and 3 (NY, PA, NJ, DE, MD, WV, VA, NC, SC, GA, FL). In the year 2020, the forecast requires energy crops in Regions 1 through 6 with Region 6 requiring by far the largest contribution from energy crops. (Merryman East Central)

5139-A7, A12, B2, B4, C2
DEATH IN A FARM WORKER ASSOCIATED WITH TOXIC GASES FROM A LIQUID MANURE SYSTEM - WISCONSIN

Anonymous
Morbidity and Mortality Weekly Report, V. 27, No. 6, p. 47-48, Feb. 10, 1978.

Keywords: Public health, Air pollution, Hydrogen sulfide, Toxicity, Safety

The apparent cause of a farm worker collapsing and dying while steam cleaning gutters inside a calf barn in Eau Claire, Wisconsin was the inhalation of toxic gases. The source of the gases was a 100,000 gallon liquid manure tank located beneath the barn. While trying to rescue him, two other workers experienced syncopal episodes but recovered. Toxic gases released from decomposing manure include hydrogen sulfide, carbon dioxide, methane, and ammonia. In this case, hydrogen sulfide was implicated as the causative agent after air tests were conducted under similar conditions two days later. Factors contributing to hazardous conditions present at the time of the incident included: (1) full manure tank, (2) 30-60 minute agitation, (3) inadequate ventilation, and (4) high protein diet of calves which made the formation of hydrogen sulfide more likely. Preventive measures against such deaths include: (1) adequate ventilation, (2) contingency plans for evacuating animals and workers from enclosed farm buildings while manure is agitating. (3) self-contained air packs and safety harnesses for such workers, and (4) reserve workers stationed outside. (Stiles-East Central)

5140-A8, B2, C2, E2
EFFECT OF VARIOUS SOURCES OF NITROGEN AND ADDED ORGANIC MATTER ON NODULATION AND NITROGEN FIXATION IN SOYBEAN

College of Agriculture, University of Peshawar, Pakistan
M. Hatam
Journal of Agricultural Research, V. 14, No. 4, p. 202-211, Dec., 1976. 1 fig., 3 tab., 15 ref.

Keywords: Nitrogen fixation, Crop response, Nitrogen, Cattle wastes, Land application, Nodulation

An investigation was conducted to see how additional inorganic nitrogen to the soybean plants could be applied without inhibiting nodulation and nitrogen fixation. Treatments were 280 Kg N/ha as NH_4NO_3, 88 tons (T) ha, 176 tons/ha of liquid cattle manure and a check which did not receive any fertilizer or manure. Each treatment was without and with 14T/ha of ground corn cobs as organic matter source. The experimental site was disced after all material had been applied to the soil surface. Total plant nitrogen in leaves, stem, petioles and roots decreased from 4.16% to 1.26% as the plant developed The pods and beans analyzed together at the fourth trifoliolate stage contained 4.36% N which increased gradually until the seed alone contained 7.18% N at the time of harvest. It was observed that addition of organic matter decreased the N percent of the plant irrespective of the nitrogen treatment. This difference was obvious in all the plants at all developmental stages. Application of 280 Kg N/ha as NH_4NO_3 increased N content of plant and seed over all other treatments irrespective of the addition of organic matter. The manurial treatments (88.176 T/ha) did not differ from the control as far as the N content of the plant is concerned. (Merryman-East Central)

5141-B2, E2
THE DESIGN AND OPERATION OF SPRAY DISPOSAL SYSTEMS FOR DAIRY FARMS IN NEW ZEALAND

Agricultural Engineering Department, Massey University, Palmerston North, New Zealand
R.M. Clarke
Agricultural Engineering Australia, V. 6, No. 1, p. 10-18, July, 1977. 6 fig., 4 tab., 6 ref.

Keywords: Land application, Dairy wastes, Irrigation, Design, Lagoons

Spray disposal can virtually eliminate all pollution if properly managed, as well as providing a measure of fertilization and irrigation. However, high labor input and pumping problems have affected its popularity. Spray disposal system design is discussed with particular reference to component and pump selection which are very much affected by the properties of waste. A system of primary solids separation to avoid damage and blocking of pumps, pipes and sprinklers is called for and this requires a screening system

which is effective and easily cleaned. Other components and fittings must be suited to the duty and simple enough for the farmer to install if necessary. Given good design, adequate screens or baskets, and traps, sumps and pipelines of adequate size, there is no inherent problem which cannot be overcome, provided the operator is prepared to clean and maintain the system regularly. Lagoons are increasing in popularity as a treatment system because of the absence of mechanical problems and a low labor input. However, the need to remove pollution brought about by the high nutrient content of the discharge may introduce further complexity offsetting any present advantages over spray disposal. (Merryman-East Central)

5142-E3
THE FEASIBILITY OF METHANE PRODUCTION FROM DAIRY ANIMAL WASTES: THE FARMER's PERSPECTIVE

Department of Rural Sociology, Cornell University, Ithaca, New York
H.R. Capener and D.C. Braithwaite
New York's Food and Life's Sciences, V. 11, No. 1, p. 18-20, 1978. 2 fig., 5 ref.

Keywords: Methane, Recycling, Gas production, Dairy industry

A study was conducted to examine the nature and level of farmer interest in utilizing readily available supplies of animal waste to generate an alternative source of energy for the farm and home. Information was obtained from 20 dairy farm operators located in New York and Vermont. Only as they became aware that the benefits of methane were directly associated with waste handling, did the farmers show a serious interest in a methane-generation system. Five significant advantages in a liquified slurry waste-handling system associated with a methane producing anaerobic system were: (1) elimination of daily spreading, (2) retention of slurry in a storage tank indefinitely which allows spreading when conditions are optimal, (3) retention of nutrient value of the waste material until it is returned to the soil, (4) increased labor efficiency, and (5) benefits of an alternate source of energy for farm and home use. In practice, the farmers want the manure out of the barn and by automatic means. Labor demand rather than cost is a primary issue. Medium-to large-scale dairy operations are in the market for improved waste-handling procedures. The part that methane gas generators will play in this quest for a breakthrough will be important to study and observe. (Merryman-East Central)

5143-A11, B3, E3
FEEDING CATTLE WASTE MAKES SENSE: CANADIANS

Anonymous
Feedstuffs. V. 50, No. 36, p. 12, Aug. 28, 1978.

Keywords: Refeeding, Cattle wastes, Performance, Animal health, Carcass quality, Zinc

University of Guelph researchers allotted three corn silage based diets supplemented with soybean meal or urea or wet cage layer excreta to 90 Hereford steers of 210 kg. During the 125 day feeding trial, steers were checked once weekly by a veterinarian for signs of illness and for digestive disturbances. The cattle accepted the corn silage diet supplemented with cage layer excreta at the 22% level consuming significantly more dry matter daily than in the corn silage-soybean meal control diet. Gains were similar and feed efficiency was slightly lower for the excreta diet. About 10% shelled corn was required in the diet to make the excreta ration comparable in energy value to the control. Except for a slightly elevated level of zinc in liver, there were no effects of diet on mineral levels in the several tissues. Except for slightly higher dressing percentage of excreta fed cattle, diet had no significant effect on carcass merit. Feeding either excreta or urea to cattle had no significant effect on juiciness, tenderness, flavor or over-all satisfaction of the beef. (Merryman-East Central)

5144-B2, C1, C2, D3, E3
CARBON/NITROGEN RATIO AND ANAEROBIC DIGESTION OF SWINE WASTE

Agricultural Engineering Department, University of Missouri, Columbia, Missouri
D. M. Sievers and D. E. Brune
Transactions of the ASAE, V. 21, No. 3, p. 537-541, 549, May-June, 1978. 9 fig., 2 tab., 12 ref.

Keywords: Anaerobic, Digesters, Swine wastes, Carbon, Nitrogen, Methane, Gas production

The greatest volume of methane production was observed in digestors operating on a substrate of high carbon/nitrogen (C/N) ratio. However, these digesters tended to be unstable ecologically and operated on the verge of failure. Digesters operated on a low C/N ratio (high nitrogen) substrate, although exhibiting lower gas production, were seen to become highly buffered and more stable. The low C/N digesters, because of their stability, were better able to adjust to increases in organic loading. The C/N range of 15.5/1 to 19/1 was found to be the optimum range in terms of maximum methane production based on variation in loading rates. Maximum gas production (690 mL CH_4 /g organic carbon loaded) occurred at a loading rate of 2.24 g volatile solids (VS)/L/day and a C/N ratio of 19/1. Due to unstable operating conditions observed at high C/N ratios, it is suggested that a C/N ratio of 16/1 may provide more operational stability with minimum loss in gas production. This corresponds to a 55 to 60% reduction in total organic carbon (TOC). (Sievers-University of Missouri)

5145-D1
CONVECTIVE HEAT TRANSFER COEFFICIENT FOR POULTRY EXCRETA

Agricultural Engineering Department, University of Idaho, Moscow, Idaho
J. E. Dixon, G. D. Wells, and M. L. Esmay
Transactions of the ASAE, V. 21, No. 3, p. 534-536, May-June, 1978. 2 fig., 1 tab., 3 ref.

Keywords Poultry wastes, Dehydration, Convective heat transfer coefficient

Data were analyzed to determine material and configuration specific constants for calculating the convective heat transfer coefficient for poultry excreta. The convective heat transfer coefficient equation used was: $h_c = aG^n / D_e^m$ where h_c is the heat transfer coefficient, G is the mass velocity, D_e is a characteristic dimension, and constants are a, m and n. The constants a, m and n were determined for use with metric and American engineering units. (Dixon-University of Idaho)

5146-B3, E3, F1
CATTLE FURNISH CHEAP SWINE FEED

Anonymous
Progressive Farmer, V. 93, No. 8, p. 21, Aug., 1978.

Keywords: Refeeding, Cattle wastes, Swine, Economics

Because his cattle were being fed on concrete, Lemmy Wilson decided to rectify his economic disaster of trying to sell dried cattle manure as fertilizer to consumers by feeding the cattle manure to hogs. Wilson's feedlot manager suggested letting the cattle mix the hog feed themselves. Ground corn and protein supplement was put on the concrete floors and after three days, the cattle had mixed their waste with the corn and supplement. The waste mixture was hauled to the swine lots for feeding. The hogs take about a thrid longer to finish than with normal swine feeding systems. But they do it with about two thirds of the feed cost. It takes 90 cattle to feed 500 hogs. This system has been used through four groups of swine and no problems have arisen so far. (Merryman-East Central)

5147-A11, B3, D1, E3
CATTLE MILKED WELL AND GAINED ON RATIONS CONTAINING MANURE

A. H Rakes, W. L. Johnson, J. C. Wilk and D. G. Davenport
Hoard's Dairyman, V. 123, No. 15, p. 921, Aug. 10, 1978. 1 fig.

Keywords: Refeeding, Cattle wastes, Screening, Cattle, Performance

North Carolina State University research has revealed that screened manure solids can be substituted for some of the conventional roughage in the blended rations of heifers, steers and milk cows. On farms short of roughage, use of manure solids can help cut feed costs, as well as eliminate some manure disposal problems. Precautions to be taken include: (1) Extra grain must be fed to compensate for low nutritive value of screened manure formulating ration. (2) Manure must be fed in a blended ration. Small amounts should be added at first and increases made as animals become accustomed to it. (3) The manure must be fed fresh or preserved in some manner. (4) Local and state regulations should be checked before feeding manure solids. (Merryman-East Central)

5148-B2, B4, C1, C2, E2
EARTHEN PITS FOR MANURE AND RECYCLED FLUSH-WATER STORAGE

USDA-SEA-FR, University of Nebraska, Lincoln

C. G. Gilbertson, J. A. Nienaber, J. R. Ellis
Transactions of the ASAE, V. 21, No. 3, p. 557-560, May-June, 1978. 5 fig., 10 ref.

Keywords: Waste storage, Earthen pits, Solids, Nitrogen, Phosphorus, Recycling, Flushing, Land application

(1) The earthen pit (8.3m deep), with a volume of 11.7m/animal was operated successfully for 4 years. However, settled solids accumulation would prevent indefinite operation with cleanout.
(2) Solids (floating and settled) accumulated in the pit at an average rate 1.56 m/animal year, or 13.6% of the design volume from January 1972 through March 1975. If the lot were operated at full capacity, however, estimated settled and floating solids would accumulate at 16%/year of the design volume.
(3) From January 1972 through March 1975, about 20% of the manure was pumped to field disposal. The remaining solids were contained in the floating mat (14%), suspended in the effluent (9%), or lost through undetermined processes.
(4) Odor production was not an apparent problem when there was a floating manure mat, which seemed to be a major advantage of this system.
(5) The storage pit contained considerable quantities of the fertilizer elements, N, and P. An estimate 1,461 kg of N and 298 kg of P were contained in the effluent pumped from the pit to the disposal field. As of March 1975, an additional 13,059 kg of N was estimated to be contained in the floating manure mat and settled solids. (6) The low volume earthen pit has potential application for manure and recycled flush water storage provided that settled solids are removed at frequent intervals. Partial cost recovery of maintenance may be possible by utilizing the settled solids as fertilizer for crop use and recycling flush water in geographic locations where water is limited. (C. B. Gilbertson-USDA-SEA-FR, University of Nebraska, Lincoln)

5149-A6, F1, F2 COMMON SCENTS: A' ANALYSIS OF THE LAW OF FEEDLOT ODOR CONTROL

Associate, Kutak Rock Cohen Campbell Garfinkle & Woodward, Omaha, Nebraska
D. P. Burke
Creighton Law Review, V. 10, p. 539-591, 1977

Keywords: Odor control, Feedlots, Legal aspects, Nuisance Law, Nebraska Law, Iowa Law

This analysis is an attempt to examine how our society, through its legal system, has responded to the problem of feedlot odor control, what rules have been developed, and what concepts have been employed to resolve the conflict. Nebraska's feedlot odor is controlled by nuisance law. The three factors relevant in determining whether a nuisance exists are: negligent operation of a feedlot, location of a feedlot, and time priority of who got there first. Possible court actions are discussed. In Iowa and some other jurisdictions the legislature has reasserted its lawmaking role by making special rules for feedlot odor suits. The Iowa nuisance law is a general one and does not modify the common law. Under Iowa's law, location is most important. Other relevant factors, including the three previously cited, are the nature, frequency, and duration of the odor. Possible court actions and enforcement mechanisms are discussed. Rules which are established by and during judicial resolution of feedlot odor disputes determine where feedlots can be located, which feedlots must be abandoned or moved, and techniques, procedures, and equipment an operator must use to control odors. However, due to the nature of the feedlot odor problem it is difficult to announce an inclusive set of rules which will define what is legally permitted and what is not. (Stiles-East Central)

5150-A2, A3, A4, B1, E2, F1, F2 FEEDLOT RUNOFF CONTROL FROM POINT/NON-POINT SOURCES

American National Cattlemen's Association
American National Cattlemen's Association Special Report, 1975, 24 p. 2 fig.

Keywords: Legal aspects, NPDES, Agricultural runoff, Feedlot runoff, Runoff control, Point sources, Non-point sources, Water pollution, Model studies, Economics

This is the National Cattlemen's Association's response to a series of informal public hearings. The Association appointed a special committee to evaluate the point/non-point sources NPDES exemption-court order. Information within the report includes: (1) Definition of "Concentrated Animal Feeding Operations," (2) Comments on Hydrologic Model to Predict Quantity and Quality of Feedlot Runoff, (3) Economic Impact of BPT and BAT vs. Size, (4) Recommendations on Effluent Limitations, (5) Recommendations for Land Application of Manure, and (6) Administrative Devices. (Merryman-East Central)

5151-B1, E2, F1 HOW CONNECTICUT DAIRYMEN HANDLE MANURE

P. Roberts
Hoard's Dairyman, V. 123, No. 5, p. 305, 374, March 10, 1978 1 fig.

Keywords: Waste management, Dairy industry, Bedding, Land application, Economics, Waste storage, Equipment-waste management

A survey of 40 Connecticut dairy farms was recently conducted which showed a great deal of variation in manure handling techniques. Herd sizes of survey farms ranged from 40 to 300 cows. Nine of the milking herds, averaging 90 cows, were housed in stanchion barns. There was also a young stock facility using stanchions which housed 40 dairy heifers. Herds on 31 farms were in free stalls. Sawdust, sand, shavings, wood chips, and even cocoa shells were used as bedding on farms in the survey. Costs for bedding ranged from $3 per month per cow in one stanchion barn and $2 per month per cow in a free stall system to as low as virtually nothing. Low bedding costs were reported in a stanchion barn with rubber mats and grates over gutters and in several free stall systems where sand was used. Seventeen farms spread manure each day. Twenty-one free stall herds and two stanchion herds used manure storage. Advantages given for daily haul were: labor demands were more uniform, no high labor demand to unload a storage, investment cost was less, no fly and odor problems, no ugly stack of manure or manure pond and less energy requirements for hauling dryer manure. Advantages given for storage were: allows scheduling of spreading to reduce runoff and loss of nutrients, has potential for best nutrient use, storage systems offer opportunities for more mechanization and they eliminate the unpleasant chore of daily spreading during adverse weather. Storage costs ranged from less than $1,000 to more than $20,000. Investment per cow varied from $12 to $70 for six months' storage. Earthen pits were most common. Equipment costs ranged from fairly expensive to relatively inexpensive. Few dairymen spread their manure very far from the loading point. Number of acres covered varied widely. (Merryman-East Central)

5152-B2, C1, C2, D3, E3 METHANE PRODUCTION FROM LIVESTOCK WASTE

Texas Agricultural Extension Service, The Texas A&M University System, College Station, Texas 77843
J. M. Sweeten
Texas Agricultural Progress, V. 24, No. 3, p. 19-22, Summer, 1978. 2 fig., 1 tab.

Keywords: Recycling, Livestock wastes, Poultry wastes, Anaerobic, Digesters, Methane, Refeeding, Thermonetics, Inc., Gas production

Of Texas' 10.6 million tons of dry matter produced each year from livestock and poultry manure, only 4.1 million tons of dry manure is economically recoverable. From this manure tonnage, about 14 trillion BTU's of energy per year in the form of methane could be produced by using a two-phase anaerobic digestion process in which organic solids are broken down by bacteria into organic acids which are then converted by bacteria into methane, carbon dioxide, and water. Because most large livestock feeding facilities are designed for efficient, low-cost manure removal, methane recovery potential is limited. However, significant quantities of methane can still be produced from most livestock operations. Manure for methane production should be collected daily, but more than ⅔ of the collectable manure produced in Texas is collected once or twice a year. Experiments with digesters have focused on crucial factors in methane production including: optimum temperature ranges, detention times, loading rates, and pH conditions. Texas A&M researchers are studying operating conditions that will allow a battery of batch-loaded digesters operated in parallel to provide peak sustained methane yields. Thermonetics, Inc. of Oklahoma City, which is already operating a Calorific Recovery Anaerobic Process plant near Guyman, Oklahoma for methane production, is planning to construct three large-scale methane generation plants in the Texas Panhandle. Economic feasibility of such plants is contingent upon the sale of feedstuffs recovered from manure slurry to furnish about half the gross revenue. Fiber containing 11% crude protein is screened from the manure slurry before it enters the digester. Then, a 26% protein filter cake is recovered from the digested slurry by centrifugation. Land area requirements for disposal of stored digested slurry are decreased 70% as compared to most other feedlot waste management operations. Large utility-scale systems are more economically feasible than smaller systems. Major sources of problems in methane productions are the mechanical aspects of manure handling and general plumbing problems. It is possible for these problems to be overcome by adequate financing and competent design. (Stiles-East Central)

5153-A10, B1
INTRODUCING DUNG BEETLES AS AN AID IN MANURE DISPOSAL AND FLY CONTROL

J.L. Lancaster, Jr. and J.S. Hunter, III
Arkansas Farm Research, V. 27, No. 4, p. 4, July-August, 1978. 1 fig.

Keywords: Fly control, Dung beetles, Cattle wastes

Laboratory evaluations of the effectiveness of the dung beetle *Onthopagus gazella* by the Australians against their bush fly showed that where sufficient numbers of beetles were confined to manure pads seeded with known numbers of eggs and larvae of the fly, complete elimination of the fly resulted if the manure was buried by the dung beetles quickly enough. Similarly, Texas workers, after introduction of this species from Australia, also showed a high reduction in horn fly emergence from cow pads exposed to high numbers of beetles. Current experiments in Arkansas have shown that if manure burial is rapid enough, reduction in face fly numbers may result. In the Harmon area of Arkansas, 975 pairs of *Onthopagus gazella* and 605 pairs of *Onthopagus taurus* were released at intervals during the summer and early fall months of 1977. Search and recovery attempts for these beetles in May and June of 1978 did not yield any beetles. A later similar experiment near Ozark was a little more successful. Traps placed in that area a year after the beetles' release yielded specimens of *Onthopagus taurus*. Several years may be required to adapt these species to their new habitat. Whether or not some fly control results remains to be seen. Additional benefits of the beetle include: (1) Burial of the manure by the beetles conserves fertility values. (2) Burrows made by the beetles aerate the soil and aid in percolation of water (Merryman-East Central)

5154-B1, B4, E2
MANAGEMENT OF DAIRY MANURE HANDLING SYSTEMS

Agricultural Engineering Department, Michigan State University, East Lansing, Michigan
T. L. Loudon and R. L Maddex
Paper No. 78-4015, American Society of Agricultual Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 12 p. 3 fig., 2 tab., 2 ref.

Keywords: Dairy wastes, Waste management, Waste storage, Land Application

Management is the intelligent input to the operation of a set of waste handling equipment and facilities Management techniques for various components of dairy waste handling systems are reviewed Particular emphasis is given to management of storage facilities. (Loudon-Michigan State University)

5155-A4, B1, F2
MISSOURI'S SHOW-ME APPROACH TO 208 INVOLVEMENT

Agricultural Engineering Department, University of Missouri Columbia, Columbia, Missouri 65211
J. M. Steichen

Paper No. 78-2034, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 6 p. 5 ref.

Keywords: Legal aspects, Water pollution, Nonpoint sources, Waste management

Section 208 of Public Law 92-500 requires that Missouri prepare an "area wide waste treatment management plan" dealing with nonpoint sources of pollution for the entire state. Many types of plans are required by Section 208, but this paper deals primarily with agriculturally related sources. Successful implementation of a 208 plan depends on public support. Public involvement early in plan development will help build this base of support. Missouri has established 114 county committees and 21 area councils. All of Missouri's 114 counties organized a County Water Quality Committee. About 110 counties have submitted reports identifying nonpoint source problems. Several also have reported on management practices and implementation programs. The committees seem to understand the problem, but are worried about finding a fair solution. They wonder who will pay for it, and how it can be done without unnecessary infringement on personal property rights. An immense education job lies ahead in order to implement the Rural Clean Water Program. (Merryman-East Central)

5156-B1, C1, C2, E2
NUTRIENTS AVAILABLE IN LIVESTOCK AND POULTRY MANURE RESIDUE AS REFLECTED BY MANAGEMENT SYSTEMS

USDA-Science & Education Administration, Lincoln, Nebraska
C. B. Gilbertson, D. L. Van Dyne, C. J. Clanton and R. K. White
Paper No. 78-3064, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 19 p. 5 fig., 8 tab., 18 ref.

Keywords: Livestock wastes, Poultry wastes, Waste composition, Computer models, Heavy metals, Trace elements, Toxic minerals, Arsenic, Potassium, Sodium, Calcium, Magnesium, Iron, Zinc, Manganese, Copper, Solids. Chemical oxygen demand

"Best usable values" for livestock and poultry manure residues were calculated by use of a computer model. Calculated constituents included total solids, volatile solids, N, P, K, Na, Ca, Mg, Fe, Zn, Mn, Cu, As, and COD from dairy, beef, swine, sheep, layers, broilers, and turkeys. The values that were determined reflect gains, losses and transfers of solids and nutrients that result from alternative manure management systems. It is recommended that livestock and poultry manure residues from specific sites be analyzed for specific constituents prior to determining land application rate, feed value, energy potential, or pollution potential. (Merryman-East Central)

5157-A1, B3, C2, D3, E2
NEW SLURRY COMPOSTING PROCESS

Anonymous
Farm Buildings Digest, V. 10, No. 3, p. 5-6, Autumn, 1975. 3 fig.

Keywords: Composting, Slurries, Equipment-composting, Cattle wastes, Design, Swine wastes, Economics, Land application

Dr. K. R. Gray and Dr. A. J. Biddlestone have developed and tested under farm conditions a new composting technique for converting slurry into a solid, stackable product with no residual liquid effluent. Composting equipment consists of four specially constructed compartments maintained under forced aeration. In each compartment a batch of slurry and straw is composted for a about a month; the compartment is then emptied and refilled. The capital installed cost of a manufactured unit is likely to be about 10 pounds/pig place, 100 pounds/cow place. Labor needs for a 1000 pig or 100 cow unit are about half an hour a day for filling and 1-2 hours a week for emptying the compartment and stockpiling the compost. For the same size of unit about 5-10 hp are needed continuously for the forced air supply, 1-2 hp for the recycle liquor pump, and 10 hp for half an hour a day for the slurry pump. Production of compost from a 1000 pig or 100 cow unit is about 650 tons/year. NPK nutrient content of the material is worth 3.90 pounds/ton fresh weight, based on February, 1975 fertilizer prices. The compost can be used immediately for field application or it can be stockpiled for future use. This process, which is now ready for commercial exploitation, makes a significant contribution towards solving the pollution problems caused by farm waste effluents. (Merryman-East Central)

5158-B2
DESIGN OF LIQUID MANURE TANK ROOF SLABS

School of Engineering, University of Guelph, Guelph, Ontario N1G 2W1, Canada
J.C. Jofriet
Canadian Agricultural Engineering, V. 20, No. 1, p. 38-44, June, 1978. 10 fig., 6 tab., 6 ref.

Keywords: Liquid wastes, Manure tanks, Design, Roofs

In many cases, it is desirable to cover liquid manure tanks. The roof slab will often be subjected to traffic loads from tractors, wagons and other farm implements. When substantial wheel loads are to be designed for, a poured concrete flat slab very often provides an economical solution. This paper deals with the effect of concentrated loads on rectangular flat slab panels. It also deals with the analysis and design of a roof slab for circular tanks that are too large for a single central column support. The result of the various analyses have been used to provide design recommendations that can be used directly by the designer if used in conjunction with the Canadian Farm Building Code and concrete design code. (Jofriet-University of Guelph))

5159-B2, C2, D3
EFFECT OF DISSOLVED OXYGEN CONCENTRATION ON THE AEROBIC STABILIZATION OF SWINE WASTE

Department of Bio-Resource Engineering, University of British Columbia, 2975 Wesbrook Mall, Vancouver, British Columbia V6T 1W5, Canada
N.R. Bulley and J.T.R. Hudson
Canadian Agricultural Engineering, V. 20, No. 1, p. 60-63, June, 1978. 4 fig., 3 tab., 12 ref.

Keywords: Swine wastes, Waste treatment, Design, Aerobic treatment, Dissolved oxygen, Chemical oxygen demand

Most aerobic waste treatment system designs recommend that the dissolved oxygen concentration be maintained at 0.5-2.0 mg/l. This design parameter may not be applicable to high strength wastes. Swine wastes (initial chemical oxygen demand (COD), 30,000 mg/l) were batch-digested at three levels of dissolved oxygen (0.5-2.0 mg/l; 5-8 mg/l; and 15-20 mg/l) over 14-day treatment periods. The results indicate that dissolved oxygen concentrations greater than 2 mg/l produce a significant increase in the rate of aerobic stabilization of the waste. For this waste, the bacteria were able to remove the organic compounds responsible for the soluble COD from solution within 2 days at all oxygen levels but they were able to oxidize these chemicals more rapidly at the higher oxygen concentrations. This increase in the rate of stabilization with oxygen concentration could have a direct effect on the design of waste treatment systems for other high strength animal and food processing wastes. (Bulley-University of British Columbia)

5160-A11, B1
MORE ON THREE-LEVEL BROILER BREEDER SYSTEM

Anonymous
Poultry Digest, V. 37, No. 437, p. 372, July, 1978.

Keywords: Poultry, Management, Design, Performance

Brian Emery, a contract hatching producer in England, has obtained satisfactory results with a three-level arrangement for housing broiler breeder birds. This arrangement utilizes a litter area on each side of a manure pit covered with slats and another slatted floor about 3 to 4 feet above the pit. The purpose of this type of arrangement is to increase poultry house capacity and to utilize body heat of the birds to maintain temperature in the winter. Emery acknowledges that there is considerable aggravation attached to inspecting the birds on the top deck, and also that there is a lot of equipment to go into the house and to be removed at clean-out time. Emery thinks if he were starting with a new house a deep pit would be better for removal of the droppings. In 1977, hen-housed average was 151.4 eggs per bird: hatching eggs per bird, 143.3; fertility, 94%, and first quality chicks per dam, 123. At the end of the lay, the birds were about ½ pound overweight. Floor eggs totaled 4%, and most of them were laid in the shadow of nest boxes on the ground floor. (Stiles-East Central)

5161-A5, B3, C2, D1, D2, E3
ANOTHER POSITIVE STEP IN RECYCLING

Anonymous
Calf News, V. 16, No. 9, p. 48, Sept., 1978.

Keywords: Salt, Groundwater pollution, Dairy wastes, Dehydration, Refeeding, Fuels

The solution to salt in the Los Angeles water table may also be another step forward in manure reclamation for large feedlots. In response to the problem of 160,000 dairy cows in the L.A. milk shed depositing 60,000 tons of salt a year through feces, the Chino Basin Municipal Water District commissioned Ceres Ecology Corporation of Sterling, Colorado to solve the problem. The salt problem was solved with a Carver-Greenfield dryer. This is the only dryer which lubricates the mass. In this process, the salt in the manure is captured and retained in the protein fraction which is pelleted. The 81% moisture manure fed into the dryer comes out as dry roughage-type product which is 80% the value of corn silage and can be refed or used as a fuel and also a dry-fine protein powder which is pelleted and refed, complete with salt. (Stiles-East Central)

5162-A6, F2
ODOR COMPLAINTS MUST BE VALID

Anonymous
Calf News, V. 16, No. 9, p. 44, Sept., 1978.

Keywords: Odor, Nuisance lawsuit

Odor regulations are being studied by the Texas Air Control Board to determine an easier, more reasonable way to perfect the present expensive procedures under the nuisance provision of the Texas Clean Air Act. Dr. John M. Sweeten, agricultural engineer, feels there are four points which should be considered in a valid odor complaint: (1) Odor frequency from the alleged source. (2) Valid records should be kept of duration of the odor. (3) Odor intensity should be scientifically established by chemical or organoleptic measurement of the average and peak odor intensities. (4) A qualified panel should determine odor offensiveness. (Stiles-East Central)

5163-B2, F1
MOVE HOGS INDOORS-NEXT STEP IN HOG CONFINEMENT

Anonymous
Missouri Ruralist, V. 119, No. 11, p. 24-25, June, 1978. 3 fig.

Keywords: Swine, Management, Design, Economics, Flushing, Ventilation

The latest trend in hog finishing appears to be the use of the modified open front building. Advantages are lower cost in comparison to total confinement barns and the benefits of natural ventilation. Harvey Peterson, a Missouri farmer, has modified the open front building to fit his particular needs. Peterson's unit is 32 by 84 feet with eight pens holding a total of 240 market hogs. Height at front eave is 12 feet and height at rear is 6 feet. The unit includes a unique gutter flush system in which the gutter has been deepened to almost 6 inches, allowing Peterson to add slats later and still use the flush system. The gutter is 6 feet wide under the flushing tank and narrows to 4 feet at the far end where the flushing water leaves the building and drains to a lagoon. The gutter's slope begins with a drop of 2 inches in 20 feet and increases in 2-inch increments every 20 feet. Total fall is 1.5 feet. Perhaps the most unique feature of Peterson's unit is the gutter flushing tank which is made from an old 300-gallon fuel tank with a wide strip cut from the length of the tank. The tank rolls on an axis within a framework to dump the water. Tripping mechanism is the weight of the water itself. A long block of styrofoam is attached inside the tank near the top on one side. As the tank fills, the styrofoam displaces water on that side and causes the tank to roll over as it gets heavier on the opposite side. Natural ventilation is achieved by raising a plastic curtain attached to the upper part of the front wall. Rear ventilation doors are lifted in summer, but tightly closed in winter. Feeders which serve two pens each are filled through roof hatches. Cost of Peterson's unit ran about $75 per hog. That's slightly higher than the $65 figured for building an open front feeding floor. However, the extra cost should be recovered in higher gains in winter. (Stiles-East Central)

5164-A6, B2, B4
OPEN LAGOONS MAY DISAPPEAR

Anonymous
Beef, V. 15, No. 1, p. 49, Sept., 1978.

Keywords: Odor, Legal aspects, Lagoons, Design

Vern Meyer, Iowa State University agricultural engineer, says many operators now using lagoons have had odor problems and Meyer predicts that new odor regulations in the state will either force feeders to abandon the lagoon system--or redesign it. Meyer told cattlemen at the recent ISU Cattle Producers Day that the obvious answer to the problem is to build much larger lagoons than operators are now using. However, a much larger lagoon has the following disadvantages: (1) large amounts of water must be used since the lagoon must be pumped half full of water before manure can be added, and (2) the lagoons will have to be emptied about twice a year, and then brought back to the half-full level. (Stiles-East Central)

5165-B3, E2
ONE FARMER'S OUTLOOK ON COMPOSTING MANURE

R. Thompson
Compost Science, V. 19, No. 3, p. 25, May-June, 1978. 1 fig.

Keywords: Composting, Land application

Problems with yields on part of his corn acreage and lack of a place to put manure in early spring made Richard Thompson of Boone, Iowa adopt composting in his manure management program. Thompson states the following as benefits derived from composting: (1) Life is more enjoyable. (2) More nitrogen is retained in the manure. (3) Energy is saved since less or no anhydrous ammonia is needed. (4) Air and water are not polluted. (5) The compost is less compacting on soil. (6) Livestock are healthier due to cleaner yards and sheds. (7) Composting is a good management tool. (8) Composting kills weed seed and helps control diseases. Thompson has bought an Easy Over compost turning attachment for his tractor and can turn more than 500 tons of compost in an hour, as opposed to the two days required by the stationary manure spreader and loader. Time and yield response make this a feasible way of disposing of manure. (Stiles-East Central)

5166-A11, B1, E3
PREPARING BROILER HOUSE WHEN USING OLD LITTER

Anonymous

Poultry Digest, V. 37, No. 437, p. 352, July, 1978.

Keywords: Poultry litter, Recycling, Animal health

If old litter is to be used for the next lot of broilers, the following precautions should be carefully considered: (1) Re-use litter only from a previous broiler flock that was in good health. (2) Old litter should not be used if the previous flock experienced a high percentage of processing condemnations. (3) Litter should not be reused if it is excessively wet throughout or excessively caked. If the above conditions are favorable, obvious economic savings are possible--in cleaning time, labor and litter material cost. The old litter must be conditioned and prepared before the chicks are brooded. Strict attention must be paid to ventilation, ammonia and dust levels when brooding broiler chicks on old litter. If these management factors are not carefully controlled, significant damage to the flock is possible and performance may be greatly impaired. (Stiles-East Central)

5167-A4, A6, A7, A11, A12, B2, D3, F3
PRINCIPLES OF TREATMENT OF ANIMAL SLURRIES

The West of Scotland Agricultural College
S. Baines, M.R. Evans, R. Hissett, and R.Q. Hepherd
The Agricultural Engineer, V. 28, No. 2, p. 72-76, Summer, 1973. 4 tab.

Keywords: Slurries, Waste treatment, Aerobic, Anaerobic, Odor, Air pollution, Water pollution, Public health, Animal health

Economic pressures have led to increasing intensification of livestock production. Shortage and/or cost of straw plus the increased number of animals confined to one place has led to animal wastes being handled in slurry form. In almost all instances slurry is subjected to storage in tanks or in under-slat channels for periods varying from 2 or 3 weeks to several months. This has resulted in uncontrolled anaerobic treatment which has given rise to odor and noxious gases. The need has been recognized to investigate and develop efficient systems for treating slurry in such a way as to minimize social nuisance, pollution of water courses, and the risks to animal and human health. Constraints inherent in any such system include a regard for cost and technical difficulties of installation operation and maintenance. The most efficient systems are therefore likely to be those which include the largest element of conservation of the valuable components of slurry and result in production of materials which can be utilized. Biological systems are considered more suitable for recycling purposes, minimizing the possibilities of added toxic chemical residues entailed in chemical treatment. Continuous aerobic systems for the treatment of whole slurries from fattening pigs, beef cattle and battery hens have been evaluated in laboratory-scale units. Biological treatment of slurries must be integrated into a system of animal housing, slurry collection, treatment and handling to meet the requirements and objectives in each individual case. Factors to be taken into account include the topography and climatic conditions, in addition to the area of land and its availability for the application of the material in either the treated or untreated form. In the immediate future, further investigations will be directed toward more profitable utilization of the components of treated or untreated slurry alongside the development of operational systems which still require agricultural land as the final treatment stage. (Stiles-East Central)

5168-A11, E3
RECYCLED SWINE WASTE FED IN GROWING-FINISHING DIET

Anonymous
Feedstuffs, V. 50, No. 3, p. 14, July 24, 1978.

Keywords: Swine wastes, Refeeding, Swine, Performance

According to a University of Kentucky study, growing-finishing pigs readily accepted both an unprocessed and a fermented feed mixture containing their own feces. Twenty-four pigs were continuously fed their own feces mixed with a basic corn-soybean meal ration at rates of 15-18% of the total ration dry matter. A control group of 11 pigs was fed the basic corn-soybean ration with no manure added. Average gains for the control treatment were .75 kg per day for the study. Pigs receiving recycled manure ate less feed and had somewhat lower daily gains. (Stiles-East Central)

5169-A2, A4
EFFECTS OF FEEDLOT RUNOFF ON FREE-LIVING AQUATIC CILIATED PROTOZOA

Department of Veterinary Pathology and Hygiene, University of Illinois at Urbana-Champaign, Urbana-Champaign, Illinois
K.S. Todd, Jr.
Research Report No. 131, University of Illinois Water Resources Center, Aug., 1977, 13 p. 3 tab., 1 fig.

Keywords: Feedlot runoff, Water pollution, Microorganisms

Water samples and free-living and sessite ciliated protozoa were collected at various distances above and below a stream that received runoff from a feedlot. No correlation was found between the species of protozoa recovered, water chemistry, location in the stream, or time of collection. (Todd-University of Illinois)

5170-A10, A11, B1
AVAILABILITY TO GRAZING SHEEP OF GASTROINTESTINAL NEMATODE INFECTION ARISING FROM SUMMER CONTAMINATION OF PASTURES

Division of Animal Health, CSIRO, McMaster Laboratory, Private Bag No. 1, Glebe, N.S.W. 2037, Australia
A.D. Donald, F.H.W. Morley, P.J. Waller, A Axelsen, and J.R. Donnelly
Australian Journal of Agricultural Research, V 29, p. 189-204, Jan., 1978. 5 fig., 3 tab., 22 ref.

Keywords: Pastures, Grazing, Animal health, Sheep, Sheep wastes, Nematodes, Larvae

In two successive years, separate phalaris-subterranean clover pasture plots near Canberra were contaminated with nematode eggs by grazing with naturally infected sheep in each of the summer months (December, January, February) and the first month of autumn (March). At intervals until mid-to late winter, the availability of infection on pasture was estimated by grazing with worm-free 'tracer' lambs which were subsequently slaughtered for worm counts. Summer rainfall in both years was above average. Tracer counts of *Haemonchus contortus* and *Ostertagia, Trichostrongylus* and *Nematodirus* spp. per 10^3 eggs per hectare remained high during summer, with evidence that migration of larvae to the herbage could continue for at least 2 months after contamination. Rates of decline in tracer worm counts over the autumn and winter did not differ between years, and from an assumed maximum 2 months after contamination in each of the summer months, were fastest from December and slowest from February contamination. These rates were similar for all genera on December-contaminated plots, but on January and February plots, *Osteragia* spp. declined more slowly. *H. contortus* numbers fell sharply in early autumn to be low by the end of May. By mid-July there would be a few larvae of all genera available on pastures contaminated in December and January, but this is less certain on February contaminated pastures, especially for *Osteragia* spp. Implications for the control of nematode infections in sheep by anthelmintic treatment and grazing management are considered. (Donald-CSIRO)

5171-A8, B2, C2, E2
EFFECTS OF LIQUID SWINE WASTE APPLICATIONS ON CORN YIELD AND SOIL CHEMICAL COMPOSITION

Purdue University, West Lafayette, Indiana 47907
A.L. Sutton, D.W. Nelson, V.B. Mayrose, and J.C. Nye
Journal of Environmental Quality, V 7, No. 3, p. 325-333, July-Sept., 1978. 2 fig., 6 tab., 32 ref.

Keywords:Liquid wastes, Swine wastes, Land application, Crop response, Soil chemistry, Aerobic, Anaerobic, Salts, Potassium, Phosphorus, Nitrogen, Nitrate

A 2-year field experiment was conducted to study the effects of salt (0.2 and 0.5%) in swine rations, liquid waste handling systems (aerobic and anaerobic), and application rates on the recycling of swine wastes to Fox silt loam and Chalmers silt loam soils cropped to corn (*Zea mays* L.). Liquid swine waste (1.8 to 3.0% dry matter) was applied annually at rates of 45, 90, and 134 metric tons/ha. The high rate provided an average of 378 kg N, 113 kg P, 163 kg K, and 42 kg Na per ha. Check and inorganic fertilizer (168 kg N/ha, 56 kg P/ha, 112 kg K/ha) treatments were included. Soil Na, nitrate N, and extractable P concentrations increased with increasing waste application rates. Soil electrical conductivity was not affected by waste application rate. The effects of dietary salt levels and waste handling systems on the chemical composition of the soils were inconsistent. There was evidence for downward movement of Na, K, and NO_3^- in the soil profile of plots receiving waste and fertilizer. Downward movement of NO_3^- was observed to a greater extent in fertilizer-treated plots than in waste-treated plots. Under climatic conditions prevailing in this study, 2 years of waste application had no detrimental effects on the chemical composition of the two silt loam soils. Soil application of waste resulting

from different dietary salt levels and waste handling systems resulted in similar corn yields and leaf chemical composition. Yields were higher from plots treated with waste and inorganic fertilizer compared to the check plot. Corn yields increased with increasing rates of waste application up to the 90-metric tons/ha rate, then leveled off. Nitrogen, P, and K concentrations in corn ear leaf tissue increased with increasing waste applications. (Sutton-Purdue University)

5172-E3, F1
SWINE WASTES AS A NUTRIENT SOURCE IN GROWING-FINISHING SWINE RATIONS

Hawaii Agricultural Experiment Station, College of Tropical Agriculture, University of Hawaii
W.I. Hugh, C.C. Brooks, D.K. Oshiro, and W.Y. Toma
Research Report 186, Hawaii Agricultural Experiment Station, April, 1978, 8 p. 4 tab., 7 ref.

Keywords: Swine wastes, Refeeding, Swine, Performance, Economics

Swine solid wastes were evaluated as a nutrient source in the rations of finishing swine Results indicated no performance advantage or feed cost saving from the inclusion of swine waste solids in finishing rations, nor was any benefit observed by the incorporation of a fermentation-producing agent. (Hugh-University of Hawaii)

5173-A8, B3, C2, E2
CROP RESPONSE AND QUALITY OF SOIL LEACHATE AS AFFECTED BY LAND APPLICATION OF BEEF CATTLE WASTE

Ohio Agricultural Research and Development Center, Columbus, Ohio 43210
F. Haghiri, R.H. Miller, and T.J. Logan
Journal of Environmental Quality, V. 7, No. 3, p. 406-412, July-Sept., 1978. 8 fig., 7 tab., 21 ref.

Keywords: Land application, Cattle wastes, Crop response, Nitrates, Organic carbon

A single application of beef cattle manure rates of 0, 49, 158, and 316 dry metric tons/ha to field lysimeters containing three different soil types was made Corn (*Zea mays* L.) yields for the first and second years reached the maximum at the 158-metric tons/ha manure rate, while in fourth year the highest yield was obtained at the 316-metric tons/ha rate. With the exception of first cropping years, at the 49-metric ton rate yields of dry matter produced were $\geq$ the control which received fertilizer annually. Corn yields for all years and from all manure treatments were significantly higher for the Wooster (Type Fragiudalf) soil compared with Celina (Aquic Hapludalf) and Hoytville (Mollic Ochraqualf) soils. Nitrate-N concentration in the leachate increased with increasing load of applied manure and decreased with time after application. More NO_3^- N was leached from the manure-amended Wooster soil than from the other two soils over a 4-year period The decomposition of manure was higher in the Celina and Wooster Soils than in the Hoytville soil. The application of beef cattle manure to soils did not influence the incidence of soil-borne plant pathogens. The results of this study indicate that annual application of beef cattle manure to soils at 50 dry metric tons/ha is far more desirable than single application of high loading rates for 2- to 3-year periods from the standpoint of maximizing plant nutrient use and water quality. (Haghiri-Ohio Agricultural Research and Development Center)

5174-A7, A12, B1, C2
AMMONIA AFFECTS SWINE HEALTH

Anonymous
Hog Farm Management, V. 15, No. 9, p. 17, Sept., 1978.

Keywords: Ammonia, Swine, Animal health, Air pollution

University of Illinois researchers S.E. Curtis, J.G. Drummond, and J. Simon conducted studies which established the following facts about atmospheric ammonia in the pig's environment: (1) At 50 or 75 ppm, ammonia hinders the young pig's ability to clear bacteria from its lungs. (2) Somewhere between 75 and 100 ppm ammonia depresses the rate of gain. (3) At 100 ppm, ammonia increases the effects of the early stages of ascarid infection. (Merryman-East Central)

5175-A4, A8, B5, C2, E2
SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICROBIOLOGICAL IMPLICATIONS (VOLUME I, CHEMICAL IMPLICATIONS)

Soil and Crop Science Department, Texas A&M University, College Station, Texas 77843
L.R. Hossner, Chun-Wei Kao, R.W. Weaver, adn J.A. Waggoner
Environmental Protection Agency Report EPA-600/2-78-131a, June, 1978, 118 p. 22 fig., 37 tab., 79 ref.

Keywords: Sewage, Effluents, Irrigation, Land application, Farmland, Soil-water-plant relationships, Nitrogen, Phosphorus, Heavy metals, Soil contamination, Water pollution

The city of San Angelo, Texas, has used sewage effluent which has undergone primary treatment for irrigation of the same 259-hectare sewage farm since 1958. The impact of 18 years of sewage effluent irrigation on the soil and water quality was studied from 1975 to 1977. The volume of sewage arriving at the sewage treatment plant ranged from 0.219 to 0.351 m^3/sec. and contributed from 3 4 to 31.2% of the total flow of the bordering Concho River in 1976. The fate of applied nitrogen, phosphorus, and selected heavy metals in the soil-water-plant ecosystem were examined. There was evidence of some NO_3-N accumulation in the soil profile and in the Concho River while no accumulation of NH_4^+-N was found in the soil profiles. Some organic nitrogen accumulated at the soil surface, but after 18 years of operation there was a net loss of total nitrogen in the soil profile Phosphorus accumulated in the soil profile depths of 200 cm along with a slight build-up of certain heavy metals in the surface soils. Deep wells appeared to be uncontaminated by the sewage farm operation. (Hossner-Texas A&M University)

5176-A8, A11, A12, B5, C2, E2
SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICROBIOLOGICAL IMPLICATIONS (VOLUME II, MICROBIOLOGICAL IMPLICATIONS)

Department of Soil and Crop Science, Texas A&M University, College Station, Texas 77843
R.W. Weaver, N.O. Dronen, B.G. Foster, F.C. Heck, and R.C. Fehrmann
Environmental Protection Agency Report EPA-600/2-78-131b, June, 1978, 93 p. 19 fig., 36 tab., 89 ref.

Keywords: Sewage, Effluents, Land application, Irrigation, Pastures, Cropland, Public health, Animal health, Parasites, Bacteria, Viruses, Cattle, Salmonella, Soil microbiology

The city of San Angelo, Texas, has been using agricultural land for decades as a means of disposing of all of its municipal sewage after primary treatment. Water applications have been high enough to satisfy crop requirements for a 600 ha farm even though the farm consists of only 259 ha. The farm routinely supports about 500 cattle on its pastures and produces both row and hay crops. Land application of sewage has public health implications, and this study was conducted to evaluate these concerns. This was accomplished by monitoring the soils and waters on the farm to determine the incidence of Salmonella and parasites. Salmonella was isolated from various locations on the farm but the frequency of isolation was not unusually high. Possible human parasites were not found in any effluent but were present in the sludge in holding lagoons. The parasite population in cattle on the farm did not increase during the months the cattle were monitored. There was an unusually high population of animal parasites in the soils as compared to off-farm control soils. This is thought to be due to the higher animal density, the vegetative cover, and relatively moist soil conditions on the farm. Column studies using soil from the farm indicated viruses could be leached through the soils. Their potential health hazard could not be determined due to insensitive detection techniques. (Weaver, Texas A&M University)

5177-B1, C2, E2
MANURE IS AN INCREASINGLY ECONOMICAL FERTILIZER SOURCE

Department of Land Resource Science, Ontario Agricultural College, University of Guelph, Ontario, Canada
E. Beauchamp
Crops and Soils Magazine, V. 30, No.2, p. 23, Nov., 1977.

Keywords: Animal wastes, Land application, Fertilizers, Nitrogen, Phosphorus, Potassium, Micronutrients

Manure is an economic source of nitrogen, phosphorus, and potassium, as well as micronutrients for crop production. Manure composition varies substantially depending on kind and age of livestock, kind of feed, and management of the manure.A problem encountered with use of manure is loss of nutrients. Loss of part of the liquid fraction could significantly reduce manure fertilizer value. Almost half the nitrogen, all the phosphate, and two-fifths the potash are contained in the solid fraction of fresh manure. Significant losses of nitrogen due to ammonia volatilization into the atmosphere can occur, particularly after field application and before incorporation into the soil. Rapid incorporation of manure into the soil conserves the ammonia. Time of application determines the fertilizer value of manure. The value of liquid manure placed on the soil surface or injected between corn rows as a sidedressing is currently being investigated since the value of phosphate in manure applied as a sidedressing is much reduced. Injection of liquid manure should place it closer to the roots and reduce ammonia loss and odor problems. (Stiles-East Central)

5178-A3, A4, B1, C2, C3, E2
NONPOINT SOURCES: STATE-OF-THE-ART OVERVIEW

Extension Agricultural Engineer, Texas A&M University, College Station, Texas
J.M. Sweeten and D.L. Reddell
Transactions of the ASAE, V. 21, No. 3, p. 474-483, May-June, 1978. 3 fig., 2 tab., 72 ref.

Keywords: Nonpoint sources, Water pollution, Pastures, Rangeland, Sediment, Pesticides, Animal wastes, Nitrogen, Phosphorus, Potassium,Fecal coliforms, Agricultural runoff, Land application

During the past few years, the term nonpoint pollution source has become exceedingly important to agriculture. In 1972, Federal legislation (Public Law 92-500) was passed bringing many forms of agriculturally related nonpoint pollution under regulatory authority. Section 208 of Public Law 92-500 created a cooperative local/state/Federal system for areawide water quality planning. Nonpoint pollution sources are a major concern to these 208 planners. During the past, both basic and applied research have been conducted on such classical soil and water conservation topics as erosion control, sediment transport, soil chemistry and physics, crop production, range management, agricultural chemicals, animal science, and forestry. The challenge today is to locate, interpret, and compile this past knowledge into forms useful for Section 208 planners. This paper reviews the current knowledge concerning the occurrence of nonpoint pollution sources such as sediment, nutrients, pesticides, and fecal contaminants. Sediment transport equations are reviewed and described and the pollution potential of range and pasture livestock production is discussed. (Sweeten-Texas A&M)

5179-B5, C2, E2
SLUDGE DISPOSAL STRATEGY: PROCESSES AND COSTS

Water Research Centre, Stevenage Laboratory
M.J. Burley and R.W. Bayley
Water Pollution Control, V. 76, No. 2, p. 205-221, 1977. 6 fig., 8 tab., 7 ref.

Keywords: Sewage, Sludge, Land application, Cropland, Pastures, Transport, Heavy metals, Pathogenic bacteria, Economics

The limitations and constraints which can be expected to influence the utilization of sewage sludge on farmland are outlined and a method for selecting an appropriate type of sludge treatment is described. Whereas the use of untreated, raw sewage sludge is not generally acceptable, it is noted that the practice has been used for years in some places without any apparent ill effect. The observance of fairly simple safeguards combined with compliance with existing advisory guidelines ensures that any risks associated with the utilization of sewage sludge on farmland are kept acceptably low. It would be desirable, to identify more clearly some of the specific risks associated with the transfer of certain pathogens from sludge to farm animals. Capital and operating costs for a variety of sludge treatment and dewatering processes have been collected, and when combined with current costs for transportation, show that treatment in lagoons with subsequent decanting could result in substantial savings even over transportation of whole untreated sludge to farmland. Further inquiry into the operation and design of treatment lagoons is suggested. (Solid Wastes Information Retrieval System)

5180-B1
PARASITES OF *HAEMATOBIA IRRITANS* AND OTHER FLIES BREEDING IN BOVINE FECES IN NORTHEAST MISSISSIPPI

Department of Entomology, Mississippi Agriculture and Forestry Experiment Station, Mississippi State University, Mississippi State, Mississippi 39762
K.J. Watts and R.L. Combs, Jr.
Environmental Entomology, V. 6, No. 6, p. 823-826, Dec., 1977. 1 fig., 3 tab., 6 ref.

Keywords: Fly control, Parasites, Cattle wastes

Six hymenopterous parasites were reared from *Haematobia irritans*(L.) pupae; (Family: Pteromalidae): *Spalangia nigroaenea* Curtis, *Spalangia cameroni* Perkins, *Spalangia nigra* Latr., *Spalangia haematobiae* Ash., *Spalangia endius* Walker, and (Family: Cynidae): *Pseudeucoila* sp. The predominant parasites of *H. irritans* were *S. nigroaenea* and *S. cameroni*. These parasites, along with immatures which did not emerge, accounted for 81% of the parasitism in 1972 and 85% 1973. Parasite activity was highest in Aug. and Oct. of 1972, with a peak of 24% occurring in July, Oct., and Nov. of 1973. Parasites were recovered from *Ravinia derelicta* (Walker) pupae; (Family: Sarcophagidae) and 2 *Spilogona* spp pupae (Family: Muscidae). (Watts-Mississippi State University)

5181-B2, C2, D3, E3
THERMOPHILIC FERMENTATION OF PIG FAECES AND STRAW BY ACTINOMYCETES

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M.J. Ginnivan, J.L. Woods and J.R. O'Callaghan
Journal of Applied Bacteriology, V. 43, p. 231-238, 1977. 3 fig., 2 tab., 21 ref.

Keywords: Waste treatment, Fermentation, Swine wastes, Refeeding, Thermophilic, Hydrolysis, Actinomycetes

An investigation was conducted to investigate the ability of certain actinomycetes (*Thermomonospora fusca, Thermomonospora curvata* and *Pseudonorcardia thermophila*) to grow on and hydrolyse pig feces and straw. It was found that a substantial fraction of the cellulosic material in pig feces was available to the actinomycetes investigated. *T. fusca* was the most effective of the three strains in utilizing this form of cellulose. Pretreatment of grass straw and barley straw with 5% (w/v) NaOH was necessary in order to raise the amount of cellulose available to *T. fusca* and *P. thermophila* to the levels available in pig feces. The cellulose activities of the bacteria were not particularly sensitive to pH changes near their respective optimum values. The tolerance to the cellulose activity to changing pH was greater on the basic side of these optima. This may have some advantage for NaOH pretreatment. The levels of digestible protein produced suggest that the waste cellulose in pig feces might be recovered by thermophilic treatment prior to re-feeding. Further work on thermophilic fermentation of pig feces and NaOH-treated straw should be done, particularly concerning pathogen survival, thermogenesis and the nutritive value of the product. (Ginnivan-University of Newcastle upon Tyne)

5182-A8, B3, B5, C1, C2, C3, E2
SOME PHYSICAL, CHEMICAL, AND BIOLOGICAL EFFECTS OF HEAVY POULTRY MANURE APPLICATIONS ON A SOIL ECOSYSTEM

R.R. Weil
Ph.D. Dissertation, Department of Agronomy, Virginia Polytechnic Institute and State University, May, 1977, 203 p. 30 fig., 33 tab., 197 ref.

Keywords: Poultry wastes, Land application, Soil properties, Soil-water-plant relationships, Arthropods, Fauna, Infiltration, Salts, Nitrogen, Phosphorus, Crop response

Research was conducted to study how repeated heavy applications of poultry manure influence the soil system with respect to: (1) changes in physical soil properties including bulk density, moisture retention and infiltration, temperature, and aggregation. (2) chemical effects on soil pH, organic matter, salinity, inorganic N forms and soil test values, (3) the biological activity of the soil in the processes of crop growth and organic matter decomposition, (4) changes in the abundance and diversity of soil arthropods, and (5) some of the interrelationships among the above factors. Poultry manure was applied to a Davidson clay loam at rates of 27, 54, 85, and 110 metric tons of dry matter per hectare. Two sets of controls were included, one with N and K fertilizer and one without. The plow layer of the most heavily manured plots was nearly twice as moist as the control plots in spring. An extremely porous structure was formed in the upper 8 cm of the manured soil. This resulted from faunal activity (primarily earthworms) and developed gradually during early summer. Despite the more porous surface structure, water infiltration was temporarily reduced in spring and summer by

the organic layer created when the fall manure application was plowed under. Where spring and summer runoff would pose a problem, large quantities of poultry manure should be incorporated by some method which does not invert the furrow slice as does moldboard plowing. Once the water-repellancy of this layer diminished, the rate of infiltration was much greater on the manured plots. Probably the most important chemical effect of the manure were the high salt and N concentrations, and the apparent mobilization of P. Both fertilized and unfertilized controls yielded over 120 quintals/ha of corn and there was no response to N or K after 5 years without fertilization with these elements. Maize yields were adversely affected by all but the lowest rate of poultry manure and even the latter gave a statistically non-significant yield reduction. Biological activity was certainly altered by the poultry manure treatments, but no consistent pattern emerged from the data collected. Manure affected the arthropod communities in two ways -- by imposing its own numerically very large fauna (mostly Ascaridae and Macrochelidae) on the soil community and by providing moist conditions and a vast quantity of organic substrate utilizable directly and indirectly by the indigenous soil fauna. (Merryman-East Central)

5183-B1, C2, C3

SPECIFIC COMPOSITION OF REPRESENTATIVE FEEDLOT WASTES: A CHEMICAL AND MICROBIAL PROFILE

Northern Regional Research Center, Agricultural Research Service, U.S. Department of Agriculture, 1815 N. University, Peoria, Illinois 61604
G.R. Hrubant, R.A. Rhodes, and J.H. Sloneker
Science and Education Administration Report SEA-NC-59, U.S. Department of Agriculture, Feb., 1978, 94 p. 30 tab., 46 ref.

Keywords: Cattle wastes, Swine wastes, Feedlots, Waste composition, Trace elements, Chemical properties, Heavy metals, Microorganisms, Salmonella, Yeasts, Fungi, Streptomycetes, Aerobes, Biochemical properties

Seven cattle and two hog feedlots were selected as sampling sites from the major cattle producing states of the Midwest and Southwest. Cattle feedlots ranged from 1,500 to 100,000 head per feedlot. In addition, the microbiology of waste, runoff, and associated sites of an eighth cattle feedlot were examined in greater detail. Samples were collected from the feedlots with a clean spade. Each sample, approximately 5 lb. wet weight, was a representative composite of five samples from a selected pen on each feedlot. Where possible, the same pens were sampled for all four collections (sampling times). The fourth collection for Feedlot H was from a nearby feedlot because Feedlot H ceased operation. Chemical and microbial analyses were performed on all samples. Study results are given. It is hoped that this publication may contribute to the need for more detailed information on the qualitative and quantitative presence of specific classes of organic compounds and inorganic constituents in feedlot wastes. (Merryman-East Central)

5184-B2, D1, E3

EQUIPMENT AND METHODS FOR THE SOLID/LIQUID SEPARATION OF SLURRIES

National Institute of Agricultural Engineering
R.Q. Hepherd and J.C. Douglas
The Agricultural Engineer, V. 28, No. 2, p. 77-83, Summer, 1973. 1 fig., 1 tab., 3 ref.

Keywords: Slurries, Separation techniques, Equipment-separators, Swine wastes, Poultry wastes, Dairy wastes, Sludge, Recycling

The performance of commercially-available and experimental processes or mechanisms for separating coarse solids from slurries from pigs, poultry, and dairy cows is assessed. The major requirements for a separator are: (a) reliability and general robustness, (b) simplicity in detail design to reduce maintenance and the incidence of mechanical failure, (c) versatility to cover a wide range of farm slurries and farm conditions, and (d) adequate output -- the ability to deal with the slurry output from 150-200 cows in an eight-hour day is probably the minimum future requirement for general farm use. Separation processes are probably a key to the development of successful slurry handling and disposal alternatives. The products of separation are far easier to handle than slurries and the coarse solids in particular may have some commercial value off the farm. Small-scale trials suggest that it may be possible to store the liquids from separated cattle slurries for long periods and then pump or tanker them to land with difficulty. Biological treatment systems either for odor control or for control of water pollution are likely to become more simple in basic design and much more trouble-free in operation if they include a separation stage to remove coarse solids. Mechanical separation is likely to be the most reliable method under farm conditions, because of the variable results and difficulties often experienced when gravity separation of slurries is attempted. The sludges are likely in many cases to form the greater part of the output from farm slurry treatment systems, and therefore separation processes aimed at reducing their volume or turning them into handleable solids, or possibly even converting them for re-use as fertilizer or feed supplements will have to be considered for those situations where the aim of a treatment process is to solve the disposal problems of livestock units with little or no land on which to dispose of wastes. The efficient separation of the liquid fraction from the solids in the sludges from treatment systems is difficult with types of separators presently being used to remove coarse solids. Although it is technically possible to achieve good separation with simple equipment (eg. dosing with flocculants followed by draining the sludge in a bale tank), these techniques presently have disadvantages for farm use. (Merryman-East Central)

5185-A11, C2, E3

POULTRY MANURE AS FEED

Anonymous
Animal Nutrition and Health, V. 33, No. 6, p. 10, Aug.-Sept., 1978.

Keywords: Refeeding, Poultry wastes, Swine, Performance, Nitrogen, Toxicity

University of Georgia College of Agriculture Experiment Station reseachers have found that within certain limits, poultry manure may be added to grain for a suitable swine feed. However, the percentage must be carefully controlled because the waste contains a non-protein nitrogen which cannot be broken down in the swine digestive system and too much can become toxic to the animal. It was found that the manure mixture measured on a wet basis resulted in reduced performance in terms of growth rate on a dry basis the conversion of body weight was as good as feed without manure. (Merryman-East Central)

5186-A6, A7

MODEL STUDY OF FIVE TYPES OF MANURE PIT VENTILATION SYSTEMS

University of Nebraska Experiment Station, Concord, Nebraska
S.H. Pohl and M.A. Hellickson
Transactions of the ASAE, V. 21, No.3, p. 542-549, May-June, 1978. 9 fig., 5 tab., 14 ref.

Keywords: Ventilation, Swine wastes, Manure pit, Design, Odor, Air pollution

Employing scale model of five pit ventilation systems and the principles of similitude and dimensional analysis, a study was initiated to determine the influence of manure pit ventilation system geometry on air removal from a swine building and to evaluate the effects of pit ventilation system geometry on swine building ventilation characteristics. It was determined that pit ventilation system design has a significant effect on average air flow velocities in the pit, with the pressurized pit ventilator system consistently generating lower velocities in the pit than those generated by the other four systems studied. The significant differences noted in velocity means indicate a need for considering the placement of the baffled ceiling inlet, with respect to ventilation system location, if proper ventilation characteristics are to be obtained. Air velocity distribution was relatively uniform at pit and swine levels for the slotted pipe underslat ventilator, the centered duct pit ventilator, and pressurized pit ventilator system, used with the center-baffled ceiling inlets. However, non-uniform air flows were noted for the outside wall pit ventilator and hooded manure pit exhaust system. Air flow patterns were adequate at both levels for the centered duct pit ventilator, pressurized ventilator system, and the outside wall pit ventilator; and inadequate for the slatted pipe under-slat ventilator and hooded manure pit exhaust system. Ventilation system design significantly affected the time required to produce an air change in the model. The composite results of the data obtained from air flow velocities and patterns and evacuation times indicate that the pressurized ventilator system and the centered duct pit ventilator provided the best ventilation characteristics in the model, with the slotted pipe underslat ventilator producing the poorest ventilation characteristics. (Stiles-East Central)

5187-B5, C2, D3, E2

USES OF ORGANIC RESIDUES AT NEBRASKA EXPERIMENT STATIONS

Nebraska Agricultural Experiment Station, Lincoln, Nebraska
W.W. Sahs
Compost Science, V. 19, No. 3, p. 21-22, May-June, 1978.3 tab.

Keywords: Organic wastes, Land application, Crop response, Animal wastes, Paunch manure, Composting, Sewage

The Nebraska Experiment Station has conducted a number of studies utilizing organic residues and fertilizers as nutrients for crops. Areas of emphasis have been as follows: 1912-1937 barnyard manure; 1935-1955 legumes in crop rotations, barnyard manure; 1955-1970 - commercial fertilizers solid, anhydrous, liquid; 1970-1975 - liquid animal wastes, feedlot manure, efficiencies of commercial fertilizer; 1975-1978 - legumes in crop rotations, paunch manure [(composted, feedlot manure (composted)], efficiencies of commercial fertilizer; and 1978 present - continuation of legumes in crop rotations with manure, composted paunch and feedlot manure, efficiencies of commercial fertilizer, and composted sewage sludge. Study results are discussed. Field trials have indicated that the best measure of the value of composted materials is to ascertain nutrient content and use it as a guideline for cropland application. Some or all of the cost of composting and transport will have to be borne by those who create the product, whether it be the city, county, feedlot operator or meat packer. (Merryman-East Central)

5188-B5, C2, E2, F4 ESTIMATING U.S. LIVESTOCK AND POULTRY MANURE AND NUTRIENT PRODUCTION

Commodity Economics Division, Economics, Statistics, and Cooperatives Service, U.S. Department of Agriculture, Washington, D.C. 20250
D.L. Van Dyne and C.B. Gilbertson
Economics, Statistics, and Cooperatives Service Report ESCS-12, U.S. Department of Agriculture, March, 1978, 145 p. 8 tab., 10 ref.

Keywords: Livestock wastes, Poultry wastes, Land application, Waste composition, Nitrogen, Phosphorus, Trace minerals, Potassium, Cropland, Pastureland

Estimates are developed for total manure, nitrogen, phosphorus, and potassium produced by and available from livestock and poultry in the United States in 1974. Also included are estimates of the amount retained after losses from storage and waste handling systems, and estimates of the amounts which could be economically recovered for use elsewhere. A ratio of total manure production to acres of cropland and pastureland is developed to provide an indication of animal manure concentration on a county-to-county basis in the United States. (Van Dyne-USDA)

5189-B2, B3, C2, D3, E3 FEEDLOT MANURE KEEPS HOME FIRES BURNING

Anonymous
Furrow, p. 30-31, Sept.-Oct., 1978. 3 fig.

Keywords: Recycling, Thermonetics, Methane, Refeeding, Fertilizers, Irrigation

Last fall a plant for methane production was built by Calorific Recovery Anaerobic Process, Inc. (a subsidiary of Thermonetics, Inc.) near Guymon, Oklahoma. By March, 1978, the facility was processing 200-300 tons of manure a day into methane. The process is based on a carefully controlled, oxygen-free environment in which microbes digest manure, releasing methane and other gases. Gas-scrubbing equipment removes such impurities as carbon dioxide and hydrogen sulfide. The methane is used in the plant, primarily to heat water for the slurry. The rest is sold to Natural Gas Pipeline Company of America. A by-product of the process is a relatively high-protein roughage the firm calls "Calfeed." Two of the feedlots that supply the plant with manure buy most of the Calfeed for refeeding purposes, but some of the product goes to several worm farmers who have discovered its value for bedding and feed. Another by-product being recovered is the reactor effluent. The effluent is 15-20% crude protein. The plant has been collecting the bacteria from this effluent with a huge centrifuge and has been adding the centrifuge cake to Calfeed experimentally. The remaining effluent has been applied through irrigation water and tested as fertilizer on a quarter section planted to grain sorghum and wheat. It is felt that the liquid fertilizer should eventually become a profitable additional enterprise for Calorific. Thermonetics has already started or is about to begin building three plants in Texas, and expects to have other plants under way in southern California within a year. Similar plants are being installed in other places. Minnesota Agricultural Experiment Station has been experimenting with a 10,000-gallon anaerobic digester on the Verlo Larson farm near St. Paul. The digester processes swine manure into gas which is used for heating and cooking and to power an electric generator. The system produces about 80% of the farm's total energy needs in the summer and about 50% in the winter. (Stiles-East Central)

5190-B2, C2, D3, E3, F1 METHANE FROM WASTE

J. Dawson
Confinement, V. 3, No. 7, p. 20-21, July-Aug., 1978.

Keywords: Methane, Recycling, Refeeding, Economics

Two years ago a research team funded by the Four Corners Regional Commission began a detailed feasibility report concerning the establishment of a utility-sized bio-conversion plant. Such a plant could furnish enough methane to generate about ⅓ of Lamar, Colorado's electrical needs. Digester residue, which will come out of the centrifuges at about 65% moisture, will be piled outside and sun-dried to about 40%. Because cattle feeders are concerned with palatability and ease of handling, they want the product to be only 12-15% moisture. This is a problem which is being worked on. In the meantime, feeding experiments are being conducted in which the wastes are being refed at 40% moisture content. These experiments are in progress and the outcome is not known. If successful, the feeding value of the residue is estimated at between $94 and $121 per ton when its closest competitor, cottonseed meal is selling at $150 to $200 per ton. Unless some very serious drawbacks come to light as it hits the marketplace, digester residue should be a factor in keeping the current feedlot capacity of 80,000 head at an 80% occupancy and possibly expanding it. Any residue not sold as feed will go as fertilizer at $2 per ton. In September of this year, the plant will go into the final design and construction stage, which will take 30 months. Then there will be a 6-month start-up period. Three years from now, there will be gas. (Stiles-East Central)

5191-A6, A10, B3, C1, D1 AIR DRYING POULTRY MANURE

Department of Poultry Science, Pennsylvania State University, University Park, Pennsylvania
G.O. Bressler and E.L. Bergman
International Poultry Industries Exposition, Cincinnati, Ohio, Oct. 26, 1970, 28 p. 6 fig., 24 tab.

Keywords: Dehydration, Poultry wastes, Fly control, Odor control, Moisture content

In 1963, Pennsylvania State University researchers began research that had the following objectives: (1) to remove as much moisture as possible from the poultry manure inside the poultry house in order to lessen the weight and volume of material to be handled; (2) to eliminate odors and flies; and (3) to develop an automatic system of manure handling to eliminate manual labor. A drying system was developed in which manure was dried from 75-80% moisture to about 30% before leaving the poultry house, which reduced manure weight to less than ⅓ the original amount produced. Offensive odors and flies were eliminated. The operation was automatic, with the end product being a fine, powdery product with no offensive odor, able to be stored in a bulk bin, ready for packaging or bulk distribution as a fertilizer, if so desired. All this was accomplished by applying simple drying techniques, blowing air across the droppings at high velocity and frequent stirring of the manure on the concrete floor, Stage One; and final drying in a heater-dryer, Stage Two. The drying method was developed as an integral part of the sloping wire floor egg production system, but the method can also be applied to cage systems. (Merryman-East Central)

5192-B2, C2, D1, D3, E3, F1 AN ALGAL REGENERATIVE SYSTEM FOR SINGLE-FAMILY FARMS AND VILLAGES

Research biologist and lecturer, Sanitary Engineering Research Laboratory, University of California, Berkeley, California
C.G. Golueke and W.J. Oswald
Compost Science, V. 14, No. 3, p. 12-18, May-June, 1973. 2 fig.

Keywords: Recycling, Animal wastes, Anaerobic, Digesters, Design, Algae, Methane, Fertilizers, Sedimentation, Economics

A description of a self-contained algal regenerative system is given. The principal components of the system are an anaerobic digester, a series of algal growth chambers, a sedimentation chamber, sand beds, a solar still, and a gas exchanger. Since it is combined with a residence needing gas for cooking, the anaerobic digester is covered to permit combustible gas to accumulate under the cover at a pressure sufficiently above

atmospheric to force the gas from the collector to the stove. Excess gas, which is 55-65% methane, is conveyed from the gas dome through conduits into the residence where it is used for household purposes. Periodically, digested solids are taken from the digester for use as soil conditioner or fertilizer for growing vegetables. Advantages of this system are: (1) the provision of a highly livable system for its occupants; (2) the establishment of an efficient and hygienic waste management; and (3) the recovery of valuable nutrients from wastes. A major disadvantage is the need for a rather substantial capital investment. A preliminary economic analysis indicates that gross income of between $250 and $1,000 per year could be realized with this system. Operation cost are estimated to range from $50 to $100 per year. (Merryman-East Central)

5193-A4, B1, E2
KEEPING DAIRY WASTE UNDER CONTROL

A. Schuhart
Soil Conservation, V. 43, No. 2, p. 15-19, Sept., 1977. 8 fig.

Keywords: Dairy wastes, Waste disposal, Water pollution, Design, Legal aspects, Land application

Californians have worked together to keep animal wastes from polluting San Francisco Bay, Tomalas Bay, and the Pacific Ocean. The prime animal waste culprit has been dairy wastes from Marin and Sonoma Counties. Regional water quality boards set tight deadlines for meeting water quality requirements: September, 1976 for dairies draining into Tomalas Bay and September, 1978 for other dairies in the Bay Area and North Coast Regions. Dairy waste committees under direction of the Farm Bureau and working closely with the Cooperative Extension Service Farm Advisors for Marin and Sonoma Counties requested special help in meeting the requirements from the Soil Conservation Service and the 5 resource conservation districts in the counties. Through the Intergovernmental Personnel Act, (IPA) Marin County in 1973 hired an SCS agricultural engineer to design waste disposal systems for dairies and help farmers plan management of the systems. Marin County further decided to pay 25% of the cost of the systems in 5 equal annual installments. The next year, Sonoma County hired an SCS engineer and a technician through IPA agreements to help dairy farmers. In spite of lack of water and increased expenses, more than 80% of the dairies in Marin County and 90% of the dairies in Sonoma County have completed waste disposal systems or are working toward compliance with the water quality standards. Pollution from dairies soon will be stopped by the cooperative effort. Designing and managing self-contained systems has been tough because many of the dairies are on hillsides along creeks that flow into urban areas. Descriptions of a number of the management plans which have been implemented are given. (Merryman-East Central)

5194-A4, A6, A7, B1, B4, C1, C2, D3, E2, F2
MANAGING HORSE MANURE FOR ENVIRONMENTAL PROTECTION

Extension Agricultural Engineer, Animal Waste Management, Texas A&M University, College Station, Texas
J.M. Sweeten
Unpublished paper, Aug., 1978, 12 p. 1 fig., 4 tab.

Keywords: Water pollution, Air pollution, Legal aspects, Horse wastes, Waste composition, Land application, Waste storage, Composting, Odor control, Nitrogen, Phosphorus, Potassium

Horses raised for pleasure and breeding purposes have not caused significant water or air pollution problems. Four reasons for this are: (1) The scale of horse operations is small, relative to other types of livestock feeding operations. (2) Horse farms typically have a large land-to-livestock ratio, relative to other types of livestock and poultry. (3) Horse owners have historically been willing to devote more labor to waste management than owners of other animal species. (4) Horse manure is low in moisture content. Horse manure averages 79 percent on a wet weight basis (feces an urine combined). Despite the fact that problems are relatively rare, the horse industry is subject to the same air and water pollution control regulations to which other segments of the livestock and poultry industry are subject. Consequently, amount and characteristics of horse manure should be considered. Animal manures vary widely in amount and composition. Horses produce manure (feces and urine) at the average rate of 45 lbs/day/1000 lbs. liveweight. The feces fraction accounts for 80 percent of the wet manure, 92% of the solids, 65% of the nitrogen, 100% of the phosphorus, and 42% of the potassium. Amount and characteristics of manure produced depends in part on ration digestibility and animal age. Factors influencing cost and efficiency of manure collection include type and size of equipment, operator skill and technique, pen size, slope, presence of obstacles, (stall partitions, troughs, etc.), manure moisture content and operator fatigue. Conventional solid waste handling methods, rather than liquid manure systems, probably will continue to be used widely in the horse industry for these reasons: (1) high initial solids content of horse manure, (2) liberal space allotment per animal, (3) attention to animal comfort, including floors that are conducive to sound feet and legs; and (4) limited size of most horse operations. Land application is an environmentally acceptable and widely used method of manure disposal. No specific research on land disposal of horse manure appears to have been done. Nevertheless, best utilization of horse manure can only be done if a soil test is performed for soil-plant nitrogen requirements and the horse manure is tested for nitrogen content. (Merryman-East Central)

5195-B2, D3, E3
BIOLOGICAL AND CHEMICAL FLUCTUATIONS DURING ANAEROBIC DIGESTION OF SWINE MANURE

USDA, SEA, Bioengineering Research Unit, Building T-12, University of Missouri, Columbia, Missouri 65211
J.R. Fischer, E.L. Iannotti, and D.M. Sievers
Paper No. 78-4011, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 11 p. 8 fig., 1 tab., 8 ref.

Keywords: Anaerobic, Digesters, Design, Diets, Swine wastes, Gas production, Lincomycin

A .42 m^3 digester was operated for one year with various operational problems. Changing the swine ration from predominantly corn to wheat resulted in lower gas production. The antibiotic lincomycin appears to be detrimental to digester bacteria. Using large organic loading rates during a startup period can lead to digester upset with a resulting decrease in gas production and excessive foaming. Gas production is a good indicator of daily digester performance. But, other information such as TS in effluent indicate digester long-term stability. (Fischer-USDA)

5196-B2, D3, E3, F1
METHANE FROM MANURE: FACT OF FANTASY

Extension Agricultural Engineer, Animal Waste Management, Texas Agricultural Extension Service, Texas A&M University, College Station, Texas
J.M. Sweeten
Unpublished paper, May 2, 1978, 10 p. 1 tab.

Keywords: Methane, Anaerobic digestion, Recycling, Livestock wastes, Poultry wastes, Economics

Production of methane from manure is becoming a present-day reality. Unfortunately, farm-sized units are not yet commercially available. Methane production from livestock and poultry manure is not a do-it-yourself undertaking. It appears that methane production must be integrated with the reclamation and sale of feedstuffs and fertilizer to achieve economic feasibility. Large-scale methane systems appear much more feasible than farm-sized units because of lower unit costs, higher process control, and 100% usage of the methane gas and by-products produced. Mechanical aspects of manure handling (grinding, mixing, screening, pumping, etc.) and general plumbing problems (gas leakage, corrosion, etc.) have been the major sources of problems in methane production, rather than the chemical/bio-chemical processes. These problems could be overcome by adequate financing and competent engineering design. It is believed that a multi-disciplinary team of qualified engineers and scientists can design a high-efficiency methane production system with presently available knowledge. The large number of research and demonstration projects currently underway will hopefully provide breakthroughs in methane production technology that will assure economic feasibility for both commercial and farm-sized systems. (Sweeten-Texas A&M)

5197-A6, A7, D1, E3
PARTICULATE AND ODOR CONTROL IN THE ORGANIC FERTILIZER INDUSTRY: A CASE HISTORY

Poly Systems, Inc., Ramsey, New Jersey
K. Schifftner
Chapter 33, Pollution Engineering Technology (Air Pollution Control Design Handbook), V. 2, Pt. 2, p. 849-853, 1977. 1 fig., 1 tab.

Keywords: Dehydration, Recycling, Cattle wastes, Fertilizers, Air pollution, Odor control, Scrubbing, Adsorption, Chemical oxidation

The Walker-Gordon Laboratory in Plainsboro, New Jersey, formerly the world's largest certified milk farm but now in a beef-feeding operation with about 1800 feeder steers, is currently drying and processing cow manure for the fertilizer market under the trade name Bovung. Walker-Gordon uses a process which involves the collection of manure which has been mixed with a bedding material of dried peanut and coconut shells, drying it in a rotating dryer, and packaging and selling the end product. The company processes 9500 lb/hr of wet manure using this method. A major problem related to this type of fertilizer production is air pollution control. Tests performed on the dryer's product-recovery cyclone showed that it was performing very well, but an odor problem existed. Walker-Gordon purchased a special wet scrubbing system in 1972 to eliminate the odor problem. This system contains an adjustable side damper venturi scrubber, a special disengagement section designed to separate scrubbing liquids, and a packed adsorption section for odor control through chemical oxidation and adsorption. Stack emission tests were conducted. The maximum total emission rate (condensible hydrocarbons plus particulates) was well within the allowable 30 lb/hr. (Merryman-East Central)

5198-A8, B3, C2, D1, E2
RECOVERY OF 15-N LABELED FERTILIZER AND PLANT GROWTH IN MANURE AND SLUDGE-AMENDED SOIL

F. Pomares-Garcia
Ph.D. Dissertation, Department of Soil Science, University of California, June, 1977, 132 p. 21 fig., 25 tab., 103 ref.

Keywords: Land application, Cattle wastes, Sewage, Sludge, Crop response, Mineralization, Soil Chemistry

A greenhouse pot experiment was conducted with the following objectives: (1) study the effects of manure and sludge on the recovery of fertilizer N, (2) evaluate manure and sludge as N sources for plant growth in terms of $(NH_4)_2SO_4$, (3) determine possible interactions between N fertilizers and organic amendments when they are applied together, (4) obtain the mineralization rates of manure and sludge, (5) obtain the N balance sheet, (6) study the effect of the rate of N fertilizer on the nitrogen "A" values, (7) study the effect of organic wastes on soil chemical properties. The study was conducted on a sandy loam soil derived from granitic rock; total N 345 ppm, NH_4^+-N 1.1 ppm, NO_3^- 12.6 ppm, and pH 6.9. The manure used was obtained from a commercial cattle feedlot at Chino. It was air dried and ground to pass through a 3.2 mm sieve. Sewage sludge fron Hemet containing relatively low concentrations of heavy metals was collected, air dried and ground to pass through a 3.2 mm sieve. Study results are given. (Merryman-East Central)

5199-B2, C2, C3, D3, E3
FERMENTATION FOR METHANE PRODUCTION

Microbiology Department, Rowett Research Institute, Bucksburn, Aberdeen, Scotland.
P.N. Hobson
Solar Energy in Agriculture, Proceedings International Conference on Solar Energy, p. 12-14, 1976.

Keywords: Fermentation, Methane, Gas production, Anaerobic, Digesters, Temperature, Bacteria, Organic wastes

Human sewage, animal excreta, organic domestic refuse (except some plastics), residues from processing of fruit, vegetables and grains of all kinds and residues from animal slaughtering and meat processing can be treated by anaerobic digestion to reduce pollution, and the gas may be used in the digestion plant. Different types of anaerobic digestion plants are possible. The type used depends on the character of the wastes being digested. The simplest plant is the anaerobic 'filter' -- an airtight tank filled with stones or other loosely-packed material, with an upward flow of liquid. Filters are used for high flow-rates of low-strength wastes with little solids. The materials in solution are quickly degraded by the high concentration of bacteria, so the size of tank can be commensurate with a liquid detention time of a few hours, while average detention time of the bacteria can be of the order of 10-15 days. High-solids wastes can rapidly clog the filter. The anaerobic 'content process' type of digester has a long detention time for the bacteria and a short detention time for the liquid. The bacteria flowing out of the digester with the treated waste are mechanically separated from the liquid and returned to the digester. Contact digesters and anaerobic filters can treat dilute factory wastes with flow rates to tens or hundreds of gallons per minute in a comparatively small overall size of plant. The most common digester is the stirred-tank digester. It is essentially designed to treat strong wastes of high solids content where the breakdown of the solids is a slow process. The wastes and the bacteria are detained in the digester from 10-90 days, so much slower liquid flows are required than in the previously described systems. Ambient temperature and heat losses are important factors in the useful gas production of a digester. Minimizing these by insulation and siting of digesters, prevention of too much cooling of wastes after production, and so on, must be considered in the design of digesters, especially in temperature climates. Running at a stable temperature can be just as important as running at a high temperature. Overall efficiency of a digester as a gas producer also depends on the ancillary equipment. Some stirring of the digester contents is needed for good contact of bacteria and substrate and for prevention of surface caking. (Merryman-East Central)

5200-B1, C1, C2, D1, D3, E2
AEROBIC TREATMENT OF FARM WASTES

Water Research Centre, Stevenage Laboratory
H.T. Mann
Water Pollution Control, V. 74, p. 560-570, 1975. 8 fig., 2 tab., 9 ref.

Keywords: Aerobic treatment, Animal wastes, Settlement, Filtration, Centrifuging, Land disposal, Suspended solids, Biochemical oxygen demand

Farm-waste treatment processes are essentially industrial waste treatment processes. The wastes vary widely from farm to farm -- in the most acute cases slurries are produced that may contain more than 100,000 mg/l SS and 3,000 mg/l BOD and effluents must be discharged to Royal Commission standard. Aerobic biological processes can play an important role in an integrated treatment process. An essential preliminary is the removal of suspended solids from the waste. This may be carried out as part of the husbandry method or by utilizing settlement, physical filtration on straw or on mechanical screens, or by centrifuging. Solids removed vary from thick sludges in settlement processes to material contalning up to 30% dry matter from mechanical processes and which can be stacked without odour nuisance. The liquids after primary solids removal can vary widely in BOD concentration; but aerobic treatment in aerated lagoons, oxidation ditches or high-rate biological filters can reduce the BOD by more than 90%. If Royal Commission standard effluents are required, two-stage treatment is advisable, with particular attention to removal of secondary solids. In situations where effluents can be discharged to the land, single-stage treatment may suffice. Experiments carried out with high-rate biological filters show (a) that brushwood can be employed as a medium, (b) that BOD loading rates of up to 0.5 kg/m d can produce similar effluents from piggery-waste treatment. Loading rates applicable to produce effluents of this standard are so much higher than those required to produce Royal Commission effluents that final land disposal should be considered as a high priority in farm-waste treatment. Since loading rate aimed at maximum BOD removal cannot produce effluents suitable for discharge, further effluent treatment is necessary to satisfy this requirement. (Mann-Stevenage Laboratory)

5201-B3, C1, C2, C3
CHANGES IN CHARACTERISTICS OF DEEP STACKED BROILER LITTER WITH TIME

Virginia Polytechnic Institute and State University, Blacksburg, Virginia
G.R. Dana, J.P. Fontenot, J.A. Duque, W. Sheehan, and K.E. Webb, Jr.
Livestock Research Report, Research Division Report 174, Virginia Polytechnic Institute and State Unversity, July, 1978, p. 104-107. 2 tab.

Keywords: Poultry litter, Stacking, Temperature, pH, Lactic acid, Fermentation, Fecal coliforms, Coliforms, Salmonella, Shigella, Proteus

Stack temperatures were found to be greater at 18 in. that 32 in. Maximum temperature was attained after 1 wk at 18 in and after 3 wk at 32 in. Litter pH was lowest initially and highest at 2 wk., after which it stabilized. Lactic acid was 0.27% of the dry matter initially, after which values tended to decline. Based on pH and lactic acid production, minimal fermentation occurred within the stack. Fecal coliforms, *Salmonella* and *Shigella* were not present at any time during the 6 wk. study. Total coliforms were detected once and *Proteus* growth appeared intermittently throughout the experiment. (Dana-VPISU)

5202-B1, C1, C2, C3, D3, E3
FERMENTATION AND DIGESTIBILITY OF BROILER LITTER

ENSILED AT DIFFERENT MOISTURE LEVELS BY ADDITION OF WHEY OR WATER

Virginia Polytechnic Institute and State University, Blacksburg, Virginia
J.A. Duque, J.P. Fontenot, K.E. Webb, Jr. and J.C.A. Berger
Livestock Research Report, Research Division Report 174, Virginia Polytechnic Institute and State University, July, 1978, p. 108-117. 6 tab.

Keywords: Poultry litter, Ensiling, Moisture content, Whey, Refeeding, Sheep, Performance, Digestibility, Waste composition, pH, Lactic acid

Experiments were conducted to study the effect of moisture level on ensiling broiler litter, by addition of whey or water. A preliminary study using 3-4 week old wood shaving based broiler litter was conducted with small laboratory silos. Twenty kilogram litter mixtures were prepared to obtain moisture levels of 22 (no whey or water added), 30, 40, 50, 60 and 70% by addition of whey or water. These were ensiled in 6 silos for a minimum of 45 days. Initial and ensiled samples were assayed for microbial count, proximate components, pH, lactic acid, water soluble carbohydrates and volatile fatty acids. A similar second small silo study was conducted. This time the litter was obtained from a broiler house immediately after the birds were marketed. A study was also conducted with large silos to evaluate nitrogen utilization and digestibility of rations containing ensiled broiler litter. Two metabolism trials were conducted with 27 crossbred wethers allotted at random in each trial. Nine different rations were fed in both trials consisting of: (1) low protein basal alone or supplemented with: (2) 13% moisture litter silage; (3) and (4) 30% moisture litter silage with water or whey added; (5) and (6) 40% moisture litter silage with water or whey added; (7) and (8) 50% moisture litter silage with water or whey added; (9) soybean meal. The supplemental material provided 50% of the dietary nitrogen for the 8 respective rations. All rations were equalized in available energy. Vitamins A and D were supplemented. Sheep were fed 700 g on dry matter basis of the respective rations plus 10 g of trace mineralized salt per day. Each trial consisted of 5-day transition, 10-day preliminary and 10-day collection period. Animals were fed twice daily at 12 hr. intervals and water provided *ad libitum* except during the two 2 hr. feeding periods. Ruminal fluid and blood samples were taken at the end of the collection period of each trial. Results for each of these studies are discussed. (Merryman-East Central)

5203-A11, B3, C2, D3, E3 ENSILED CORN FORAGE AND BROILER LITTER FOR FINISHING HEIFERS

Virginia Polytechnic Institute and State University, Blacksburg, Virginia
W.H. McClure, J.P. Fontenot and K.E. Webb, Jr.
Livestock Research Report, Research Division Report 174, Virginia Polytechnic Institute and State University, July, 1978, p. 131-134. 2 tab.

Keywords: Silages, Ensiling, Poultry litter, Refeeding, Cattle, Performance

Forty-eight straight bred and crossbred weanling heifer calves were grouped according to breeding and weight and allotted to 2 replications of 4 pens of 6 head each. Four pens were fed regular corn silage and 4 were fed silage containing 70% corn forage and 30% broiler litter, dry basis. Within each kind of silage, 2 pens were not fed supplemental protein and 2 were fed 2 lb soybean meal/head/day. Sufficient grain was fed to provide a total concentrate level of 1% for bodyweight. The silages were full-fed. The broiler litter contained 76% dry matter and the corn forage combined with it contained 42% dry matter. The proportions used to give a level of 30% litter, dry basis, in the silage were 81% corn forage and 19% broiler litter. The litter was placed on top of each wagon load of corn forage with a front-end loader. Heifers to be fed were weighed initially, at monthly intervals, and at the end of the trial. At the trial's end, the cattle were slaughtered and carcass data were obtained. The corn forage-litter mixture ensiled very well. The protein content of the regular corn silage was 8%, dry basis. Substituting broiler litter with 30% of the dry matter of the corn forage increased the protein level to 15.7%, dry basis. Cattle fed no protein supplement had the lowest rate of gain. Supplementing with soybean meal increased daily gain to 2.07 lb. The rate of gain for heifers fed ensiled corn silage-litter was higher than for the regular corn silage fed animals. Cattle fed the corn silage-litter ate much more silage than those fed regular corn silage. Carcass grades and dressing percent were similar for cattle on the various rations. There was a trend for the grades to be a little higher for cattle fed the ensiled corn silage litter. (Merryman-East Central)

5204-A11, B3, C1, C2, C3, D3, E3 ENSILING CHARACTERISTICS AND UTILIZATION BY SWINE OF ENSILED SWINE WASTE AND GROUND CORN GRAIN

Virginia Polytechnic Institute and State University, Blacksburg, Virginia
J. Berger, E.T. Kornegay, J.P. Fontenot, and K.E. Webb, Jr.
Livestock Research Report, Research Division Report 174, Virginia Polytechnic Institute and State University, July, 1978, p. 158-166. 6 tab.

Keywords: Swine wastes, Ensiling, Refeeding, Swine, Digestibility, Waste composition, pH, Lactic acid, Fecal coliforms

Study objectives were to determine fermentation (ensiling) and characteristics of different levels of swine feces when ensiled with ground corn grain silages fed to swine. A small silo study was conducted in which various proportions of swine waste and ground corn grain were ensiled to determine the most desirable combinations. Good ensiling occurred in mixtures of 40:60 to 80:20 of swine waste to ground corn grain. pH values of all ensiled mixtures were below 5.0 which indicates good ensiling. Lactic acid values of the ensiled mixtures decreased with decreasing amounts of swine waste in the mixture. There was a reduction in soluble carbohydrates and fecal coliforms were completely destroyed by the ensiling process. Salmonella, shigella and proteus organisms were not present in the ensiled material. Crude protein, ether extract and crude fiber all decreased with decreasing levels of swine waste in the mixture. A large silo study was conducted in which a larger amount of the two best combinations used for the digestibility and acceptability trials were 60:40 and 40:60 mixtures of waste and ground corn grain.

Three digestion trials were run with 10 crossbred gilts weighing approximately 200 lb. All gilts were blocked by weight and randomly assigned to treatments and pens. A typical corn-SBM diet (14% protein) was used as the basal diet. Diets for the digestion and acceptability trials were (1) basal, (2) 75% basal + 25% 40:60 silage, (3) 50% basal + 50% 40:60 silage, (4) 75% basal + 25% 60:40 silage and (5) 50% 60:40 silage. Each trial consisted of a 2-day transition, 7 day preliminary, and 5 day collection period. Following the digestion trials, a palatability trial was conducted with 30 crossbred gilts weighing approximately 200 lb. Apparent digestibility of dry matter, organic matter and crude protein for the basal diet and diets containing the 40:60 silage were significantly higher ($P<.05$) than diets containing the 60:40 silage. Nitrogen intake ranged from 39.4 /day to 44.4 g/day. There was no significant difference in nitrogen retained expressed as percent of intake between gilts fed any of the diets. Acceptability as measured by the dry matter intake (g/w - 15 /day) showed no significant differences between treatments, although intake of the basal diets containing the 40:60 silage tended to be higher. (Merryman-East Central)

5205-B2, C1, C2, D1, D3 RESEARCH IN ANIMAL WASTE MANAGEMENT

Department of Agricultural Engineering, College of Agriculture, University of Missouri-Columbia, Columbia, Missouri 65201
D.M. Sievers
Research in Animal Waste Management, College of Agriculture, University of Missouri-Columbia, October, 1977, 12 p. 4 fig., 3 tab., 8 ref.

Keywords: Swine wastes, Digesters, Methane, Agitation, Screening, Sedimentation, Deep pits, Salts, Bacteria, Antibiotics, Feed additives, Waste composition, Lagoons

This report summarizes research in animal waste management being done through the Agricultural Experiment Station University of Missouri-Columbia in the following areas: (1) Operation and Management of a Farm-size Swine Digester, (2) Gas Agitation Requirements for Swine Digesters, (3) Use of Fertilizer Nutrients from Swine Anaerobic Digesters, (4) Effects of Antibiotics and Feed Additives on the Conversion of Swine Waste to Methane: Screening, (5) Bacteriology of Anaerobic Waste Digestion of Swine Waste, (6) Biochemistry of Swine Waste Digestion, (7) Bacterial Response to Salts in an Anaerobic Dairy Lagoon, (8) Survey of Swine Lagoons in Central Missouri, (9) Sedimentation of Swine Wastes, and (10) Lagoon Recycle System for Deep Pits. Much of the work in the Agricultural Engineering Department is a cooperative venture with the Agricultural Research Service, United States Department of Agriculture. results of this cooperative work is included in this report. (Merryman-East Central)

5206-A6, B2, C2, D3 COLOR THESE LAGOONS PURPLE

Anonymous
Agricultural Engineering, V. 59, No. 9, p. 45, Sept., 1978.

Keywords: Odor control, Swine Wastes, Purple sulfur bacteria, Hydrogen sulfide

John Gerrish and Ted Loudon have been doing research at Michigan State University which utilizes purple sulfur bacteria to convert hydrogen sulfide to odorless elemental sulfur. The problem involved developing a technique for getting the bacteria to survive in the colder winter weather. The bacteria apparently can survive if the loading rate is light. The next step is to modify design and management practices so swine producers can easily utilize the inexpensive technique. (Stiles-East Central)

5207-A8, B2, C2, E2
YOU CAN PUT LIQUID MANURE ON YOUR ALFALFA

Southern Experiment Station, University of Minnesota, Waseca, Minnesota
G.W. Randall
Hoard's Dairyman, V. 123, No. 11, p. 724, 741, June 10, 1978. 1 fig., 2 tab.

Keywords: Liquid wastes, Dairy wastes, Land application, Crop response, Waste composition, Nitrogen, Phosphorus, Potassium, Salt burn

Application and incorporation of liquid dairy manure to the soil before planting row or annual crops is preferred to application on growing alfalfa. However, if circumstances necessitate spreading on alfalfa, rates from 2,000 to 4,000 gallons per acre usually can be applied to alfalfa. Because of less loss and greater efficiency, injection of liquid manure is to be encouraged for general crop production. However, on alfalfa, injection is almost impossible without damaging the alfalfa stand to the injector and, generally, is not recommended. Problems with runoff, odor, poor palatability of alfalfa, and salt burn can result from surface application of liquid dairy manure on alfalfa if great care is not taken. Consequently, land application of liquid dairy manure on alfalfa as a regular practice is not recommended even if application is done after cutting. (Merryman-East Central)

5208-A3, B2, B4
RUNOFF CONTROL SYSTEMS FOR CATTLE FEEDLOTS

Anonymous
Wallaces Farmer, V. 103, No. 15, p. 24, Aug. 12, 1978.

Keywords: Feedlot runoff, Cattle, Waste storage, Debris basins, Holding ponds, Design

Agricultural engineers from USDA and the University of Nebraska recommend that holding pond capacity equal 100% of the runoff from the 24-hour storm that occurs once in 10 years for sites with climate similar to eastern Nebraska. Design of debris basins, holding ponds, and disposal systems must be tailored to individual operations. Locating the debris basin inside a cattle pen: (1) uses land efficiently, (2) allows cattle to use ledges of the basin to avoid muddy lots in extended wet periods, (3) promotes faster drying of pens in dry weather because hoof action increases evaporation by stirring the debris. Drawbacks of locating debris basins inside pens are: (1) Debris basins inside pens stay damp longer in cool, wet weather than those outside. (2) Inside basins also may have drainage problems in summer and winter when cattle churn the solids into a mud slurry which can plug risers and drain openings. (3) Ledges of basins inside pens must be rebuilt occasionally due to cattle eroding the slopes. (4) Placement of the fenceline can be a problem. Debris basins located outside pens are usually drier and easier to manage. Mud slurry conditions are usually limited to wintertime. However, externally placed debris basins can have the following problems: (1) Extreme snowmelt slurry runoff can bury fencelines. (2) Solids may accumulate at the fenceline. (3) Weed control on sideslopes of basins is difficult. Mounds in the pen are especially needed when cattle cannot seek dry ground in severe weather on the berms of a basin inside the pen. Locating the holding pond beside the debris basin has 2 advantages: (1) Runoff from a storm exceeding design capacity of the basin will overflow directly into the holding pond and (2) The basin can be smaller. A minimum design capacity of 167 cu. yd. per acre of feedlot area is recommended for a gravity-drained basin adjacent to a holding pond. (Merryman-East Central)

5209-A8, B2, C2, D3
SALT BUILDUP CAUSES LAGOON FAILURE

Anonymous
Calf News, V. 16, No. 8, p. 26, Aug., 1978.

Keywords: Lagoons, Dairy wastes, Anaerobic, Electrical conductivity, Salinity

The effect of salt concentration on lagoon bacterial activity was studied and related to an easily-obtainable field measurement. It was determined that salt concentration which produces an electrical conductivity efficiency. Researchers concluded that anaerobic dairy lagoons should be maintained at an electrical conductivity of four to eight millimhos per centimeter (2600 to 5200 ppm total salt) for peak operation efficiency. Salinity can be reduced to this level by disposal of lagoon liquid and dilution with water from wells or stock ponds. Precautions should be taken in disposing of effluent containing more than 1500 ppm total salt to prevent soil salinity. (Stiles-East Central)

5210-A10, B1, C3
A REVIEW OF THE FOOD HABITS OF THE INSECT FAUNA INHABITING CATTLE DROPPINGS IN NORTH CENTRAL CALIFORNIA

Division of Entomology and Parasitology, University of California, Berkeley, California 94720
R.W. Merritt
Pan-Pacific Entomologist, V. 52, No. 1, p. 13-22, 1976 1 tab , 36 ref.

Keywords: Cattle wastes, Insects, Pastures, Rangeland, Predators

A two-year study (1971-73) in the Sierra Nevada foothills of California included: (1) a quantitative analysis of the differences in diversity and abundance of the insect fauna colonizing and inhabiting undisturbed cattle droppings in 4 different pasture and rangeland ecosystems; and (2) a study of the relationship between the diversity and abundance of insect inhabitants per cowpat and the rate of pat degradation. Observations were made on the feeding habits of selected dung insects and a general literature survey was conducted. This report reviews the known food habits of the insects recorded in the previous study. Many of the families, genera and species considered here, also occur in bovine manure throughout North America and other parts of the world. A general tabulation is given of the food habits of dung-associated insects for both adult and immature stages. Except for the empid *Drapetis*, no Diptera were reported predacious on Coleoptera. About 50% of the Coleoptera and all the Hymenoptera have been cited as predators of parasitoids of Diptera. There are limited data regarding the food habits of insect species inhabiting cattle droppings. This is largely due to difficulties involved in examining the interspecific and intraspecific interactions inside the dung. Clarifying the several insect trophic levels within the cow dung community will require more detailed investigations. (Merryman-East Central)

5211-A6, B2, B4, C1, C2, E2, E3
HOLDING POND AND FLUSH GUTTERS

Anonymous
Confinement, V. 3, No. 7, p. 7, July-Aug., 1978.

Keywords: Cattle wastes, Flushing, Waste storage, Recycling, Wastewater reuse, Land application, Odor control

Cattle wastes at a commercial housed feedlot near Fairfield, Nebraska are flushed through gutters 3 times weekly to an earthen pit 27 feet deep with design capacity of 409 cu ft per animal. The pit has operated successfully for 4 years, but solids must be removed periodically. The wastewater is recycled for flushing the gutters, which have a 1% slope to the center of the building and empty into a 24-inch diameter conduit leading to the pond. The development of a floating manure mat on the pond surface has minimized odor. It is felt that utilizing settled solids as fertilizer on adjacent cropland may partially recover maintenance costs, including operation of the recycle pump and cleanout. (Merryman-East Central)

5212-A7, B1, C2, D2, D3
WARNING! MANURE GASES ARE DANGEROUS

Anonymous
Confinement, V. 3, No. 7, p. 12-13, July-Aug., 1978. 1 fig.

Keywords: Gases, Hydrogen sulfide, Methane, Carbon dioxide, Ammonia, Animal wastes, Animal health, Safety, Ammonium

Manure gases present a double hazard. The serious accidents involving manure gases are the result of high concentrations accumulating under certain conditions for a short period of time These conditions occur infrequently. A problem of greater complexity involves exposure of confined animals to low or moderate concentrations of manure gases either intermittently or over prolonged periods. Numerous reports have suggested that such exposures may be detrimental to the health and

performance of animals. CO_2, CH_4, NH_4, and H_2S frequently are cited as the principal hazards in connection with animal production facilities. Carbon dioxide does not seem to be a critical problem in animal housing. Methane also is unlikely to be a factor in animal health and performance in normally ventilated buildings. Its significance lies in its flammable and explosive nature. Although difficult to prove conclusively after the event, CH_4 has been implicated as the most probable cause of explosions and accompanying fire damage in several instances in animal barns. Evidence of detrimental effects of NH_3 on animals is sketchy and complicated by the presence of other atmospheric contaminants. Concentrations of 500 ppm in the presence of dust appear to reduce daily weight gains in pigs, and increase the incidence and severity of pneumonia. A lethal phenomenon involving ammonia in pig barns occurs when the ammonia in the air goes into solution in water vapor which condenses on cold surfaces, where it is subsequently oxidized by bacterial action to nitrate or other methemoglobin-forming compounds. If a pig licks the condensate, these compounds may cause rapid poisoning and death. Hydrogen sulfide is potentially the most dangerous of the manure gases and is implicated in fatalities involving both humans and livestock. Risks are greatest during emptying tanks or pits, with concentrations in the head space in pits and above slats reaching an excess of 1000 ppm. Such concentrations are absolutely deadly and occur within a few minutes of the commencement of agitation. Safety precautions for minimizing hydrogen sulfide danger are listed. Approaches that have been tried in attempting to control noxious gases are discussed. Much research is required to establish maximum safe concentrations of manure gases in the environment for different animal species. (Merryman-East Central)

5213-A8, B1, C2
SOIL POLLUTION FROM FEEDLOTS IN GEORGIA

U.S. Army agronomist, Ft. Gordon, Georgia
H.W. Fordham and J. Giddens
Georgia Agricultural Research, V. 15, p. 17-19, 1974. 8 fig.

Keywords: Feedlots, Cattle wastes, Soil contamination, Waste composition, Nitrogen, Phosphorus, Potassium, Magnesium

A survey was made of 21 beef cattle feedlots in Georgia, 19 in the Coastal Plain and 2 in the Piedmont. The soils were sandy loam to loamy sand surface and the subsoil was predominantly sandy clay loam to sandy clay texture. The cattle stocking rates averaged about 200 per acre. The rations of cows generally contained high protein supplement and corn. Manure resulting from these confined animals contained about 4.8 tons nitrogen, 0.64 tons phosphorus and 3.3 tons potassium per acre. The feedlots were on land sloping an average of 3 percent. Control soil samples were taken upslope from the lots. Other soil samples were taken within the feedlots and down-slope from the lots at about 100 and 300 feet distance in December, 1971. Samples were analyzed for nitrate and nitrite after water extraction and for P, K, Ca and Mg after extraction with dilute acid. Salt content was determined by electrical conductivity and organic matter by wet oxidation. Average soil nitrate-content of topsoil in the feedlots was less than 20 ppm. Less nitrate was found in topsoil down-slope than in the feedlot. Phosphorus, calcium and magnesium did not increase greatly in the feedlots or down-slope from lots except in the surface 12 inch depth. Phosphorus averaged 368 ppm, calcium 1280 ppm, and magnesium 960 ppm in surface soil of the feedlots; but at a lower depth, content of these elements was not greatly different from non-feedlot soil. Potassium content of feedlot soils was very high in the surface and moved downward into the soil more readily than the other nutrients. However, the potassium concentration in feedlot soils was not at a toxic level. It was concluded that pollution of groundwater from beef cattle feedlots in Georgia is probably not significant. (Merryman-East Central)

5214-A3, C2, E2
TRANSPORT OF POTENTIAL POLLUTANTS IN RUNOFF WATER FROM LAND AREAS RECEIVING ANIMAL WASTES: A REVIEW

Biological and Agricultural Engineering Department, North Carolina State University, Raleigh, North Carolina 27650
R. Khaleel, K.R. Reddy, M.R. Overcash, and P.W. Westerman
Paper No. 78-2058, American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 32 p. 9 fig., 3 tab., 35 ref.

Keywords: Land application, Animal wastes, Agricultural runoff, Nitrogen, Phosphorus

A considerable amount of research has been conducted at various locations, and under a variety of conditions, to determine total N and P loads from land areas receiving animal wastes. The available data on these nutrients are summarized, and effects of various factors, like time of manure application, method of application, rates of application, soil and cropping management practices, in relation to transport of N and P are reviewed. An attempt was made to establish relationships between nutrient loading rates and its concentration and mass yield in runoff water from land application sites. The results of a linear regression analysis showed significant correlations. The plot areas receiving manure during winter and spring, and subject to snow melt runoff followed a different relationship compared to those receiving applications during summer and fall, and not subject to snowmelt runoff. It is to be realized, however, that N and P data obtained under extreme weather conditions were not considered in building the regression equations. These relationships, therefore, represent N and P transport under average climatic conditions, and can be used only as guidelines in estimating average N and P losses for given loading rates. It is also to be mentioned that almost all data presented herein contain results of pollutant yields from small plot sized areas. The reported values of N and P should not therefore, necessarily be interpreted as amounts reaching surface waters. Many of these parameters can be altered during transport across or through soil. Several studies reported data on total N and P losses in runoff waters from pastured livestock and rangelands. In many cases, it appears that it may be difficult to distinguish between pollution from animal wastes and natural or "background" levels of pollution. It appears that the best method of controlling nutrient discharges in runoff from these areas is in controlling management or grazing schedule, controlling erosion and sediment transport, and surface runoff. The limitations of the available data on nutrient losses are discussed in terms of identifying future research needs. The greatest need appears to be of relating the limited data on small plot sized areas to larger watershed areas, and edge-of-field losses to receiving waters. (Khaleel-North Carolina State University)

5215-B3, E2, F1
TWICE THE CATTLE AT HALF THE COST

J. Head
Wallaces Farmer, V. 103, No. 15, p. 56-57, Aug. 12, 1978. 3 fig.

Keywords: Cattle wastes, Confinement, Management, Economics, Cleaning, Land application

Warren Feldick of Winnebago County, Iowa expanded his cattle production by building a 152 x 70-ft building and not including a manure pit. This saved him over $60,000. Without the pit, Feldick must clean the floors at least once every 4-5 weeks -- 2-3 weeks in winter. He uses a tractor mounted scoop and a 400-bu. manure spreader. Allowing about 35 sq. ft. per animal, he shuts cattle on one end of the building to clean the other. During the "spring rush", Feldick piles the manure outside the building until he has time to haul it to a nearby oat field chopped for silage. During the winter and early spring, manure goes on corn stubble. While more labor is involved with this type of management, Feldick has plenty of time and figures his labor is cheap. (Merryman-East Central)

5216-B1, D1, D2, D3, E3, F1
A GRAPHICAL ANALYSIS OF LIVESTOCK PRODUCTION AND WASTE - MANAGEMENT SYSTEMS

Agricultural Engineering Department, University of Illinois, Urbana, Illinois
H.C. Kim, W. Mayeda, and D.L. Day
Transactions of the ASAE, V. 21, No. 4, p. 747-753, July-Aug., 1978. 7 fig., 7 ref.

Keywords: Cattle wastes, Chemical treatment, Wastelage, Economics, Graphs

This paper deals with a topological approach to a system analysis by a signal flow graph. A farm flow graph is derived from a signal flow graph, and a Mason formula is modified. The chemical treatment and wastelage methods of processing wastes for refeeding are compared. In a given design capacity of Y_{∞}, X_{∞}a unit cost of a beef cattle production system with chemical treatment of wastes is given in equation. The annual monetary expense of this system is $X_{\infty}Y_{\infty}$. An energy expense can be approximated by the methods used in the Energetics of Alternative Waste Management Systems (Kim and Day, 1975). With the wastelage process of treating wastes, the variables and constants associated with the chemical treatment are replaced by those of the wastelage process. The ratio between the output and the inputs is expressed in terms of weights of edges, that it is the technical processing coefficients, K_{ij}. With the Chemical treatment, the output-input ratio is given in equation (12). A network simulated in this study does not satisfy Kirchoff's current and voltage laws. We assumed that the current law was satisfied on the non-reference verticles alone where cutset was applied. However, the network satisfied the voltage

law by introducing a definition of a system graph. Circuits were formed by joining the common datum nodes. The voltage law was applied in these circuits. The network was used only to obtain mathematical equations, and from them the signal flow graphs were developed. These signal flow graphs were modified into the farm flow graphs, where general solutions were searched out topologically by applying Mason's formula. In an economic system analysis, a commodity flow, or the demand of a commodity, could be treated as a counterpart of a current flow in an electrical network. A price can be considered as a voltage. Kirchoff's current and voltage laws are the fundamental laws which can be applied in a physical system. It is possible to simulate an economic network which satisfies both laws. Then, the system network can be conveniently analyzed by the properties of an electrical network. It would be desirable to search out such a system network in an agricultural economic system later. This study attempts to use a topological approach in the analysis of an agricultural system, particularly in a livestock production system which would be affected by alternate waste management systems. A topological approach by the use of signal flow graphs provided quite a convenient way to solve simultaneous equations in a complex system analysis. Such an analysis has been demonstrated in this paper. Those who are dealing with an agricultural system might wish to study graph theory and apply it to their fields. (Kim-University of Illinois)

5217-A11, B3, E3, F1
DPW PROVIDES NITROGEN FOR COWS

Anonymous
Poultry Tribune, V. 84, No. 7, p. 54, July, 1978.

Keywords: Refeeding, Poultry wastes-dried, Cattle, Performance, Milk production, Economics

Dr. C.C. Calvert of Beltsville Agricultural Research Center and Dr. R.L. King of the University of Maryland conducted tests involving groups of six Holstein cows, each fed one of four diets. The diets consisted of corn-soybean meal concentrate supplemented with either: 2% urea, 17.2% dehydrated poultry waste (DPW), 26% DPW, or additional soybean meal. All diets contained 24% crude protein and concentrates were mixed with corn silage which provided 50% of the dry matter in the diets. The amount of feed consumed was about the same for all four diets. Cows on the 17.2% DPW supplemented diet produced 8% more milk than cows on the urea supplemented diet and 7% more milk than cows on the 26% DPW or soybean diet. DPW diets were less expensive than either of the other two diets. (Stiles-East Central)

5218-A10, B1, C3
DOMESTIC FLY PROBLEMS IN DEEP PIT POULTRY HOUSES

L.L. Dunning, E.C. Loomis, W.S. Coates, and F.C. Price
California Agriculture, V. 32, No. 9, p. 16, Sept., 1978. 6 fig., 2 tab.

Keywords: Fly control, Deep pits, Poultry wastes, Predators, Ventilation

This survey evaluates the various types of deep pit houses and determines why some have a domestic fly problem while others do not. It was determined that deep pit houses can be odor and fly free if managed properly. Recommendations were: (1) Design house and fan placement for proper air movement. (2) Prevent dripping water. (3) Discard dead birds and broken eggs in proper containers; in the pit they encourage fly development. (4) Control rats and mice. (5) Save old manure with high predator populations when cleaning the pit. Failure to do this may result in several weeks' delay in establishing a new predator population. (6) Do not use larvicides in the pit if mites and predator populations are to be maintained. Axtel (1968) showed deleterious effects of 12 insecticides on predaceous mite populations in poultry manure. If necessary, careful application of certain adulticides can be made above the pit without ill effect to pit predators. (Merryman-East Central)

5219-A10, B1, C1
FEATHERS ON MANURE CAN INCREASE FLY CONTROL

Anonymous
Poultry Digest, V. 37, No. 439, p. 455, Sept., 1978.

Keywords: Fly control, Poultry wastes, Feathers

If feathers from molting chickens are allowed to accumulate on top of manure in open cage houses, fly breeding can increase because the feathers insulate and hold in manure moisture -- a state conducive to fly breeding. Frequent use of a feather burner to prevent feather accumulation is recommended. (Merryman East Central)

5220-B2, C2, D3
BACTERIA CONTENT SOLVES LAGOON PROBLEMS

University of Missouri
D. Sievers
Hog Farm Management, V. 15, No. 10, p. 30, Oct., 1978. 2 fig.

Keywords: Lagoons, Anaerobic, Bacteria, Salts, heavy metals, Antibiotics pH

The purpose of an anaerobic lagoon is to provide a suitable environment in which anaerobic bacteria can live and break down organic waste materials. Microorganisms reduce insoluble organic materials through successive steps to gases (primarily carbon dioxide, methane, and water with smaller amounts of ammonia and hydrogen sulfide) and soluble salts. The key to maintaining an acceptable lagoon is managing it to reduce imbalances Such management will include proper loading procedures, periodic dilutions to prevent salt buildup, controlling pH and keeping large amounts of heavy metals and antibiotics from entering the lagoon. Visual detection of imbalances is difficult and misleading. The lagoon should be tested for pH and electrical conductivity at least three times a year. These parameters provide a sound basis for making management decisions. (Merryman-East Central)

5221-A9, A10, B1, C3, E2
LESSER MEALWORM BEETLES INVADE MAINE RESIDENCES

Anonymous
Poultry Digest, V. 37, No. 439, p. 464, Sept , 1978.

Keywords: Beetles, Poultry wastes, Insecticides

About 90% of the cage houses in Maine have the lesser mealworm. It is also found in broiler litter houses. These beetles emerge from manure and litter that has been hauled to land. They emerge and migrate to nearby dwellings. More than 100 homes in Turner and other areas of Maine have complained of these beetles. If the beetles get too numerous in poultry houses, they can be controlled by spraying with Sevin. (Merryman-East Central)

5222-B2, B5, C2, E2, F1
WASTIGATION

Anonymous
Calf News, V 16, No 10, p. 42, Oct., 1978 2 fig.

Keywords: Cattle wastes, Irrigation, Waste composition, Land application, Economics

Estherville, Iowa farmer John Greig uses a flush-type manure handling system in his 1000-cow confinement facility. Waste is collected from a series of flumes in the sloping concrete floor and flushed with large quantities of water into a nearby lagoon. A Bauer pump is used to pump the enriched wastewater from the lagoon to a mobile pivot. The pivot is equipped with an electric sequenced solids handling package and is designed especially for handling animal manure solids. Three guns are spaced along the pivot and their operation is electrically timed to give optimum uniform coverage. The nutrients applied from the lagoon are sufficient so the land does not require any other fertilizer. Greig feels that fertilizer savings will pay for the mobile pump system in four years. Utilizing animal wastes through irrigation has meant not only savings in fertilizer costs but also in labor costs. (Merryman-East Central)

5223-A6, B1, D1, D3, F1
MANAGING MANURE ECONOMICS

D. Winters
Hog Farm Management, V. 15, No. 10, p. 52, Oct., 1978. 1 fig., 3 tab.

Keywords: Swine wastes, Waste management, Economics, Slatted floors, Oxidation ditch, Flushing, Odor

A study at the University of Illinois compared the estimated investment and net annual operating costs for several popular swine waste handling facilities. Costs in the study were based on contractor and manufacturer prices as of late 1976, and should be raised 10-15 percent to reflect current prices. The methods considered were: (1) Total slats, (2) Oxidation ditch, (3) Partial slats, (4) Flush flume-plastic pit, (5) Flush flume-steel tank, (6) Flush flume-aerated lagoon, and (7) Cable scraper-plastic pit The total slats system offered extreme simplicity and low labor

requirements, but had higher operating and investment costs than the flush flume-plastic pit. The flush flume easily trained the pigs to manure in the flume, and the plastic pit offered the best odor and fly control because the manure was stored in an air-tight container. The cable scraper-plastic pit offered moderate operating and investment costs, but was fairly complex mechanically and required more labor to manage it properly. The aerated lagoon was relatively odor-free, but had high electricity costs and a larger land requirement. The above-ground steel tank storage system had an advantage in flexibility of location, for no major excavation must be done for the building or manure storage, but it had a high investment cost and the highest net operating costs of all systems compared. The oxidation ditch was the costliest to operate and to purchase, and required constant management of the oxidation rotors. It did not control odors well and reduced the amounts of waste to be hauled. (Merryman-East Central)

5224-B1, D3, E3
SMALL FARM ENERGY PROJECT

Anonymous
Compost Science, V. 19, No. 3, p. 15, May-June, 1978.

Keywords: Recycling, Biogas, Methane, Refeeding, Anaerobic, Digesters, Composting, Fertilizers

The Small Farm Energy Project, a research and demonstration project sponsored by the Center for Rural Affairs in Walthill, Nebraska, communicates the latest information in alternative energy developments such as wind and solar, bio-fuels and methane, as well as waste recycling and energy conservation. It focuses on cooperating farms in Cedar County, Nebraska. Among developments reported are the following: (1) The U.S. Meat Animal Research Center at Clay Center, Nebraska - This center operates a thermophilic anaerobic digester which digests beef feedlot manure for methane and high protein feed. (2) Ted Landers farm in Drury, Missouri - Mr. Landers utilizes a mix tank to produce methane from crop residues. (3) A number of farms which use composters to convert organic wastes to valuable soil amendments. On August 26, 1978, a "Small Farm Energy Field Day" will be offered at an energy seminar. A full-day tour of various farms in the Harrington, Nebraska area will feature solar heating of a farrowing barn, solar water heating, a wind electric generator, solar grain drying and other innovations. (Merryman-East Central)

5225-A6, A12, B1, C2, C3, D3, E2, E3
THE UPGRADING OF AGRICULTURAL WASTES BY THERMOPHILIC FUNGI

Biodeterioration Information Centre, Department of Biological Sciences, University of Aston in Birmingham, Birmingham, England
K.J. Seal and H.O.W. Eggins
Food From Waste, Chapter 5. Applied Science Publishers Ltd., London, 1976. p. 58-78. 4 fig., 4 tab., 33 ref.

Keywords: Waste treatment, Thermophilic, Land application, Refeeding, Microorganisms, Swine wastes, Odor, Public Health, Waste composition

Intensified crop and animal production in Great Britain has increased the amounts of waste produced. When produced in amounts greater than the natural recycling process can cope with, accumulation can occur making land more difficult to reuse. If the waste is to be removed for storage, storage problems may occur. The use of microorganisms to achieve a quick recycling could be useful in alleviating the pollution problems caused when wastes are stored or overloaded on the land. It could also provide a cheap source of protein to be incorporated into animal rations. Thermophilic bacteria are especially important in speeding up the degradation process and in removing potential pathogens. Work has been done on upgrading intensively produced pig manure and waste straw. Problems that were overcome using thermophilic temperatures of between 50°C and 60° C. included: (1) separation of solid and liquid wastes, (2) odor, (3) public health hazard, (4) pathogen problem, and (5) the high polluting ability of the wastes. The solid product resulting from treatment with thermophilic fungi was enhanced in its total protein content from 5% up to between 10 and 13% to handle and could be dried and stored until required for use. (Merryman-East Central)

5226-A12, B2, B3, C2, C3, D3, E2, E3, F1
METHANE GENERATION FROM HUMAN, ANIMAL, AND AGRICULTURAL WASTES

National Research Coucil
Methane Generation from Human, Animal, and Agricultural Wastes, National Research Council. Washington, D.C., National Academy of Science, 1977, 146 p.

Keywords: Recycling, Methane, Organic wastes, Anaerobic, Fermentation, Economics, Waste composition, Public health, Design, Storage, Land application, Sludge, Digesters

This is a compendium of up-to-date information on the generation of methane from organic matter. The compendium includes general background for officials in developing countries who are responsible for rural planning and development and technical information for those interested in undertaking methane generating projects in rural areas. This study is written as a companion piece to an ACTI report in renewable resources of energy, and technologies for their exploitation, in rural areas of developing countries. The report discusses the means by which the natural process of anaerobic fermentation can be controlled by man for his benefit, and how the methane generated by this process can be used for fuel. A bibliography of more detailed publications on the subject is included along with a list of the panel members to whom technologists in developing countries may turn for direct assistance with specific problems. (Merryman East Central)

5227-A2, B1, C1, C2, D3
BARNYARD SEDIMENT AND NUTRIENT REMOVAL BY GRASS FILTERS

Agricultural Engineering Department, University of Wisconsin, Madison, Wisconsin 53706
D.A. Broten and G.D. Bubenzer
Paper No. 78-2087, American Society of Agricultural Engineers, 1978 Summer Meeting,Utah State University, June 27-30, 1978, 22 p. 9 fig., 4 tab., 24 ref.

Keywords: Agricultural runoff, Sediment, Total solids, Nitrogen, Phosphorus, Chemical oxygen demand, Grass filters

A mixture of barnyard sediment and water which approximated actual barnyard runoff was applied to a grass filter under laboratory conditions. The profiles of the deposited sediment could be described as triangular or trapezoidal, but assumptions made in other research on a simulated grass filter were not valid in a natural grass filter. The downstream slope of the sediment profile was not constant but decreased with time and the sediment did not completely inundate the grass before the profile changed from triangular to trapezoidal. The regression equations developed to predict the length of the sediment profile could be used in grass filter design with supporting field data to determine design hydrologic and sediment values. The grass filter was effective in reducing the levels of total solids and some chemical pollutants in the water. Total solids, total Kjeldahl nitrogen, total phosphorus, total inorganic phospohrus, and COD were reduced by 90-99%. Nitrate and dissolved inorganic phosphorus were not effectively filtered by the grass. (Broten-University of Wisconsin)

5228-A6, B2, D3, E3, F1
AUSTRALIANS UTILIZE FARM WASTE TO PRODUCE EDIBLE PROTEIN PRODUCTS

F. Rees
Feedstuffs, V. 50, No. 43, p. 25, Oct. 16, 1978.

Keywords: Swine wastes, Fermentation, Proteins, Refeeding, By-product recovery, Yeasts, Odor, Fertilizers, Economics

Peter Henry, the director of the University of Queensland's animal breeding house, has helped develop a process which produces foodstuff from swine wastes and turns grass into protein at 16 times the efficiency of a cow. Mr. Henry conducted a pilot study in which swine feces and urine were piped from a piggery into concrete tanks and mixed with water. After two days' fermentation, volatile fatty acids were produced. After fermentation, the effluent was pumped into shallow vats where the yeast *Candida Ingrens* grew prolifically, and in doing so cleansed and deodorized the swine waste. The yeast was harvested by skimming it from the surface of the effluent. The yeast was then dried for future use, or mixed into wet feed to give added protein for stock. The yeast, a rich protein source which also provided significant quantities of calcuim, phosphorus and B group vitamins was found to be relished by animals such as swine and dogs, but for human palatability it had to be mixed with other foods such as curries, stews and vegetable dishes, or with cereal flour as a protein supplement. The remaining liquid was high in nitrogen and phosphorus and was suitable for use as a liquid fertilizer. As a swine feed, the recycled waste could save up to $2,000 a year in a piggery of 100 sows. It was found that when used with grass fermentation, the process could have great advantages for developing countries, particularly where there are religious barriers to

eating meat. In many underdeveloped countries, it could mean a high protein diet for people who would otherwise be denied it. The University of Queensland has patented the process in Australia, North America and the United Kingdom. (Merryman-East Central)

5229-A4, A7, A8, B1, D2, D3, E2, E3, F4
ANALYSIS OF STATE LAWS AND REGULATIONS IMPACTING ANIMAL WASTE MANAGEMENT

Texas Tech University, Lubbock, Texas 79409
G.A. Whetstone, B.M. Kramer, D.M. Wells, W.J. Huffman, R.H. Ramsey, and W. Grub
Environmental Protection Agency Report EPA-600/2-78-155, July, 1978, 219 p. 51 ref.

Keywords: Legal aspects, Animal wastes, Management, Water pollution, Air pollution, Soil contamination, Nuisance lawsuits, Refeeding, Land application

Those laws and regulations of the fifty states which have an impact on the management of animal wastes are summarized, state-by-state, under the headings water, solid waste, air, commercial feed and fertilizer, agriculture, nuisance, soil and water conservation, and land use. The code provisions are then compared and the actual and potential effects of the codes on the economics of animal agriculture, on planning under Section 208 of P.L. 92-500, on the refeeding of manure, and on animal residue conversion processes are discussed in separate sections. Reasonableness and enforceability of the codes are evaluated. (Whetstone-Texas Tech University)

5230-B2, D3
A CONTROL SYSTEM FOR AN AUTOMATED ANAEROBIC DIGESTER

USDA, SEA, NCR, Building T-12, University of Missouri, Columbia, Missouri 65211
J.R. Fischer, N.F. Meador, and C.D. Fulhage
Paper No. 78-5017. American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 13 p. 6 fig.

Keywords: Anaerobic, Digesters, Swine wastes, Design

Anaerobic digesters can become integrated into animal production in the United States only if the digester system requires minimum labor. This is possible if the functions of daily operation of the digester can be controlled automatically. An automated sequence of events for digester operation is controlled by a 24-hour cam timer. The system controls manure removed from the buildings, the digester loading and unloading, and digester operation. The digester has been in operation since Sept., 1976. (Fischer-USDA)

5231-B2, C2, D3
WATER QUALITY RENOVATION OF ANIMAL WASTE LAGOONS UTILIZING AQUATIC PLANTS

Louisiana State Agricultural Experiment Station, Louisiana State University and Agricultural and Mechanical College, Baton Rouge, Louisiana 70803
D.D. Culley, Jr., J.H. Gholson, T.S. Chisholm, L.C. Standifer, and E.A. Epps
Environmental Protection Agency Report EPA-600/2-78-153, July, 1978, 148 p. 15 fig., 80 tab., 139 ref.

Keywords: Lagoons, Waste treatment, Duckweeds, Dairy wastes, Nutrients, Protein, Nitrogen, Phosphorus, Potassium

Duckweeds *Spirodela oligorhiza, S. polyrhiza* and *Lemna gibba* (clone G3) grown on dairy waste lagoons gave an estimated maximum annual yield of 22,023 kg dry wt./ha. *S. oligorhiza* and *L. gibba* had higher growth rates in the spring, fall, and winter, with *L. gibba* growing throughout most of the winter. Nutrient content of the plants increased with increasing nutrients in the lagoons. Mean crude protein of dry duckweeds was 36%, to a maximum of 42%. Maximum protein yield/m^2 exceeded protein produced by peanuts, soybeans, and cottonseed 9, 12, and 40 fold respectively. The duckweeds recovered on a hectare basis the N, P, and K of 15.5, 34, and 8.8 lactating cows respectively. Reductions in lagoon TKN, NH_4^+, and P were significantly greater in the duckweed lagoons than controls. Reduction of TKN averaged 0.91 mg/l/day in summer for duckweed-covered lagoons and 0.74 mg/l/day for controls. During the winter the rate was 1.27 mg/1/day (duckweed lagoons) and 0.82 mg/l/day for controls. Ammonium reduction was 84% greater in the duckweed lagoons during winter. Phosphorus reduction in duckweed lagoons, though significantly different from controls, was insufficient to meet water quality standards. (Culley-Louisiana State University and Agricultural and Mechanical College)

5232-A8, B3, E2
EFFECT OF AMENDMENTS TO SAND TO INCREASE THE MOISTURE LEVEL FOR THE GROWTH OF *BAJRA (PENNISETUM TYPHOIDES S&H)* UNDER SALINITY STRESS

Central Salt and Marine Chemicals Research Institute, Bhavnagar, India
M Abraham, E.R.R. Iyengar
Indian Journal of Agricultural Research, V. 10,No. 2, p. 115-121, 1976. 3 tab., 8 ref.

Keywords: Land application, Animal wastes, Moisture, Salinity, Crop response

A pot experiment was conducted to study the effect of amendments of vermiculate and farmyard manure (FYM) to sand on the growth and ion accumulation in *bajra* grown with tap-water and diluted sea water of 20,000 ppm. The degree of salt accumulation as a result of these treatments was also determined. Application of vermiculate and FYM increased the moisture content in the substrate compared to only sand without such amendments. Growth of *bajra* was improved in the salinity treatments when the sand contained FYM singly or in combination with Vermiculate. But accumulation of minerals in the different plant parts was higher when irrigated with sea water and the effect was more pronounced in the treatment with vermiculate and FYM combination to sand. (Abraham-Central Salt & Marine Chemicals Research Institute, Bhavnagar)

5233-A11, B3, C1, E3
COMBINED EFFECTS OF SCREENED MANURE SOLIDS AND CRUDE FIBER IN RATIONS OF LACTATING COWS

Department of Animal Science, North Carolina State University, Raleigh, North Carolina 27607
A.H. Rakes, D.G. Davenport, J.C. Wilk, and A.C. Linnerud
Journal of Dairy Science, V. 61, No. 9, p. 1238-1241, Sept., 1978. 2 tab., 11 ref.

Keywords. Refeeding, Animal wastes, Cattle, Performance, Crude fiber, Animal health

Effects of screened manure solids and two levels of crude fiber in rations for lactating cows were studied with 24 Holstein cows from approximately 14 days prepartum until 305 days postpartum. Neither crude fiber percent nor additions of screened manure solids significantly influenced intake of dry matter, total milk, fat-corrected-milk, or percentages of protein or solids-not-fat. Fat percentages were higher for cows fed rations with medium fiber than for those fed rations of low fiber. Rations with up to 41% of the crude fiber derived from screened manure solids maintained fat percentages as well as those without screened manure solids. No health problems or reproductive problems were related to either crude fiber or screened manure solids. (Rakes-North Carolina State University)

5234-B1
BEAT EXPENSIVE SYSTEMS -- SUN, WIND BEST FOR HANDLING WASTE

Anonymous
The Ada Sunday News, No. 166 (75th year), p. 16A, Sept. 24, 1978. 1 fig.

Keywords: Design, Confinement, Drying, Bedding, Livestock wastes, Wind, Sunlight

Oklahoma State agricultural engineer George Mahoney says that if manure could be dried in place within livestock confinement shelters, comfortable bedding conditions could be created for livestock. Expensive waste handling methods could thus be reduced or eliminated. This could best be accomplished through optimal conditions resulting from best use of sunshine and air movements inside the shelter. To determine optimum building shape, Mahoney initiated an Oklahoma Agricultural Experiment Station study using a smoke chamber to visually record the effects of wind moving through small plastic models of louvered buildings. Thirty-six models were scaled down to 1120 the size of an actual building and used for study of the effects of wind and sunlight. Three basic shapes of buildings were tested a standard gable roofed building with louvers halfway on the south slope; a building with the ridge one-third of the way back from the front opening, creating a shelter with a longer 312 roof in the rear and 612 louvered roof in front; and a building with a ridge one-fourth back, with a rear of 312 and a front slope of 912. It was assumed that the open fronts would face south, with the roof vents kept parallel to the sun's elevation. (Merryman-East Central)

5235-A8, C2

RELATIVE AVAILABILITY OF PHOSPHORUS FROM SOME ORGANIC MANURES AND PHOSPHATIC FERTILIZERS IN A LETERITIC SOIL

Department of Agricultural Chemistry and Soil Science, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, India
A.R. Bangar and T.L. Deshpande
Research Journal of Mahatma Phule Agricultural University, V. 6, p. 109-115, 1975. 3 tab., 12 ref.

Keywords: Phosphorus availability, Organic wastes, Fertilizers

Release of phosphorus in an available form from some concentrated and bulky organic manures such as F.Y.M. (farmyard manure), compost, fishmeal, meatmeal, bonemeal, sterameal, groundnut cake and enriched organic manure was studied in the laboratory through mineralization studies in an acid soil with a view to explore the possibility of utilizing these comparatively cheaper sources of phosphorus in comparison with the superphosphate. The results of the experiment led to the following conclusions. (1) The availability of phosphate in an inorganic 'P' carrier i.e. superphosphate was found to be the highest amongst all the treatments. (2) Enriched organic manure was slightly inferior to superphosphate in mineralization of phosphate, (3) the mineralization rate of phosphorus in groundnut cake was highest among the other organic 'P' carriers. (4) Fishmeal and meatmeal were found to be similar so far as mineralization of phosphorus in the soil is concerned. These were, however, inferior to groundnut cake. (5) Sterameal and bonemeal were slightly inferior to fishmeal and meatmeal but sterameal was as good as bonemeal for availability of phosphorus. (6) The F.Y.M. and compost were found to be very poor sources of phosphate. The mineralization rate of phosphorus was found to be the lowest in comparison with other 'P' carriers. (7) By addition of phosphate through super along with the nitrogen, the total availability of phosphorus increased than with the superphosphate alone. (8) The availability of phosphate from ammonium sulphate was more than the control. (Banger-Mahatma Phule Krishi Vidyapeeth)

5236-B1, B5, C2, E2
MANURE SPREADING BUILDS SOIL AND PROFITS

Anonymous
Wyoming Stockman Farmer, p. 61, Oct., 1978.

Keywords: Animal wastes, Economics, Fertilizers, Land spreading, Trace elements

John Furry, product manager for spreaders at Sperry New Holland, discusses the benefits of returning manure to the land. He says that research has shown even higher crop yields where manure was added after the land had already gotten as much chemical fertilizer as the crop could use. Manured land also seems to hold water better for droughty periods. Manuring the land is an easy way of stalling off micro-nutrient fertilizer deficiencies because most of the plant food nutrients, including trace elements, can go back to the land in the manure. Besides fertilizer savings to be gained, land spreading of manure is also cheaper than most other disposal alternatives. (Merryman-East Central)

5237-A8
THE CONCENTRATION OF LIQUID MANURE AFFECTS ITS INFILTRATION INTO SOIL

Department of Agricultural Engineering, The Pennsylvania State University, University Park, Pennsylvania 16802
W.R. DeTar
Paper No. 77-2060, American Society of Agricultural Engineers, North Carolina State University, June 26-29, 1977, 41 p. 20 fig., 8 tab., 12 ref.

Keywords: Liquid wastes, Dairy wastes, Soil types, Infiltration, Temperature, Hydraulic conductivity, Sealing, Soil mechanics, Earthen impoundments

Liquid dairy manure was used in groups of double-ring infiltrometers in the field of 4 different subsoils. Concentration was found to be more important than type of soil. Infiltration went down sharply with rise in temperature. The procedure permits determination of the impedance of the sealing layer and also provides the relationship between hydraulic conductivity and matric suction in the soil under the sealing layer. (DeTar Pennsylvania State University)

5238-B2, B4, E2
USE OF CLIMATIC DATA IN ESTIMATING STORAGE DAYS FOR SOILS TREATMENT SYSTEMS

National Climatic Center, Asheville, NC
S.M. Whiting and R.E. Thomas
Paper No. 77-4064, American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 25 p. 12 fig., 3 ref.

Keywords: Climates, Waste storage, Land application, Computer programs

Prolonged wet spells, snow and cold can be constraints to some land application systems. An estimate of the number of days that storage of wastewater may be expected can be provided by the analysis of 25 to 30 years of daily climatological data. Two computer programs are discussed that estimate storage for wet and cold regions. (Whiting-National Climatic Center)

5239-A6, B1, C2
MEASUREMENT OF ODOUR INTENSITY IN FARMING SITUATIONS

Warren Spring Laboratory, Stevenage, Great Britain
T.A. Dorling
Agriculture and Environment, V. 3, No. 2-3, p. 109-120, June, 1977. 2 fig., 7 tab., 37 ref.

Keywords: Odor measurement, Chemical properties, Threshold Dilution Value

Techniques employed for odor intensity measurements are described and examples of levels which have been found in farming operations are discussed. Chemical analysis can provide useful data but, of themselves, only provide a measure of the concentration of the various chemical species present and cannot indicate whether any single constituent or the whole mixture possesses an objectionable odor. Consequently, we have to rely upon direct methods of odor intensity assessment which are independent of a knowledge of the chemical species present. The ultimate sensing device is the nose and direct methods for odor assessment which depend upon the subjective judgement of a panel of human observers. Such measurements are obtained by presenting to the panel samples of odorous air which have been diluted with odor-free air to different degrees until a range of dilutions is obtained corresponding to a positive response varying from 0 to 100%. The Threshold Dilution Value, the dilution at which a person can just perceive an odor, is taken as the dilution corresponding to a 50% positive response. This value is a reproducible characteristic of the sample and is a semi-quantitative measure of the odor intensity at the source. The principal methods used to prepare and present diluted samples to the observer are: the odor room, the ASTM syringe method, and the dynamic dilution method. It is hoped that, eventually, correlations between chemical composition and the directly determined intensity will be established so that instrumental monitoring will be possible. (Merryman-East Central)

5240-A6, B1, C2
SAMPLING, CHARACTERISATION AND ANAYLYSIS OF MALODOURS

Central Institute for Nutrition and Food Research (CIVO) TNO, Zeist (The Netherlands
J. Schaefer
Agriculture and Environment, V. 3, No. 2-3, p. 121-128, June, 1977. 2 fig., 2 tab.

Keywords: Odor, Swine wastes, Poultry wastes, Confinement, Gas chromatography, Volatiles

An investigation was conducted with the purpose of developing an instrumental method for measuring malodors emitted by confinement swine buildings. Manure was considered to be the main source of odor. Consequently, volatile components of manure were extracted and analyzed by gas chromatography. These included: indole, skatole, phenol, p-cresol, acetic acid, propionic acid, i-butyric acid, n-butyric acid, i-valeric acid, n-valeric acid, NH_3, H_2S, methanethiol, daicetyl, acetaldehyde, propionaldehyde, butyraldehyde, valeraldehyde, acrolein, and croton aldehyde. In the ventilation air of swine confinement buildings, the volatile components identified above are not all present in measurable amounts due to low concentrations, low vapor pressure, or decomposition of components in air. Components that are present in distinctly measurable amounts include phenol, p-cresol, and the carboxylic acids C_2 -C_5. After comparative measurements of the stench components in the ventilation air of 17 swine buildings, it was evident that their proportion was constant within reasonable limits. In another investigation, the concentration of stench components in 20 swine confinement buildings was determined by gas chromatography and the intensity of the odor of the ventilation air was measured by a panel of 16 persons. Investigation of stench components of poultry houses has revealed the volatiles of the manure to be very similar to those of swine manure, similar in proportion but lower in concentration. (Merryman-East Central)

5241-A6, B1, C2, D2
CHARACTERIZATION OF ODORS AND OTHER VOLATILE EMISSIONS

Agriculture Engineering Department, Oregon State University, Corvallis, Oregon
J.R. Miner
Agriculture and Environment, V. 3, No. 2-3, p. 129-138, June, 1977. 12 ref.

Keywords: Odor control, Volatile gases, Ammonia, Legal aspects

Psychological aspects of odor evaluation compound the difficulties in making objective measurements of either odor strength or odor quality. Data indicate that the total odor created may not be just the simple summation of individual contributing chemicals, but that extensive interaction may be occurring which creates the odor. Forty-five odorous compounds have been identified to date in odorous air from animal waste degradation. Amines, mercaptans, organic acids, and heterocyclic nitrogen compounds are generally regarded as being of greatest odor significance. Existing chemical techniques for measuring the concentrations of odorous compounds are not always sensitive enough to identify offending odorous compounds. Extensive modification of traditional analytical techniques is needed. Although certain odorous gases are toxic to humans and animals, the primary concern is one of annoyance or nuisance to humans. Rules and regulations relative to livestock odors are based primarily on the concept of nuisance. Ammonia is the most widely studied odorous gas being evolved by anaerobic manure decomposition, partially because of its potential for reabsorption by nearby water bodies which can lead to aquatic enrichment. There are several odor control chemicals being sold for odor reduction or masking. Their performances have received only limited study and the published results are highly variable. (Merryman-East Central)

5242-A6, A7, B1, C2
A METHOD FOR SAMPLING AIR IN ANIMAL HOUSES TO ANALYSE TRACE GASES INCLUDING ODORANTS WITH THE GAS CHROMATOGRAPH

Tierarztliche Hochschule, Hannover (Federal Republic of Germany)
J. Hartung and H.G. Hilliger
Agriculture and Environment, V. 3, No. 2-3, p. 139-146, June, 1977. 6 fig., 2 ref.

Keywords: Trace gases, Air pollution, Odor, Gas chromatography, Temperature gradient tube, Swine wastes, Sulfur, Housing

Because there is no accepted procedure for sampling trace gases, the use of the temperature gradient tube was investigated in swine buildings. The temperature gradient is built up by liquid nitrogen. In the laboratory the sample is expelled by heat desorption and nitrogen carrier gas from the tube into the deep cooled column and analyzed in a gas chromatograph equipped with deep temperature program. Using two detectors (FID, FPD) simultaneously, two different chromatograms are received simultaneously. The chromatogram of the FID is considered as a "Fingerprint". The FPD related to sulphur compounds. The objective is to find a relationship between the total area (or single peaks) of the FID-chromatogram and direct sensory evaluation and possibly a correlation between isolated peaks, especially of sulphur compounds, and the different forms of swine housing. (Merryman-East Central)

5243-A6, B2, B4, C1, C2
CHARACTERIZATION OF MALODOURS DURING ANAEROBIC STORAGE OF PIG WASTES

Station de Recherches sur l'Elevage des Porcs, I.N.R.A. 78350-Jouy-en-Josas (France)
J.L. Roustan, A. Aumaitre, and E. Salmon-Legagneur
Agriculture and Environment, V.3, No. 2-3, p. 147-157, June, 1977. 3 fig., 4 tab., 22 ref.

Keywords: Waste storage, Swine wastes, Slurries, Odor, Anaerobic, Waste composition, Dry matter, Volatile Fatty Acids, Nitrogen, Slurries, Measurement

This study was conducted to design and test analytical methods for measuring quantitatively the major malodorous components in animal manure. Samples of swine manure were taken. Analyses were performed for determining dry matter, Volatile Fatty Acids, and nitrogenous compounds. Preliminary results revealed a mineralization process during anaerobic storage which increased ammonia content. Degradation of the carbonaceous matter in the manure led to an increase in Volatile Fatty Acid content. The dry matter content of the slurries appeared to play a special role in the accumulation of odorous components during storage. Studies need to be undertaken to determine the role of various manure components in perceived odor, especially during spreading which leads to dispersion of the manure and which might favor the evolving of some types of compounds. (Merryman-East Central)

5244-A6, B1, C2
SAMPLING AND ANALYSIS OF AIR IN PIG HOUSES

Rijksstation voor Landbouwtechniek, Burgemeesters Van Gansberghelaan 115, B9220
F. Lunn and J. Van De Vyver
Agriculture and Environment, V. 3, No. 2-3, p. 159-169, June, 1977. 5 fig., 2 tab., 31 ref.

Keywords: Odor, Swine wastes, Spectrophotometry, Gas chromatography, Ammonia, Skatole

Research was started in 1975 to develop a means of evaluating odor nuisance. The first investigations utilized MSA (Drager) tubes and spectrophotometric techniques. Determinations with the MSA tubes were neither selective nor sensitive. Spectrophotometric techniques were used for determining ammonia and skatole. For the latter the lower limit of detection was too high. Gas chromatography was also used for evaluating odor in piggeries. Sampling was accomplished with a gas pipet Later, the sample was adsorbed on Tenex G.C., active charcoal or absorbed in a suitable medium. Future work will include the use of several other column packings, longer columns, the use of other techiques prior to gas chromatography (cold trap technique) and the application of the flame photometric detector for sulphur components Further research will also be done using the gas chromatography-mass spectrometry combination to identify the components. (Merryman-East Central)

5245-A6, B2, B4, C2, E2
ODOURS ARISING FROM THE LAND-SPREADING OF PIG SLURRY

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D. McGrath
Agriculture andEnvironment, V. 3, No. 2-3, p. 171-182, June, 1977. 3 tab., 10 ref.

Keywords: Land application, Swine wastes, Slurries, Odor

A study was conducted with the purpose of formulating the best practice for land-spreading animal wastes. It was determined that a number of factors influence the intensity of odor from land-spread slurry: (1) Length of storage--There is a period of between one and two weeks after voiding when the slurry is most obnoxious. (2) Odor is related to strength of slurry. Consequently, watered slurry can be spread with more impunity than undiluted slurry. (3) Additives have no significant effect on smell. (4) Spreading on ploughed land will not reduce odor although soil incorporation virtually eliminates odor. (5) In the period after spreading, rain and windrun (both of which have time as a component but are not themselves related) have a strong influence on the loss of smell. About 5 mm of rainfall will reduce odor considerably. (6) Certain meteorological conditions are known to accentuate velocity and litter turbulence. (Merryman-East Central)

5246-A6, B2, B4, C1, C2, D1, D3
ODOUR CONTROL OF LIQUID SWINE MANURE BY AERATION

Rijks Agrarisch Afvalwaterdienst, Arnhem (The Netherlands)
K.W. Van Der Hoek
Agriculture and Environment, V. 3, No. 2-3, p. 183-188, June, 1977. 1 tab., 8 ref.

Keywords: Waste storage, Swine wastes, Aeration, Odor control, Waste composition, Energy consumption, Nitrogen

An aerated storage basin, a system commonly used in Holland, is described. The need to minimize the high energy-consumption without causing odor complaints and the need to minimize nitrogen losses while utilizing such a system are discussed. A calculation of the composition of liquid swine manure is presented. (Merryman-East Central)

5247-A6, B2, B4, C2, D1, D3, E2, F1
FRENCH EXPERIMENT IN PIG SLURRY DEODORIZATION

Ministere de l'Agriculture, (C.T.G.R.E.F.) Division Qualite Des Eaux, Peche et Pisiculture, 14 Avenue de Saint-Mande, 75012 Paris (France)

B. Lefevre
Agriculture and Environment, V. 3, No. 2-3, p. 189-195, June, 1977. 5 tab.

Keywords: Odor control, Swine wastes, Slurries, Land application, Aeration, Costs, Thermophilic, Filter towers, Separation techniques, Waste compositon

Two kinds of systems of stabilization and deodorization of swine slurry before spreading were studied -- slurry aeration with a floating surface aerator (aerated-storage process) and aerobic thermophilic stabilization (Licom process). Tabulated material indicates the effects and costs of each of these 2 kinds of treatment. The quality of the output products was observed for various settings of the aeration. In the second phase of the study, the following types of aerated storage installations were constructed in order to demonstrate their efficiency to farmers--aerated storage without pretreatment; aerated storage by circulation through filter towers after separation; aerobic, thermophilic stabilization separation; aerobic, thermophilic stabilization, with or without separations. This phase of study has not yet been completed. Study results thus far have been fairly good concerning deodorization during storage and spreading. Occurrence of an accumulation of anaerobic sludge in the storage tank is one of the most common problems encountered in the experiments. The aeration system should meet two main conditions--sufficient supply of oxygen and sufficient stirring power. (Merryman-East Central)

5248-A6, B2, C1, C2, D1, D3 VEAL-CALF MANURE DEODORIZATION BY SURFACE AERATION

Union des Cooperatives agricoles d'Alimentation du Betail, B.P. 75-02400 Chateau-Thierry (France)
A. Weil and C.R. Bernard
Agriculture and Environment, V. 3, No. 2-3, p. 197-206, June, 1977. 9 tab., 3 fig.

Keywords: Odor control, Cattle wastes, Aeration, Waste composition, Slurries

Because veal-calf breeding is concentrated in some West European countries, resulting manure odor has caused nuisance problems. The deodorization of such wastes by surface aeration was investigated. In this study, the manure was produced in two 120 cubicle barns (the animals were raised in 20 or 60 lots from 40 to 170 kg). The dejections were daily evacuated by a water gush and by a hand scrapper. The consumed washing water was recorded and the produced slurry was collected in one 10 m^3 reception pit. A representative sample of slurry was taken weekly. Samples were analyzed for dry matter, ash, total nitrogen, ammonia, phosphorus, calcium, potassium, pH, BOD5, COD, and suspended solids. An Alfa-Laval Centrirator was chosen for deodorization. It was found that veal calves have a daily manure production from 5-11% of their live weight. This manure is relatively low in dry matter and value as a fertilizing agent. Agronomical value fluctuates according to water dilution. Average daily pollution of a calf bred to 170 kg is 90 g for BOD and 200 g for COD. It proved better to process large volumes at the end of the storage time rather than processing progressively according to the manure production. (Merryman-East Central)

5249-A6, B1, C2, D1, D2, D3 TECHNIQUES AND COSTS RELATING TO ODOUR CONTROL

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Agriculture and Environment, V. 3, No. 2-3, p. 207-216, June, 1977. 6 fig.

Keywords: Odor control, Slurries, Chemical treatment, Physical treatment, Biological treatment, Chemical oxygen demand, Biochemical oxygen demand

The various techniques of slurry processing and odor reduction are discussed. Slurry processing methods include: application of deodorizing chemicals, injection, aerated storage combined with other techniques such as screening or flocculation, anaerobic treatment, physical and chemical processing, composting, dehydration, and recycling for feed. Odor control methods include: ozonization, chemical deodorization, washing of released air, absorbing filters, electrostatic filters, ventilation. For normal rearing conditions in France, cheap technical solutions to odor control must be available. The environmental problem requires a technical solution before legislation can work. (Merryman-East Central)

5250-A6, B1, D3, F3 ODOUR CONTROL WITH BIOLOGICAL AIR WASHERS

IMAG Wageningen (The Netherlands)
M.A. Van Geelen and K.W. Van Der Hoek
Agriculture and Environment, V. 3, No. 2-3, p. 217-222, June, 1977. 1 fig., 1 tab., 8 ref.

Keywords: Odor control, Air scrubbing, Design

A description is given of a biological air washer, types of packing material used, circulation pumps, and water distribution. Installation of such air-scrubbers in the ventilation of the exhaust system on livestock and poultry farms can eliminate dust in the air and can reduce odor. Two types of air washers are available. Those working on the cross-current principle draw air into the washer on the sides, while the water flowing from top to bottom keeps the packing material wet. Those working on the counter-current principle draw air in at the bottom of the washer, while the water flows through the packing material in the opposite direction. Types of packing material, circulation pumps and water distribution are described. Some of the theoretical aspects of water consumption and the mechanism of the air washer are discussed, together with a cost study. The wash-water contains nitrite and nitrate as a result of biological activity. Future research should be concerned with: (1) Comparison of different packing materials with respect to odor reduction and price. (2) Comparison of different flows of wash-water with respect to odor reduction and energy consumption of the pump. (3) Improvement of the wash-water distribution system in order to get a correct wetted cross-sectional area, and (4) How much wash-water has to be discharged to maintain a good working air washer. (Merryman-East Central)

5251-A6, D3 ODOUR REMOVAL FROM THE EXHAUST AIR OF ANIMAL SHELTERS

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Agriculture and Environment, V. 3, No. 2-3, p. 223-228, June, 1977. 1 fig., 2 tab., 1 ref.

Keywords: Odor control, Confinement, Air scrubbers, Costs, Design

In agriculture, the only process suitable for odor removal from exhaust air from confinement housing is gas washing. Problems often accompanying such an odor abatement system include: excessive total cost, maintenance problems, and variability of the efficiency according to the rate of stocking. Design and design changes for air scrubbing in the study ending in 1974 are outlined. The author gives complete design data for a standard foil scrubber along with an extensive cost allocation. (Merryman-East Central)

5252-A6, A11, B1, D2, F1 DEODORIZATION BY MEANS OF OZONE

Rijksstation voor Landbouwtechniek, Merelbeke (Belgium)
R. Priem
Agriculture and Environment, V. 3, No. 2-3, p. 229-240, June, 1977. 2 fig., 4 tab.

Keywords: Odor control, Ozone, Swine wastes, Animal health, Confinement, Performance, Economics

Tests were conducted to determine the influence of ozone on odor intensity inside a piggery, as well as on the state of swine health and performance. With each experiment, a comparison was made of the atmospheres inside a treated and a non-treated piggery. Daily growth and feed efficiencies of some pigs from both sites were noted. This increase in performance largely paid for the costs of the ozone production. There were indications of a (small) increase in the performances of the swine in the ozone-treated sites. Because ozone is potentially dangerous, concentrations should be kept low and should be monitored. (Merryman East Central)

5253-A1, B1, F2 DANISH RULES AND REGULATIONS RELATED TO ENVIRONMENTAL PROTECTION

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T. Huld
Agriculture and Environment, V. 3, No. 2-3, p. 241-244, June, 1977.

Keywords: Legal aspects, Feedlots

The Danish Environmental Protection Act, which became official on October 1, 1974, is an improvement over the earlier Sanitary Regulations for Rural Municipalities. This act provides that such enterprises as livestock keeping cannot be established without approval. If necessary, the municipal council may prohibit the continuation of an enterprise or impose antipollution measures. The Danish Environmental Protection Act imposes established minimum distances between live-

stock and waste facilities and the boundaries of neighbors. Only one enterprise has had to close down in the last five years. (Merryman-East Central)

5254-A6, B1, F2
U.K. PROBLEMS AND LEGISLATION RELATING TO ODOUR CONTROL

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Agriculture and Environment, V. 3, No. 2-3, p. 245-257, June, 1977. 3 tab.

Keywords: Odor control, Legal aspects

While there is no comprehensive law relating to odor control that applies to the whole of the United Kingdom, it would seem that for England, and Wales the statute Law (especially the Public Health Act and its by-law) offer some possibilities for legal action with regard to odor pollution. England and Wales, Scotland and Northern Ireland were surveyed concerning odor or nuisance complaints arising from agricultural complaints. This survey was conducted in January, 1976 by the Environmental Health Officers Association. Salient points from the survey data included: (1) The incidence of prosecutions and convictions for odor offenses in the United Kingdom are very low. (2) A majority of Councils stated that the farm odor position is not deteriorating. (3) Spray irrigation of liquid effluent received adverse comment from many areas. Irrigation by both tanker and pipeline were mentioned. (4) Most authorities suggested that occasional odors were more acceptable than continuous ones. (5) Most authorities felt that the correct place for animal manures was agricultural land. It was implied that pollution control was best exercised by higher standards of housekeeping, the avoidance of accidents and correct design, operation and siting of livestock buildings. (6) Some authorities, particularly in Scotland, suggested that the existing legislation with regard to actions in the Courts was difficult to enforce. (7) The general consensus seemed to be that persuasion and voluntary cooperation was a better method of achieving success than the imposition of punitive legal sanctions. Legislation for Scotland and Northern Ireland is closely allied to that of England and Wales. (Merryman-East Central)

5255-A6, B1, F2
ODOUR PROBLEMS AND ODOUR CONTROL IN INTENSIVE LIVESTOCK HUSBANDRY FARMS IN THE NETHERLANDS

Institute of Agricultural Engineering, Wageningen (The Netherlands)
A.A. Jongebreur
Agriculture and Environment, V. 3, No. 2-3, p. 259-264, June, 1977. 2 tab.

Keywords: Odor control, Legal aspects, Livestock, Poultry

In the Netherlands, The Public Nuisance Act requires the livestock farmer to have a permit to store manure on his farm. The Public Health Officer may impose further conditions to control bad odors. Local police regulations may also regulate a farmer's activities. Aeration of swine and poultry manure before spreading it on to the land can help prevent odor. Soil injection, drying of manure in laying hen houses, and proper ventilation may also assist in odor abatement. (Merryman-East Central)

5256-A6, F2
FRENCH REGULATIONS CONCERNING ODORS

Service de l'Environnement Industriel, Ministere de la Qualite de la Vie, Neuilly/Seine (France)
J.P. Vellaud
Agriculture and Environment, V. 3, No. 2-3, p. 265-268, June, 1977.

Keywords: Odor, Regulation, Legal aspects

The French parliament is studying a project to update legislation dating back to 1917. All livestock will be covered by this law as one of the most important innovations of the project. This law will apply to all activities which can potentially cause pollution -- agricultural, industrial, commercial, etc. The activities covered by this law are detailed in a nomenclature which consists of an alphabetic list. Some livestock is included in this list and is covered by the law if the number of animals is above a certain limit. The activities covered by the law are classified into law groups: those whose construction or enlargement need simply be declared to the Prefect; those which fall under the jurisdiction of the Prefect. For activities which present the most risk of pollution for the environment, the Prefect stipulates specific conditions that must be respected when work starts. The new regulation concerns all types of pollution resulting from an activity, i.e., water pollution, atmospheric pollution (dust, odors, smoke), noise, explosions. In each department, a body of inspectors has the responsibility of auditing authorizations and can propose penalities if it is necessary. The Departmental Sanitary Regulations cover all the other activities which are not covered by the legislation concerning classified establishments, which means that, if necessary, legislation is ready to cope with the odor problem. (Merryman-East Central)

5257-A7, F2
BELGIAN LEGISLATION CONCERNING THE BUILDING AND EXPLOITATION OF STOCK-FARMS

Management for Agricultural Engineering, Ministry for Agriculture, Brussels (Belgium)
A. Van Der Voorde
Agriculture and Environment, V. 3, No. 2-3, p. 269-274, June, 1977.

Keywords. Air pollution, Legal aspects

Three kinds of legislation are differentiated in Belgium -- legislation concerning town and country planning; legislation concerning dangerous, unhealthy and inconvenient establishments, and legislation recently adopted as so-called environmental laws, concerning water and air pollution. The stock-breeder will find in each of these 3 types of legislation a corresponding permission regulation which he may need for the construction and exploitation of his enterprise. These three corresponding permissions are the building-license, the exploitation license and the discharge license. (Merryman-East Central)

5258-A6, B1, D1, D3, E2
INVESTIGATIONS IN THE U.K. INTO METHODS OF ODOUR CONTROL FOR FARMS

Farm Buildings Department, National Institute of Agricultural Engineering, Silsoe, Bedford (Great Britain)
J.C. Hawkins
Agriculture and Environment, V.3, No. 2-3, p. 277-286, June, 1977. 2 fig., 17 ref.

Keywords: Odor control, Separation techniques, Slurries, Confinement buildings, Composting, Aeration, Dehydration, Flushing, Ventilation

Investigations were undertaken in the United Kingdom to reduce the odor of stored slurry when it is mixed, transported and spread on land and to reduce odors in and around livestock buildings. It was found that mechanical separation of slurry permits composting of the solid fraction and land application of the liquid fraction with less risk of odor nuisance. Aeration or dilute stored slurries can also reduce odor. Partial treatment of slurry in conventional aerobic treatment plants has produced wet sludges which can be spread on land without odor problems Pilot scale experiments have indicated that odor in and around livestock buildings can be achieved by a complete waste treatment system, incorporating separation, aerobic treatment and sludge de-watering. Linkage of the ventilation and waste treatment systems would allow most of the waste to be converted to odorless solids while the exhaust ventilating air could be scrubbed to remove dust and odor. Flushing of channels under slats to remove slurry from confinement buildings prevents anaerobic conditions from developing within buildings and reduces offensive smells. In experimenting with drying poultry manure, a major problem with artificial drying has been the control of odor from the exhaust gases of manure driers. Effective drying which reduces odor in and around poultry buildings can be achieved by in-house drying using waste heat from the birds. (Merryman-East Central)

5259-A6, B1
DISPERSION OF ODORS IN THE NEIGHBOURHOOD OF PIG HOUSES

Central Technical Institute TNO -- Apeldoorn (Holland)
B. Stork
Agriculture and Environment, V. 3, No. 2-3, p. 287-296, June, 1977. 4 fig., 3 tab., 6 ref.

Keywords: Odor, Swine, Confinement, Model studies, Design

The dispersion model presented gave a fairly good description of the dispersion of odors emitted by swine houses. According to calculations, it seems worthwhile to build a swine house so that the nearest neighbor faces

it lengthwise. The model described can aid in calculating the effect of emission reductions and chimneys. It appears that chimneys of about 10-15 cm can be a good solution to odor problems caused in swine houses. It is advisable to perform experiments on a practical scale to prove this, however. More information is needed concerning distances where swine houses do not cause a nuisance. When these distances are known, necessary emission abatement measures can be calculated more easily. (Merryman-East Central)

5260-A6, B1
THE DUTCH RESEARCH PROGRAM ON ODOR CONTROL

Ministerie van Landbouw en Visserij, Rijks Agrarische Afvalwaterdienst, Kemperbergerweg 67, Arnhem (The Netherlands)
J.H. Voorburg
Agriculture and Environment, V. 3, No. 2-3, p. 297-302, June, 1977. 2 fig.

Keywords: Odor control, Model studies

The following 3 models were developed: (1) a model for production and emission of smells: (2) a model of transport and dispersion of smells from the emission point: and (3) a model of the immission of bad odors, that can possibly be calculated from models (1) and (2). The 2 main sources of bad odors in stables are the manure and the animals. The following factors influence the transport and dispersion of odors around stables, manure pits or fields where manure is spread: (a) ventilation system, (b) distance, (c) weather conditions, and (d) obstacles like windscreens, walls and buildings. If models of odor emission, transport and dispersion are available, the odor immission at any point in the neighborhood can be calculated. In cooperation with legislators, some rules should be made concerning the maximum allowable immission. From this maximum immission, the maximum emission can be calculated. A special problem in regions where many livestock farms are concentrated is the accumulation of bad odors from different sources. (Merryman-East Central)

5261-A11, B3, C2, D3, E3
A NOTE ON THE FERMENTATIVE CHANGES OF DIETS PREPARED WEEKLY WITH MANURE SILAGE AND FINAL MOLASSES FOR GROWING CHICKENS

Instituto de Ciencia Animal, Apartado 24, San Jose de las Lajas, La Habana, Cuba
C. Hardy, O. Romero and A. Elias
Cuban Journal of Agricultural Science, V. 11, No. 1, p. 91-95, 1977. 3 tab., 15 ref.

Keywords: Refeeding, Silages, Cattle wastes, Poultry, Fermentation, Performance

1. A study was made of the fermentative changes that took place in twelve diets prepared weekly, with four substitution levels of maize by manure silage (15, 30, 45, and 60% of the diet) containing three proportions of manure and molasses (80:20; 60:40 and 40:60, respectively) and 2% urea. 2. Changes in all of the fermentative indices, as well as a tendency for the pH to increase at the 15% substitution levels were observed. 3. The possibility of preparing the diets weekly with manure silage is suggested. (Hardy-Instituto de Ciencia Animal)

5262-C2
PHOSPHORUS IN ORGANIC MANURES: I. FRACTIONATION OF DIFFERENT FORMS OF PHOSPHORUS

Chemistry College of Agriculture, Dhulia, India
P.L. Narkhede and T.L. Deshpande
Punjabrao Krishi Vidyapeeth Research Journal, V. 2, No. 2, p. 103-109, 1974. 2 fig., 3 tab., 8 ref.

Keywords: Phosphorus, Fractionation, Organic wastes

To investigate the nature of different forms of phosphorus and to determine their relative proportions in various organic manures, twenty-two organic manures of animal, vegetable and animal and vegetable origin were analysed. Fractionation studies included the determination of phospholipid phosphorus (easily available), phytin phosphorus, inorganic phosphorus (difficulty available), phosphorus in other organic forms and nucleic acid phosphorus. It was observed that in general, various oil cakes contain the major portion of their total phosphorus in the organic forms. The manures of animal origin such as fish-meal, hair-meal, poultry manure and manures of vegetable and animal origin such as farm-yard manure and compost contain a greater proportion of their total phosphorus in inorganic form as compared to oil-cakes. (Narkhede-Chemistry College of Agriculture)

5263-A11, B3, C2, E2
DPE NITROGEN SOURCE FOR GROWING LAMBS

Anonymous
Poultry Tribune, V. 84, No. 9, p. 26D, Sept., 1978.

Keywords: Poultry wastes-dried, Poultry litter, Nitrogen, Sheep, Performance

USDA animal scientist Lewis W. Smith conducted 2 experiments at the Beltsville Agricultural Research Center in Maryland in which soybean meal, urea, dehydrated poultry excreta, and broiler litter were compared as nitrogen sources for lambs. These sources provided 35, 26, 32, and 36 percent, respectively, of the total dietary nitrogen in complete pelleted feed. Each diet was individually fed to 5 lambs. In the first experiment, lambs gained an average of 282 grams per day, had a feed conversion ratio of 5.2 kilograms of feed to 1 kilogram of weight gain and dry matter intake of 1.4 kilograms/day. In the second experiment, lambs on the diets containing poultry excreta and broiler excreta and broiler litter gained more weight per day, had higher dry matter intakes, and better feed-to-gain ratios than lambs on urea and soybean meal. (Merryman-East Central)

5264-A11, C2, E3
WET POULTRY WASTE MAKES BETTER FEED

Anonymous
Poultry Tribune, V. 84, No. 9, p. 32, Sept., 1978.

Keywords: Poultry wastes, Refeeding, Sheep, Nitrogen, Digestibility

Victor Arvat and Joe Vandepopuliere, University of Missouri-Columbia poultry scientists, tested dry versus wet poultry waste on sheep and found the wet material was significantly better in terms of nitrogen availability and digestibility. They acknowledged that the dry product is easier to ship and store, but they felt that any producer who feeds the dry product would have to supply a greater amount to make up the lost protein (nitrogen). (Merryman-East Central)

5265-A1, A6, A11, A12, B1, C1, C2, D1, D2, D3, E2, E3, F1
ANIMAL WASTES

E.P. Taiganides, editor
Animal Wastes. Applied Science Publishers Ltd., London, 1977, 429 p.

Keywords: Feedlots, Design, Effluents, Gases, Odor, Animal wastes, Waste storage, Separation techniques, Dehydration, Lagoons, Composting, Aeration, Pyrolysis, Hydrogenation, Refeeding, Land application, Recycling, Economics

This book contains revised material based upon papers presented at the Seminar on Animal Wastes, organized jointly by the Regional Office for Europe of the World Health Organization and the Government of the Czechoslovak Socialist Republic, in cooperation with the United Nations Development Programme, held in Bratislava, Czechoslovakia. The technical, economic, and environmental consideration of methods of waste and wastewater handling, treatment, disposal and utilization for nutrient and/or energy recovery are discussed and evaluated. The book provides practical reference for all involved in every aspect of animal production. In addition to waste management and disposal, information is provided on animal feedlot development, layout and operation, ventilation requirements of confinement animal units, and environmental health requirements. Leading authorities discuss animal waste management and utilization in terms of practical technology for immediate application. (Merryman-East Central)

5266-A1, B1, E1
AGRICULTURE IN CZECHOSLOVAKIA

First Deputy-Minister of Agriculture and Food of the Czechoslovak Socialist Republic, Prague, CSSR
E. Cakajda
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 3-10.

Keywords: Confinement, Animal wastes, Waste disposal, Pollution

Czechoslovakia was instrumental in organizing this seminar because it wanted answers to

the problems related to the processing and utilization of excrements from large-capacity animal production facilities. Expert opinion was necessary. Czechoslovakia is introducing industrial modes of production in agriculture. Cooperating activities are practiced both by cooperatives and by state organizations. Facilities with the following animal concentrations are presently being built for animal production: cows -- 600-1200 head; calves -- 1200 head; beef cattle -- 1000 head; pigs -- up to 10,000 head; and hens -- 150,000 birds. Under Czechoslovak conditions (population density 140/km^2), the possibility of a safe system of excrement disposal is a limiting factor on further concentration, particularly in pig production and also, to some degree, in cattle breeding. Unfortunately the existing systems do not fully guarantee the protection of the environment. (Merryman-East Central)

5267-B1
ANIMAL FEEDLOTS: DEVELOPMENT, TRENDS, PROBLEMS

Vice-Minister, USSR Ministry of Agriculture and Food, Moscow, USSR
B.A. Runov
Animal Wastes, Applied Science Publishers Ltd., London, 1977, p. 11-22. 1 tab., 6 ref.

Keywords: Feedlots, Waste management, Cattle, Swine, Poultry, Sheep, Horses, Livestock wastes, Poultry wastes

The challenge to animal scientists, public health officials, government policymakers and engineers is to continue to strive for more food from animals with less feed grains and roughage, energy and land resources. Higher efficiencies and good-quality products have been achieved in animal feedlots, but economic waste management under environmentally sound principles could limit progress in achieving even higher plateaux of productivity in animal feedlots. The author discusses feedlot types and accompanying waste production and waste handling procedures for beef cattle, dairy cattle, swine, poultry, sheep and horses. (Merryman-East Central)

5268-B1
WORLD DEMAND FOR ANIMAL PRODUCTS FOR HUMAN FOOD, 1970-2000

Agricultural Industries Officer, Food and Agriculture Organization, Rome, Italy
W.H. Barreveld
Animal Wastes. Applied Science Publishers Ltd , London, 1977, p. 23-39. 1 fig., 13 tab., 21 ref.

Keywords: Animal production, Protein, Single-cell protein

The World Food Conference held in November, 1974 made it abundantly clear that "increasing the rate of food production substantially, especially in developing countries" is the number one priority to mankind to meet the challenge of an explosive population growth and the urgent need to increase the quality of life. Out of approximately 4000 million people, 460 million are actually starving, while 2000 million are badly nourished. If people's preference for animal protein products persists during the next few decades, it is expected that under the pressure of increasing world demand for food grains and fossil fuels, there will be a shift to greater reliance on forages and agricultural by-products for ruminant feeding on a worldwide scale. The combination of grazing and feedlotting only to improve the quality and palatability of the meat with a minimum amount of grain is expected to be the trend in animal agriculture in the developed and developing countries. Consequently, instead of the divergence in production systems that has emerged in the world with its inherent problematic issues and consequences, there will be an increasing tendency towards a more uniform approach towards providing the world with its needed animal protein. The pooling of potential feeding resources, manpower, technical skills and investment resources from both the developing and the developed world is needed to achieve this in the quickest and most effective way. Tabulated material provides important information concerning current and projected protein production and consumption in terms of countries assigned to three economic levels. A table also projects potential worldwide production and pilot facilities for single-cell protein by 1980. (Merryman-East Central)

5269-B1
CRITERIA AND GUIDELINES FOR THE SELECTION OF ANIMAL FEEDLOT SITES

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P.H. Jones
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 41-48. 1 tab., 15 ref.

Keywords: Feedlots, Site selection

Such considerations as waste disposal, environmental regulations, climate, topography, and the use of surrounding land influence site selection for feedlots. Traditonally animal production facilities have been located in rural areas. The author proposes 2 innovative arrangements which might reduce to a minimum some of the problems associated with site selection for intensive livestock operations. The first is an industrial city or park setting. Advantages of this include: (1) Access to substantial water supply to maintain clean, odor-free operations. (2) Accessibility of high-flow city sewer systems to transport and dilute the animal wastes prior to treatment in a municipal plant (if possible). (3) Easy access for feed and market. Disadvantages include: (1) Danger of noxious industries harming the livestock. (2) Loss of nutrients in waste which should, from a conservation viewpoint be recycled to the land. (3) Possible problems of odors from neighboring industries. (4) If city waste flow is low, possible expense of sewer surcharge causing the cost of waste handling to increase rapidly. The second suggestion is an agri-business park. This would be basically like an industrial park but located in the rural countryside. It presupposes the managed location of mutually supportive agri-business activities. Advantages of the agribusiness park would be: (1) All people would be agriculturally oriented and farm odors might be less offensive to them. (2) The surrounding land would be available for waste disposal. (3) Potential for growing feed at minimum cost. (4) Cooperative use of expensive capital equipment rendering it more efficient. Disadvantages would be: (1) Difficult to assemble such a large area of land without long-range planning and government support. (Merryman-East Central)

5270-B1
LAYOUT AND DESIGN OF ANIMAL FEEDLOT STRUCTURES AND EQUIPMENT

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M.L. Esmay
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 49-72. 7 fig., 5 tab., 6 ref.

Keywords: Feedlots, Design, Poultry, Cattle, Swine

The main purpose in planning the production unit is to develop a structure which will provide the type of environment needed for optimum economic animal production and at the same time provide good working conditions for humans Management and engineering decisions to be made include: (a) type of confinement facilities -- sheltered or unsheltered, warm or cold, and associated animal space requirements; (b) type of shelter construction -- wood, stone, metal, or other materials; (c) feed handling system -- type of storage bins, silo, (vertical or bunker), mechanized conveyance of feed to animals or do animals move to feed; (d) orientation of facilities with respect to climatic factors and access to roads; (e) layout to optimize traffic patterns -- animal traffic, feed, water and materials transport, vehicle traffic in and out of feedlot, and traffic pattern of workers; and (f) waste disposal -- storage, treatment, final disposition, mode and handling. In making decisions for the development of feedlot structures, the planner is constrained by (a) human health and safety considerations, not only of workers but also of the consumers of the animal products, (b) economic advantages and disadvantages of each alternative, (c) animal health and relative productivity under alternative systems of production, and (d) environmental pollution limits plus odor, dust and insect nuisance considerations. All of these items are discussed with reference to such decison making for poultry, dairy cattle, beef cattle, and swine. (Merryman-East Central)

5271-B1, F2
MANAGEMENT OF THE LIVING ENVIRONMENT

Deputy Director, Czechoslovak Research and Development Centre for Environmental Pollution Control, Bratislava, Czechoslovakia
Z. Kobos
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 73-75.

Keywords: Pollution, Feedlots, Legal aspects, Model studies

Utilization and disposal of wastes from feedlots are certainly economic in nature, but they are also of legal concern because of their impact on the human and the living environment. Consequently, feedlot waste management is not only a concern of agriculture but also of all government agencies and operations. The main means by which we can develop and protect the environment are: planning, economic policies, legal and legislative measures, the utilization of science and technology, public education, and programs of research. Modelling and computer simulation are being utilized more and more in solving environmental problems. Two types of models are mainly used to simulate the quality

of the environment: (a) the balance models of production and consumption wastes and (b) environmental models. The balance model is a mathematical function relating production variables to the resulting sum of wastes. Environmental models depict the impact of wastes (solid, liquid, gaseous, heat) on the quality of the individual components of the environment. Environmental models may be classified into (a) soil dispersion models, (b) atmospheric dispersion models, (c) waterflow quality models, and (d) ecosystem models. (Merryman-East Central)

5272-A4, B1, F2
EFFLUENT REGULATIONS FOR ANIMAL FEEDLOTS IN THE USA

Director, Environmental Studies Program, Cornell University, Ithaca, New York
R.C. Loehr and J.D. Denit
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 77-89. 1 fig., 3 tab., 8 ref.

Keywords: Water pollution, Point sources, Feedlots, Legal aspects

In the United States, recent changes in federal water pollution control regulations have become constraints which affect agricultural production. This paper discusses such federal regulations and how effluent limitations are developed for point sources. It also describes details of effluent limitations for animal feedlots. The Water Quality Act of 1965 assigned the federal government a leading role in the control of water pollution. In 1970 the national Environmental Protection Agency was established and was given the responsibility of integrating environmental quality activities in a manner which minimizes pollution. The Federal Water Pollution Control Act, as amended in 1972, contained the first specific federal requirements for the abatement of agriculturally related sources of pollution. The Act stipulated that each state must develop a waste management plan that would incorporate identification of agricultural pollution sources and set forth feasible procedures to control such sources. Similarly, the 'source control' philosophy developed in previous legislation was implemented by requiring technology-based effluent limitations in the control of point sources of waste discharges from all industrial operations including feedlots. The technology was to be achieved at three levels of control -- best practical control technology currently available (BPCTCA); best available technology economically achievable (BATEA) for existing sources; and best available demonstrated control technology (BADCT) for new sources. The technology was to consider no discharge as a possible limitation wherever technically and economically feasible. Feedlots limitations evolving from a 13-month study of the feedlot industry included: (a) no discharge except for the overflow from a specified storm for BADCTA and BATEA for all feedlots and BPCTCA for all feedlots except duck producers; and (b) specific mass and concentration limits for BPCTCA for duck producers. Limitations incorporated into regulations for the feedlot industry are reasonable, are being met by current feedlots, are consistent with technical and economic capabilities of the industry, and are within the intent of the Federal Water Pollution Control Act. (Merryman-East Central)

5273-A11, A12, B1, E1
IMPACT OF INTENSIVE ANIMAL PRODUCTION ON HUMAN ECOLOGY

Veterinary Public Health Officer, World Health Organization, Geneva, Switzerland
K. Bogel
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 91-93.

Keywords: Feedlots, Epidemiology, Animal health, Public health, Waste disposal

The trend towards mass production of food animals (in some areas also of fur animals) involves separation of the animal production units from feed source and from waste disposal areas. This can complicate epidemiological conditions and sometimes makes measures of precaution and control very difficult. In order to procure safe food and to protect personnel of animal industries, veterinary public health services in collaboration with other disciplines have to watch carefully over the whole production chain of feed, animal food, by-products and wastes. Appropriate health services should be consulted whenever sites for large animal feedlots are planned or modified. It should be noted that a number of infectious and non-infectious contaminations have been found to be particularly associated with feedlots. In some areas the odor nuisance has restricted the development of new production units because the public objects to the odor of the animal wastes. It is essential to establish environmental health guidelines based on a census of animal production, type of landscape, number and size of farms, number and species of animals per feedlot in relation to its surface area, percentage of dead animals, percentage of inedible offal per slaughtered animal of the various species, and effluents from slaughterhouses. In some countries, detailed requirements for the land disposal of animal wastes have been established. It is hoped that these activities will lead to the formulation of guidelines for country wide programs on dead animal carcass and waste disposal. (Merryman-East Central)

5274-A4, A6, A8, A11, A12, B1, D1, D2, D3, E2
MANAGEMENT OF HYGIENIC PROBLEMS IN LARGE ANIMAL FEEDLOTS

Professor of Veterinary Hygiene, University of Hohenheim, Stuttgart-Hohenheim, Federal Republic of Germany
D. Strauch
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 95-104. 1 fig., 2 tab., 12 ref.

Keywords: Epidemiology, Animal health, Public health, Water pollution, Soil contamination. Chemical treatment, Physical treatment, Biological treatment, Land application, Chlorination, Antibiotics, Odor

Hygienic problems involved in large animal confinement feedlots include: (a) major problems in epidemiology of infectious diseases and (b) major problems in environmental health. Epidemiological problems involved in large animal feedlots are closely associated with those of animal waste disposal. Conventional livestock units utilizing bedding do not cause epidemiological problems because if proper management procedures are carried out, dung heaps develop such high temperatures as to destroy pathogens that may be present. However, the liquid collection and handling methods which are now so often utilized do not have such spontaneous generation of heat and thus constitute a threat unless precautions are taken. Chemical disinfection, while effective, may be costly and may cause damage to plants if disposed of on land. Physical disinfection methods which might be employed are: aeration, oxidation ditch, and dehydration. Other health problems associated with large animal feedlots are noxious gases, contamination of soil with heavy land applications of wastes, and water pollution. Methods of controlling or moderating noxious gases include aeration, dilution, ozonation, combustion of exhaust air and activated carbon. To prevent soil contamination and protect public health from land application of animal wastes, the Federal Republic of Germany has established maximum permissible livestock density per hectare. Chlorination of wastewaters which may enter waterways will help prevent water pollution. In order to minimize environmental hazards, official proposals have been made to the effect that antibiotics used in medicine for therapeutic purposes should be suppressed in animal feeding. In the meantime, new products have been put on the market which are not to be used in human medicine. These substances are reported not to be resorbed, hence will not get into food of animal orgin. Manufacturers also claim that these antibiotics do not produce transferable resistance. (Merryman-East Central)

5275-A11, A12, B1, B5, D2, E2
HEALTH EFFECTS FROM WASTE UTILIZATION

Veterinary Medicine College, University of Brno, Brno, Czechoslovakia
J. Hojovec
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 105-109. 1 tab., 10 ref.

Keywords: Public health, Animal health, Refeeding, Land application, Chemical treatment, Chlorination, Formaldehyde, Ozonation, Ionizing radiation, pH

This paper focuses on public health problems associated with the utilization of animal wastes in refeeding both directly and indirectly as in application on to grasslands which are grazed by animals. For waste to be eligible for use as supplemental feeds to animals, three things must first be established: (a) its nutritive value, (b) its safety to animals, and (c) the safety of its residues in the animal products consumed by humans, assuming that the economic and technical feasibility of refeeding has been established. For a waste to have a feed value, it must be high in concentration of proteins and/or vitamins, amino acids and/or energy ingredients. However, it must be free of such extraneous materials as wire, glass, nails, toxic levels of heavy metals, a limited level of coliform organisms, and free of pathogenic bacteria and prescribed levels of drug residues. Liquid manure to be applied to land should be stored a minimum of seven days to ensure control of infectious disease from animal feedlots. If infection of the animals with an infectious disease agent is verified, then liquid waste must be disinfected before disposal. Disinfection methods depend on the nature of the agent to be eliminated or inactivated, on the subsequent use of the waste and the liquid waste itself. For bacterial pathogenic agents, disinfection by chlorination, formaldehyde, ozonation, ionizing radiation, heating, pH alteration and the addition of other bacteri-

cidal chemical compounds may be used. All these methods are expensive, and their technical feasibilities in large feedlots have not been demonstrated. (Merryman-East Central)

5276-A6, A7, A11, A12, B1, C2, D1, D2
NOXIOUS GASES AND ODOURS

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Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 111-119. 11 fig., 7 tab., 23 ref.

Keywords: Odor control, Animal health, Public health, Toxicity, Hydrogen sulfide, Ammonia, Slurries, Anaerobic, Site selection

During anaerobic degradation, gases are formed which are toxic and/or malodorous. Of the 20-30 gases identified in confinement buildings, hydrogen sulfide and ammonia are the primary gases that can occur in toxic amounts. Gas concentrations vary widely between the different manure handling systems and during the varous phases of manure handling. In buildings with solid manure systems, hydrogen sulfide is hardly detectable. Toxic gases are primarily associated with slurry systems. To prevent manure gases from entering the livestock building during cleaning, slurry systems should be fitted with gas traps and the drain ventilation suited to the system being used. When slurry is loaded into a tanker the gases released inside the tanker rise up through the filling hatch. Lethal accidents may occur if tankers, pump pits, manure containers, deep channels, etc., are entered before they have been thoroughly ventilated. A common complaint from neighbors of a feedlot is that there is too much odor. The determination of odor emissions from livestock buildings can only be done by means of a panel. Noxious odorants may be reduced by keeping buildings clean, not spreading the manure over a large surface, and cleaning the buildings at least twice a day if mechanical scraping is used. While chemical or biochemical compounds may be used to help reduce odors, they are usually excessively expensive. Another method of reducing emission is to treat the ventilation air before it is released. This can be done by adsorption, absorption, combustion (direct or catalytic) or by chemical destruction. The most promising of these appears to be some kind of absorption, i.e. washing of odorants. Another means of combatting odor complaints is through selecting a site where there is a sufficiently large buffer zone between it and the nearest residential area. Otherwise wind conditions, topographic conditions, and vegetation should be taken into consideration. (Merryman-East Central)

5277-B1, C1, C2, C3
BIO-ENGINEERING PROPERTIES OF FEEDLOT WASTES

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E.P. Taiganides
Animal Wastes. Applied Science Publishers Ltd , London, 1977, p. 131-153. 10 fig., 3 tab. 35 ref.

Keywords: Waste composition, Feedlots, Waste management

Properties of feedlot wastes influence waste handling. Feedlot wastes are affected by such factors as animal species, size and age, animal feed and water intake, microenvironment on the feedlot and climate. Feedlot waste properties may be classified as physical, chemical and biological. Physical properties include: temperature, color, taste, odor, specific gravity, bulk density, particle size, viscosity, and hydrophilic properties. Biochemical parameters include: biochemical oxygen demand, chemical oxygen demand, and soil oxygen demand. Chemical properties include: metals, fertilizer elements, and electrical conductivity. Major bacteriological parameters to be considered are total fecal coliforms, total count of bacteria, and identification of pathogens. Other feedlot waste parameters which are important in feedlot waste management planning are population equivalent, animal equivalent, and animal unit. (Merryman-East Central)

5278-B1, B2, B4
COLLECTION, STORAGE AND TRANSPORT OF CATTLE WASTES

Director, Agricultural Engineering Research Institute, Prague, Czechoslovakia
M. Velebil
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 157-164. 1 tab., 7 ref.

Keywords: Dairy wastes, Slurries, Solid wastes, Waste management, Housing, Design, Waste removal, Waste storage, Waste transport

Selection of systems for collection, storage and transport of cattle wastes is affected by the type of housing and by the concentration of animals. The housing system determines if solid or slurry handling equipment will be used. Present methods of dairy cattle housing include conventional stanchion barns, loose housing systems and free-stall systems with or without slatted floors. Stationary systems of waste handling have the following advantages: (a) always ready for operation, (b) require less maintenance and offer better flexibility in terms of designing systems to fit in with housing layout, and (c) offer good possibility of automation and programming. Disadvantages include: (a) necessity for special construction, (b) limited use of the machine in only one barn, and (c) confinement to a limited number of stall rows. Mobile systems of management have the advantage of servicing several barns and also being used for other tasks. Disadvantages include high labor requirements and the limitation of their use to certain types of housing layout. Mobile systems require frequent opening of doors during winter months. Also, the most serious disadvantage is the impossibility of automation with mobile systems. The most widespread stationary equipment for straw manure is the circulating endless chain cleaner equipped with paddles. The chain and paddle cleaner is supplemented with a conveyor for loading manure on trailers or for stacking manure in layers on the farmstead manure heap. Other stationary systems for disposing of straw manure (shuttle stroke barn cleaners, pushing bars with flaps) are used in small-capacity barns. In large barns with minimal bedding, bars with flaps may be used to move manure out. Mobile units for daily disposal of straw manure that may be used are tractor-mounted front loaders or tractor mounted scrapers with a special blade. Tractors mounted with blades may also be used to evacuate slurry and push it into a collecting storage. For hydromechanical waste removal, a flushing system may be used. Design parameters are given for waste storage. The most common means of handling solid dairy manure containing straw is the conventional type manure spreader. Liquid manure transport generally requires chopper pumps and tank wagons. A general discussion of system costs and of new waste handling developments is given. (Merryman-East Central)

5279-B2, B3, B4, F1
COLLECTION, STORAGE, AND TRANSPORT OF SWINE WASTES

Swine Breeding Research Institute, Kostelec and Orlici, Czechoslovakia
T. Jelinek
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 165-174. 11 fig., 3 tab., 8 ref.

Keywords: Swine wastes, Waste removal, Waste storage, Waste transport, Design, Economics

The main factors affecting systems for removal, transport, storage and utilization of the wastes are public health considerations and technical feasibility requirements, including economic factors. Waste produced per mean weight of pigs in the feedlots in this study, ranged between 5.5 kg waste/day/pig fattened. However, the mean wastewater production was 7 4 litres/day/pig. To reduce excessive water content in wastes, water feeders and methods of cleaning pens with minimum use of water are recommended. In housing units without bedding or straw, mechanical floor scrapers may be used Liquid manure may be removed by gravity either by collecting waste in pits for 3-5 weeks and then releasing it or by continuous overflow canals in which a 15 cm gate is installed at the end of the channel and water is added to a depth of 15 cm, prior to operation. Flushing is an effective means of removing waste collected in gutters or in canals under slotted floors. Recommended storage capacity for swine wastewaters is 3 months, including a mandatory storage for 7 days in a separate pit without new waste entering the pit during that week to meet the required time for pathogen control. Transport systems include tank wagons varying in size from 3-10 m^3, tractor-drawn or mounted on lorries, both vacuum and mechanically loaded wagons are suitable for swine wastewaters. Design parameters are listed for waste collection and storage. (Merryman-East Central)

5280-B2, B3, B4
COLLECTION, STORAGE AND TRANSPORT OF POULTRY WASTES

Poultry Research Institute, Ivanka pri Dunaji, Czechoslovakia
V. Peter and F. Zacharda
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 175-181. 25 ref.

Keywords: Poultry wastes, Waste removal, Waste storage, Waste transport

This paper examines waste handling techniques for commercial egg-laying poultry

operations. Poultry wastes considered are the manures and wastewaters from large, modern commercial egg-laying operations. The poultry wastes may be handled either by dry or by liquid methods. Dry systems have the advantages of low quantities to be handled, control of water pollution potential, abatement of odors and less frequent waste removal. Major disadvantages include the need for good management, difficulties in automating the removal process, and dust problems. Dry poultry manure can be dehydrated easily and/or composted for utilization. Dry systems have special ventilation requirements which have to be engineered to provide good air circulation over the manure. Liquid systems have advantages which include less management attention than dry systems, ease of automation of transport and treatment, less labor requirements, and more economical. Major disadvantages are odor problems, water pollution potential, and larger quantities of wastes to be handled. Dry handling systems include open housing, the slat system, in-house drying, and dehydration. Equipment for the removal of droppings varies with the method of drying and amount of storage. For field disposal, conventional or flail-type manure spreaders may be used. For transportation to long distances, lorry trucks should be used. In liquid handling systems, bird droppings and overflow from waterers and from other operations such as egg washing may be collected in shallow or deep pits underneath the cages. Several methods can be used to move the waste/wastewaters from the shallow channel underneath the cages to the storage tank. One such method is the floating-dam flooding system. Another technique for liquid manure removal is the flushing-gutter system which has been successfully operated in swine buildings, using tipping buckets, dosing siphons, trap-door tanks, etc. Waste storage may be in pits built above or below ground. Most poultry units use underground pits to which wastes may be scraped mechanically or hydraulically or with conveyors. Storage time must be designed to suit local climatic conditions, cropping patterns and land availability. Transport is usually in tank wagons. The latest development in tank wagons are those equipped with soil injection implements. (Merryman-East Central)

5281-B2, B3, C1, C2, C3, D1
SOLIDS SEPARATION AND DEWATERING

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Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 183-195. 7 fig., 3 tab., 16 ref.

Keywords: Separation techniques, Centrifugal separators, Screens, Filters, Evaporation, Sedimentation

Advantages of solid-liquid separation techniques are: volume reduction, concentration of solids for separate treatment or re-use, reduction or complete removal of settleable solids, reduction of the pollution potential of wastewater, prevention of clogging, ease of hydraulic handling, moderation of odors, etc. Major disadvantages are high energy and investment costs for mechanical devices, as well as labor requirements for maintenance and operation. Solids separators may be broadly classified as mechanical, thermal, physical, and bio-physical. Separators may also be classified in terms of whether they dewater, clarify the liquid, or classify the solids. Separation may be accomplished by centrifugal separators, screens, filters, evaporators, or sedimentation. Centrifuges cost money (12,000-20,000 per m^3 /hr capacity), energy (20-30 h.p. per m^3 /hr capacity), and have high labor requirements for cleaning and maintenance. A less expensive means which utilizes centrifugal forces is the liquid cyclone. Two categories of screens may be used -- stationary and vibrating. Vacuum filters and the filter press are means of filtering. Evaporators still need to be better researched before they will be practical. For open feedlots exposed to rainfall, runoff contains solids which may be separated from runoff flow by use of settling basins. Earth basins or channels also may be used to settle out solids by slowing down the runoff velocity or by the use of porous dams or perforated pipe. Each of these types of separators is discussed in terms of how they work and their efficiency. (Merryman-East Central)

5282-A6, B3, C1, D1, D2, F1
DEHYDRATION SYSTEMS FOR FEEDLOT WASTES

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Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 197-211. 6 fig., 6 tab., 4 ref.

Keywords: Dehydration, Livestock wastes, Design, Economics

Dehydration of livestock manure can serve as a pollution control device and can greatly improve the handling characteristics of the wastes. The reduction of manure moisture to the 10-15% level produces a stable odorless product that can be stored, transported and conveniently used as fertilizer or as feed supplement. Moisture reduction is usually achieved by: (1) evaporation, (2) physical separation of liquid, or (3) increase of dry matter portion by addition of moisture absorbing materials (i.e. bedding, litter). The moisture reduction process of main concern in this chapter is evaporation. Evaporation can be achieved in various ways with different sources of energy: (1) natural air dehydration by wind, (2) forced air dehydration by mechanically controlled ventilation with fans, and (3) heated air dehydration with mechanical dryers having heat sources of (a) fuel oils, (b) natural or liquefied petroleum gas, (c) biomass materials, such as wood or other plant waste products, (d) coal, (e) solar radiation. Each of these methods is costed and discussed in detail. (Merryman-East Central)

5283-B2, D3, F1
LAGOON SYSTEMS FOR ANIMAL WASTES

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Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 213-232. 7 fig., 5 tab., 20 ref.

Keywords: Lagoons, Design, Feedlots, Economics, Aerobic, Anaerobic, Facultative, Algae

Removal of pollutants and stabilization occurs in lagoons primarily through two processes. One of these processes is the settling out of solids through sedimentation and/or chemical precipitation. The second process involves stabilization of organics through biological transformations. The mode of the biological transformation determines the type of lagoon. Usually four types of lagoons are recognized: (1) Aerobic-Algal Lagoons -- Bacteria and algae, in a symbiotic mode of operation, combine to stabilize organic wastewaters. (2) Aerated Lagoons -- These 3-4 m deep lagoons are mixed and aerated by mechanical surface or diffused air equipment. (3) Faculative Lagoon -- These Lagoons have a surface aerobic zone and a bottom anaerobic zone. (4) Anaerobic Lagoons -- These lagoons function without atmospheric oxygen. Design criteria are detailed for each of these lagoon types. Satisfactory operation of lagoons and ponds depends upon good management in addition to correct design. The manager must be concerned with odor control, effluent disposal, solids disposal, and pumps and pipes for recycling flush water. Lagoon performance must be evaluated in terms of public health, aesthetics, ecology and economics in addition to pollutant removal efficiency. Examples of lagoons for large feedlots are given. (Merryman-East Central)

5284-A1, A6, B2, D3, E2
AEROBIC STABILIZATION OF PIG FEEDLOT WASTEWATERS IN CZECHOSLOVAKIA

Hydroprojekt, Prague, Czechoslovakia
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Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 233-240. 3 fig., 6 ref.

Keywords: Swine wastes, Biological treatment, Aerobic, Thermophilic, Activated sludge, Sewage

In the Czechoslovak Socialist Republic, swine wastes from large-scale feedlots are disposed of on fields after a period of anaerobic storage. Difficulties often arise from odor and occasionally water pollution. To alleviate these problems, a series of swine waste stabilization systems was tested. Neither thermophilic aerobic stabilization nor activated sludge aeration proved totally satisfactory. In the city of Trebon, Czechoslovakia, swine wastes are being treated with municipal wastes. In the town of Steti, Czechoslovakia, swine wastes were added to industrial wastewaters for treatment in a sewage treatment plant. It was found that combining swine wastes with the treatment of municipal or industrial wastewaters requires less capital and costs less than if each were treated separately. Furthermore, better performance is attained during winter when swine wastewaters are warmed up by the relatively warmer sewage wastewaters. Because of these studies, it has been decided that future construction of large-scale swine feedlots (over 10,000 head) should be abandoned in cases where the wastes are to be disposed of by application on land after thermophilic stabilization. Feedlots with a capacity higher than 25,000 pigs should always be connected to a municipal or industrial wastewater treatment plan, using one of the methods of treatment described above. (Merryman-East Central)

5285-B3, D3, E2
COMPOSTING OF FEEDLOT WASTES

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Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 241-251. 25 ref.

Keywords: Composting, Feedlots, Livestock wastes, Windrows, Continuous flow, Digesters, Recycling

Composting is the aerobic, thermophilic decomposition of organic wastes to a relatively stable humus. The main factors influencing composting are: moisture content, aeration, carbon to nitrogen ratio, phosphorus and potassium content, temperature, pH, particle size, plus micronutrients and microenvironmental conditions conducive to the growth of aerobic organisms. The two major methods of composting are natural and mechanical. Modern feedlots where large quantities of wastes are generated and excessive odors cannot be tolerated must use mechanical aeration to get a good compost process started. The easiest and most common type of composting is the windrow process in which the materials are shaped into heaps which are turned over manually or with specially designed mechanical equipment. Another mechanical method of composting is the continuous flow composter in which the materials in a bioreactor (digester) are subjected to environmental conditions that are mechanically controlled to provide uniform airflow distribution and maintain optimum moisture. Detention time in the bioreactor may be reduced to as little as two weeks followed by four weeks of aging in open windrows. The liquid composting technique consists of submerged aeration with downdraught type aerators equipped with propellors to agitate and aerate the liquid. Operating costs of this process to give complete treatment, which may include vacuum filtration, will be in the range of $230/dairy cow/year. Because it is not likely that farmers will use high-quality compost in field crop production, a well-defined market for the compost product should be defined and developed before undertaking expensive composting operations. (Merryman-East Central)

5286-A6, B1, C2, D2, D3, E2 NUTRIENT CONTROL APPLICABLE TO ANIMAL WASTES

Director, Environmental Studies Program, Cornell University, Ithaca, New York
R.C. Loehr
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 253-269. 4 fig., 3 tab., 9 ref.

Keywords: Biological treatment, Land application, Phosphorus, Nitrogen, Chemical precipitation, Oxidation ditch, Odor control

Waste management at a livestock facility is concerned with odor control, waste stabilization, nitrogen and phosphorus control consistent with land disposal constraints, and ease of waste handling and disposal. Viable alternatives to accomplish these needs include: (a) aerobic biological treatment followed by land disposal, or (b) direct land disposal in a prudent, environmentally sound manner. The desirable level of nutrient control is related to the utilization of the nutrients when the wastes are disposed on the land. Alternatives for controlling phosphorus in animal wastes or wastewaters are: (a) land disposal and (b) chemical precipitation. Chemical precipitation is more applicable to liquid wastes that are intended to be discharged to surface waters. When evaluating the overall costs of phosphate removal, the following should be added to the chemical costs: cost of energy for pumping and mixing, costs of additional qualified manpower. Controlled land disposal should be considered as a high-priority method for phosphorus control from agricultural wastewaters because it is more amendable to normal agricultural production operations, avoids the need for chemical control and treatment plant operation, and eliminates the additional problems of chemical costs and sludge production. In considering nitrogen control, it is very difficult to conserve all the nitrogen in animal wastes. Even if maximum nitrogen conservation (70%) takes place in an oxidation ditch, additional losses will occur as the stabilized wastes are stored, transported and distributed on the land. Probably less than 50% of manurial nitrogen excreted by the animals remains after stabilization, storage and spreading of wastes. The amounts actually available for plant growth will be even less and will depend upon the degree of nitrification, denitrification and leaching that takes place in the soil. Nitrogen control that occurs in aerated liquid livestock waste stabilization systems, such as oxidation ditches is consistent with other waste management needs of livestock producers: odor control, waste stabilization, and ease of mechanical handling. (Merryman-East Central)

5287-C1, C2, D2, D3, E3 ENERGY RECOVERY FROM ANIMAL WASTES: ANAEROBIC DIGESTION, PYROLYSIS, HYDROGENATION

Environmental Studies Program, Cornell University, Ithaca, New York
W J. Jewell and R.C. Loehr
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 273-294. 9 fig., 5 tab., 23 ref.

Keywords: Recycling, Gases, Anaerobic digestion, Pyrolysis, Hydrogenation, Design, Economics, Methane

This paper reviews animal waste management processes that offer the potential of energy recovery. The paper: (a) examines the potential application of energy recovery from animal wastes, (b) reviews the status of pyrolysis, hydrogenation and anaerobic digestion and their application to animal wastes, and (c) discusses the potential utility of the energy produced from the above processes. Factors to be considered when determining the potential for energy recovery from animal wastes include size of the installation, status of the technology, availability of full-scale equipment, degree of skilled operation required, operational time commitment, complexity of the process, and whether it is expected that the unit will be operated by agriculturally trained personnel. Design and economics of utilizing pyrolysis, hydrogenation, and anaerobic digestion are discussed in detail. (Merryman-East Central)

5288-A11, A12, B2, B3, C2, D1, D2, D3, E3, F1 UTILIZATION OF LIVESTOCK WASTES AS FEED AND OTHER DIETARY PRODUCTS

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Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 295-314. 12 fig., 11 tab., 23 ref.

Keywords: Refeeding, Waste treatment, Animal health, Public health, Safety, Drying, Oxidation ditch, Wastelage, Cereco, Corral, Grazon, Economics

Information that must be known in evaluating an animal waste product for refeeding are: (1) nutritive value of the waste, (2) safety of refeeding it to animal health, and (3) safety to humans eating the animals that have consumed the wastes. Also, the product must be acceptable to be eaten or the animals will not eat it. If the waste is satisfactory, a ration must be formulated around it to give a resultant adequate diet for the target animals. Equipment and procedures must be established to (a) harvest the raw waste material, (b) process it, (c) incorporate it into the animal diet, and (d) refeed it to the animals. Cost and returns must be considered along with impact on pollution control. Regulations concerning refeeding must be observed and public acceptance of the refeeding scheme must be promoted. The more common methods of processing animal wastes for refeeding include: drying; creation of wastelage by collecting fresh manure from cattle feedlots, mixing it with hay, and ensiling it; and reuse of oxidation mixed liquor (aerobically treated with liquid wastes that make a nutrient-rich drinking water). There are also three major commercial methods of processing cattle wastes for refeeding wastes -- Cereco, Corral, and Grazon. All of these processing methods are discussed in detail. (Merryman-East Central)

5289-A8, B2, C2, E2 UTILIZATION OF ANIMAL WASTES FOR CROP PRODUCTION

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Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 315-327. 10 tab.

Keywords: Liquid wastes, Fertilizers, Land application, Economics, Nitrogen, Waste composition

Crop fertilization is the most common and effective way of utilizing liquid manure in Czechoslovakia. Four years of research have resulted in the following findings: (1) Application of liquid manure to land at a proper rate with ploughed-under straw and/or in combination with mineral fertilizers tends to increase dry matter yields of crops, improve the agrochemical properties of the soil, and enhance the soil nutrient availability. (2) Liquid manure may easily replace farmyard manure and composted materials, particularly if used in combination with straw. (3) When compared with equivalent nutrient amounts contained in commercial fertilizers, liquid manure is highly competitive. (4) Timing of application is of critical significance as far as pollution potential and fertilizer effectiveness are concerned. (5) Graduated doses of liquid manure increased nutrient availability by a

minimum of 9% and a maximum of 96%. (6) The fertilizers effectiveness of liquid manure is higher for fodder crops than for cereal crops. (7) Adding supplementary nitrogen to fields treated with 50 tons/ha/year of liquid manure is not necessary. Liquid manure is an economical fertilizer when compared with farmyard manure. The economic return is estimated at two to six times better than the cost of applying liquid manure. (8) An application rate exceeding 200 tons/ha inhibits seed germination and crop emergence. (9) The simultaneous ploughing-under of straw with liquid manure allows high manure application rates on light soils and reduces nitrogen losses by 30-50%. (10) Applying composted swine manure in a mixture with city solid wastes produces yields slightly higher than liquid manure. The added cost of composting before land application has not been evaluated. (11) Nitrogen availability as found in either the solid portion or the liquid fraction of liquid wastes is not significantly different. On light soils, the solids fraction of liquid manure is equivalent to the farmyard manure. (12) Poultry liquid manure is an efficient organic fertilizer for heavy and light soils. Nutrient release rate is faster on light than on heavy soils. (13) Liquid manures from modern animal units are a valuable organic fertilizer for plant production; they return nutrients and organic substance back to the land, increasing soil fertility and productivity and improving land ecology. (Merryman-East Central)

5290-A8, B2, B5, C2, E2, F1
LAND DISPOSAL OF FEEDLOT WASTES BY IRRIGATION IN CZECHOSLOVAKIA

Irrigation Research Institute, Bratislava, Czechoslovakia
R. Kurc
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 329-331.

Keywords: Land application, Feedlot wastes, Irrigation, Tank wagons, Equipment-irrigation, Fertilizers, Potassium, Economics

The simplest method of tranporting animal wastes to the field is by tank wagons. Wastes may also be applied to fields by irrigation methods. Both systems have advantages and drawbacks which are discussed in this article. Separation of the solid and liquid phases of animal wastes enables them to be applied separately to the soil. The solids can be spread upon the land while liquids can be added to irrigation water as liquid fertilizers. Another advantage of the separation process is the reduction in potassium content which is achieved. This allows higher application rates for the separated liquid than could be used for the original waste. Irrigation equipment presently on the market which offers promise are the central pivot systems which are self-mobile and may cover over 50 ha/day. Such systems require semi-permanent installation and high initial investment. Disposal of liquid wastes by irrigation costs about one-third to one-half the cost of trucking. (Merryman-East Central)

5291-B2, E2, F1
COSTS OF LIQUID HANDLING AND TREATMENT OF LARGE SWINE FEEDLOT WASTES

Swine Breeding Research Institute, Kostelac and Orlici, Czechoslovakia
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Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 335-337. 3 tab.

Keywords: Economics, Swine wastes, Liquid wastes, Feedlots, Land application, Labor

The costs of land disposal of swine wastes in Czechoslovakia were studied for one year (1973-4) in swine feedlots ranging from 1200 to 20,000 pigs capacity. Two types of wagons were used for land application: lorry-mounted and tractor-drawn tank wagons with tank capacities of 3.5 and 10 m^3. Costs ranged from $0.69 to $1.33 per cubic meter of liquid waste hauled and spread on cropland. The 10 m^3 capacity was more economical than the 3.5 m^3 tank. In terms of animal live weight, the costs fo liquid manure waste handling ranged from $0.013 to $0.024 live weight gain. Approximately 12-20 kg of liquid manure were generated per kg of daily weight gain by the animals. Labor requirements amounted to .20-.40 man-hr/100 kg of live weight gain. The quantity of liquid waste hauled and disposed ranged from 4 to 10 m^3 /man-hr. A 10 m^3 capacity lorry tank can haul wastes for 3400-4500 fattening pigs. The investment on such a lorry tank would be about $10/pig. For tractor-drawn wagons of the same capacity, the investment is $9/pig. Initial investment for storage facilities (2-3 months storage, .8 m^3 /pig capacity) amounts to $50/pig. Treatment of feedlot wastes is more expensive than direct land disposal. A comparison of costs is given. Hauling pig slurry for 150 days per year over a distance of 4 km would cost $2.36/ton. However, the additional benefit accrued in increased yields amounts to $6.50-10.00/ton. In large feedlots these economic benefits cannot be realized due to insufficient storage and the fact that the weather will not allow the application of manure in accordance with the optimal needs of crops for nutrients. (Merryman-East Central)

5292-A4, B2, B3, D1, D3, E3, F1
COST OF ANIMAL WASTE MANAGEMENT

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Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 339-367. 3 fig., 17 tab., 5 ref.

Keywords: Waste management, Economics, Water pollution, Cattle wastes, Dairy wastes, Swine wastes, Poultry wastes, Feedlots

Legislation concerning water pollution places increasing importance on studies to analyze the economic impacts of alternative effluent guidelines and suggested management practices. These costs must be compared with expected societal benefits in order to appraise the desirability of pollution control measures. This paper combines information from several studies and presents the data and comparisons on a cost-per-head basis; however, the information does not represent all conditions that may be encountered. There is a large variation in costs relative to size of production unit, species produced, geographical location, and topography of the site. All costs presented are for conditions existing in the United States in 1973. Cost data for construction costs and material costs in the United States in years past are delineated. Consequently, it is simple to update that data to the present, allowing comparison of old systems with proposed new ones. The approaches used to develop these cost estimates should be the same as the ones presented in this paper. Use of these data for any other location should be done by an experienced, qualified engineer. However, it is hoped that these cost data may serve as general guidelines in national policy-making related to environmental quality around animal feedlots. Cost calculation methods are outlined for open feedlots and for covered feedlots. Beef, dairy, swine, and poultry systems are considered. (Merryman-East Central)

5293-A8, B2, B5, C2, E2
LAND DISPOSAL OF ANIMAL WASTES IN THE GDR

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Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 371-378. 7 tab.

Keywords: Slurries, Waste disposal, Waste composition, Legal aspects

Considering the population density and the strained water regime as well as the great demands on the productive power and the recreational value of the territory of the German Democratic Republic, the Constitution and the Environment Act contain highly stringent regulations for keeping Germany's waters clean and for protecting the landscape. Animal waste disposal in the German Democratic Republic is based on the following guidelines: (1) The considerable amounts of plant nutrients, organic matter and water contained in slurry must be maximally and most efficiently used for reproducing soil fertility and boosting crop production. (2) Technologies for the treatment and disposal of slurry and wastewaters must comply with the requirements of environmental protection. (3) Methods for the treatment and disposal of waste products must provide for the innocuous integration of factory-type livestock units into their respective landscapes. Slurry composition and handling methods are discussed. (Merryman-East Central)

5294-B2, C1, C2, D1, D2, D3, E2
SWINE FEEDLOT WASTEWATER TREATMENT IN ROMANIA

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Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 379-381. 2 tab.

Keywords: Swine wastes, Feedlots, Wastewater treatment, Settling tanks, Activated sludge, Aeration, Oxidation ponds, Chlorination

In Romania, industrial-type large pig fattening feedlots have been constructed. Wastes generated in these units are hydraulically removed with the addition of large amounts of dilution water. Disposal of the resulting wastewater, which is 30-40 litres/pig/day, is limited by the amount of land surrounding the feedlot. Such land is usually inadequate. Also, because transport of the wastewaters is economically limited to short hauls, extensive treatment of the feedlot wastewater is

necessary. Treatment systems adopted to process wastewaters from these large pig feedlots include primary treatment and secondary treatment with disinfection. Primary treatment is achieved in horizontal settling tanks equipped with scraping mechanisms. Secondary treatment consists of activated sludge basins with mechanical systems of aeration, or oxidation ponds, followed by final settling tanks for activated sludge systems, and chlorination before stream discharge. (Merryman-East Central)

5295-A4, B2, C2, C3, D1, D2, D3, E1, F2
FEEDLOT WASTE MANAGEMENT IN UPPER SILESIA, POLAND

Environmental Pollution Abatement Centre, Katowice, Poland
O. Kosarewicz and I. Firlus
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 383-385. 5 ref.

Keywords: Swine wastes, Liquid wastes, Wastewater treatment, Legal aspects, Feedlots, Water pollution

Several methods of treatment of wastewaters from Polish swine feedlots are being installed and others are being studied on a laboratory or pilot plant scale. Seldom do the feedlots have sufficient land to dispose of their wastes. Swine wastewaters may be disposed of on land at application rates of 50-100 m^3 /ha/year. One wastewater treatment system that has been installed on several swine feedlots is of Hungarian design, the so-called Vidus type. This system utilizes screening, pre-aeration, coagulation, activated sludge treatment, sedimentation, and disinfection with chlorine. Studies concerning wastewater management from large animal feedlots are aimed at analyzing the feasibility of large pig units in view of the high wastewater treatment requirements. Such research is being conducted in Poland by Agricultural Institutes, the Institute of Meteorology and Water Management and some universities. Feedlot location, operating conditions and waste treatment efficiencies to attain at each location are all controlled by legislation enacted in 1970 and in force as of January 1, 1971. (Merryman-East Central)

5296-A4, B1, C1, C2, D1, D2, D3, E2, E3, F2
FEEDLOT WASTE MANAGEMENT IN HUNGARY

Research Institute for Water Resources Development, Budapest, Hungary
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Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 387-394. 7 tab., 4 ref.

Keywords: Water pollution, Legal aspects, Feedlots, Swine wastes, Waste composition, Waste treatment, Waste disposal, Recycling

Total 1973 animal population in Hungary was about 2 million cattle, 7 million pigs and 33 million poultry. A 1973 survey of 25 pig farms revealed that the average pig feedlot has 8,000 pigs. The volume of wastewater generated in Hungarian pig feedlots averages about 20 liters/day/pig. About 65% of such wastewater is discharged on land. About 82% of the land-disposed wastewater is pretreated by solids separation via lagooning, settling units, straw filters, etc., followed by land irrigation. The rest of the feedlot wastewaters are discharged into rivers after treatment. Treatment by means of anaerobic lagoon, oxidation ditch, lime-activated sludge, and alum-activated sludge and denitrification are discussed in terms of the effluent qualities obtained. Parameters measured include COD, BOD_5, SS, Total N, Total P, and Total salts. In 1974, The National Water Authority published guidelines for the resolution of the conflict between the public demands for good, inexpensive pork and good, unpolluted water quality. These included: (1) The main objective of treating liquid manure should be to conserve its fertilizer value. (2) A prequisite to liquid manure utilization is pretreatment. Type and degree of pretreatment will be governed by local conditions and constraints. (3) The simplest form of utilization of liquid manure is soil conditioning and its use as a fertilizer. Alternative methods include fish-ponding, biogas production, and animal feed recycling. (4) In planning, constructing and operating waste utilization systems, public and veterinary health as well as water quality must be considered fully. (5) If local and economic constraints do not permit utilization or land disposal, two alternatives are: (a) either manure is purified to a degree prescribed for municipal and industrial wastes before discharge in surface water, or (b) no animal feedlot with hydraulic waste flushing system is permitted to operate in such localities. (6) The construction and operation of waste disposal and utilization systems is the responsibility of the animal producing enterprise, even when the state government is granting financial and technical aid to the enterprise. (7) Disposal of feedlot waste and wastewaters on pasture or cropland must be done properly according to official guidelines. Issuance of the above mentioned guidelines is but the first step in the effort of the Government of Hungary to balance requirements of food production and environmental quality. (Merryman-East Central)

5297-A1, B1, D1, D2, D3, E3
FEEDLOT WASTE MANAGEMENT IN THE SOVIET UNION

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Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 395-396.

Keywords: Feedlots, Waste management, Fertilizers, Refeeding, Recycling

In the Soviet Union, meat production has increased from 8.7 million tons in 1960 to 12.3 million in 1970 and 14.5 million in 1974. More than 260 large-scale livestock complexes have been built in the Russian Federated Republic over the last few years, largely as a result of a government decision in 1971 to develop livestock production on an industrial basis. More than 1000 such large livestock complexes are planned in the Soviet Union. In the design of such complexes, manure removal, processing, disinfection and storage must ensure the maximum preservation of fertilizer value with minimum labor, transportation and disposal costs. These goals are usually met by gravity-flow and recirculating manure removal systems, with subsequent fermentation under anaerobic conditions in the thermophilic regime. Manure is also utilized in the Soviet Union as a supplement in feed rations after drying the manure in dehydrators. Serious efforts are under way within the Soviet Union to develop manure utilization methods which will effectively eliminate the possibilities of environmental pollution. (Merryman-East Central)

5298-A1, B2, B3, D1, D2, D3, E2, F2
ANIMAL WASTE MANAGEMENT IN GREECE

Ministry of Agriculture and Ministry of Social Services, Athens, Greece
F. Plytas, J. Matsoukas and M. Panayiotidis
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 397-399. 3 tab.

Keywords: Feedlots, Poultry wastes, Swine wastes, Liquid wastes, Land application, Waste treatment, Biological treatment, Chlorination, Legal aspects

In Greece, the impressive increase in the demand for meat, milk and eggs after World War II led to the development of animal feedlots near towns and villages. Additional slaughterhouses and meat and milk processing plants had to be built, compounding environmental health and pollution problems from animal agriculture. Rapid growth and change to intensive and mass production methods resulted from new techniques and methods which are being applied in poultry and swine production today, as well as from the fact that the successful practice of the modern poultry and swine production industry does not need direct connection with agriculture. In large animal feedlots, various methods of waste handling are used. Liquid manure handling systems are common in swine feedlots. Poultry manure from deep litter houses is dry when removed, so there are no major difficulties with its direct disposal on cropland. Feedlot wastewater treatment systems utilizing primary treatment for mechanical removal of solids, biological treatment for removal of BOD and final disinfection by chlorination are being designed into the newly constructed large feedlots. Construction of animal production units must be made according to good animal husbandry principles and must be within the laws and regulations concerning environmental quality and public health protection. Feedlot wastewaters come under the general regulations governing effluent discharges into public waterways from industrial sources. In order to upgrade wastewater treatment, the government offers loans and subsidies to animal producers. (Merryman-East Central)

5299-A6, B1, D1, D3, E2, F2
ANIMAL WASTE MANAGEMENT IN THE NETHERLANDS

Institute of Agricultural Engineering, Wageningen, the Netherlands
A.A. Jongebreur
Animal Wastes Applied Science Publishers Ltd., London, 1977, p. 401-405. 4 tab.

Keywords: Legal aspects, Feedlots, Odor control, Air scrubbing, Soil injection, Manure banks

A 100-year old Public Nuisance Act in the Netherlands requires that every livestock

producer must have a permit, which is given only to a feedlot which meets the minimum distance standards specified. In the case of existing feedlots, if the minimum distances are exceeded, odor control procedures must be initiated. Research is now being carried out to correlate odors and odor control with the size and type of animal feedlot, the housing system, the ventilation system, the management of the feedlot and the type of manure storage and handling. One objective of this research is to develop a simple and objective odor measurement technique. Odors from ventilation exhausts have been successfully controlled through the use of biological air washers. Odors from field spreading may be prevented by aeration of the waste before disposal. Direct injection into the soil also helps prevent odors. The Netherlands encourages the use of feedlot wastes on cropland through the Development Fund for Agriculture which has organized Manure Banks which subsidize transport of liquid manure to croplands over long distances. Manure Banks are now operating in three provinces in the Netherlands. (Merryman-East Central)

5300-A1, A4, B2, D1, E2, F1 FEEDLOT WASTE MANAGEMENT IN BULGARIA

Research Institute on Water Supply, Sewage Purification and Sanitary Engineering, Sofia, Bulgaria
N. Bogoev
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 407-408.

Keywords: Feedlots, Swine wastes, Dairy industry, Pollution, Flushing, Land application, Biological treatment, Economics

In Bulgaria, large animal feedlots of up to 100,000 pigs and dairy cattle complexes of up to 1500 head are now operational. This high concentration of livestock production has led to environmental pollution problems. Bulgaria's most critical issue is how to dispose of wastes and wastewaters generated at the large swine feedlots. Hydraulic flushing is used at most of these lots creating wastewater production of about 40-100 liters/pig/day. Public health officials are requiring pretreatment of wastes before irrigation on land. Wastewaters from pig farms must be treated to remove 95-99% of BOD. This high treatment is needed for farms discharging into rivers with low flows. The first biological treatment plant designed by a foreign firm consisted of a collection pit followed by solids separation with a vibrating screen, aeration, final sedimentation and drying beds for separated solids. Frequent clogging of the vibration screen and other failures rendered the plant ineffective. Experiments for alternate treatment methods are being done. For swine feedlots of 100,000 pig capacity, the capital costs for proper wastewater treatment are excessive, making such large feedlots not economically feasible (Merryman-East Central)

5301-A1, B2, D1, D2, D3, E2, E3, F3 FEEDLOT WASTE MANAGEMENT IN CZECHOSLOVAKIA

Veterinary Medicine College, University of Brno, Brno, Czechoslovakia
J. Hojovec
Animal Wastes. Applied Science Publishers Ltd., London, 1977, p. 409-412.

Keywords: Feedlots, Liquid wastes, Land application, Waste treatment, Recycling, Refeeding, Substrates, Reclamation

At the modern large animal feedlots of Czechoslovakia, the most common method of waste handling is in the form of liquid manure. Based on existing information, the following recommendations should be followed in the use of liquid manure systems for large cattle, swine or poultry feedlots: (1) In considering a site, selecting it and in designing a feedlot: (a) General public health and veterinary sanitation principles should be followed so as to keep the surrounding territory disease-free as much as possible and to prevent gross environmental pollution; (b) Liquid manure must be stored in places which are located on the periphery of the farm, preferably on a side opposite the nearest residential area or to other premises whose sanitation is critical and must be protected. (2) Land application of liquid manure guarantees the most efficient use of the soil-fertilizing values of animal wastes with the lowest investments of capital and costs of operation. (3) Storage pits and sewer pipes must be watersealed and sized to provide at least 100 days of storage, plus additional space for emergency storage, and must have provision for the adequate disinfection of all the stored wastes during times of disease epidemics or when disinfection is essential in the protection of the surrounding land and water areas. Disinfection chemical residues must not create soil pollution either. (4) Untreated liquid manure can be spread on agricultural fields only on condition that it was produced by disease-free livestock. Problems which require additional research are the tenacity of the pathogenic germs in liquid manure, odor control, and waste treatment system design. Systems of fertilization also need further improvement, both from the viewpoint of efficient use of liquid manure and from the viewpoint of the protection of soil and water. Suitable application equipment for liquid manure needs to be further developed and internationally tested before being marketed. One form of waste treatment being tested is composting the liquid manure with water-absorbing materials such as pulverized municipal solid wastes. Land reclamation, liquid swine wastes as a substrate for growing mushrooms, and refeeding are also being tested. For a quicker solution to waste utilization, it is recommended that the feasibility of establishing a network for the prompt exchange of information on results of work being carried out on these problems in various parts of the world be studied immediately and implemented soon. (Merryman-East Central)

5302-B2, C2, D3, E3, F1 BIOCONVERSION NO PANACEA AS DISPOSAL ALTERNATIVE

Anonymous
Civil Engineering, V. 48, No. 8, p. 73-75, Aug., 1978.

Keywords: Biogas, Methane, Economics, Recycling

The biogas plant, which has recently gained wide publicity as a resource recycling technology appropriate for developing countries, operates on the same principle used in conventional anaerobic sewage sludge digestion. The digestion tank is fed water daily along with organic farm and household waste. The mixture ferments without air to produce biogas (carbon dioxide and methane) which is used primarily for domestic cooking and lighting. Evaluation of such biogas plants is complex. Very little information exists with respect to the capital costs of the biogas unit, costs on land, the dung produced by animals, seasonal fluctuations on demands, availabilities and values of resources, and products, product yields, etc. Before biogas plants are propagated across the developing world, we must support the determination of site specific, socio-economic conditions under which biogas plants have the greatest chance of success. (Merryman-East Central)

5303-A6, B2, C1, C2, D3 ANAEROBIC DIGESTION OF PIGGERY WASTE: I. THE INFLUENCE OF DETENTION TIME AND MANURE CONCENTRATION

Department of Water Purification, Agricultural University, Wageningen, The Netherlands
A.F.M. van Velsen
Netherlands Journal of Agricultural Science, V. 25, No. 3, p. 151-169, 1977. 7 fig., 8 tab., 16 ref.

Keywords: Swine wastes, Anaerobic digestion, Detention time, Odor control, Total solids, Nitrogen, Waste composition

The influence of the manure concentration -- in the range of 50 to 112.5 g total solids (TS)/litre -- and the detention time -- in the range of 40 to 10 days -- upon the anaerobic digestion of piggery waste was investigated in laboratory experiments (1.5-6 litres) and in *pilot plant experiments (240 litres). In spite of* high ammonia nitrogen concentrations a stable digestion could be achieved and maintained at all manure concentrations and all detention times applied, except when 112.5 g TS/litre manure was added at a 10-day detention time (space load 8.1 kg volatile solids (VS) per m^3 per day). Although a stable digestion could be maintained up to a space load of 5.4 kg VS m^{-3} day^{-1}, the maximum space load at which a satisfactory reduction of objectionable manure odor was attained appeared to be about 3.6 kg VS m^{-3} day^{-1}. (van Velsen-Agricultural University)

5304-A11, B1, C1 EFFECT OF DIETARY SODIUM AND POTASSIUM EXCESS ON WATER CONSUMPTION, URINE EXCRETION AND MOISTURE CONTENT OF FECES OF CHICKENS

National Institute of Animal Industry, Chiba-shi, Japan
S. Hijikuro
Japanese Poultry Science, V. 13, No. 2, p. 37-42, March, 1976. 4 tab., 7 ref.

Keywords: Poultry, Poultry wastes, Diet, Sodium, Potassium, Water consumption, Moisture content

Two experiments were conducted to determine the effect of dietary sodium and potassium excess on water consumption, urine excretion and moisture content of feces of the chickens with an artificial anus. Water consumption, urine excretion and moisture content of feces of the chickens significantly increased when the dietary sodium levels were excess or potassium sulfate was added to the control diet. The dietary potassium excess affected much less compared with sodium excess on water consumption and urine excretion, whereas the effects of potassium and sodium excess on moisture content of feces were similar. When potassium sulfate was supplemented to the diets along with sodium excess supplementation, water consumption and urine excretion increased but not significantly, whereas moisture content of feces was not affected. In both experiments, there was a highly significant correlation between water consumption and urine excretion, and urine excretion increased proportionally with the increase of water consumption. However, the moisture content of feces did not increase over about 80%, even when water consumption increased markedly. (Hijikuro-National Institute of Animal Industry)

5305-B2, C2, D1, D3, E3
COLORADO BIOGAS PLANT WINS ACEC TOP PRIZE

Anonymous
Civil Engineering, V. 48, No. 8, p. 74, Aug., 1978. 1 fig.

Keywords: Feedlots, Cattle wastes, Recycling, Biogas, Methane, Refeeding, Algae, Calcium, Potassium, Sodium, Waste treatment

The American Consulting engineers Council has awarded the top prize for Engineering Excellence to a process for converting feedlot manure into methane gas to fuel the Lamar, Colorado generating plant. The project was developed by the consulting engineering firm CH2M Hill of Denver. In this process, manure will then be degritted and stored for 20 days in anaerobic digestors. Biogas will form which is about 40% carbon dioxide and 60% methane. The carbon dioxide will be removed by amine adsorption. The remaining methane will be conveyed to fuel the power plant. The digested slurry will be centrifuged for dewatering. The solids will be dried and used as a cattle feed supplement. The water removed from the slurry will be treated in ponds, where algae will remove contaminants (calcium, potassium and sodium) potentially toxic to the bacteria. Algae will be removed from the water and combined with the digested slurry for cattle feed. Algae clarifier overflow will be recycled to the beginning of the process to form slurry before digestion, so the plant will have effectively "zero discharge." By applying the process to manure from 50,000 steers, Lamar will produce up to 50% of the gas required to fuel its 25-MW power plant. (Merryman-East Central)

5306-A7, B1, C2
MYCOFLORA OF A TURKEY CONFINEMENT BROODER HOUSE

Supervisor of Mycology Laboratory, Analytab Products, Inc., 200 Express Street, Plainview, New York 11803
C.B. Pinello, J.L. Richard and L.H. Tiffany
Poultry Science, V. 56, No. 6, p. 1920-26, 1977. 2 fig., 4 tab, 16 ref.

Keywords: Poultry, Air pollution, Litters, Mycoflora, Fungi, Confinement

The mycoflora of the air and litter of a turkey confinement brooder house was sampled every two weeks for five months. At each sampling, some turkeys in the house were bled for gel-precipitin and passive hemagglutination test, autopsied and lung, liver and brain tissues ground for fungal isolation. *Scopulariopsis, Penicillium, Aspergillus,* and *Petriella* constituted the major mycoflora of the air and litter. The same fungi were isolated from the lung, liver or brain tissue from one day old turkeys. Evidence of possible fungal invasion was demonstrated in turkeys six weeks old by the presence of lesions and the isolation of potential pathogenic fungi Turkeys of eight weeks of age were the first to show antibodies against the *Aspergillus* fumigatus antigen used in gel-precipitin and passive hemagglutination tests. (Pinello-Analytab Products, Inc.)

5307-A6, B2, D2
CHEMICAL TREATMENT FOR ODOR ABATEMENT MEASURED ORGANOLEPTICALLY IN LIQUID DAIRY MANURE

Department of Dairy Science, Michigan State University, East Lansing, Michigan 48824
C.C. Stallings, J.W. Thomas, and L.R. Prewitt
Journal of Dairy Science, V. 61, No. 10, p. 1509-1516, Oct., 1978. 7 tab., 17 ref.

Keywords: Odor control, Chemical treatment, Dairy wastes, Liquid wastes, Odor measurement, Lime, Paraformaldehyde, Hydrogen peroxide, Potassium permanganate

Lime, paraformaldehyde, hydrogen peroxide, and potassium permanganate were evaluated for their efficacy in controlling odor produced from decomposed liquid manure (5.6% dry matter). Paraformaldehyde reduced total aerobic microbial numbers and ammonia in treated manure, indicating a reduction in decomposition. In odor evaluation, allowing panelists to rate each treatment for degree of offensiveness olfactory fatigue was a significant problem for large numbers of treatments. In a second experiment to alleviate this problem, each panelist was allowed to evaluate only three jars at one time. The three jars, one always a control, were ranked by their relative offensiveness. Hydrogen peroxide at 100 and 500 ppm consistently reduced offensiveness rankings from .5 to 1.5 h after addition, but reduction was nil at day 9. On the other hand, 500 ppm potassium permanganate was consistently effective longer (8 and 9 days). This technique of odor evaluation reduced olfactory fatigue and allowed detection of subtle differences between treatments. (Stalling-Michigan State University)

5308-B3, C3, D1, D3, E3
DISTRIBUTION OF ENTEROBACTERIACEAE IN RECYCLED MANURE BEDDING ON CALIFORNIA DAIRIES

Department of Clinical Pathology, School of Veterinary Medicine, University of California, Davis, California 95616
E.J. Carroll and D.E. Jasper
Journal of Dairy Science, V. 61, No. 10, p. 1498-1507, Oct., 1978. 1 fig., 7 tab.

Keywords: Bacteria, Coliforms, Composting, Flushing, Recycling, Bedding, Dairy wastes, Separation techniques

The distribution of coliform organisms on three California dairies which use a system of automatic flushing of alley ways and composted, recycled manure solids as free stall bedding for utilization of waste was studied. There was a wide distribution of *Escherichia coli, Klebsiella,* and *Enterobacter* and to less extent *Citrobacter* organisms. *Klebsiella* were not commonly in bovine feces. Composting manure solids effectively reduced coliform counts to few or to zero. However, if given proper conditions of moisture and temperature, coliforms could multiply to large numbers again in composted solids whether from survivors or from external contamination. Dried composted manure was satisfactory material for bedding of free stalls provided it was dried properly before application. (Carroll-University of California)

5309-A11, B1, E3
UTILIZATION OF SWINE MANURE IN A POLYCULTURE OF ASIAN AND NORTH AMERICAN FISHES

Illinois Natural History Survey, Kinmundy, Illinois 62854
D.H. Buck, R.J. Baur, and C.R. Rose
Transactions of the American Fisheries Society, V. 107, No. 1, p. 216-222, Jan., 1978. 6 tab., 16 ref.

Keywords: Swine wastes, Fish farming, refeeding

Chinese methods of fish culture were evaluated for potential use in animal waste management, pollution control, and the production of protein. Two ponds were stocked with grass carp (*Ctenopharyngodon idella*), silver carp (*Hypopthalmichthys molotrix*), bighead carp (*Aristichthys nobilis*), carp (*Cyprinus carpio*), northern largemouth bass (*Micropterus salmoides salmoides*), channel catfish (*Ictalurus punctatus*), and the hybrid of bigmouth buffalo female (*Ictiobus cyprinellus*) and black buffalo male (*I. niger*). One pond (0.127 hectare) received the total wastes from five growing pigs (about 39 pigs/hectare of water area), the other pond (0.121 hectare) received the wastes from eight pigs (66 pigs/hectare). Two consecutive lots of pigs were fattened during the study. Over a fish-growing period of about 170 days (May to October 1975) the net increments in fish biomass were 2,971 kg/hectare in the 0.127-hectare pond and 3,834 kg/hectare in the 0.121-hectare pond. A beneficial influence by the fish on water quality was indicated by continuously adequate levels of dissolved oxygen, and final biochemical oxygen demands in the range of 8-12 mg/liter. (Buck-Illinois Natural History Survey)

5310-B1
SCHEDULING SWINE PRODUCTION FACILITIES

Department of Agricultural Engineering, Purdue University, West Lafayette, Indiana
J C Nye, B A McCarl, P.L. Nuthall, D.H. Bache, and J.E. Kadlec
Paper Number 77-4567, American Society of Agricultural Engineers, 1977 Winter Meeting, Chicago, Illinois, Dec. 13-16, 1977, 20 p. 6 fig., 8 tab.

Keywords: Computer models, Management, Swine

A computer model was developed to assist swine producers that plan to modify, expand and start a new swine production complex. The user supplies management information by completing an input questionnaire. The program will then determine size of buildings needed, the amount of feed needed and the amount of manure produced. (Nye-Purdue University)

5311-B3, C1, D1
SUMMER UTILIZATION OF SOLAR ENERGY FOR DRYING POULTRY EXCRETA

Agricultural Engineering Department, Michigan State University, East Lansing, Michigan 48824
F Hall, M Esmay, C. Sheppard, and C Flegal
Paper No 77-4536, American Society of Agricultural Engineers, Chicago, Illinois, Dec. 13-16, 1977, 6 p. 1 fig., 2 tab., 2 ref.

Keywords. Dehydration, Poultry wastes, Moisture content, Solar energy

The 1200 square foot solar collector at MSU was used during August and September of 1977 to dry poultry excreta. The collector and ventilation system were able to remove approximately half of the moisture from the wastes. (Hall-Michigan State University)

5312-B2, B3, E3
AGRICULTURAL WASTES IN FISH FARMING

Fish and Aquaculture Research Station, Dor, Israel
G.L. Schroeder
The Commercial Fish Farmer, V. 4, No. 6, p. 33, Sept., 1978. 2 fig.

Keywords: Swine wastes, Cattle wastes, Poultry wastes, Fish farming, Recycling

Experiments performed at the Fish and Aquaculture Station at Dor, Israel indicate that manure can by recycled into fish ponds where the manure's organic and mineral components are converted into microorganisms and planktons which in turn provide food for the fish There were usually 3 repetitions for each experiment. Pond treatments included manure (cow and chicken) only; standard food pellets only, and a combination of feed and manure. The latter treatment was an attempt to get, at low cost, the maximum fish yield per unit area of pond. The ponds were manured 6 days per week For ponds up to 1,000 m2 area, cow manure -- as a fluid containing the urine and feces -- was stored in open tanks adjacent to the pond and was poured at one location. For homestead farming, adding a fish pond to the already existing chicken, pig or cow husbandry will, in all likelihood give an increase in food production that is a large fraction of the previous output. Using the land animals' manures as the nutrient input to the pond is, in essence, recycling and getting a second crop from the original animal's food. (Merryman-East Central)

5313-A11, B3, E3
CATTLE MANURE AND FINAL MOLASSES SILAGE IN CHICKEN FATTENING. I. HIGH SUBSTITUTION LEVELS OF MAIZE BY SILAGE SUPPLEMENTATION WITH FAT AND METHIONINE OR FAT AND LYSINE

Instituto de Ciencia Animal, Apartado 24, San Jose de las Lajas, Habana, Cuba
R. Romero, A. Elias and C. Hardy
Cuban Journal of Agricultural Science, V. 11, No 1, p. 83-90, 1977 7 tab., 18 ref.

Keywords: Refeeding, Silages, Feed additives, Poultry, Performance, Cattle wastes, Methionine, Lysine, Fat

1. 300 Plymouth Rock X Cornish chickens, distributed in a completely randomized 2 x 2 factorial design and a control were used in order to include 45 or 60% of manure silage in the diets and evaluate the supplementation with 5% fat plus 0.2% methionine and 5% fat plus 0.2% lysine in the manure/molasses diets. 2. Weight gains and live weight at eight weeks differed ($P < .01$) between treatments with manure/molasses and the control and tended to become worse as silage inclusion level increased. Interactions were not found between the silage inclusion levels and the amino acid supplementation. The chickens fed silage significantly increased feed consumption (wet basis) ($P < .01$). Silage inclusion reduced the DM contents of the dropping. 3. It is suggested that the energy content and protein quality of the silage should be improved. (Romero-Instituto de Ciencia Animal)

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16. ABSTRACT

Management and research information on animal wastes has expanded in recent years. This material has appeared in such diverse sources as journal articles, conference papers, university publications, government publications, magazine articles, books or book chapters, and theses. This bibliography was compiled in order to speed the flow of information on findings in one segment of livestock industry to other segments that could benefit from this technology.

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