FINAL REPORT

A STUDY OF THE SHORT TERM AGRICULTURAL USER ADJUSTMENT PROBLEMS ASSOCIATED WITH MAJOR PESTICIDE REGULATORY RESTRICTIONS

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS
CRITERIA AND EVALUATION DIVISION
WASHINGTON, D.C. 20460

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PREFACE

CONSAD Research Corporation prepared this report during the period of July 1, 1975 to November 30, 1976, under Contract Number 68-01-1917 for the Criteria and Evaluation Division, Office of Pesticide Programs, Environmental Protection Agency. The field work phase of the study (on which this report is based) took place during the period of January 1, 1976 to March 15, 1976. Dr. Robert R. Reynolds was the EPA Project Officer.

Mr. Alan Bernstein, Dr. Douglas Stewart and Mr. Robert Lowrey, were the principal CONSAD personnel assigned to this project. Mr. Roger Mayland and Mr. Larry Koch performed the field interviews during the study.

Dr. Herbert Cole, the Pennsylvania State University, Dr. Gerald Klonglan, Iowa State University, and Dr. Jerry Stockdale, University of Northern Iowa, were the principal consultants.

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Finally, and most importantly, a special thank you to all those individuals -- farmers, pesticide dealers, implement dealers, local financial institutions, professional scouts, professional applicators, local educators, chemical company representatives, extension agents, ASCS directors, etc. -- who provided us with information while we were in the field.

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ABSTRACT

The objectives of this study were to identify the range of short-term (tentatively defined for purposes of this study as three years) "on the farm" user adjustment problems associated with major pesticide regulatory decisions, as well as to explain user problems and responses to those problems. The existing knowledge base relative to these phenomena was not one which could support a rigorous, quantitative study.

Not knowing the potential problems or the explanatory mechanisms which could emerge required that the data collection activities be extremely flexible and utilize a case study ("ethnographic") approach. As distinct from the standard social science survey in which all questions are known prior to initiation of field work, the case study or "ethnographic" approach adopted here was one in which field activities for the second week were planned by the field observer and field director on the basis of data collected and interpreted during the first week (and so on throughout the field work phase).

Two case studies were performed, each focusing on a particular pesticide/crop/pest problem combination. Criteria for the selection of study pesticides and study crops were identified. Once these criteria were applied, the two case studies emerged -- one focusing on field corn where aldrin/dieldrin and chlordane/heptachlor were used to control the black cutworm and the other focusing on cotton where DDT was used to control the tobacco budworm. The study site for each case study consisted of two counties, which were selected in light of the pesticide/crop/pest problem combinations described above.

The field work phase (i.e., the data collection phase) began in early January, 1976 and lasted ten weeks. Once the field work phase was completed, post field work activities took place including the analysis of the data generated in the field and the writing of the final report.

In reviewing the farmer adjustment responses and problems and the influential forces associated therein, a number of conclusions were found to be pertinent for providing EPA with a better understanding of the process associated with replacing a banned pesticide in the short term (i.e., within a period of three years):

Although farmers may become aware (i.e., "hear something") of a pesticide regulatory action near the time Federal decisions are made via the news media, they do not necessarily act on this information (i.e., take the message seriously, attend to it, solicit and receive detailed information, etc.). Indeed, the regulatory restriction does not become problematic until carry-over supplies of the banned pesticide become scarce. Thus, little experimenting with alternatives is done prior to this time and no preparatory or anticipatory adjustments are made.

The initial user adjustment response amongst farmers is usually an attempt to maintain their current pest control practice and hence they continue using the banned pesticide. Indeed, many farmers augment their supply by stockpiling and are encouraged to do so through advice received in the community-based institutional service network.

User adjustment responses that simply entail the substitution of the banned pesticide with a new chemical are also fairly common, but the adoption of new pest control practices not utilized in the past (e.g., alternate crops, intensive use of scouting with contingent use of rescue insecticides, etc.) are met with greatest resistance by the farmer and are usually only adopted by the larger, more established and higher resource farmers in the short term.

These user adjustment responses are not without their reported difficulties by farmers. Most of their concerns center around matters that could inhibit yield and profit; less concern for health or environmental side effects is apparent. The following user concerns are in evidence: pesticide shortages, increased cost and reduced efficacy of alternate chemicals (the latter partially caused by improper application) resulting in increased production costs, reduced yields, reduced income and increased debt; allergic reactions and the lack of institutional services for alternate crops; and the lack of institutional services for adjustment responses involving new pest control practices (e.g., intensive use of scouting).

- Farmers look to an institutional service network in their surrounding community for alternate courses of action when faced with replacing a banned pesticide (e.g., the extension service, the agricultural experiment stations, chemical companies, pesticide dealers, lending organizations, professional scouts, neighbors, friends and relatives, etc.). However, institutional constraints which impede responsiveness to the pesticide regulatory action can preclude otherwise possible responses by the farmer.

- A farmer's past practices (i.e., tradition) and his beliefs about what kinds of pest control strategies are effective for a particular pest, influence his adjustment responses in the sense that they restrain the range of attractive options.

- Financial resources (e.g., cash and/or credit) also constitute a significant attribute with respect to a farmer's response and problems associated therewith. That is, those farmers that can weather one or two poor crop years while the community based support institutions seek viable alternatives to the banned pesticide are least likely to have serious adjustment problems.

- Noncontrollable confounding conditions such as inflation, the weather, fluctuating market conditions for alternate crops, prior and expected levels of pest infestation, and pesticide shortages caused by raw material shortages (e.g., a petroleum crunch), all influence both a farmer's response to a pesticide regulatory decision and the subsequent problems that may develop. Nevertheless, the nature of the relationships between the farmer and the various support organizations will, to varying degrees, mitigate or soften the effects of these otherwise uncontrollable conditions in the production operating environment.

- Hence, the magnitude or seriousness of a farmer's adjustment problems (i.e., the degree to which a particular adjustment problem affects his ability to adapt to a new pest control option with confidence)

is influenced by both his personal resources (i.e., past practices to pest control, financial resources, information seeking activities, managerial skills, and friendship ties with pesticide dealers) and the ability of the institutional service network to provide timely, supplementary resources for responding to a regulatory action. Curiously, the interphase of these two resource factors means that adjustment problems can be equally serious for different farmers in the same geographical locality.

In summary, a period of three years appears to be a reasonable definition for describing "short term" transitional user adjustment problems. This study found that during the first growing season affected by a regulatory action, many farmers will attempt to "buy time" by stockpiling the banned pesticide. For some farmers, such stockpiles may be sufficient to carry them through the second growing season as well. However, in the third growing season affected by a regulatory action, few carry-over supplies of a banned pesticide exist and, thus, most, if not all, farmers are forced to make an additional adjustment response. Nevertheless, the available response options (i.e., alternate pest control strategies), the extent to which each is chosen, and the difficulties anticipated in adopting each option are, of course, influenced by a complex set of personal and community institutional resource conditions. Therefore, the response options open to the farmer and adopted by him in the "short term" (i.e., three years) will vary both between farmers of the same commodity sector, as well as between farmers of different commodity sectors.

1.0 INTRODUCTION

1.1 Rationale for the Study

Under Public Law 92-516, the Environmental Protection Agency is charged with the protection of man and the environment from deleterious effects of pesticide use. However, the amended FIFRA (PL 92-516) requires that decisions the Administrator makes governing the use of pesticides determined to produce "unreasonable, adverse" environmental effects shall be made with an awareness of the prospects for "unreasonable, adverse" social, economic and environmental effects resulting from the decision. Thus, if the substitute pest control procedures available present different health hazards or, if there are no substitutes available to maintain food and fiber production, then one problem is merely substituted for another.

Congress, in desiring to minimize the occurrence of such outcomes, has provided funds for the evaluation of problem pesticides and the consequences of various decision options for their use. The review program associated with the Substitute Chemical Program is a pivotal component of this policy thrust. Funds have been targeted in this program for the purpose of identifying pest control procedures that can feasibly substitute for problem pesticides, and for the purpose of evaluating evidence pertaining to probable short and long term effects of their use. However, information is not always available for certain classes of problems.

Data documenting short-term (i.e., tentatively defined for purposes of this study as three years*) transitional problems experienced by farmers faced with the problem of replacing a cancelled or suspended pesticide is one of the areas in which more knowledge is needed.** Short-term user problems can become long term problems for society,

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*Chosen because the DDT decision was three years old when this study was undetaken.

**This problem has been alluded to in past research and in previous pesticide regulatory decisions. For example, see RvR Consultants, Farmer's Pesticide Use Decisions and Attitudes on Alternate Crop Protection Methods, Report prepared for the CEQ and the EPA, Contract Number EQC 325, July, 1974; National Academy of Sciences, Pest Control: An Assessment of Present and Alternative Technologies, (5 volumes), 1975; and Opinion of the Administrator, EPA, on the Suspension of Aldrin and Dieldrin, FIFRA Dockets Numbers 145 et. al., October 1, 1974.

especially if major regulatory decisions are made without an adequate understanding of the scope and magnitude of problems.

The type and magnitude of farmer adjustment problems experienced were not well understood at the time the study was initiated, but were thought to possibly include shortages of substitute supplies, problems associated with the attainment of application skills, occupational health problems stemming from the use of unfamiliar products, etc.

Therefore, in order to upgrade the Environmental Protection Agency's capacity for identifying and understanding post-regulatory agricultural user adjustment problems and in order to provide direction to EPA in areas having optimal policy benefit, this study was undertaken.

1.2 Project Objectives and Constraints

Within the limits imposed by the relative lack of knowledge regarding user response to pesticide withdrawals, this study was a developmental one and was viewed as one of discovery and exploration. That is, the objectives of this study were to identify the representative range of "on the farm" user adjustment problems associated with major pesticide regulatory decisions, as well as to establish a testable theoretical framework for explaining user problems and responses to those problems.

The primary focus of the study was on farmers of select commodities and the scope of work stipulated that two major crops be selected to further focus the study effort. Moreover, the contract stipulated that the study should be targeted to, but not necessarily confined to adjustment problems associated with decisions to cancel aldrin/dieldrin and chlordane/heptachlor. Overall farmer adjustment problems were to encompass a range of issues including managerial problems, resource shortages, poor results with substitute pest control procedures, new pest problems, crop failure, safety problems, etc.

Finally, the contract specified that the sampling design and data collection procedures be sufficiently flexible to permit development of a policy understanding of the user adjustment problems specific to various crop production systems, without sacrificing the precision

necessary to identify response profiles of the most serious problems. In addition, the relationship between user behavior and the influence of local and extra-local institutional conditions to pesticide use and response to regulatory decisions were to be identified.

1.3 Organization of the Report

Chapter 2.0 provides a detailed description of the study approach utilized. First, information concerning the selection of corn and cotton as study crops, the selection of counties (or parishes) for in-depth field work and the nature of the crop/pesticide/pest relationship of primary focus to the study effort is presented. A description of the data gathering and analysis methodology used in each study site is then provided. Included are discussions of the methodological orientation, the field manual used, the selection, training, and oversight of the field person, the installation of the field person, the initial coding, analysis and debriefing activities and the final analysis activities undertaken.

The report is then divided into three major parts -- the first describes the field corn case study results, the second describes the cotton case study results, and the third summarizes key similarities and differences between the two case studies.

Parts I and II are written in a similar fashion and each contains five chapters. The first chapter in each part (i.e., Chapters 3.0 and 8.0 for corn and cotton, respectively) provides a description of the corn (or cotton) crop production systems and pest control strategies exhibited by the farmers in the study site. The factors influencing a farmer's decision to grow a particular crop and to use particular pesticides are first discussed, followed by a typology of different crop production systems (based upon insecticide use strategy) exhibited by the farmers in the study site. Chapters 4.0 and 9.0 describe the influence of local and extra-local institutions on the corn and cotton crop production systems and pest control strategies, respectively. These institutions are categorized based on whether they impact on the input side or the output side of the crop production process. Each institution is discussed with respect to the types of farmers that use the institution, the role that the institution and institutional representatives play in dictating pest control strategies to the farmer, the mechanisms of interaction used by the institution, the interaction the institution has with other institutions within the community, and the extra-local

institutional relationships between the local institution and its counterpart at the state, regional or federal level. The influence of the federal regulatory timetable on the crop production systems and pest control strategies exhibited by the farmers in the study site are next described in Chapters 5.0 and 10.0 for corn and cotton, respectively. A brief review of the aldrin/dieldrin and chlordane/heptachlor (or DDT) regulatory decision(s) is first given, followed by the initial reaction of farmers to the knowledge of the pending and then actual suspension (or cancellation) of these pesticides. The user adjustment response patterns are discussed in the fourth chapter of each part (i.e., Chapter 6.0 and 11.0 for corn and cotton, respectively). Included are descriptions of the various responses, the types of farmers exhibiting the response, whether the response is problematic (and if so for whom), and the reason why the response is or is not problematic. Chapters 7.0 and 12.0, the final chapter in each part, provide conclusions relative to the corn and cotton field work, respectively, including a description of the influential forces in the user adjustment response process.

Part III, which summarizes the results and conclusions presented in Parts I and II, consists of three chapters. Chapter 13.0 presents a cross commodity comparison analysis and focuses on key similarities and differences in the corn and cotton crop production practices and institutional arrangements and activities found in the two study sites, including the implications for possible adjustment responses and problems. A comparison of the user adjustment responses for each of the two case studies, including a discussion of the influential forces in the adjustment process and the important concerns for EPA, is then presented in Chapter 14.0. Chapter 15.0 provides recommendations for EPA policy decision making and for areas requiring further work.

2.0 STUDY APPROACH

2.1 Overview

As stipulated in the project objectives, the focus of the present study was to identify the range of "on the farm" user adjustment problems associated with major pesticide regulatory decisions, as well as to explain user problems and responses to those problems. The existing knowledge base relative to these phenomena was not one which could support a rigorous, quantitative study.

Not knowing the potential problems or the explanatory mechanisms which could emerge required that the data collection activities be extremely flexible and utilize a case study ("ethnographic") approach. As distinct from the standard social science survey in which all questions are known prior to initiation of field work, the case study or "ethnographic" approach adopted here was one in which field activities for the second week were planned by the field observer and field director on the basis of data collected and interpreted during the first week (and so on throughout the field work phase). In addition, the effect of two case studies (one for each major crop selected to focus the study) on the dynamic nature of the project is significant for it allowed insights derived from one commodity to be explored through similar data acquisition procedures on the other.

Conjoined with this emphasis on flexibility was a planning approach which indicated a set of procedures and initial data sources. Of particular importance was the enumeration of non-farm sources of information. This methodological approach was supported by the overall conceptual orientation -- that the farmer exists within an institutional context which can serve as an important explanatory basis regarding the farmer's responses. A wholistic view of the social structure and process pertinent to the farmer's use of pesticides and exposure to the banning of a pesticide was sought. That is, those conditions (including the various institutional structures enmeshed in the agricultural community) that either alleviate or aggrevate the user adjustment process were of concern to the study.

It should also be emphasized that this study is based on what respondents (farmers and others) reported, given that the thrust of the study was to discover and explain user adjustment responses and problems. These reports are, in turn, based on respondents' perceptions.

Thus, the study is reporting on the perceptual world's of various actors in the crop production system. The implications should be clear: this report was not to address the "real" or "objective" consequences of specific pesticide regulatory decisions and therefore, this study was not to be an assessment of the "real" impact experienced by farmers when faced with the banning of a particular pesticide. However, the important point to be recognized here is that "real" behavior and decisions are based on perceptions, whether valid or not, and thus are of utmost concern, in policy decision making and program implementation.

In order to implement the above approach and fulfill the project requirements, a three phased effort was utilized. Pre-field work activities were first undertaken to select study crops and study sites in order to focus the field work phase. Utilizing the "ethnographic" approach, the field work phase was then implemented and involved the development of a field manual to guide the data collection activities, the selection, training, and installation of field observers, as well as the actual field work, i.e., data collection activities which began in early January, 1976 and lasted ten weeks. Once the field work was completed, post field work activities took place including an initial coding, analysis and debriefing session, an analysis plan meeting, field analysis, and the writing of the final report.

Each of these phases are discussed in detail in the sections below.

2.2 Pre-Field Work Activities

2.2.1 Selection of Study Crops

2.2.1.1 Crop Selection Criteria

The primary concern in choosing crops for focusing the study was to insure that the broadest possible spectrum of short term user adjustment problems likely to be experienced by farmers when faced with the banning of a pesticide would be found. Upon consideration of the types of short term probems likely to result from such a decision, and with expert advice provided by project consultants, it was believed that the problems, for the most part, would be either crop production cost related or managerial skill related. Crop production cost related problems are those factors that cause the cost of producing the crop to change. Managerial skill related problems are those factors related

to the skills required to use pest control alternatives and the issue of whether alternative pesticides, or other means of pest control, do in fact exist for those pesticides that are banned.

These types of problems revolve around the economic institutions of agriculture (e.g., lending institutions, pesticide dealers, marketing outlets, etc.) although they do impact and are impacted by other institutions (e.g., extension service, agricultural experiment stations, etc.). Therefore, in structuring the commodity selection criteria, those criteria that focus on the economic institutions and involve either crop production cost related or skill related issues were used. In consultation with project consultants, it was decided that criteria relevant for describing managerial skill related and crop production cost related problems can be delineated on the following dimensions:

- Availability of alternatives (chemical and otherwise) for those pesticides that are banned;
- Input/output crop production relationships (e.g., technological inputs, contractual arrangements between grower and buyer, etc.); and
- Intergrower crop production relationships (e.g., grower cooperatives, political strength, etc.).

Moreover, the consultants suggested that variations between crops on these dimensions in the crop production relationships could be important conditions or contingencies of user adjustment.

Therefore, in order to insure that the representative range of problems would be found, it was desirable to choose crops where alternatives for those pesticides that are banned might <u>not</u> be readily available. Moreover, it was desirable to consider crops where there <u>are</u> basic differences in crop production relationships, e.g., in the input/output crop production relationships. In addition, the data collection and sampling design aspects of the study (i.e., the field work phase activities) had to be considered in the crop selection process. These thoughts are further supported in the following paragraphs.

In the initial selection of any crop for study, a determination had to be made as to what crops were treated with the study pesticides and if the study pesticides were perceived by farmers as being indispensable to the production of these crops, i.e., does the farmer think suitable

pest control alternatives are not available for the study pesticides? If the farmer believes that no alternative exists to control the pest problems as well as the study pesticides (i.e., without a reduced yield and at a similar cost), he will perceive the study pesticides as being indispensable to the production of his crop. This suggests two initial interrelated criteria for selecting crops for study: those crops on which the study pesticides were used and those crops where the farmer perceived the study pesticides as being indispensable. It was thought that this is where the user adjustment problems are more likely to be found and where a comprehensive picture of the range of impacts resulting from such problems can be obtained.

Basic differences in the input/output crop production relationships also had to be represented in the crops selected. Input/output relationships are defined to mean various factors involved in the production and sale of the crop, i.e.:

- Technological inputs used in the production of the crop (e.g., level of capital investment in mechanical equipment, level of pesticide use, level of labor intensiveness, etc.);
- Types of crop output produced (e.g., for fresh market, for processing, etc.);
- Contractual arrangements between the producer/seller and buyer;
- Credit arrangements; and
- Government regulations on crops sold (e.g., residue levels, intrastate regulations, interstate regulations, etc.).

By including crops with basic differences in input/output crop production relationships, one can delineate the various user adjustment problems for these differently structured relationships. Moreover, one can explore the extent to which institutional structures alleviate or aggrevate the user adjustment process and how differently structured forms of crop production cope with user adjustment problems. Some of these basic differences can be found both within the production of the same crop and between the production of different crops because of differences in factors such as:

- Climatic, soil and pest infestation characteristics;
- Variations in economic institutional structures;
- Size of the farm operation and financial resources of the farm firm;
- Types of output produced; and
- Preferences of the farm operators.

A second way for delineating crop production relationships is the matter of intergrower relationships. These differences can be measured by such factors as:

- Political strength (e.g., formalization of grower organizations, trade associations lobbying for the crop producers);
- Cooperative buying or using of crop production inputs, (e.g., materials, equipment, farm management services, etc.): and
- Cooperative selling of the crop.

By including basic differences along this dimension of the crop production process as well, the possible influence of grower organization on the types of user adjustment problems can be detected. Once again, these differences can be found both within the production of the same crop and between the production of different crops for similar reasons as outlined above.

Finally, the crop selection process had to consider the data collection and sampling design aspects of the study. That is, to insure the success of obtaining pertinent information in a timely fashion and within the available resources, both the geographic locations where the crop is grown and the ability to locate farmers growing the crop and having used the study pesticides had to be reviewed. If this were not done, the resources allocated to this phase of the study could have become insufficient and resulted in an inadequate understanding of the user adjustment process.

The application of these criteria is discussed in the next section.

2.2.1.2 Selection of Corn and Cotton

As indicated above, the application of the criteria must begin with a determination of those crops where the use of the study pesticides is deemed to be "indispensable" to the production of the crop (as perceived by farmers). Therefore, the selection of study pesticides was first necessary in the crop selection process.

The three major pesticide regulatory decisions affection agricultural production to date were chosen as study pesticides for this study, i.e., DDT, aldrin/dieldrin, and chlordane/heptachlor. The DDT decision was chosen because: (1) it was the first major pesticide decision to affect the agricultural community, and (2) since it has been in effect since December 21, 1972, it was thought that farmers would be able to relate some real adjustment experiences. The aldrin/dieldrin and chlordane/heptachlor decisions were chosen because: (1) they provided a contrast to DDT in that the decisions have not been in effect for as long (i.e., aldrin/dieldrin were suspended effective August 2, 1974 and chlordane/ heptachlor were suspended effective July 29, 1975 for most uses and August 1, 1976 for corn), (2) given this fact, it was thought that these decisions would provide an opportunity to study early phases of the adjustment process directly in order to capture the formulative ingredients therein, and (3) aldrin/dieldrin and chlordane/ heptachlor were used by many farmers as substitutes for one another (hence the reason for including both decisions).

In the selection of two major crops, one crop was chosen in which the use of DDT was perceived by farmers as being indispensable and one crop was chosen in which the use of aldrin/dieldrin and chlordane/ heptachlor were perceived by farmers as being indispensable.

In further study of the use of aldrin/dieldrin and chlordane/ heptachlor, it was found that field corn is the crop where the majority of all aldrin/dieldrin and chlordane/heptachlor applied to crops were applied (see Exhibit 2.1 on the following page). The use of these pesticides has been as a soil insecticide to protect field corn primarily against rootworms, wireworms, and cutworms, although it was also registered for use against other pests such as grubs, seed corn maggots and seed corn beetles. Alternatives to aldrin/dieldrin are chlordane/heptachlor and although there are EPA registered alternatives to chlordane/heptachlor (e.g., Bux, carbaryl, carbofuran, Dasanit, diazinon, Dyfonate, Mocap, parathion, phorate, toxaphene), many state entomologists, and farmers in particular, feel that all four are

Exhibit 2.1:
Major and Minor Crops Treated with Aldrin/Dieldrin and Chlordane/Heptachlor in 1971

Pesticide	Crop	Pounds Applied (thousands)	Acres Treated (thousands)
Aldrin	corn	7,759	7,540
	other grains[1]	67	57
	citrus	35	11
	other field crops[2]	31	39
	soybeans	11	9
	all crops	7,907	7,658
Dieldrin	other field crops[2]	118	50
	cotton	65	174
	other vegetables[3]	64	123
	other fruits and nuts[4]	47	103
	citrus	15	17
	nursery and greenhouse crops	6	na
	apples	5	4
	all crops	321	480
Heptachlor	corn	1,104	1,901
	other vegetables[3]	34	10
	alfalfa	3	14
	all crops	1,143	1,927
Chlordane	corn	842	553
	apples	373	10
	nursery and greenhouse crops	133	na
	other grains[1]	41	78
	Irish potatoes	33	55
	other field crops[2]	29	16
	citrus	18	10
	other vegetables[3]	16	7
	other fruits and nuts[4]	7	4
	tobacco	2	1
	all crops	1,496	717

[1] Includes sorghum, rice, oats, mixed grains, barley, rye.
[2] Includes sugar beets, summer fallow, mung beans, peppermint, spearmint, rutabagas, sesame, spelt, sunflowers, velvet beans, grass and hayseed, buckwheat, castor beans, hops, lentils, millet, dry beans, dry field peas, flax, popcorn, broomcorn, cowpeas, sugarcane, sweet potatoes.
[3] Includes cabbage, carrots, celery, lettuce, onions, tomatoes, watermelons, sweet corn, snap beans, spinach, artichokes, asparagus, broccoli, cauliflower, cucumbers, beets, green peppers, green peas, cranberries, other vegetables.
[4] Includes grapes, avacados, figs, blackberries, blueberries, boysenberries, currants, gooseberries, loganberries, raspberries, strawberries, almonds, filberts, pecans, walnuts, olives, tung nuts.

Source: P.A. Andrelinas, Farmers' Use of Pesticides in 1971: Quantities, USDA, ERS, July 1974.

indispensable to the control of the various corn soil insects, particularly the black cutworm, as suitable alternatives did not exist.*

In further study of the use of DDT, it was found that cotton is the crop where the majority of all DDT applied to crops has been applied (see Exhibit 2.2 on page 2.9). The use of DDT has been as an insecticide to control a variety of cotton insects, primarily the boll weevil, bollworm and tobacco budworm. The USDA considered the use of DDT essential for controlling these pests and at the 1972 Annual Conference on Cotton Insect Research and Control, DDT was recommended for control of the bollworm and tobacco budworm. Numerous alternatives to DDT are registered and recommended, but entomologists and other experts argue that all are not equally efficacious or economically feasible in all areas due to pest resistance and other factors.** This was highlighted in 1975 when the State of Louisiana submitted a petition to EPA for emergency use of DDT on cotton to control the tobacco budworm, stating that the currently available pesticides or combinations of pesticides have not controlled the tobacco budworm and that farmers have not controlled this pest effectively since DDT was banned for use on cotton.

In addition, comparison of input/output and intergrower crop production relationships for corn and cotton production shows that variations do exist between the two crops, a characteristic deemed desirable in the crop selection process (see Exhibit 2.3 on page 2.10).

Moreover, the use of aldrin/dieldrin and chlordane/heptachlor on corn has been concentrated in the Midwest states of Iowa, Missouri, Illinois, Indiana and Ohio (i.e., the Corn Belt), although the crop is grown in every region of the United States. Similarly, the use of DDT on cotton has been concentrated in the Southeast, Delta, Appalachian, and Southern Plains states, although cotton is grown in other regions as well. Therefore, the data collection process could be concentrated and the ability to locate farmers was deemed to be nonproblematic for both corn and cotton.

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*Based on telephone conversations with corn producing counties in the Corn Belt. For a more detailed discussion, see EPA Cancellation of Chlordane/Heptachlor; Economic and Social Implications, Economic Analysis Branch, Criteria and Evaluation Division, Office of Pesticide Programs, EPA, May, 1975, Part III, pp. 23-83.

**EPA, DDT: A Review of Scientific and Economic Aspects of the Decision to Ban Its Use as a Pesticide, Washington, D.C., July, 1975, pp. 163-173.

Exhibit 2.2: Major and Minor Crops Treated with DDT in 1971

Crop	Pounds Applied (thousands)	Acres Treated (thousands)
Cotton	13,158	2,383
Corn	4	4
Wheat	9	16
Other grains[1]	91	262
Soybeans	197	247
Tobacco	7	6
Peanuts	62	22
Other field crops[2]	47	49
Other hay and pasture[3]	1	1
Irish potatoes	77	38
Other vegetables[4]	330	68
Citrus	5	2
All other fruits and nuts[5]	16	8
Nursery and greenhouse crops	1	not available
All crops	14,005	3,106

[1] Includes sorghum, rice, oats, mixed grains, barley, rye.

[2] Includes sugar beets, summer fallow, mung beans, peppermint, spearmint, rutabagas, sesame, spelt, sunflowers, velvelt beans, grass and hayseed, buckwheat, castor beans, hops, lentils, millet, dry beans, dry field peas, flax, popcorn, broomcorn, cowpeas, sugarcane, sweet potatoes.

[3] Includes all hay (other than alfalfa) and rangeland.

[4] Includes cabbage, carrots, celery, lettuce, onions, tomatoes, watermelons, sweet corn, snap beans, spinach, artichokes, asparagus, broccoli, cauliflower, cucumbers, beets, green peppers, green peas, cranberries, other vegetables.

[5] Includes grapes, avacados, figs, blackberries, blueberries, boysenberries, currants, gooseberries, loganberries, raspberries, strawberries, almonds, filberts, pecans, walnuts, olives, tung nuts.

Source: P.A. Andrelinas, Farmer's Use of Pesticides in 1971: Quantities, USDA, ERS, July 1974.

Exhibit 2.3: Crop Production Characteristics for Corn and Cotton

Crop Production Characteristics	Crops	
	Field Corn	Cotton
I. Type of Crop (i.e., Annual Crop or Perennial Crop)	Annual Crop	Annual Crop
II. Input/Output Production Relationships		
Technological inputs used	Varied (although most operations mechanized, the size complexity and efficiency of equipment varies; use of chemical pest control varies)	Varied (although most operations mechanized, the size complexity and efficiency of equipment varies; use of chemical pest control varies)
Types of output produced	For processing into livestock feed	For processing into cotton lint and seed
Contractual arrangements	Not usual/mostly independent operations/ some make arrangements to sell in Grain Futures Market	Many arrangements do exist between grower and buyer
Credit arrangements	Usual arrangements used in agriculture	Usual arrangements used in agriculture
Government regulations on crop sold	Pesticide residue levels are regulated	Pesticide residue levels are regulated
III. Intergrower Crop Production Relationships		
Political strength	Low	High
Cooperative buying or using of crop production inputs	Many farmers are coop members but will do their business elsewhere if the "price is right"; i.e., they operate independently	Many such arrangements exist, i.e., cooperative ginning
Cooperative selling of crop	Many farmers are coop members but will do their business elsewhere if the "price is right"; i.e., they operate independently	Practically none/ mostly independent operations
IV. Data Collection and Sampling Design Considerations		
Geographic areas where crop is grown	Primarily in the Corn Belt States	Primarily in the Southern Plains, Delta Southeast and Appalachian States
Ability to locate farmers for interviewing	No major problems foreseen	No major problems foreseen

Source: Dr. Herbert Cole, plant pathologist and pesticides expert, Penn State University; Dr. Earl Partenheimer, agricultural economist, Penn State University;

Hence, given the fact that: (1) corn is a major crop where the majority of all aldrin/dieldrin and chlordane/heptachlor applied to crops was used and these pesticides are perceived by farmers as being indispensable to corn production, particularly for controlling the black cutworm, (2) cotton is a major crop where the majority of all DDT applied to crops was used and DDT is perceived by farmers as being indispensable to cotton production, particularly for controlling the tobacco budworm, (3) the input/output and intergrower crop production relationships are sufficiently varied for corn and cotton for exploring the effect of such relationships on the user adjustment process, and (4) the ability to locate farmers having used aldrin/dieldrin and chlordane/heptachlor in corn production, or DDT in cotton production, was deemed nonproblematic, field corn and cotton were chosen as the two major crops on which to focus the study.

2.2.2 Selection of Study Sites

2.2.2.1 County Selection Criteria

The county selection criteria had to be developed to insure that those counties chosen (at most two for each crop given the project's resources) would indicate the range of agricultural user adjustment problems, as well as the role the institutional structures play in alleviating or aggrevating the adjustment process. Moreover, given that the study was primarily interested in learning about differences in response that were behavioral in nature, climatic and geographic influences between counties had to be minimized within a given crop as well.

In attempting to insure that the range of agricultural user adjustment problems would be found during the field work phase of the study, it was necessary to select counties that had characteristics pertinent to the pesticide and crop affected by the particular regulatory action. More specifically, considering that the current study was to focus on those adjustment problems associated with corn production due to the aldrin/dieldrin and chlordane/heptachlor suspensions and those adjustment problems associated with cotton production due to the DDT cancellation, two initial county selection criteria emerged, i.e.:

- For corn, a history of aldrin/dieldrin use* and for cotton, a history of DDT use; and

- Corn (cotton) counties should show high land use allocation (i.e., acreage) to corn (cotton) production and this production should also be represented by various farm size operations.**

Furthermore, the potential for user adjustment problems was thought to be greater in corn counties that have the black cutworm problem,*** and in cotton counties that have the tobacco budworm problem.**** Thus, another county selection criteria emerged for each crop, i.e.:

- Corn counties must have shown a relatively high incidence of black cutworm problems in the last two growing seasons;***** and

- Cotton counties must have shown a relatively high incidence of tobacco budworm problems in the last two growing seasons.******

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*For the corn sites, a history of chlordane/heptachlor use was not deemed necessary since they are viewed as alternatives to aldrin/dieldrin and thus, may only be used if no aldrin/dieldrin can be found.

** The notion of various farm size operations was included because it was thought that user adjustments, and any problems associated with them, may differ because of the different institutional constraints confronting various farm size operations.

***See EPA Cancellation of Chlordane/Heptachlor: Economic and Social Implications, Economic Analysis Branch, Criteria and Evaluation Division, Office of Pesticide Programs, EPA, May, 1975.

****For example, see the State of Louisiana's emergency request for DDT.

*****The last two growing seasons (i.e., the 1974 and 1975 growing seasons) were chosen so that the pest problems would be present both before and after at least one of the two regulatory decisions being studied were made. (The aldrin/dieldrin suspension applies to all products formulated after August 2, 1974 and the chlordane/heptachlor suspension applies to all products formulated after July 29, 1975.)

******The last two growing seasons (i.e., the 1974 and 1975 growing seasons) were chosen so that the pest problems would be present after the DDT decision had time to impact (the DDT decision became effective December 31, 1972).

Further criteria to be applied in the county selection process relate to the underlying institutional structures and other conditions of crop production that could potentially effect the farmer's adjustment process, i.e.:

- Corn (cotton) counties in two different states should be considered if possible, in order to explore the effect, if any, of government structure on the adjustment process;

- For each crop, counties should be selected in which the perceived difficulty of the adjustment process (as viewed by the state and local agriculturists) varies, if at all possible, so that the underlying conditions and processes causing these differences can be explored; and

- The opinions of state extension specialists and county agents concerning a particular county should coincide and these people should have a "feel" for whether the user transitions have been problematic in nature or not.

Finally, given the resource constraints of the project and the desire to minimize climatic and geographical influences between counties for a given crop, the following criteria were important:

- The county should have a relatively complete mailing list (either through the extension office or the ASCS), and the county agent should be able to assist in the initial selection of a balanced sample of farmers;

- The two counties for each crop should be adjacent to one another, if possible; and

- The county should <u>not</u> have special local problems unrelated to the regulatory decision (e.g., rapid urbanization, large scale industrialization, natural phenomena such as a drop in the water table, etc.) that may impact upon a farmer's crop production practices or his decision to continue farming.

In order to apply the above criteria, the following steps were utilized:

- Published information and EPA "in-house" information on current use patterns of aldrin/dieldrin, and chlordane/heptachlor and DDT and on current pest problems in various localities were first reviewed to help narrow the number of states (and, in certain instances, counties within states) to be contacted.

- State extension specialists in those selected states were then contacted to help obtain a concise list of counties worthy of further screening, given the criteria set forth above.

- County extension agents in those selected counties were then contacted to verify the information obtained from the above sources.

- Other knowledgeable sources of information at the county level (e.g., area extension agents, ASCS county executive directors, etc.) were then contacted to verify the information obtained from the above sources.

The results of this information seeking effort are described below for each of the two crops.

2.2.2.2 Selection of Corn Counties

A review of published information* indicated that the ten leading corn growing states, in terms of acreage planted in 1973, were as follows:

Iowa	(11,800,000)
Illinois	(9,980,000)
Nebraska	(6,400,000)
Minnesota	(6,200,000)
Indiana	(5,400,000)
South Dakota	(3,760,000)
Ohio	(3,300,000)

*USDA, Agricultural Statistics, 1974, Table 39, p. 29.

- Wisconsin (3,200,000)
- Missouri (2,800,000)
- Michigan (2,100,000)

Furthermore, EPA in-house data* indicated that five of these states -- Illinois, Indiana, Iowa, Ohio and Missouri, (i.e., The Corn Belt States) -- have had relatively severe black cutworm problems and have used aldrin/dieldrin and chlordane/heptachlor, among other insecticides, to control corn soil insects. A summary of the pertinent information appears in Exhibits 2.4 and 2.5. Further review of this data indicated that the three leading states, in terms of the number of farms reporting and treating for black cutworm problems, are Illinois, Iowa and Missouri. In addition, these three states have treated the most acres with aldrin/dieldrin and chlordane/heptachlor. Therefore, these three states were used to limit the further search for two appropriate counties.

Contacts were made with state extension entomologists in each of the three states.** In each case, the state entomologist was asked to indicate a number of representative counties where corn production is relatively high, where the black cutworm is a typical problem, where aldrin/dieldrin and chlordane/heptachlor were used in the past couple of years, and where the adjustments being made by farmers, due to the aldrin/dieldrin and chlordane/heptachlor decisions, are being accomplished with varying degrees of difficulty. The resultant list of counties was as follows:

- Macoupin County, Illinois
- Shelby County, Illinois
- Appanoose County, Iowa
- Fremont County, Iowa
- Mills County, Iowa
- Warren County, Iowa
- Atchison County, Missouri
- Knox County, Missouri
- Lincoln County, Missouri

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*Data supplied by Doane Agricultural Service under contract to the Criteria and Evaluation Division, OPP, EPA.

**Included in these contacts were Dr. Harold Stockdale, Iowa State University; Dr. George Thomas, University of Missouri; and Dr. John Wedberg, University of Illinois, who consulted with Drs. Steve Moore and D. Kuhlman, University of Illinois.

Exhibit 2.4: Number of corn farms reporting cutworms as a major problem on a farm, percent treating, and percentage of total commercial farms and acreage treated, 1973/74 average*

	Illinois	Indiana	Ohio	Iowa	Missouri
Farms Reporting Cutworm Problem					
Number	10,059	5,083	3,077	9,760	5,826
% of Total Farms	11.5	8.8	5.6	8.4	12.3
Farms Treating					
Number	7,065	2,808	1,374	6,755	4,570
% of Total Farms	8.1	4.9	2.5	5.8	9.6
Treated Acreage					
Per Farm	140	155	102	99	85
Total Acres (000)	989.8	436.4	140.7	665.4	387.5
% Total Acres Grown	9.7	7.9	3.9	5.4	13.3

* Data supplied by Doane Agricultural Service under contract to the Criteria and Evaluation Division, OPP, EPA.

Exhibit 2.5: Acreage of corn insecticide treatments on commercial farms, by chemical, in major corn states, 1975*

	Illinois	Indiana	Ohio	Iowa	Missouri
			Acreage (000)		
Aldrin	547	454	257	422	523
Belt/Chlordane	339	242	123	40	109
Heptachlor	380	112	- -	504	245
			Percent of Total Acreage		
Aldrin	5.0	7.9	7.2	3.3	17.9
Belt/Chlordane	3.1	4.2	3.4	0.3	3.7
Heptachlor	3.5	2.0	- -	3.9	8.4

* Data supplied by Doane Agricultural Service under contract to the Criteria and Evaluation Division, OPP, EPA.

Considering that black cutworm problems are most susceptible on low lying, poorly drained, heavy river bottom soils subject to flooding (i.e., alluvial or gumbo type soil),* the geographic location of these counties is of importance. Atchison County, Fremont County and Mills County all border on the Missouri River, Lincoln County borders on the Mississippi River, and Knox County is adjacent to a county that borders on the Mississippi River. The other counties are at least 100 miles away from either river, except for Macoupin County, which is about 50 miles away from Mississippi.

In terms of corn production, the following information was compiled concerning the number of corn acres planted for all purposes in 1974 and the yield per planted acre in 1974:**

County	Corn Acres Planted	Yield per Planted Acres (in bushels)
Macoupin County, Illinois	146,800	92.0
Shelby County, Illinois	164,300	87.0
Appanoose County, Iowa	39,100	74.7
Fremont County, Iowa	114,700	43.0
Mills County, Iowa	100,200	54.4
Warren County, Iowa	72,500	71.5
Atchison County, Missouri	122,000	46.0
Knox County, Missouri	39,300	68.3
Lincoln County, Missouri	59,000	61.2

In order to learn more about what was occurring in each of these counties and in order to verify the information supplied by the state extension entomologists, the county extension agents in most of the counties were contacted.*** Information obtained from these phone conversations provided some additional insights, i.e.,:

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*EPA Cancellation of Chlordane/Heptachlor: Social and Economic Implications, op. cit., p. 31.

**Information obtained from Statistical Reporting Service, USDA.

***Appanoose County, Iowa was not contacted because information received from the Statistical Reporting Service, USDA indicated that the corn acres planted in the county in 1974 (39,100 acres) was significantly lower than in the other counties in the state. Therefore, it was deleted from the list of potential counties. Mills County, Iowa was also not contacted directly because the county agent for Fremont County (which is directly south of Mills County) indicated that the situation in Mills County was similar.

Both Macoupin County, Illinois and Shelby County, Illinois indicated that the adjustment has not been too difficult because the black cutworm problem has not been that serious in the past couple of years. In most cases those farmers that wanted aldrin, chlordane or heptachlor were able to get it. However, indications were received that the farmers are concerned about what would happen if a bad infestation occured because they knew of no alternative with the same cost and effectiveness as aldrin.

Fremont County, Iowa indicated that 10-15 percent of its 114,700 corn acres were affected with black cutworm in 1975. Aldrin was said to be heavily used in 1973, but in 1974 and 1975, it was said to be unavailable and the same was true of chlordane and heptachlor. A Sevin bait was said to be used by some instead and other farmers had to replant their crop. Many farmers were reported as simply suffering with the problem, although no farmer had all of his acreage affected. However, all farmers were voicing concern about the aldrin/dieldrin and chlordane/heptachlor suspensions.

Warren County, Iowa indicated that the corn rootworm was the major problem at the present time and that no major concern was being voiced about the aldrin/dieldrin and chlordane/heptachlor suspensions.

Atchison County, Missouri indicated that the cutworm problem was relatively bad in 1975 and that 45 percent of their corn acreage was treated for cutworm prevention. Aldrin was used the most, then heptachlor, and then chlordane. Nevertheless, approximately 8000 acres were said to be "hit hard" with the problem, where the farmers involved did suffer economic loses due to lost production. Those farmers not yet "hit hard" are concerned about what will happen in the next growing season.

Knox County, Missouri indicated that one third of the county's 30,000 - 40,000 corn acres had some cutworm problem in 1975 and that 80 percent of all corn acres were treated with either aldrin, chlordane or heptachlor.

Nevertheless, approximately seven to eight percent of the corn acres were replanted and 7,500 acres were left with a 60 percent stand. The adjustment was said to be hard (i.e., costly in terms of lost production and income) for many of those farmers having serious cutworm problems.

- Lincoln County, Missouri indicated that the adjustment was not too difficult yet, but that the farmers are concerned about the suspensions. Most farmers have not switched to an alternative pesticide and no one has been severely damaged.

Based on these results, three of the counties -- Fremont County, Iowa, Atchison County, Missouri, and Knox County, Missouri-- appeared to have the more severe black cutworm problems. Due to the desire to have each county in a different state, further consideration was given to Fremont County, Iowa and Atchison County, Missouri, since they are adjacent to one another (a county selection criteria) and would, in terms of manageability, be more desirable. In addition, both are located adjacent to the Missouri River, thus having the type of soil most amenable to corn cutworm problems.

In making the final decision, the following additional factors were considered carefully for the two counties:

Different conditions, each possibly affecting the difficulty in adjusting to the aldrin/dieldrin and chlordane/heptachlor decisions, were noticed in the two counties (i.e., Atchison County appeared to have a more severe cutworm problem; Fremont County appeared to have no available aldrin, chlordane and heptachlor).

The county extension agents in each of the two counties appeared to be knowledgeable about the cutworm problem and how farmers were reacting to it in light of the aldrin/dieldrin and chlordane/heptachlor decisions. In addition, they were quite cooperative in supplying information requested of them and both indicated that they would cooperate in any way they could if their counties were selected for in depth field work. Obtaining the necessary clearance at the state level had been investigated and no difficulty was anticipated in getting the states to authorize the county agents to cooperate.

- A complete listing of farmers in each county was available through the county ASCS office. Clearance to obtain these records was received and discussions with the county executive director in each county indicated that full cooperation would be obtained. Verification was also received that a wide range of farm size operations are present in each of the two counties.

In the final analysis of all the above information, Atchison County, Missouri and Fremont County, Iowa were believed to possess the characteristics likely to reflect a range of the most important user adjustment problems because of the aldrin/dieldrin and chlordane/heptachlor suspensions. Moreover, in view of the resource constraints, they were also desirable since they were adjacent to one another. Therefore, they were determined to have sufficiently satisfied the county selection criteria and, hence, were selected as the two field corn counties for in depth field work.

A brief demographic and agricultural profile of these two counties is provided in Appendix A for the interested reader.

2.2.2.3 Selection of Cotton Counties

A review of published information* indicated that the ten leading states, in terms of upland cotton acreage planted in 1974, were as follows:

Texas	(5,200,000)
Mississippi	(1,780,000)
California	(1,250,000)
Arkansas	(1,200,000)
Louisiana	(650,000)
Alabama	(600,000)
Oklahoma	(570,000)
Tennessee	(540,000)
Georgia	(423,000)
Missouri	(400,000)

*Economic Research Service, Cotton and Wool Situation, USDA, September, 1975, p. 7.

In terms of tobacco budworm problems, the pest first originated in Mexico and began moving to the northeast. It "periodically reeked destructive blows on cotton production in the Rio Grande Valley of Texas, and in the past two years (i.e., 1973 and 1974) left a crippling mark on some of the most productive cotton farms of the Red River Valley of Louisiana ... In addition, late maturing crops of the Macon Ridge and Northeast Louisiana suffered serious losses from the tobacco budworm".* In 1975, the tobacco budworm was more sporadic and and localized with moderate infestations in Louisiana and heaviest infestations and the greatest damage in Arkansas, Mississippi and South Carolina.

Given the extent of the tobacco budworm problem in Louisiana in 1973, 1974 and 1975 and the State's petition to use DDT on an emergency basis in 1975, further effort was concentrated in Louisiana in order to find two appropriate parishes.

Initial contacts were made with the Agricultural Experiment Station at Louisiana State University and with the Louisiana Cooperative Extension Service.** Results from these conversations indicated three geographical areas worthy of consideration, i.e.:

- The western area of the state (e.g., Caddo Parish);
- The lower Red River Valley area of the state (e.g., Rapides Parish); and
- The northeast area of the state (e.g., Richland and Franklin Parishes).

More specifically, it was learned that the tobacco budworm problem originated in the western part of the state in the early seventies and that this area continues to be the most heavily infested area. A DDT-toxaphene mixture was used with good success until 1973 when DDT no longer was available. No alternative crop can really be grown

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*Roussel, J.S., The Bollworms: An Up-dated Status Report (Draft); December 1975 paper presented at the 1976 Annual Conference on Cotton Insect Research and Control.

**Contacts were made with Dr. Dale Newsom, Head, Department of Entomology, LSU; Dr. John Roussel, Assistant Director and Coordinator of Cotton Research, Agricultural Experiment Station, LSU; and Dr. Norvel Thames, Associate Director, Louisiana Cooperative Extension Service.

in the area and cotton production in the area has drastically been reduced over the last couple of years (other factors, such as climate and market conditions, have also contributed to the decline of cotton production).

The lower Red River Valley area of the state had severe tobacco budworm problems in 1973 and 1974 and fair tobacco budworm problems in 1975. Many farmers have switched from cotton production to growing other crops, such as soybeans, corn, and sugarcane, because climatic and soil conditions are conducive to such changes. As a result, there have also been some cotton gin closings.

The northeast area of the state presently represents the majority of cotton production in the state. Roughly 70 percent of all cotton acreage is in this area and Richland and Franklin Parishes are the two leading cotton growing parishes in the state. Furthermore, they are adjacent to one another. The tobacco budworm was severe in the area in 1974, but milder in 1975. Alternative crops are somewhat limited in this area (more so in Franklin Parish than in Richland Parish) and therefore, the growers are forced to find alternative pest control strategies, more so than in other parishes of the state. Consequently, user adjustments to the DDT cancellation were said to have been hard (i.e., increased pest control costs, reduced yields, etc.) in the past couple of years in these two parishes. Franklin Parish is characterized by mostly small growers (50-60 acres) although there are a few 300-400 acre operations. Richland Parish, on the other hand, has a better mixture of both small and large growers.

Contacts with the extension personnel in both of the above parishes confirmed what was learned at the state level and all were cooperative and willing to help in any way that they could.

The ASCS offices were also contacted and it was learned that a complete listing of farmers was available. Clearance to utilize th records was received and full cooperation was indicated.

Therefore, given that Richland and Franklin Parishes leading cotton producing parishes in the state, given that t severe tobacco budworm infestations, given that they sh in farm size and variation in the ability to switch to al and given that they were adjacent to one another, th were deemed preferable as the choice for the stud

However, before the final decision was made, visits were made to all four areas (given the relative proximity to each other) at the beginning of the field work phase of the effort. At this time, it was further learned that although quantitative differences may exist between these parishes in terms of user response to the DDT decision, qualitatively, responses would be similar. For example, the percentage of farmers switching crops may vary across these parishes, but switching crops does occur in all four parishes.

Hence, in the final analysis of all the above information, the decision was made to focus the field work effort in Richland and Franklin Parishes, Louisiana because they were believed to sufficiently satisfy the county selection criteria and thus, possess the characteristics likely to manifest the most troublesome user adjustment problems because of the DDT cancellation.

Appendix B contains a brief demographic and agricultural profile of these two parishes for the interested reader.

2.3 Field Work Activities

Within this section the overall orientation of the field work activities will be discussed and, in turn, the mechanisms used to implement that orientation.

2.3.1 The Field Manual

Given the style of the research that was undertaken, i.e., the case study ("ethnographic") type approach, the preparation of a field manual was necessary to assure common understanding of the field-related tasks to be undertaken by the field staff. A draft manual was prepared by the field director and circulated to various consultants and others concerned with the project. A revised manual, responsive to comments received, was prepared with the following table of contents:

1.0 Purposes of the Study
2.0 Some General Methodological Views
3.0 Specific Data Sources and Their Uses
4.0 Phasing of the Field Work
5.0 Data Recording Procedures
6.0 Some Final, Specific, Suggestions

Each of these sections will be briefly described to further present the methodological orientation as it was communicated to the field staff; however, the full manual is included as Appendix C for the interested reader.

2.3.1.1 Purposes of the Study

This section comprised a brief (2.5 pages) discussion of the EPA mandate to protect man and the environment from deleterious effects of pesticide use with knowledge concerning "unreasonable, adverse" social, economic and environmental effects resulting from bans of such pesticides. Further, the relative lack of knowledge concerning the responses and problems of farmers confronted with a pesticide ban was emphasized. Indeed, it was the existence of this gap which prompted the current effort. Finally, a discussion of research questions was presented in order to assure proper understanding of the purposes of the field work.

2.3.1.2 Some General Methodological Views

While it was presumed that the field staff would be composed of sophisticated persons with a social science background, this section was considered appropriate to orient the field people toward the current project's rationale. The summary to this section is instructive:

To summarize the relevance of all this for the current effort, we may make the following points:

- Data do not speak for themselves, however, the observer can enter a situation with more or less structure through which events are filtered.

- At certain stages in the field-observation process, certain insights or "working hypotheses" may emerge. These should be articulated and the evidence for them explicated and thought through.

- As hypotheses are developed, one should resist the temptation to invest self or ego in them; rather, one ought continue searching for alternatives.

- At an advanced stage in the field work, the field observers in cooperation with other project staff, should begin developing a full-blown model of the adjustment process.

2.3.1.3 Specific Data Sources and Their Uses

It was anticipated that three broad classes of information would be necessary to fulfill the objective of the project:

- The nature of the institutional context for agricultural activities;
- The nature of the social and political environments of the counties to be studied; and
- Views and activities of individual farmers.

Specific contacts were indicated (e.g., newspaper editor, school principal, county extension agent, etc.) for varying sorts of information and the manner in which the field interviewer should present himself and the study, i.e.,

> The overall problem is to convey to the person you wish to interview, in a quick and concise communication, who you are, what you are doing, and why.

2.3.1.4 Phasing of the Field Work

The initial paragraph of this section stated:

> Whereas a "lock-step" approach to the sort of theoretical field work intended here may seem inappropriate, the period of two months* allocated for field work needs some agreed upon schedule. Moreover, it would be unfair to the field staff were they to be instructed simply to "find out what's going on".

The balance of this two page section specifies -- broadly -- the activities to be undertaken on a week-by-week basis.

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*Ten weeks, rather than the anticipated two months, were actually spent in the field.

2.3.1.5 Data Recording Procedures

Given that the study was viewed as largely "ethnographic" and flexible in design, the primary means of data acquisition was to be (and was, in fact) non-participant observation and the unstructured interview. Indeed, during the ten weeks on site, the field worker's casual contacts became extensive and conversations over morning coffee could be considered "interviews". Therefore, the field operative was instructed to take notes during an interview, where appropriate, and "flesh out" such notes following the interview (using a tape recorder if considered worthwhile) when fully writing up each interview. Data recording procedures were suggested to encourage some commonality of format in writing up field notes; however, data recording forms were not developed since the study had been predicated on the lack of sufficient knowledge to design a thoroughly structured data acquisition scheme.

An additional point needs to be emphasized with respect to the functions assigned to (and expected of) the field person:

> A major concern with the sort of field work being employed in this project is that the field staff will develop hunches, hypotheses, conceptual models, etc. These are given very high priority although they should be kept separate from data recording. As a mechanism for reporting hunches, etc. as well as summarizing data acquisitive activities, a weekly report will be required.

Thus, the field person was expected to fill all functions in the loop of data acquisition, data analysis, reconceptualization, data acquisition, etc.

2.3.1.6 Some Final, Specific, Suggestions

This concluding section concerned the "craft" of quality field work with discussions of such topics as, the field person as intruder, don't be a "blabbermouth", the role of informants, etc. In sum, the field workers were instructed in the role of non-participant observers.

2.3.2 Selection, Training, and Oversight of the Field Person

The recruitment of the high quality field persons required by the selected, "ethnographic", design entailed a fair level of effort with much help coming from project consultants. Following telephone interviews with both project director and field director, the field director personally interviewed and approved the final choice. Prior to entering the field, the field person came to CONSAD's central (Pittsburgh) offices for a period of training and orientation. Following installation (see Section 2.3.3), the field director or (in one instance) the project director visited the field person on a bi-monthly schedule. In addition, during those weeks when a central staff person was not in the field, an extensive, end of the week telephone report and discussion occurred. Through these means, the "flexible" design was maintained under control. Moreover, the project director held weekly telephone briefings for the EPA contract monitor in order to ensure a commonality of understanding as the project evolved.

2.3.3 Installation of the Field Person

For the field corn field work, the field director accompanied the field person in early January, 1976 into his county of residence for several days and during that period interviewed and introduced various prominent individuals to the field person (e.g., county agents, county ASCS directors, local college faculty, etc.).

For the cotton field work, the field director and field person arrived in Baton Rouge the Sunday night before the first week of field work (i.e., the week of January 12, 1976), and went over materials relative to cotton culture and the DDT decision. Monday and Tuesday they met with State Extension Service and Research Station staff members for an overview of the post cancellation environment and reactions thereto. Additionally, further documentation, including yearly pest control pamphlets, were acquired. The two days of discussions with state level staff members were followed by one day of meetings with extension agents in two "non-sample" parishes (Rapides and Caddo Parishes). The last two days of the work week were spent in the two sample parishes (Richland and Franklin Parishes) acquainting local Extension, ASCS and other "influentials" with the purposes of the CONSAD study and gaining initial perspectives on the local situation.

In each case, this mechanism served several purposes:

- The field director served as a role model in the interview situation;

- The visible involvement of a senior project member served to legitimate the project in the eyes of the local individuals contacted; and

- The field director was able to observe the operating style of the field person and offer suggestions for improvement.

2.4 Post Field Work Activities

2.4.1 Initial Coding, Analysis, Debriefing

At the completion of field work in mid March, 1976, the field person and field director met for several days, intensively, in order to organize data files, code interview write-ups. note and fill data gaps, and "pull out" a series of descriptive propositions. The entire process proceeded as follows:

- Daylong discussion with shared orientation as the purpose;

- Development of propositions, both regarding farmers and the relations among various institutions;

- Refine a previously developed taxonomy of farmer types; and

- Develop a thesaurus relating propositions to data file elements.

An important function served by this end-of-field work meeting was to capture insights which might have gone unrecorded. Furthermore, occasional data gaps could be identified and filled through phone calls. The products of this process provided a major basis for the analysis plan meeting (see Section 2.4.2).

2.4.2 Analysis Plan Meeting

A two day meeting was held at CONSAD, involving all project staff members (including field people from both sites), several project consultants and the EPA project monitor. It was on this occasion that commonalities of language were hammered out and previously unarticulated insights explicated. The outcome of this meeting was the intended analysis plan and structure of the final reports to be undertaken by the project and field directors.

2.4.3 Final Analysis

Ultimate responsibility for analysis and report preparation rested with the project and field directors who further refined the file structure and analysis thereof.

The existance of two sites with different pests, crops, institutional frameworks, general practices, and time since the relevant regulatory decisions were made, is of powerful significance for this study. Differences in the time since the relevant regulatory decisions were made constitutes a double-edged sword in that the pessimist can well point out that the data derived from different stages of the adjustment cycle are non-comparable, whereas the optimist can point out the significance of observations on different portions on the cycle without spending several years in the field.

As mentioned earlier, certain of the comparative analyses occurred during the actual field work with insights derived from one commodity applied to data acquisition procedures on the other. Comparative analyses during the post-field work phase were based on contrasts of individual responses, institutional factors, and historical practices. Some of the most important contrasts for understanding different user responses occurred in the institutional domain. In summary, the cross-commodity analyses proved at least as powerful in generating understanding of adjustment problems as the within commodity contrasts among farmers.

2.4.4 A Note Concerning the Nature of Evidence

As has been repeatedly noted, the project staff, in conjunction with EPA staff, settled on a largely non-quantitative, ethnographic approach for this study. This technique depended upon the skills, craftmanship and insight of those involved, to a degree greatly in excess of that associated with conventional survey research techniques. For

this reason, selection of field personnel and their monitoring posed a very important task. This is so because much of the evidence produced is the result of the interpretations made in the process of data acquisition. It should be emphasized that no structured interview schedule was used, no readily defined population was sampled, and the initial research questions were very broad. While most of the substantive statements made in this report can be referenced to "data" (and in the exceptional cases they are so designated), the relative importance attributed to various "facts" is in large degree based on the informed judgment of field staff. In short, the professional integrity of the researchers needs to be explicitly asserted. This, CONSAD feels confident in doing.

It is again important to note that this study is based on what respondents (farmers and others) reported given that the thrust of the study was to discover and explain user adjustment responses and problems. These reports are, in turn, based on respondents' perceptions. Thus, it must be emphasized that the study is reporting on the perceptual world's of various actors in the crop production system. The implications should be clear: this report was not to address the "real" of "objective" consequences of pesticide regulatory decisions and therefore, this study is not an assessment of the "real" impact experienced by farmers when yields were reduced in 1974 relative to other years is taken by some as attributable to the DDT ban, though others mention weather and infestation levels as causative factors. The important point to be recognized here is that "real" behavior and decisions are based on perceptions, whether valid or not, and this should be of utmost concern to the EPA in their policy decision making and program implementation.

A further note concerning quantification needs to be made. The study's charge was to determine the kinds of adjustment problems experienced by farmers. In pursuit thereof, the field observers sought out those said to have problems or focused their efforts in areas known to have experienced problems with some severity. Having done so, of course, it is inappropriate to make any estimates of the incidence (or rates) of the various farmer adjustment responses. Moreover, attempts to generalize to other populations or locations are doomed except in a somewhat abstract or structural manner. Even here, CONSAD would urge that the results of this research be used to sensitize decision-makers and future investigators as to the classes of phenomena to be looked for. Because of this orientation, a single instance of a problematic phenomenon is of significance as it has been evidenced as a "possible" phenomenon, although we would not presume to remark on its "probability."

Part I - FIELD CORN CASE STUDY RESULTS

3.0 CORN CROP PRODUCTION SYSTEMS AND PEST CONTROL STRATEGIES

In order to appreciate the user adjustment process exhibited by corn farmers faced with the suspension of aldrin, heptachlor and chlordane, it is necessary to first have an understanding of the factors bearing on their decisions to produce corn. Once this is accomplished, it is important to look at the strategies (i. e., production systems) used by different farmers in growing corn, paying particular attention to their insecticide use strategies prior to these regulatory actions.

3.1 Factors Determining Corn Production by Farmers

A number of components enter into the farmer's decision of whether or not to grow corn in certain fields that they farm. The first determinant is the farmer's rotation plan. Most farmers have developed a rotation plan (involving corn and soybeans primarily) that is suited to the soil type of the land and the pest problems experienced by them. Therefore, barring any addition problems, the rotation plan usually dictates what crop they will grow in each field each year. For example, many farmers used to put their cutworm susceptible land into the Soil Bank when this program was in effect. Since this program has been repealed, they can no longer do this and have had to put this land into the rotation plan by planting either corn or soybeans, and in some cases, wheat or milo.

However, there are other considerations of importance impinging on the farmer's final decision to grow a particular crop. A most important consideration is the weather which is, of course, uncontrollable. Ideally, corn should be planted in late April and early May.* However, if weather conditions are unfavorable (e.g., if cold weather or heavy rains in the spring do not allow one to get into the fields), then a change in crops may be necessary. Drought, also, has been a problem during the past two to three growing seasons and has contributed

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*Benson, G.O. and H.E. Thompson, Corn Planting Dates, PM 595, Iowa State Extension Service, July, 1974.

to some farmers switching to crops such as wheat or milo which are drought resistant. Wheat also allows the farmer to spread the work load since wheat is planted in September and harvested in July.

The price and availability of fertilizer and pesticides also play a part in the crop decision process, as does the price of the crop itself. For example, in recent years (i.e., 1974 and 1975), there have been shortages of pesticides and with the suspension of aldrin, chlordane and heptachlor, many farmers have been unable to get suitable cutworm insecticides. Therefore, although some of these farmers have taken a chance with no cutworm insecticides, others have switched to alternate crops (e.g., soybeans, wheat, and/or milo) because the prices of these crops have been favorable.

In addition to these factors dictating a farmer's decision to grow a particular crop, farmers can receive messages from a number of sources, which in some way may affect their crop decision and subsequently their pesticide use decisions. As our field work discovered, these sources may include:*

- Family members (i.e., tradition);
- Neighbors and friends (i.e., other farmers in the community);
- Landlord (if a tenant);
- County extension agents;
- University extension publications;
- Agricultural night classes;
- Agricultural chemical dealers;
- Implement and supply dealers;
- Trade and promotional meetings;
- Pesticide manufacturers representatives;
- Seed corn company;
- Pesticide label;
- Radio;
- Television;
- Farm Magazines;
- Bankers, production credit association, Farmers Home Administration; and
- Federal Crop Insurance.

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*Similar findings were also found in a study performed by RvR Consultants; i.e., see RvR Consultants, Farmers's Pesticide Use Decisions and Attitudes on Alternate Crop Protection Methods, report prepared for Council on Environmental Quality and EPA, Contract Number EQC 325, July, 1974, pp. 101-114.

Some of these sources are more influential than others and most farmers do not receive messages from all of the above sources, but rather some subset of them.

In order to give an indication of when farmers would receive information from these various sources vis-a-vis the production of corn, a one year timeline of crop production can be developed with these sources superimposed on that timeline. Such a timeline appears in Exhibit 3.1. As shown in the timeline, farmers receive much information concerning pesticides during the winter months, when farming activities are at a minimum.

A further discussion of these sources of information and their influence and impact on the user adjustment process appears in subsequent chapters.

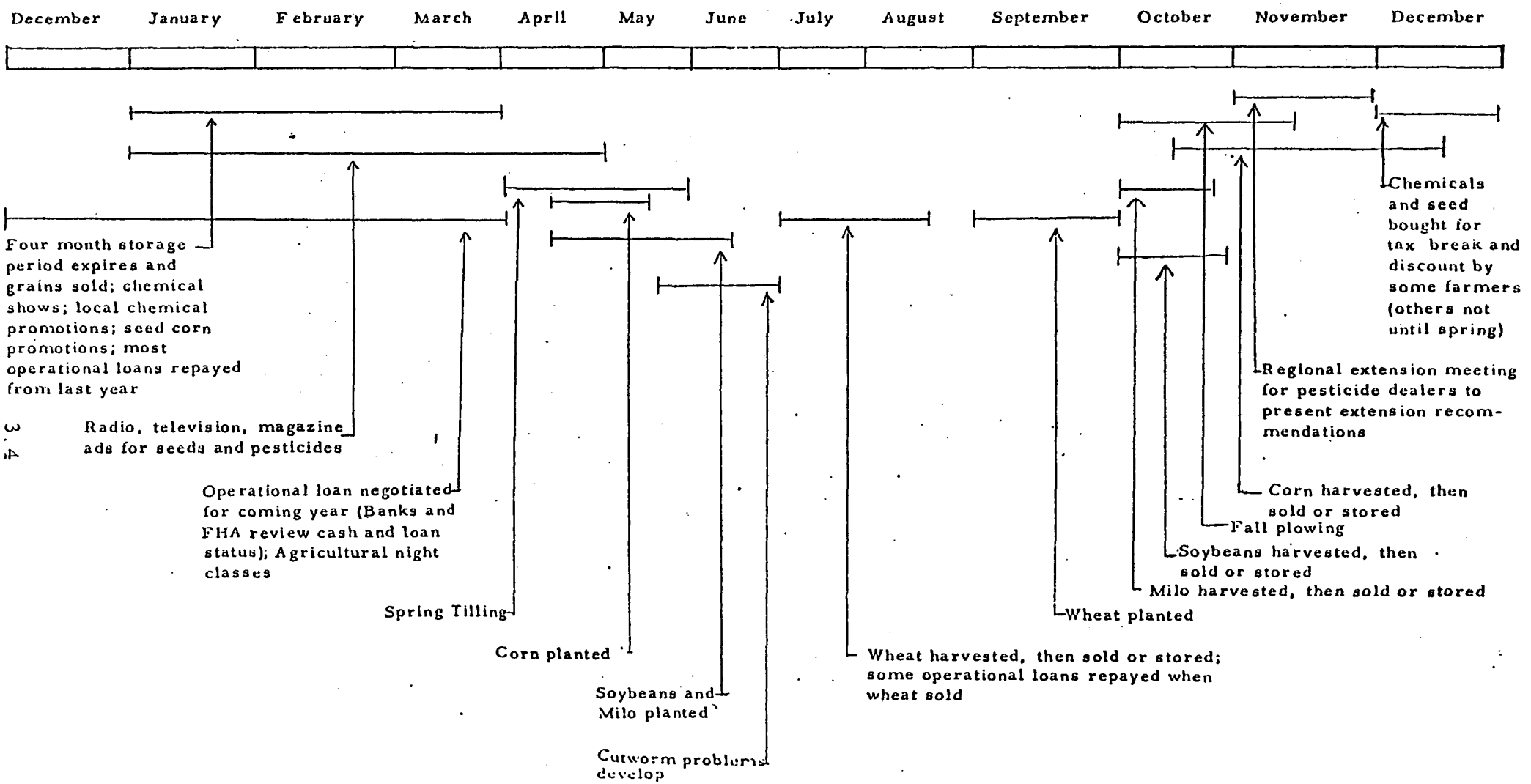
3.2 Corn Crop Production Systems

Specifically related to the pesticide use decision, three factors alluded to above - the rotation plan, soil type and previous pest problems -- have played important roles in the initial decision to use various types of pesticides. For example, many farmers indicated that they do not use cutworm insecticides because they never had or do not currently have a cutworm problem. These farmers are typically located in the hills and do not have any gumbo soil (i.e., low lying, poorly drained, heavy river bottom soils subject to flooding).

Moreover, the rotation plan can promote various kinds of pest problems and consequently the need for various types of insecticides. That is, fields planted to corn every year (i.e., continuous corn) are susceptible to corn rootworm problems, and if the field has gumbo soil, cutworms may be a problem as well. Crop rotation with soybeans will alleviate the rootworm problem, but on gumbo soil has been found to produce a greater chance for cutworm problems, especially if minimum tillage is used.

In addition, control of the cutworm using resistant corn varieties is in its infancy. Some research by seed corn companies was suggested by a couple of farmers who sold seed for various companies, but no such variety is on the market. Thus, the use of chemical insecticides to control the cutworm problem is part of the culture, whereas the varietal one is not.

Exhibit 3.1: Timeline of Crop Production



For those farmers that do use cutworm insecticides (or other pesticides for that matter), a number of sources were continually indicated for helping them decide what particular pesticides to use and how to use them, i.e.:

- Pesticide dealers;
- Farm magazines;
- Pesticide label; and
- Neighbors, friends and relatives.

The relative importance of each source can vary among farmers, with some choosing a particular pesticide simply because their father had used it, and others choosing a pesticide because their pesticide dealer or a neighbor recommended it. Past research also indicated these same four sources as being used most often by corn farmers to obtain information about what pesticides to use and how to use them.*

In order to distinguish between different types of farmers, or crop production systems, a typology of farmers, based upon their insecticide use strategy during the 1972-1974 growing seasons, was developed. This distinction was used in light of the purpose of the study, i.e., to assess adjustment responses and problems associated major pesticide regulatory restrictions, such as the suspension of aldrin/dieldrin (affirmed October 1, 1974) and chlordane/heptachlor (affirmed December 24, 1975 and effective August 1, 1976 for corn). Since a farmer's adjustment responses and problems are related, in part, to his insecticide use patterns prior to the regulatory actions, e.g., during the 1972-1974 growing seasons, this distinction was deemed a logical one. Four types of farmers (i.e., crop production systems) were identified from those interviewed, i.e.:

- Type I - non-contingent users of aldrin and/or heptachlor;
- Type II - contingent users of aldrin and/or heptachlor;
- Type III - insecticide users, but non-users of aldrin and heptachlor;
- Type IV - non-insecticide users.

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*For example, RvR Consultants, op. cit., pp. 101-114.

Each type appeared to be stable with no farmers switching between types over this 3 year period.

Type I farmers, non-contingent users of aldrin and/or heptachlor, were found to exhibit the following characteristics:*

- Used aldrin or heptachlor regularly before the aldrin suspension as a preventive or prophylactic measure, and this will continue even if no cutworm damage is found;
- Use of aldrin has been habitual, even traditional across generations, from father to son;
- Are located on the flats with gumbo soil;
- Has had actual cutworm damage or can cite someone who has when aldrin was not used;
- Are large land owners and/or renters (total crop acreage) during this time ranged from 240 acres to 1,700 acres with an average of 813 acres);
- Had corn yields ranging from 50 to 115 bushels per acre during this time; and
- Were and still are rotating their crops.

Type II farmers, contingent users of aldrin and/or heptachlor, were found to exhibit the following characteristics:**

- Used aldrin or heptachlor as needed, that is, on replanting after cutworm damage was noticed in the first planting;
- Stated that aldrin or heptachlor was used only in emergencies;

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*Based on interviews with 28 farmers designated as of this type.
**Based on interviews with 4 farmers designated as of this type.

- Has occasional cutworm damage and usually cites problem spots in their fields;

- Are located on the flats with gumbo soil;

- Cites crop rotation as a solution for less of a problem;

- Are relatively large land owners and/or renters (total crop acreage during this time ranged from 345 to 1,700 acres, with an average of 745 acres); and

- Had corn yields ranging from 40 to 125 bushels per acre during this time.

Type III farmers, insecticide users, but non-users of aldrin or heptachlor, were found to exhibit the following characteristics:*

- Uses insecticides for rootworms, and cites rotation as a way to handle any cutworm problems;

- Has not typically had cutworm problems;

- Are primarily located in the hills with relatively little or no gumbo soil;

- Are both landowners and/or renters (total crop acreage during this time ranged from 69 to 1,025 acres, with an average of 554 acres);

- Had corn yields ranging from 43 to 105 bushels per acre during this time; and

- Some farms had and still have livestock operations.

Type IV farmers, non-insecticide users, were found to exhibit the following characteristics:**

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*Based on interviews with 18 farmers designated as of this type.
**Based on interviews with 10 farmers designated as of this type.

- Some had an altruistic attitude for the non-use of insecticides (i.e., they kill birds and fish and upset the natural order of things);

- Are located in the hills with no gumbo soil;

- Has not had cutworm damage;

- Cites crop rotation to prevent rootworm and cutworm damage;

- Are both land owners and renters (total crop acreage during this time ranged from 90 to 620 acres, with an average of 281 acres);

- Had corn yields ranging from 20 to 90 bushels per acre during this time; and

- Had and still have livestock operations.

As indicated above, a wide variation of productivity (i.e., corn yield) was exhibited in each of the four crop production systems. This variation can be explained, in part, by the resources available to, utilized by, and inherent in the individual farmer in the production of his crop. For descriptive purposes, three general resource levels -- high, medium, and low -- can be used to describe the farmers interviewed in this study.*

"High level resource farmers" typically:

- Own land;

- Have good management skills resulting in a high net return and stable production system;

- Have an established position both in and out of the local community;

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*The descriptions that follow have been found to be consistent with past research. For example, see: Rogers, Everett M. and F. Shoemaker, Communication of Innovations: A Cross Cultural Approach, The Free Press, New York, 1971; and Iowa State Cooperative Extension Service, "The Diffusion Process", Special Report No. 18, Ames, Iowa, November, 1972.

- Have direct access to information sources (e.g., university extensive service, chemical corporations and seed corn companies);

- Have established credit and assets in and outside of the community;

- Have an updated progressive operation vis-a-vis extra-local standards; and

- Are innovative.

"Medium level resource farmers" typically:

- Own and/or rent land;

- Have good management skills;

- Utilize local sources of information (e.g., county extensive agents, local pesticide dealers, neighbors, etc.);

- Have an established position within the local community;

- Have established credit and assets within the local community;

- Have an updated progressive operation vis-a-vis local standards; and

- Are somewhat innovative.

"Low level resource farmers" typically:

- Own and/or rent a small amount of land not adaptable to a good crop rotation plan;

- Have poor management skills resulting in a low net return and unstable production;

- Do not utilize outside or local educational resources;

- Have little established credit inside the local community;
- Cite themselves as the "problem-solver";
- Have a traditional pattern of operation; and
- Are least innovative.

The majority (65-80 percent) of the farmers interviewed would fall into the medium level resource category, with 5-10 percent being high level resource farmers, and 15-25 percent being low level resource farmers.

These crop production systems will be further discussed in subsequent chapters when talking about farmers' responses to these regulatory actions.

4.0 INFLUENCE OF LOCAL AND EXTRA-LOCAL INSTITUTIONS ON CORN CROP PRODUCTION SYSTEMS AND PEST CONTROL STRATEGIES

Institutions, which represent an integrated set of ideas (i.e., goals, values, norms, etc.) can prescribe, to a given audience on a given subject, what should be done and how it should be done. In Chapter 3.0, a number of sources representing various institutions were indicated as having an influence on a farmer's crop production practices, and more specifically, his pest control strategies. In this chapter, these institutional structures are further described.

These institutions can be broken down into two general types - those having an influence on the input side of the crop production process and those having an influence on the output side. Each type is described with the relationships between institutions explored, as well as some implications for farmer adjustment responses and problems to the aldrin/dieldrin and chlordane/heptachlor suspensions.

4.1 Crop Production Input Factors

In addition to the influence of neighbors, friends and relatives, a number of institutions were shown to have a bearing on the input side of the corn production systems and pest control strategies practiced by the farmers interviewed in this study. Most important among these institutions are: the extension service, the agricultural experiment station, chemical companies, pesticide dealerships, loan institutions, Federal Crop Insurance, professional scouting and the mass media. Each is discussed below.

4.1.1 Extension Service

The extension service's primary role is one of education, and in the area of pest control, it is a most demanding one. The primary goals are to make available the recommendations of pest control specialists and to disseminate general educational material in this area.

Each year, the university extension service supplies pesticide recommendations for the control of insects and weeds on various crops, with particular attention paid to corn and soybeans (as opposed to corn, soybeans, wheat, milo, etc.). They have recognized the close relationship that exists between the pesticide dealer and farmer regarding information about pesticides and have geared their activities accordingly.

In Iowa, the university extension insecticide recommendations are usually first distributed to area pesticide dealers at the various regional university extension meetings, held in the middle of November for the upcoming growing season. These regional meetings are then followed up by a statewide meeting. This year (i.e., 1976), the meeting was held in January in Des Moines and was attended by 4,000 dealers. University extension, university research and chemical formulating personnel were all on the program. In Missouri, similar activities are undertaken.

At the local level, the county extension agent disseminates the university extension recommendations as well, with supervision and assistance provided by an area agent. Their job is a most difficult one as described below:

> "County agents and area specialists are not salesman for products or services, yet they must know the relative characteristics and performance of commercial products. They are not usually farmers themselves, yet their traditional role has long emphasized service to farmers in their production activities. They are not usually well trained in ecology or environmental protection, yet they are often asked about the ecological aspects of various products and techniques. Those extension agents closely involved in pest control or related problems are not often sociologists or rural social scientists, yet they may be accused of helping only large, efficient producers rather than small, inefficient, part-time farmers struggling along with low incomes."*

The county agent maintains contact with the pesticide dealers and is available to assist any farmer with any particular pest problem that he may have. In Fremont County, Iowa, the mass media, educational programs, and personal contact are used to disseminate extension information. The county agent felt that he came into direct contact with half the farmers over a year's time period and further felt most farmers had access to university extension information either directly through him or indirectly through their pesticide dealers.

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*National Academy of Sciences, Pest Control: An Assessment of Present and Alternative Technologies, Volume II: Corn/Soybeans Pest Control, National Academy of Sciences, 1975, p. 128.

Turning to the characteristics distinguishing a farmer who uses the extension service from one who does not, our interviews would indicate that the low resource, lower educated farmer, especially those who grew up on the farm and continued to farm the way their father had farmed, are less likely to utilize the extension service. For example, some older farmers rejected the idea of using the extension service, saying they had been farming longer than the extension agent had been alive! There are exceptions in that some lower educated farmers realize their lack of knowledge and realize that farming technology is changing. These farmers will seek out advice from the extension service when special problems arise.

The farmers who utilize the county extension office the most are the medium resource farmers who have in some way become acquainted with the material available, either through 4-H or some other activity. This group may also depend on the extension office for social activities, as well as a source of information.

Finally, there is a small group of farmers who are college educated and can utilize literature straight from the landgrant university or technical journals, should they so desire. These would tend to be the large, land-owning, high resource farmers.

4.1.2 Agricultural Experiment Station

The agricultural experiment stations at the landgrant universities play an important role in dictating pest control strategies for farmers to follow, although they usually do not have any direct contact with farmers. Rather, by working closely with the extension service, perceptions of problems are transmitted from the farm level through the extension service to the research entomologists. In turn, their recommendations get transmitted to the farmer through the extension service recommendations.

Entomologists and other specialists at these experiment stations pursue research in a number of areas related to corn pest control including:*

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*NAS, op. cit., p. 111.

- Basic research on biology of pests and hosts. Both chemical and nonchemical segments of pest control are included in this category.

- Breeding for disease and insect resistance and evaluating the resistance of existing varieties and hybrids.

- Comparisons and evaluations of new and old pesticides supplied mainly by private industry. In some cases, economic analyses are performed along with the scientific studies.

- The development of alternative strategies for pest control based on local farming systems, local and national regulations, economic factors, and the important regional pest problems and environmental conditions.

Specifically related to the black cutworm problem, research has only recently begun on understanding its life cycle and where cutworm infestations are located. Currently, the five Corn Belt states are working together on the problem. Funding first became available in 1973 from the Cooperative State Research Service of the USDA and the work is now being funded by EPA.

Prior to this time, research entomologists were preoccupied by the rootworm problem. Cutworm research received little attention because aldrin had been highly effective and cutworms were not considered to be a problem. Furthermore, cutworms affected far fewer farmers than rootworms.

Research entomologists were aware that after the ban on DDT, aldrin would be next to go. However, rootworms were becoming a more serious problem in the Corn Belt and many did not think that heptachlor, an alternative to aldrin, would be suspended so soon after aldrin, leaving no preventive black cutworm alternative to the farmer.

One research entomologist at the Ohio State Research Center, indicated that the hearings and suspension of aldrin definitely facilitated grants becoming available for cutworm research. However, he also felt that the suspension of heptachlor has come too soon because research is still three to four years away from providing a full understanding of the life cycle of the cutworm and predicting where cutworm

infestations are likely to occur. The problem is that weather and soil type must be considered and compound the problem of researching the cutworm. Consequently, an effective pest management control system, utilizing rescue insecticides* for cutworm control, is still years away according to this source.**

These feelings are evidenced in the Iowa and Missouri extension recommendations that continue in 1976 to recommend the use of any carry-over supplies of aldrin, heptachlor and chlordane to combat the cutworm. Rescue insecticides (e.g., Sevin bait) are recommended, but in a conversation with an extension entomologist at Iowa State, he conceded that because there is still no clear understanding about the life cycle of the cutworm or its predictability, he felt that pest management strategies are hard to develop and the rescue method cannot be used effectively. Thus, until a pest management control system for cutworms is further developed, it appears that these extension services feel the need for a preventive type insecticide for cutworms (such as aldrin, heptachlor, etc.). Otherwise, farmers will have to resort to the rescues and learn to accept a certain level of crop damage (possibly higher than would normally be expected since the rescue method cannot, as yet, be used effectively according to certain experts).

4.1.3 Chemical Companies

The role of chemical companies in pest control strategies and their relationship to other institutions, has been very well described in the NAS study on pest control technologies, i.e.:

> "In general, the primary synthesis and initial testing of pesticides to control weeds, diseases, and insects is done by private companies. Once a product has shown effectiveness with regard to field performance against a pest in a major commodity, it is introduced

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*Rescue insecticides are insecticides applied <u>after</u> cutworms are noticed on the corn plants, as a means to save the present crop. This differs from preventive type insecticides which are soil insecticides applied <u>prior</u> to planting to prevent cutworm infestations from occurring.

**Other experts may disagree on these conclusions and those that follow in the paragraph below.

to university and government scientists at experiment stations and extension services. These researchers, given the material on an experimental basis, field test it. If those tests are positive, it will go into additional large scale field experiments sponsored by government and private firms. Labeling and registration efforts then will proceed.

The Federal Insecticide, Fungicide and Rodenticide Act, as amended in 1972 Federal Environmental Protection Control Act (FEPCA), adds a new dimension to the pesticide situation. It provides authority for the regulation of pesticide application and use. If a pesticide is not labeled for a particular use, then it cannot legally be recommended and used for that pest problem. Before the FEPCA amendments of 1972, federal regulations provided for the registration of products, the establishment of efficacy, and the definition of permitted residues and tolerances. If research demonstrated that the pesticide controlled pest X, then it could be recommended for that use. However, under the current FEPCA (1972), the material must be labeled for use to control pest X before it can be recommended for that use. This is especially important in view of the high costs for registering pesticides for specific uses. Several chemical companies estimate that it now costs 7-10 million dollars to register and market a new pesticide. With costs in this general range, companies primarily will proceed to register products for major market use. Registration may not be attempted for effective chemicals against pests of secondary importance, those occurring sporadically, or those affecting only minor commodities."*

As is evident, cooperation between the extension service, agricultural experiment station and the chemical companies has occurred in the past. In recent years, this cooperation has become strained as the extension service and research entomologists look for ways to reduce pesticide use and promote integrated pest management, while the chemical companies continue to promote the chemical solution to pest problems.

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*NAS, op. cit., pp. 108-109.

Of particular importance to this study is the fact that development of preventive type insecticide products for cutworm control is minimal at the present time, because the cutworm problem is a sporadic one not affecting large numbers of farmers. Interviews with a number of sales representatives from major chemical companies indicate that many of them are less than interested in cutworms. Mobil will be testing an organo-phosphate and one or two more indicate that they are researching the area. However, the sales representatives seemed to indicate an attitude of disgust on the part of the chemical companies, because the chemical world had an answer to the cutworm problem and it was then taken away by the Environmental Protection Agency. An air of frustration would explain their feelings about devoting manpower and money to any more research on the cutworm problem and so most are content with marketing already registered rescue insecticides and preventive type insecticides, although the latter does not amount to much. Thus, the farmer is in a dilemma because the extension service is more confident in recommending a preventive type insecticide (e.g., carry-over supplies of suspended pesticides and the hope for a new preventive type insecticide) until they (the extension service) learn how to more effectively recommend the use of rescue insecticides, while the chemical companies are content to market rescues and not research new preventive type insecticides for the cutworm.

At the local level, the chemical company conveys information on its products through sales pamphlets and other literature, through field demonstrations, promotional meetings and expositions, through advertisements in farm journals, in newspapers, on radio and on television and through personal contacts between their sales representatives and parties involved in distributing pesticides and pesticide information, particularly pesticide dealers. Only a very small percentage of farmers, those with a better education and higher resources, will come into contact with sales representatives directly. Most others will receive chemical company information through their pesticide dealer.

4.1.4 Pesticide Dealerships

The primary role of the pesticide dealer is to supply the farmer with pesticides. However, as alluded to above, the pesticide dealer is also one of the most important sources of information to the farmer about insecticides. Seventy to eighty percent of the farmers indicated that they go to the dealer to find out what is available for a particular pest problem. Many indicate that it did not matter what the university extension recommendations were, but rather what the dealer had available for the problem when he went to him.

Pesticide dealers recognize that farmers depend upon them for information and advice. According to pesticide dealers, farmers relied upon them for information about insecticides much more so than for herbicides. Some dealers suggested that since farm magazines printed comparative studies of herbicides, farmers felt more confident in deciding which herbicides to use, compared to insecticides where no comparative studies seem to be available.

Contact with the farmer is usually on a face to face basis although the local media is also used in advertising. During the winter months, some local dealers will sponsor promotional dinners where they invite their regular customers. A chemical company representative may be the invited speaker and the extension agent may also attend. Pesticide literature will usually be disseminated at the meeting. Farmers will then usually contact the dealer when they want to buy their pesticides or when they have a particular problem. In recent years, due to pesticide shortages and marked variability in prices, farmers have begun to shop around, rather than going to the "family dealer" as in the past.

As indicated in above sections, dealers receive their information from both the university extension service -- via extension publications -- and the chemical companies through their company representatives. Therefore, the dealer does attempt to handle those pesticides that are recommended for the pest problems particular to their service area. However, some dealers have typically handled either Shell products (i.e., aldrin) or Velsicol products (i.e., heptachlor and chlordane), rather than both at any one time.

Pesticide dealers are showing concern over the suspension of aldrin, heptachlor and chlordane, more so than their customers, saying that they just did not know what they could recommend to the farmer once supplies of these pesticides are gone, since no new preventive type insecticide was available and since rescues were not typically stocked by them.* Indications were received that all remaining supplies of aldrin were received by the dealer and sold during the 1975 growing season. Some dealers who typically sold heptachlor had problems with shortages in 1975 also. All dealers had ordered heptachlor and chlordane for the 1976 growing season and some say that they ordered enough

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*See bottom of page 4.9 and top of page 4.10 for more discussion on this point.

to have carry-over supplies available for 1977. Some say that they will have enough for their customers and others point out that their entire supply was completely sold back in Jaunary, 1976. Most dealers indicate that they will only sell to their regular customers and when other customers come in, they have been refused. Our interviews also noted that dealers who typically ordered aldrin may experience more problems getting heptachlor, than those who have ordered heptachlor in the past, due to ties with the chemical companies.

Unitl recently, dealers would order their supplies in February and March, receive delivery in early April and sell to farmers in mid to late April. The dealer was not billed by the chemical company until the close of harvest and did not bill his customers until after harvest. However, due to the "petroleum crunch" and pesticide shortages in recent years, many dealers now begin ordering their supplies in July to insure that they will get what they want (e.g., many dealers ordered heptachlor in July, 1975 for the 1976 growing season). The chemical company now bills the dealer on delivery (usually January 1) and the dealer in turn has been forced to bill the farmer on a 30 day basis. The dealer has also been offering the farmer a 1.5 percent discount for each month of early delivery, i.e., taking delivery before April, to induce the farmer to buy earlier and reduce his (the dealer's) storage costs. Some farmers (i.e., those with high resources) have been doing this to insure that they would get what they wanted. In addition, the transition year of early delivery also offers the opportunity to double the chemical bill for a given tax year.

In the past, the releasing of university extension recommendations between November and January has not been a problem for the dealer or the farmer, because dealers did not place their orders until February or March and farmers received what they wanted. In the last two or three years, dealers have had to place orders in the middle of the summer or in the fall, before the recommendations have come out. There have been no cited problems by dealers, but there have also been no basic changes in the recommendations for the last few years.

Nevertheless, one conflict already has been noticed between the dealers' practices and university extension recommendations. Rescue insecticides have been recommended in the past and are currently recommended as an emergency treatment for cutworms. However, dealers have been reluctant to stock large amounts of rescue insecticides for four reasons: (1) it is hard to predict how much would be used in any one growing season, (2) there are many different types of rescues,

each useful under different circumstances, (3) the shelf life of the rescues is at most one growing season, and (4) there is no local distributor for Union Carbide, the manufacturer of the Sevin bait rescue insecticide. Thus, the dealer does not want to get stuck with pesticides he cannot sell the following year, and which may have been difficult for him to obtain. As a result of this behavior, the use of rescues by farmers has been precluded as an adjustment response due to their very limited availability.

4.1.5 Loan Institutions

In order to farm today, large sums of money are needed both for machinery and equipment and for yearly operational expenses. Particularly for bottomland farming, these expenses can run as high as $150,000 for machinery and equipment and $100,000 for yearly operational expenses.

Virtually every producer must obtain a yearly operational loan to pay for some or all of the cost of producing and harvesting a crop, i.e., seed, fertilizer, pesticides, fuel and labor. These operational loans may total from a few thousand dollars to $100,000 mentioned above and are usually negotiated during the winter months.

In order to borrow the money to operate today, it is necessary for a farmer to have land and/or machinery to use as collateral, or a proven credit rating. The building of credit is done much as it is done in the larger city but with the added feature that the bank or other institutions loaning money most likely knows more about the farmer's family background which adds another dimension. One basically is allowed to borrow small sums of money and if there are no problems with returning the loans, credit ratings increase and larger sums are permitted in future years. The additional dimension prevalent in the smaller, rural towns is that the credit rating does not necessarily reflect the ability of the individual as much as it reflects the individual's family and their position and ability to meet loan commitments.

A number of sources are available for yearly operational loans including local banks, production credit associations and the Farmer's Home Administration.

For those farmers who have been successfully farming for a number of years (i.e., high and medium resource farmers) or for those farmers who own or inherit land, go into partnership with a relative, or have a good family background (i.e., come from families who are respected in the community, who have good credit ratings, etc.), a loan may be secured either from a local bank or a production credit association.

Local banks vary in their exact requirements but usually require a financial statement showing the assets (i. e., land, machinery, livestock, Federal Crop Insurance, etc.) covering the loan and any outstanding liabilities (see Exhibit 4. 1 for a typical financial statement required). Family background, including the farmer's credit rating, is always considered and for the younger farmer, the bank will consider his family's assets when determining the loan limit. Banks usually ask their their regular customers to come to the bank beginning in December to fill out a new financial statement for the upcoming year and to negotiate a loan. The current lending rate is about 8. 5 percent per year. Loan officers usually do not ask about specific pest problems, but they do expect the farmer to use insecticides and herbicides to protect their crop. For example, one banker said he would turn down an application if a farmer did not include pesticides in his crop production practices.

The loan limit also varies amongst banks, with some banks having a $50,000 limit and others basing the limit on the farmers net worth. One banker indicated that the average size loan is $50,000 and would typify a farmer with 750 acres and some livestock. For the bottomland farmers, loan amounts average $70,000 to $100,000. Thus, banks with $50,000 limits cannot accomodate bottomland farmers, whereas those with no limit can accomodate both types.

The production credit associations will only make loans to farmers and one must be a stockholder to borrow money. One becomes a stockholder by purchasing stock, and his loan limit is based on his financial statement and the value of the stock he owns (i. e., the farmer must have enough shares to cover a certain percentage -- e.g., 5 percent -- of the loan). He will also be evaluated on his credit rating, character references and a visit to the farm by the loan officer. For younger farmers, a co-signer may be required. The current lending rate is also 8. 5 percent and the loan is negotiated in the winter months and made in quarterly payments. One production credit association also requires the farmer to submit a cash flow budget and an actual cash flow each quarter which is reviewed with the loan officer. Farmers are told to use "good management practices" (presumably which would include pesticides if past history indicated the need to) and are encouraged to utilize the extension service and other educational resources, which production credit officers also keep in touch with. Both high and medium resource farmers in the hills and on the bottomland are members of production credit associations, although older farmers tend not to borrow from this source due to the bookkeeping requirements.

Exhibit 4. 1

AD 1—FARMER
DE LAND SERVICE, INC
ALLEGAN, MICHIGAN 49010

FARMER FINANCIAL STATEMENT

NAME _____ _____ 19 ___

BUSINESS _____ ADDRESS _____

TO _____
(NAME OF BANK)

FOR THE PURPOSE OF OBTAINING ADVANCES FROM TIME TO TIME ON BILLS, NOTES AND OTHER COMMERCIAL PAPER SIGNED OR ENDORSED BY THE UNDERSIGNED, AND OF OBTAINING CREDIT GENERALLY, THE UNDERSIGNED MAKES THE FOLLOWING STATEMENT OF FINANCIAL CONDITION AS OF THE CLOSE OF BUSINESS ON THE DAY OF 19 , AND CERTIFIES TO THE ABOVE NAMED BANK THAT THE INFORMATION HERE-INAFTER SET FORTH IS IN ALL RESPECTS TRUE, ACCURATE AND COMPLETE, AND CORRECTLY REFLECTS THE FINANCIAL CONDITION OF THE UNDERSIGNED ON THE DATE AFOREMENTIONED.

(FILL IN ALL BLANKS, WRITING "NO" OR "NONE" WHERE NECESSARY TO COMPLETE INFORMATION)

ASSETS				LIABILITIES			
CASH ON HAND AND IN BANKS ... $				NOTES PAYABLE TO BANK-SECURED $			
NOTES RECEIVABLE SECURED				-UNSECURED			
NOTES RECEIVABLE UNSECURED				NOTES PAYABLE TO OTHERS			
ACCOUNTS RECEIVABLE				NOTES PAYABLE TO RELATIVES AND FRIENDS			
GOVERNMENT SECURITIES				CHATTEL MORTGAGES			
OTHER STOCKS AND BONDS (SEE SCHEDULE)				ON LIVE STOCK			
LIVE STOCK (SEE SCHEDULE)							
FARM PRODUCTS ON HAND (SEE SCHEDULE)				ON MACHINERY			
CASH VALUE OF LIFE INSURANCE							
OTHER CURRENT ASSETS				CROP MORTGAGES			
				COVERING _____ ACRES			
TOTAL CURRENT ASSETS _____ $				DELINQUENT INTEREST			
				DELINQUENT REAL ESTATE TAXES			
FARM LAND (SEE SCHEDULE)				DELINQUENT PERSONAL TAXES			
ACRES IN _____ CO. @ $				CASH RENT DUE			
CITY REAL ESTATE (SEE SCHEDULE)				LOANS ON LIFE INSURANCE			
FARM MACHINERY, AUTOS, TRUCKS,				OTHER CURRENT LIABILITIES			
TRACTORS & OTHER EQUIP. (SEE SCHEDULE)				TOTAL CURRENT LIABILITIES _____ $			
STOCKS & BONDS (GIVE DESCRIPTION & VALUES)				MORTGAGES ON REAL ESTATE			
				MORTGAGES ON CITY PROPERTY			
				TO			
				ALL OTHER DEBTS (ITEMIZE)			
OTHER ASSETS							
				TOTAL LIABILITIES			
				NET WORTH			
TOTAL _____ $				TOTAL $			

I HAVE ENDORSED NOTES FOR OTHERS _____ $ _____ I AM BONDSMAN FOR OTHERS _____ $ _____

LIVE STOCK

___ HORSES _____ @ $ ___ PER HEAD $				___ CALVES _____ @ $ ___ PER HEAD $			
___ MULES _____ @ ___ PER HEAD				___ SOWS _____ @ ___ PER HEAD			
___ COLTS _____ @ ___ PER HEAD				___ PIGS _____ @ ___ PER HEAD			
___ COWS, STOCK @ ___ PER HEAD				___ STOCK HOGS @ ___ PER HEAD			
___ COWS, DAIRY @ ___ PER HEAD				___ SHEEP _____ @ ___ PER HEAD			
___ STEERS @ ___ PER HEAD				___ EWES _____ @ ___ PER HEAD			
___ HEIFERS @ ___ PER HEAD				___ LAMBS _____ @ ___ PER HEAD			
___ BULLS @ ___ PER HEAD							
___ FEEDERS @ ___ PER HEAD				TOTAL $			

GRAIN AND FARM PRODUCTS

ON HAND				GROWING CROPS CONDITION			
___ BU. CORN _____ @ $ _____ $				___ ACRES CORN _____ $			
___ BU. WHEAT _____ @				___ ACRES WHEAT _____			
___ BU. OATS _____ @				___ ACRES OATS _____			
___ TONS HAY _____ @				___ ACRES HAY _____			
___ BALES COTTON _____ @				___ ACRES COTTON _____			
___ LBS. TOBACCO _____ @				___ ACRES TOBACCO _____			
___ BU BARLEY _____ @				___ ACRES BARLEY _____			
TOTAL $				TOTAL $			

(BE SURE ALL SCHEDULES ON OTHER SIDE ARE FILLED OUT)

Exhibit 4.1 (continued)

SCHEDULES

BE SURE TO INCLUDE EVERY ITEM UNDER EACH SCHEDULE

FARM MACHINERY, AUTOS, TRUCKS, TRACTORS AND OTHER EQUIPMENT

UNITS	TYPE OF EQUIPMENT	MAKE	AGE	CONDITION	MARKET VALUE	ENCUMBRANCES (IF ANY)
				TOTAL	$	$

IN WHOSE NAME IS TITLE TO REAL ESTATE RECORDED? _____

IS REAL ESTATE HELD IN FEE SIMPLE OR LEASEHOLD? _____

TAXES PAID TO _____ 19___. MORTGAGE INTEREST PAID TO _____ 19___

LAND UNDER LEASE: _____ ACRES OF _____ LAND. THE RENTAL PRICE BEING $ _____ WHICH HAS BEEN PAID TO _____ 19___

REAL ESTATE

DESCRIPTION	ACRES	LOCATION	NATURE OF IMPROVEMENTS	VALUE		MORTGAGES	EQUITY
				ASSESSED	CASH		
			TOTAL	$	$	$	$

HAVE YOU ANY PARTNERS IN YOUR BUSINESS? _____ IF SO, STATE PARTICULARS _____

HAVE YOU EVER BEEN ADJUDGED A BANKRUPT? _____ IF SO, STATE PARTICULARS _____

JUDGMENTS OR SUITS PENDING AGAINST YOU AT THIS TIME $ _____

NAMES OF PEOPLE WITH WHOM YOU HAVE HAD BUSINESS RELATIONS AND WHO ARE ACQUAINTED WITH YOUR PERSONAL AND FINANCIAL CONDITION _____

_____

LIFE INSURANCE $ _____ PAYABLE TO _____

BUILDINGS INSURED FOR $ _____ GRAIN INSURED FOR $ _____ CATTLE AND HOGS INSURED FOR $ _____

OTHER INSURANCE (ITEMIZE) _____

POST OFFICE ADDRESS _____
(TOWN) (COUNTY) (STATE)

I HAVE RESIDED AT ABOVE LOCATION _____ YEARS _____ MONTHS FORMERLY RESIDED _____

PROCEEDS OF LOAN MADE BY YOUR BANK ARE TO BE USED (OR HAVE BEEN USED) BY ME FOR _____

_____
(STATE PURPOSE)

I EXPECT TO RETIRE THIS INDEBTEDNESS FROM _____ BY _____ 19___
(STATE SOURCE)

IN SUBMITTING THE FOREGOING STATEMENT THE UNDERSIGNED GUARANTEES ITS ACCURACY WITH THE INTENT THAT IT BE RELIED UPON BY THE AFORESAID BANK IN EXTENDING CREDIT TO THE UNDERSIGNED AND WARRANTS THAT _____ HAS NOT KNOWINGLY WITHHELD ANY INFORMATION THAT MIGHT AFFECT CREDIT [illegible] AND THE UNDERSIGNED EXPRESSLY AGREES TO NOTIFY IMMEDIATELY SAID BANK IN WRITING OF ANY MATERIAL CHANGE IN FINANCIAL CONDITION WHETHER APPLICATION FOR FURTHER CREDIT IS MADE OR NOT AND IN THE ABSENCE OF SUCH WRITTEN NOTICE IT IS EXPRESSLY AGREED THAT SAID BANK IN GRANTING [illegible] CREDIT MAY RELY ON THIS STATEMENT AS HAVING THE SAME FORCE AND EFFECT AS [illegible] THE DATE ADDITIONAL CREDIT IS REQUESTED OR EXISTING CREDIT EXTENDED OR CONTINUED.

SIGNED AT _____

THIS _____ DAY OF _____ 19___ SIGNATURE _____

For most farmers starting out who do not own or inherit land or go into partnership with a relative, and for those farmers who cannot secure a loan by any other means,* it may be necessary for them to get a loan from the Farmer's Home Administration, an agency within USDA, which will tolerate the higher risk. FHA operational loans are given to family farms and can be up to a maximum of $50,000. The current lending rate is about 8.5 percent. FHA loan recipients are expected to show improved management skills and increased net income and therefore are expected to build-up a good credit rating and become a feasible risk to the local lending institutions within an average of six years. FHA tries to accomplish these purposes by close supervision of cash flow (see Exhibit 4.2 for statement required) and by encouraging the farmer to attend local extension programs and agricultural night classes. If the farmer does not utilize the local educational resources and FHA directives and if progress isn't made, the next year's loan may not be made and the FHA supervisor may advise the farmer to liquidate. Bottomland farmers do not usually borrow from FHA because of the $50,000 loan limit and because they do not qualify for FHA credit since they are usually in partnership with a relative. Usually the young (18-30 year old) farmer with low credit and assets, and the older (55 years and older) farmer with low education and poor management skills, utilize the FHA.

In recent years, the average size of the operational loan has increased as more financial burdens have been put on the farmer, e.g., because pesticide dealers no longer extend credit until after harvest, farmers must increase their loan amount to buy pesticides. The number of carry-over loans (i.e., loans made in one year and carried into subsequent years) have also increased due to a number of factors, e.g., drought, poor prices for crops and possibly cutworm problems. The production credit association expects carry-overs and will continue to back the farmer until his loan limit is reached. Many bankers indicate that if some farmers have another bad year, they will have to foreclose on them. Other bankers say that they are not looking for new borrowers because of the drought and the carry-overs, which are presently ranging from $12,000 to $25,000.

Specifically related to the suspension of aldrin, heptachlor and chlordane, one banker said that the ban represents something new to them in considering loans. They will not be able to react to the ban on aldrin or heptachlor until they have a case where someone cannot meet

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*Included may be farmers who used to go to the local banks or production credit associations, but due to a series of bad crop years, were forced to return to the FHA.

Exhibit 4.2

USDA-FHA
Form FHA 431-2
(Rev. 12-1-72)

Position 1

FORM APPROVED
OMB NO. 40-R1077

COUNTY

FARM AND HOME PLAN

NAME OF HUSBAND | NAME OF WIFE | ADDRESS

AGES OF PERSONS IN HOUSEHOLD	HUSBAND	WIFE	SONS	DAUGHTERS	OTHERS	TOTAL ACRES (OWNED)	(RENTED)	CROP ACRES (OWNED)	(RENTED)	OPERATED SAME FARM LAST YEAR?	YES / NO	WRITTEN LEASE?	YES / NO

TERMS OF LEASE | PERIOD OF LEASE

A. FINANCIAL STATEMENT AS OF , 19

PROPERTY OWNED	ACRES	VALUE
REAL ESTATE (LOCATION):		
FARM		$
OTHER REAL ESTATE		
TOTAL REAL ESTATE		$
LIVESTOCK:	NO.	VALUE
LIVESTOCK HELD FOR SALE		$
DAIRY COWS		
BEEF COWS		
OTHER CATTLE		
BROOD SOWS AND GILTS		
OTHER HOGS		
EWES		
OTHER SHEEP		
POULTRY		
TOTAL LIVESTOCK		$
MACHINERY AND EQUIPMENT:		
TRUCK(S): YR. ____ MAKE ____		
TRACTOR(S): YR. ____ MAKE ____		
MAJOR ITEMS OF EQUIPMENT		
OTHER FARM MACHINERY		
TOTAL MACHINERY AND EQUIPMENT		$
OTHER PERSONAL PROPERTY:	QUAN. OR NO.	VALUE
CROPS HELD FOR SALE		$
GROWING CROPS		
FEED		
SEED AND SUPPLIES		
AUTO: YR ____ MAKE ____		
HOUSEHOLD GOODS		
CASH ON HAND		
BONDS AND INVESTMENTS		
ACCTS. OWED US—COLLECTIBLE		
TOTAL OTHER PERSONAL PROP.		$
TOTAL PROPERTY OWNED		$

DEBTS OWED	FINAL DUE DATE	INTEREST RATE	ANNUAL INSTAL.	AMOUNT DELINQ	UNPAID BALANCE
LIENS ON REAL ESTATE:					
			$	$	$
TOTAL LIENS ON R. E.			$	$	$
LIENS ON CHATTELS AND CROPS:					
			$	$	$
TOTAL LIENS CHATTELS & CROPS			$	$	$
JUDGMENTS:					
TOTAL JUDGMENTS:			$	$	$
TAXES DUE: REAL ESTATE $ ____ PERSONAL $ ____					
INCOME & SOCIAL SECURITY $ ____ TOTAL TAXES DUE					$
ALL OTHER DEBTS (DOCTOR, STORE, ETC., DESCRIBE):					$
TOTAL OTHER DEBTS					$
TOTAL ALL DEBTS					$

1. TOTAL OF CASH ON HAND, CROPS AND LIVESTOCK HELD FOR IMMEDIATE SALE, AND INCOME TO BE RECEIVED IN IMMEDIATE FUTURE $
2. DEBTS AND EXPENSES WE WILL PAY FROM ABOVE CASH AND INCOME (Itemize) $
3. CASH CARRY-OVER FOR NEXT YEAR'S OPERATIONS AFTER PAYING THESE DEBTS $

	BEGINNING OF YEAR	END OF YEAR	INCREASE OR DECREASE
4. NET WORTH (TOTAL PROPERTY OWNED MINUS TOTAL ALL DEBTS)	$	$	$
5. TOTAL LAND DEBT			
6. TOTAL DEBTS OTHER THAN LAND	$	$	$

PERIOD COVERED BY PLAN: FROM 19 TO 19

FHA 431-2 (Rev. 12-1-72)

Exhibit 4.2 (continued)

NOTE: All "actual" data to be completed by end of crop year

B. CROPS, PASTURE, ETC.—PRODUCTION AND SALES

PLANNED							ACTUAL						
CROPS, PASTURE, SET-ASIDE PROGRAM PAYMENTS, ETC.	ACRES	YIELD PER ACRE	OPERATOR'S SHARE UNITS FOR: FARM USE	SALE	@	DOLLAR SALES	ACRES	YIELD PER ACRE	OPERATOR'S SHARE UNITS FARM USE	HELD FOR SALE	SOLD	@	CASH INCOME
1.					$	$						$	$
2.													
3.													
4.													
5.													
6.													
7.													
8.													
9.													
10.													
11.													
12.													
13.													
14. FARMSTEAD, GARDEN AND ROADS													
15. TOTAL (ENTER TABLE J, LINE 1)						$							$

C. LIVESTOCK AND PRODUCTS—PRODUCTION AND SALES

PLANNED							ACTUAL						
LIVESTOCK AND PRODUCTS AND WOOL-MOHAIR PROGRAM PAYMENTS	NO.	PROD. PER ANIMAL	OPERATOR'S SHARE UNITS FOR: FARM USE	SALE	@	DOLLAR SALES	NO.	PROD. PER ANIMAL	OPERATOR'S SHARE UNITS FARM USE	HELD FOR SALE	SOLD	@	CASH INCOME
1.					$	$						$	$
2.													
3.													
4.													
5.													
6.													
7.													
8.													
9.													
10.													
11.													
12.													
13. MILK (LBS)													
14. EGGS (DOZ.)													
15. TOTAL (ENTER TABLE J, LINE 2)						$							$

Exhibit 4.2 (continued)

D. IMPROVEMENTS AND KEY PRACTICES—FARM, HOME, AND FINANCIAL MANAGEMENT

CROPS; SOIL; LIVESTOCK; FINANCIAL MANAGEMENT; MAINTENANCE; REPAIRS; FOOD PRODUCTION AND CONSERVATION; HEALTH, HOME, ENVIRONMENTAL, COMMUNITY AND RURAL DEVELOPMENT ACTIVITIES; ETC.	WHEN TO DO IT	SOURCE OF FUNDS	ACTUAL ACCOMPLISHMENTS
TYPE OF ANALYSIS (_____) MONTH			

E. FAMILY LIVING AND INSURANCE

WE PLAN TO PRODUCE, PROCESS, AND USE FOR OUR FAMILY:

ITEM	PLAN	ACTUAL	ITEM	PLAN	ACTUAL
MILK (GAL.)			GARDEN (SIZE)		
EGGS (DOZ.)			CANNED AND FROZEN:		
POULTRY (NO.)			VEGETABLES (QT.)		
PORK (LIVE WT.-LB.)			FRUITS (QT.)		
BEEF (LIVE WT.-LB.)			DRY STORED VEGETABLES (BU.)		
OTHER MEATS (LIVE WT.-LB.)			DRY STORED FRUITS (BU.)		

TOTAL CASH VALUE OF FOOD ACTUALLY PRODUCED AND/OR PROCESSED FOR HOME USE $_____

TYPE OF INSURANCE	FACE VALUE			TYPE OF INSURANCE	FACE VALUE		
	PRESENT	PLAN	ACTUAL		PRESENT	PLAN	ACTUAL
DWELLING	$	$	$	LIFE	$	$	$
OTHER REAL ESTATE				HEALTH			
CHATTELS				HOUSEHOLD GOODS			
FARM LIABILITY				AUTO			

CHECK IF YOU HAVE					
	☐ RUNNING WATER	☐ REFRIGERATOR	☐ WASHING MACHINE	☐ TELEPHONE	☐ SEWING MACHINE
	☐ FULL BATH	☐ HOME FREEZER	☐ DRYER	☐ TELEVISION SET	☐ WATER HEATER

Exhibit 4.2 (continued)

F. CASH FAMILY LIVING EXPENSES	OTHER CREDIT NEEDED	FHA CREDIT NEEDED	PLANNED EXPENSES	ACTUAL EXPENSES
HOUSEHOLD OPNG.	$	$	$	$
FOOD INCL. LUNCHES				
CLOTH., PERS. CARE				
HEALTH				
HOUSE REPAIR AND SANITATION				
SCHOOL				
CHURCH, RECREATION				
PERS. INSURANCE				
TRANSPORTATION				
FURNITURE & OTHER				
TOTAL	$	$	$	$

G. CASH FARM OPERATING EXPENSES	OTHER CREDIT NEEDED	FHA CREDIT NEEDED	PLANNED EXPENSES	ACTUAL EXPENSES
HIRED LABOR	$	$	$	$
MACHINERY REPAIR				
FARM BUILDING & FENCE REPAIR				
INTEREST				
RENT				
FEED				
SEED				
FERTILIZER				
PESTICIDES & SPRAY MATERIALS				
OTHER SUPPLIES				
LIVESTOCK EXPENSE				
MACHINERY HIRE				
FUEL AND OIL				
PERSONAL PROP. TAX				
REAL ESTATE TAXES				
WATER CHARGES				
PROPERTY INSURANCE				
AUTO & TRUCK EXPENSE				
UTILITIES				
CURRENT OPNG. BILLS (TABLE A)				
TOTAL	$	$	$	$

H. CAPITAL EXPENDITURES	OTHER CREDIT NEEDED	FHA CREDIT NEEDED	PLANNED EXPENSES	ACTUAL EXPENSES
	$	$	$	$
DEBTS REFINANCED (TABLE A)				
TOTAL	$	$	$	$

I. CREDIT FOR:	OTHER	FHA	TOTAL	ACTUAL
FAMILY LIVING		$	$	$
FARM OPERATING				
CAPITAL EXPENDITURES				
TOTAL	$	$	$	

J. SUMMARY OF YEAR'S BUSINESS	PLAN	ACTUAL
1. CROP INCOME (*Table B*)		
2. LIVESTOCK INCOME (*Table C*)	$	$
3. CONSERVATION PAYMENTS AND OTHER FARM INCOME		
4. TOTAL CASH FARM INCOME (*1, 2 and 3*)	$	$
5. CASH FARM OPERATING EXPENSES (*Table G*)		
6. NET CASH FARM INCOME (*4 Minus 5*)	$	$
7. NON-FARM INCOME		
8. TOTAL NET CASH FARM & NON-FARM INCOME (*6 Plus 7*)	$	$
9. CASH FAMILY LIVING EXPENSES (*Table F*)		
10. NET CASH INCOME (*8 Minus 9*)		
11. CASH CARRY-OVER (*Page 1, Line 3*)		
12. LOANS AND OTHER CREDIT (*Table I*)	$	$
13. INTEREST (*Table G*)		
14. TOTAL AVAILABLE (*10, 11, 12 and 13*)	$	$
15. CAPITAL EXPENDITURES (*Table H*)		
16. BALANCE AVAILABLE (*14 Minus 15*)	$	$
17. GROSS CASH INCOME (*4 Plus 7*)	$	$

K. DEBT REPAYMENT

TO WHOM OWED	AMOUNT DUE THIS YEAR (PRIN. AND INT.)	PLAN			ACTUAL AMOUNT PAID
		PRIN. AND INT. TO BE PAID	DATE	SOURCE OF FUNDS	
	$	$			$
INCOME AND SOCIAL SECURITY TAXES					
TOTAL	$	$			$

We agree to follow this plan and to discuss with the County Supervisor any important changes that may become necessary.

(DATE) (BORROWER) (WIFE)

(COUNTY SUPERVISOR)

their loan obligations which apparently has not occurred. He is very concerned about the situation because it does increase the risk, but to what degree, they cannot predict. He wishes he did know, since those farmers who are directly affected by the pesticide decisions are his larger borrowers.

4.1.6 Federal Crop Insurance

The basic purpose of Federal Crop Insurance is to promote the general welfare by providing crop insurance against loss from unavoidable causes, such as weather, insects and plant disease. In the two counties studied, an all risk crop insurance policy is sold and insures against all natural hazards beyond the farmer's control including: drought, excess moisture, hail, insects, frost, freeze, plant disease, flood, fire, hurricane, winter kill, and wind. It guarantees a specific amount of bushels and pays a loss when the bushels fall below the guarantee, i.e., claims are based on the number of acres and actual yield compared to the yield set by a 5 year ASCS average.

The Federal Crop Insurance Corporation requires that "good farming practices" be used, and in Fremont and Atchison Counties, there are also fertilizer requirements. These are determined from data received from the university extension service and are minimum amounts of the recommended rates. Farmers having fields prone to cutworm problems must also show that they took precautions, e.g., used insecticides, rotated corn with crops not prone to cutworms, etc.

The "good farming practices" are determined by the adjuster if a claim is made. If the adjuster believes that the farmer did not use good management compared to his neighbors, he will notify his supervisor and they will seek the opinion of the local extension agent to determine whether good practices were utilized.

The adjusters are part time (3 or 4 months) workers who are either local small farmers who can handle the extra work or school teachers or someone else with a farm background.

Every year, each county is reassessed to see if there is a significant shift in the yields, such as during an extended drought period of more than 5 years. If there is a shift, they will either adjust the yield or discontinue insuring crops in that county, because the loss over the areas insured must equal no more than 90 percent of the premiums. Currently, corn, oats and soybeans can be insured in Fremont County, and corn, oats, soybeans, and wheat in Atchison County indicating that some alternative crops, e.g., milo, cannot be insured (see Exhibit 4.3 for insurance application form).

Exhibit 4.3

Form FCI-12-Revised
August 1972

UNITED STATES DEPARTMENT OF AGRICULTURE
Federal Crop Insurance Corporation

N S I O T X

APPLICATION FOR FEDERAL CROP INSURANCE FOR 19_____ AND SUCCEEDING CROP YEARS

_____ (Contract Number)

_____ (County) _____ (State)

_____ (Name and Address) _____ (Zip Code)

_____ (Identification Number)

A. The undersigned applicant, subject to the provisions of the regulations of the Federal Crop Insurance Corporation (herein called the "Corporation"), hereby applies to the Corporation for insurance on his share (for cotton, peanut and tobacco insurance, on his sharecropper or share tenant shares as specified in paragraph B below) in the crops stated below that are insurable crops planted on insurable acreage as shown on the applicable county actuarial table of the Corporation for the above-stated county. The applicant elects each plan of insurance, amount of insurance, or price at which indemnities shall be computed, shown below which in each case shall be an electable plan, amount, or price, as provided on the applicable county actuarial table on file in the Corporation's office for the above county. The premium rates and production guarantees shall be those shown on the applicable county actuarial table for each crop year.

CROPS	ELECTIONS	(A)	(P)

B. Applicable only to cotton, peanut and tobacco:

If the applicant intends to insure only the shares of his sharecroppers or share tenants who have no insurance on the crop with the Corporation, "(SC-Int.)" shall be entered following the name of the crop. If the applicant intends to insure both his individual share and the shares of his sharecroppers or share tenants, "(Comb. Int.)" shall be entered following the name of the crop. Insurance for sharecroppers and share tenants shall be provided in accordance with the regulations of the Corporation (7 CFR-401, 103(b)).

C. Upon acceptance of this application by the Corporation the contract shall be in effect for the first crop year specified above, except on any crop on which the time for the filing of applications has passed at the time this application is filed, and shall continue for each succeeding crop year until cancelled or terminated as provided in the contract. This application, the insurance policy, endorsements, and the county actuarial tables shall constitute the contract. Any changes in the contract shall be on file in the Corporation's office for the county at least 15 days prior to the applicable cancellation date.

D. This application, when executed by a person as an individual, shall not cover his share in a crop produced by a partnership or other legal entity.

The applicant is a _____ (Type of Entity)

All natural persons in whose behalf this application is made are over 18 years of age _____ (Yes or No)

E. PREMIUM NOTE: In consideration hereof, the insured promises to pay to the order of the Corporation each crop year of the contract the annual premiums. It is agreed that any amount due the Corporation by the insured may be deducted from any indemnity payable to the insured and when not prohibited by law, from any loan or payment otherwise due the insured under any program administered by the United States Department of Agriculture.

_____ (Witness to Signature) _____ (Signature of Applicant) _____, 19____ (Date)

Code _____

ADDRESS OF OFFICE FOR COUNTY	LOCATION OF FARM(S) OR HEADQUARTERS
Box 330 Maryville, Mo. 64468 PHONE 816 582 5311	PHONE

In 1975, there were 314 all risk insurance policies written in Fremont County and 164 in Atchison County. Claims collected on these policies have been increasing because of the drought conditions experienced in these counties. However, Federal Crop Insurance data indicated that no claims were paid for cutworm damage in recent years (see Exhibits 4.4 and 4.5 for claim forms).

One farmer who was interviewed stated that he may use his Federal Crop Insurance as insurance against cutworm damage. That is, if he cannot get aldrin or heptachlor in 1977, he may increase his payment limits and take a chance and plant corn. If he incurs cutworm damage, he would then collect and replant with soybeans. The risk of doing this a number of times is that if his claims become excessive, his Federal Crop Insurance may be withdrawn, which in turn may affect his ability to get operational loans, since Federal Crop Insurance can be used as collateral. Therefore, farmers who may have cutworm damage every year (i.e., those planting corn on gumbo soil), may have a problem if they use their insurance in this manner, because claims may be filed yearly (unless some effective alternative becomes available) which may cause an investigation by the Federal Crop Insurance Corporation and which may result in a farmer's insurance being cancelled.

4.1.7 Professional Scouting

Until the suspension of aldrin, farmers had a relatively inexpensive means to control cutworms and in their opinion, it was always 100 percent effective. Therefore, there was never a need to scout their fields for cutworm damage because they believed it never occurred. As many farmers noted, when they were able to use aldrin, they never had a cutworm problem and never had to replant.

Now that aldrin is out of the pipeline, many farmers have switched to heptachlor. Some feel it is as good as aldrin, while others feel that it does not give the 100 percent control that they thought aldrin did. However, both types would agree that the control is sufficient so that scouting is unnecessary and replanting is usually not necessary.

Once these preventive type pesticides are completely used, and barring the registration of a new preventive insecticide for cutworm control, farmers will have to use rescue insecticides if they want to use a chemical insecticide to control the cutworm in the production of their corn crop. However, associated with the use of rescues is the need to scout the fields in order to determine when the rescues should

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UNITED STATES DEPARTMENT OF AGRICULTURE

FEDERAL CROP INSURANCE CORPORATION

NOTICE OF DAMAGE OR LOSS

NAME AND ADDRESS OF INSURED

1. State and County Code and Contract Number

2. Crop | Crop Year

3. Name of Person to be Contacted | Phone No.

4. Days and Time Contact can be Made

5. Location Where Contact can be Made

6. On _____ 19____, notice of substantial damage or loss under the above-identified contract was received with respect to the units identified in Column (A) below:

	Unit Number(s)	Cause of Damage	Date of Damage	Is Appraisal Requested?	If Appraisal Requested, Show Date Land Needed and Intended Use	Is Harvest Completed? If "Yes," Show Date	Total Reported Production	Prior Inspection?	Other Contract Numbers
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
(1)									
(2)									
(3)									
(4)									
(5)									
(6)									
(7)									
(8)									
(9)									
(10)									

Signature of Corporation Representative | Date Prepared | Signature of Insured or Method of Reporting

7. Adjuster's Copy of this form and the applicable contract files sent to: | Name | Date

8. REMARKS

Exhibit 4.5

FORM FCI-63-CORN
JANUARY 1966

Form Approved Budget Bureau No. 40-R3335

UNITED STATES DEPARTMENT OF AGRICULTURE
FEDERAL CROP INSURANCE CORPORATION

CLAIM FOR INDEMNITY

(CORN)

1. Contract Number | Unit Number
2. Crop | Crop Year
3. Name of Indian Landlord
4. Name of insured or other claimant
5. Date of Damage
6. Date Harvest Complete
7. Date Notice of Damage or Loss
8. Practice | % | Practice | % | Practice | % | Practice | %
9. Primary % Loss
10. Primary Cause of Loss
11. Secondary Cause of Loss
12. Legal Description
13.

PART I ACREAGE DATA AND APPRAISED PRODUCTION

Area No.	Acres Whole	Acres 10 ths	Insured's Share	Practice	Stage & Use	Appraisal per acre: Potential	Appraisal per acre: Uninsured Causes	Adjustments to Appraisal per acre: % Shell	Adjustments to Appraisal per acre: % Moisture	Adjustments to Appraisal per acre: % Damage	Agreed Factor	Bushels or Tons
A	B		C	D	E	F	G	H	I	J	K	L
TOTAL ACRES												

PART II HARVESTED PRODUCTION

1. Farm Storage

Length or Diameter	Width	Depth	Deduction For Studs	Husk Factor	Test Weight	% Shell	Ground Shelled Ear, or Silage	Share	Bushels By Weight	% Moisture	% Damage	Agreed Factor	Production not to Count
A	B	C	D	E	F	G	H	I	J	K	L	M	N
2. Sold or Commercial Storage													
3. Other Production													

SKETCH MAP:

NARRATIVE:

Enter the reasons for any appraisals shown in column O, Part I. Where a factor is shown in column M, Part II, enter the grade, test weight, or other factors which make the production subject to quality adjustment.

PART III CERTIFICATION OF ADJUSTER

I certify that, to the best of my knowledge and belief, the data in Part II and above are complete and true, and hereby consent to any acreage on this unit being put to another use.

SIGNATURE OF ADJUSTER | DATE

DATE

CERTIFICATION, CLAIM, AND RELEASE BY CLAIMANT
(Insured, his heirs, legal representatives, assignee or transferee)

(a) It is hereby certified that, to the best of claimant's knowledge and belief, all data in Part II and above are complete and true.
(b) Claim is hereby made for indemnity computed pursuant to terms of the insurance contract identified above on the basis of the aforesaid data.
(c) Payment received by claimant in accordance with (b) will release and discharge insurer from all liability under said contract with respect to the unit identified above.

SIGNATURE OF INSURED OR OTHER CLAIMANT | DATE

NATIONAL SERVICE OFFICE

U. S. GOVERNMENT PRINTING OFFICE

TM/OC

be applied. This type of practice is something new to most farmers, and only the better managers and more successful farmers have scouted their fields in the past to determine if they should replant because of cutworm damage. This practice however has not been without some problems. Recognizing cutworm damage is sometimes difficult and sometimes mistaken for rootworm damage in continuous corn situations. In addition, damaged (young) plants will dry up and blow away rapidly. Thus, unless a stand count is undertaken, a farmer may not realize small amounts of damage because none would visibly be present. Consequently, a 40 percent loss in stand may result before the farmer realizes what has happened. This has implications for professional scouting as well (e.g., stand counts and worm counts may be necessary).

Nevertheless, if the use of rescues is to be widely used in an effective manner by farmers, more scouting of fields will be necessary and the farmers will either have to learn how to detect insect damage and the point at which pesticides should be applied or hire someone to do this for them. At the present time, most farmers themselves do not have this capability because they never felt the need to have it.

Private industry has only recently seen a market for professional scouting in this area of the country and this study located two sources for professional scouting in the study area -- one in Indianola, Iowa and one in Lincoln, Nebraska.*

One of the firms is a pesticide distributor and applicator. This particular company has hired an entomologist to develop a pest management control system that can be used by their pesticide dealers. At present, the system is primitive and consists of a scouting network that would be used to try and spot the cutworm and other pests as they approach the economic threshold level. The company will try to convince dealers to contact their area farmers and enlist them in the program. The dealer or his employee would be trained by the company to identify pest problems. When a pest problem is cited, the local scout would call the company's entomologist, who would then advise the dealer what to recommend to his customers. The chemical company also has planes for aerial application if requested. Attempts to use this system

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*However, publicly funded research on scouting has occurred in other Corn Belt states, e.g., Indiana.

will be made for the first time in 1976 and therefore no information could be obtained as to dealer participation, farmer cooperation, and cost to either the dealer or farmer. The entomologist in the company indicated that the suspension of aldrin, chlordane and heptachlor precipitated the need for a pest management control system and professional scouts.

The second firm, headed by a Ph.D. entomologist, is a pest management control firm with professional scouts. Their program will identify the pest, the economic threshold level and the insecticide and application necessary for control. A spokesman for the firm stated that in order to put a scout in a particular area, he must have about 35 to 50 fields or about 4,000 acres. Each scout, who is usually an entomology or agronomy major, must sample each field at least once a week, and if a problem is developing, the field will be sampled twice a week. As of March, 1976, the firm does not have any clients in the study area.

Thus, what remains to be seen is: (1) whether or not the farmers in the area will utilize rescues and scout the fields themselves or use professional scouts, and (2) whether professional scouting services will sufficiently develop to handle whatever demand is generated. Until the present time, these services have not been widespread because the economic incentives for private crop protection advice were non-existent since chemical crop protection methods were quite economical. As all carry-over supplies of aldrin, heptachlor and chlordane are exhausted and as more reliance on a pest management control system, possibly involving rescues, is needed, professional scouting may no doubt become economically viable (as it has in other parts of the country), and increase to meet the demand.

4.1.8 Mass Media

Previous sections have alluded to the use of mass media to disseminate information about pesticides and pest control strategies. As indicated, newspapers, radio, television, farm magazines and other publications are all used by both the extension service as well as chemical companies and pesticide dealers. Below, some additional insights about the local radio stations, the local newspapers, and farm magazines are given.

The radio is an important information source for the farmer, as suggested by an implement dealer who stated that all farmers order

one -- at an extra cost -- in their tractors. A discussion with a local radio station stated that the sponsors for their "farm reports" were primarily chemical companies. All the major formulators and distributors of aldrin and heptachlor advertised on the radio. The average advertiser would have 12 one minute spots per week at $25 a spot during the season. This translated into a yearly income of $12,000-$15,000 for the radio station. However, advertising for aldrin was discontinued in 1974 and heptachlor will not be advertised in 1976. The station expected that the reason for this was the fact that supplies would be low and there would be no use in increasing demand. Currently, the station does not have anything to advertise for cutworms. In the past, the radio station would review the weekly insect reports put out by the university extension service and check with the university extension service recommendations and then advertise the appropriate product of their advertisers. Presently, the radio station feels their advertisers will advertise rescue operations in 1976 if cutworm infestations result.

The extension service also uses the local radio station to disseminate information about educational meetings and other pertinent information, as discussed previously.

The importance of the radio may also be suggested by the fact that the area in which this study took place is not represented by a daily newspaper, but rather a weekly newspaper. Fremont County residents rely either on the Des Moines Register or the Omaha Herald. Residents of Atchison County must get their daily newspaper from St. Joseph, Missouri. None of these newspapers include any specific news about Fremont or Atchison Counties and a person may be buried before the weekly newspaper comes out. Thus, for everyday local information, the radio is more useful. However, in the local weekly newspaper, extension service articles may appear and local pesticide dealers do advertise.

For national news (e.g., suspension of a pesticide such as aldrin, heptachlor, or chlordane), the major network affiliations on the radio and television are relied upon in the area. Farm magazines also disseminate the national farm news to their readers. Wallace's Farmer, Successful Farming and the Farm Bureau News Letter were read, among others, by farmers in the area, and carried word of the decisions (including editorial comments), as well as advertisements by the chemical companies, market forecasts, etc.

4.2 Crop Production Output Factors

On the output side of the crop production process, i.e., in the marketing of the crop, institutions were also found to be influential. One important factor found in this study was the grain elevators as discussed below.

4.2.1 Grain Elevators

In deciding to grow a particular crop, a farmer must consider the facilities available to store and then sell the product. If a local elevator will not handle a particular crop, then that crop may not be a viable alternative for the farmer, even if there are no problems in actually growing the crop. For example, in this study, one found that although wheat and milo were being suggested as alternative crops to corn because of the drought and cutworm problems, many grain elevators either could not or would not handle two grains at one time (i.e., corn and milo are harvested at the same time). There was one grain elevator in the area that could and would handle the two grains and thus this problem did not arise in the study area. However, in areas where local elevators will not accept a particular crop, the farmer would then be forced to ship the crop to the nearest buying market or depot which could quickly make the crop too expensive to grow.

Therefore, the marketing outlets for a crop must be considered in the crop production practices of farmers when looking for viable alternatives to growing a particular crop.

5.0 INFLUENCE OF THE FEDERAL REGULATORY TIMETABLE ON CROP PRODUCTION SYSTEMS AND PEST CONTROL STRATEGIES

In this chapter, brief reviews of the federal regulatory timetable for the aldrin/dieldrin and chlordane/heptachlor decisions are first given, including the mechanisms used to disseminate this information to the local level and particularly to the farmer. With this as a background, the initial reaction of farmers to the knowledge of the pending and the actual suspension of these pesticides will be discussed.

5.1 The Aldrin/Dieldrin Decision*

The first public widespread indication that the Environmental Protection Agency wanted to take regulatory action against aldrin/dieldrin came in March of 1971 when the Administrator issued a notice of intent to cancel all registrations of aldrin/dieldrin products. In response to a request by 84 companies whose products were affected by the cancellation order, a scientific advisory committee reviewed the matter and issued a report in March, 1972. They recommended that the following uses be disallowed: all applications by aircraft; all folia spraying or dusting; mothproofing by any methods in which residues are discharged into waterways or settling ponds; all use on turf except as controlled by individuals trained or licensed in pest-control; any use involving application in aquatic environments.

In June, 1972, an EPA order withdrew cancellation notices for aldrin and dieldrin uses in deep ground insertions for termite control, nursery dipping of roots and tops of non-food plants, and fabric mothproofing when there is no wastewater discharge. Notices of intent to cancel all other major uses of these chemicals were reaffirmed.

*Much of this description was taken from EPA press releases and Environmental Facts on Aldrin and Dieldrin compiled in January, 1975 by the EPA.

Six months later, in December, 1972, EPA issued an order which elaborated on its action of June, 1972, announcing that the Agency would continue to permit use of aldrin and dieldrin for the protection of corn, citrus and certain other crops pending the outcome of a public hearing scheduled to begin in April, 1973. This order followed the voluntary withdrawal by industry of such controversial registered uses as those involving aerial applications, dust formulations, products for fire ant control, and granules for termite control.

The cancellation hearing on the benefits and risks of aldrin and dieldrin began on August 7, 1973 in Washington, D.C. Primary participants in the hearing were the Shell Chemical Company, sole manufacturer of aldrin and dieldrin; USDA; Environmental Defense Fund (EDF); and EPA. Regional hearings were also held in Davenport, Iowa and in Kansas City, Missouri and a number of farmers from the study area (i.e., type I farmers with medium to high resources) indicated that they testified at these regional hearings.

One year after the cancellation hearings began, on August 2, 1974, EPA issued a notice of intent to suspend registrations of those uses of aldrin and dieldrin under investigation in the cancellation hearing, based primarily on evidence that the pesticides are potential carcinogens and thus pose an "imminent hazard" to human health. The cancellation hearing was temporarily adjourned when Shell appealed the suspension and requested an expedited hearing on the question of "imminent hazard." The expedited hearing took place in Washington, D.C. and was concluded on September 12, 1974.

On October 1, 1974, following the recommendation of the Administrative Law Judge at the close of the hearing, the EPA Administrator reaffirmed his earlier notice of intent to suspend and prohibited the further production for use of all aldrin and dieldrin products not specifically exempted in the June, 1972 order. The October order, however, permitted continued sale and use of the very limited existing stocks of the pesticides formulated prior to issuance of the notice of intent to suspend on August 2, 1974. The suspension order was appealed in the U.S. Court of Appeals by Shell and USDA. EDF, which supported the suspension, appealed the Administrator's decision to permit the use of existing stocks of the pesticides. On April 4, 1975 the U.S. Court of Appeals upheld the EPA suspension order as originally stipulated.

Throughout this long proceeding, EPA kept the public informed through periodic press releases issued in Washington and through

notices issued in the Federal Register. Major news sources -- newspapers, national news on television and radio, weekly news magazines, etc. -- all covered these developments and disseminated the information in a timely fashion. Therefore, it is likely that many farmers and those institutions concerned and affected by the decision, first heard about the final suspension order through the mass media. In addition, some farmers were aware that hearings on the cancellation of aldrin/dieldrin had taken place since they testified at the regional hearings. Furthermore, certain institutions (e.g., the extension service and chemical companies), through their involvement in the legal proceedings, were aware of the regulatory actions; however, they typically follow these developments through the Federal Register as well.

Secondary sources -- e.g., farm magazines, pesticide dealers, extension service newsletters, etc. -- also provided information and more details about the decision, tailored to the particular interests of their clientele. In fact, for some farmers, the pesticide dealer was the initial source of such information.

Finally, neighbors, friends and relatives, when they got together socially, at meetings, or at the local "hangouts" (i.e., pesticide dealers grain elevators, etc.), also served as a source of disseminating this information to those farmers who did not hear about the decision through the typical mass media channels.

Further details about how news of the regulatory decision filtered down to the local level, e.g., time lag from the EPA news releases to the actual knowledge of the regulatory action (which was not necessarily obtained via the mass media) cannot be given due to the limited data that was received and the lack of recall on the part of the respondents. However, some thoughts are suggested in Section 5.3 below.

5.2 The Chlordane/Heptachlor Decision*

On March 18, 1971 the Administrator of the EPA announced that active internal review was being initiated on a number of pesticide products, including those containing chlordane and heptachlor. Approximately three and one half years later, on November 18, 1974, the EPA

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*Much of this description was taken from EPA press releases.

Administrator issued a notice of intent to cancel the majority of uses of these two pesticides. Excluded from this notice were the following uses: subsurface ground insertion for termite control and the dipping of roots or tops of non-food plants. Among the cases affected by the notice were: heptachlor for use on corn, other vegetables, cereals, forage crops, seed crops, and seed treatments; chlordane for household and commercial applications, including crabgrass and indoor pest uses, and uses on corn, grain, fiber and forage crops, certain fruits and vegetables, seed treatments and summertime use in sewage treatment plants for control of certain larvae.

A public hearing to provide an opportunity for all affected parties to air their views was requested within the thirty day limit by a number of parties, including the Velsicol Chemical Corporation of Chicago, Illinois, the principal U.S. manufacturer of chlordane and heptachlor. Written testimony for the cancellation hearings was taken beginning in January, 1975.

However, before this public hearing actually got underway, the EPA Administrator on July 29, 1975 issued a notice of intent to suspend the registrations of products containing these pesticides for most household and agricultural uses citing an imminent human cancer hazard. The only uses excluded from this notice were those excluded in the cancellation notice.

The expedited suspension hearings began on August 6, 1975 in Washington, D.C. before an Administrative Law Judge and were concluded on December 5, 1975. On December 24, 1975 the EPA Administrator reaffirmed his earlier notice of intent to suspend and announced an immediate ban on approximately 85 percent of the uses of heptachlor and 70 percent of the uses of chlordane. However, for those uses now suspended, existing stocks of chlordane/heptachlor products produced prior to July 29, 1975 may be used up according to label directions.

Continued use of chlordane/heptachlor on corn was allowed through August 1, 1976. However, the Velsicol Chemical Corporation voluntarily agreed to stop producing heptachlor for many uses, including corn. The Administrator found that while chlordane and heptachlor are used on only 1.5 and 1.3 percent of farms on which corn is grown, respectively, no major economic or crop loss would occur if chlordane were unavailable for that use. However, because the need for these pesticides is concentrated in certain areas of comparatively wet land, and because the farmers in those areas need time to develop operating

experience and familiarity with insect scouting and other techniques as alternatives to chlordane, the Administrator will continue to permit that pesticide to be used for the 1976 growing season only, with a cut-off on August 1, 1976.

The Administrator's December 24, 1975 decision has been challenged in two separate law suits -- one by the Velsicol Chemical Corporation and one by the Environmental Defense Fund. Velsicol's petition requested the court to set aside all portions of the Administrator's order that suspend any registrations of heptachlor and chlordane, and EDF charges that the Administrator violated FIFRA by failing to suspend immediately all uses of the pesticides.

Whether the suspended and allowable uses of heptachlor and chlordane will remain will depend on the outcome of more in-depth cancellation hearings. The cancellation hearings were interrupted by the suspension action and were resumed in Washington, D.C. on June 22, 1976.

As was the case with the aldrin/dieldrin regulatory action, EPA has kept the public informed through periodic press releases and through notices in the Federal Register. The same sources that disseminated the information about the aldrin/dieldrin decision were found to be at work during this regulatory action as well; however, some farmers affected by the decision had no knowledge of the chlordane/heptachlor regulatory action as is further discussed below.

5.3 The Reaction of Farmers

A farmer's reaction to a pending or actual decision to restrict the use of a pesticide is, of course, first contingent upon knowing that some kind of regulatory action has taken place. The current study found that a farmer's knowledge about the aldrin/dieldrin and chlordane/heptachlor regulatory actions was correlated to his current use of these pesticides. Those farmers who never used or have not used the pesticides in recent years -- i.e., type III and IV farmers -- either knew nothing or very little about the regulatory actions, other than they thought they had heard something about it but were unsure of when or how. For them, the decisions did not have any real effect on their crop production practices, and thus there was no need to "keep up" on the decisions.

For those farmers that do use these pesticides -- i.e., primarily type I and in emergencies, type II farmers -- most were aware that aldrin/dieldrin had been suspended. Knowledge about chlordane/heptachlor being suspended was more limited, but some of these farmers did know that some regulatory action was being taken against these two pesticides. Accounting for the fact that the aldrin/dieldrin decision was rendered in October, 1974 and the chlordane/heptachlor decision in December, 1975 (i.e., the aldrin/dieldrin decision has had more time to filter down), two additional factors explain these differences -- contact with pesticide dealers and supplies of the pesticides. Although many farmers heard "something" about these regulatory actions via the news media or in farm magazines, the aldrin decision, for example, did not "hit home" until they then came into contact with their pesticide dealer, in December, 1974 and January, 1975 for some farmers, and in the spring of 1975 for most farmers. This is where they again heard about the decision (or for some heard about it for the first time), and where the decision first affected them, if carry-over supplies of the banned pesticides were tight or unavailable. That is, most farmers did not become fully knowledgeable of the aldrin decision (i.e., receive detailed information, take the messages seriously and attend to it) and really view it as problematic until they contacted their dealer and found that they had or would have difficulty buying what they used to use. Therefore, prior to the time when carry-over supplies became scarce, farmers tended to do little experimenting with alternatives and did not actively seek information about alternatives. For example, many farmers said that they did not know of an alternative pesticide as effective as aldrin and were concerned when the supplies ran out; however, they also said that they just did not know what to do because they never had to face a situation of this sort before.

Nevertheless, for some farmers who had heard about the regulatory action through the national news or through some other form of the news media, their first reaction was to contact their pesticide dealer. In some cases, dealers contacted their long time customers to tell them about the decision and to come in early to order their pesticides due to the shortages that were apparent. Upon contacting their dealer, these farmers reacted by stockpiling carry-over supplies of the banned pesticide. This reaction was exhibited by the larger higher resource type I farmers who depended upon aldrin year after year. Other farmers, unaware of the decisions or unable to afford the cost of stockpiling, waited until they normally bought their insecticides and either took what their dealer had to offer or shopped around looking for supplies of the banned pesticide.

Hence, it appears that pesticide supply is the primary stimulus for the farmer to change his previous production practices, and not awareness of the regulatory action itself (i.e., "hearing" something about the pesticide regulatory action). Thus, because carry-over supplies of aldrin/dieldrin had been banned and they began adjusting to the situation. However, for chlordane/heptachlor, adequate supplies were still available in 1975 and few farmers interviewed in January and February of 1976 realized that production of heptachlor had been discontinued by Velsicol in July, 1975 and that useof chlordane/heptachlor was allowed only until August 1, 1976 on corn. It can be assumed that as more farmers went to their dealers to order their pesticides for the 1976 growing season, they became knowledgeable that chlordane/heptachlor have also been suspended on corn effective August 1, 1976, and that they began to react to this suspension due to the tight carry-over supplies that would result.

The user adjustment response patterns to the aldrin/dieldrin and chlordane/heptachlor regulatory actions are described in the next chapter.

6.0 USER ADJUSTMENT RESPONSES AND PROBLEMS

Adjustments to date (i.e., as of March, 1976) have been minimal on the part of corn farmers. Overall, there had been a great deal of stability of approach to pest control prior to the regulatory actions against aldrin/dieldrin and chlordane/heptachlor (indeed, sufficient stability that a fourfold typology of pest management strategies has been developed which adequately typifies individual farmers over time -- with very few moving across group boundaries). Moreover, the most striking finding amongst corn farmers is that this stability carried over into the 1975 growing season (i.e., the first growing season affected by the aldrin/dieldrin decision) such that it minimized user adjustment responses. Nevertheless, some trends have been noted and are anticipated and these will be discussed under the following categories:

- No response to the regulatory action;
- No change in current pest control practices;
- Use of new chemical pesticides;
- "Take a chance"; and
- New practices to pest control, e.g.:
  - Use of early to moderate maturing varieties and/or early planting;
  - Reallocation of crop acreage; and
  - Intensive use of scouting.

These categories, it should be emphasized, are not necessarily disjoint empirically. Rather, they are offered as a means of conceptually organizing data from corn farmers. That is, farmers may have simultaneously exhibited more than one adjustment response described above or may have switched from one response to another. Moreover, it should be emphasized that the responses observed (except for the no response observation) are by and large on behalf of type I farmers, and to some extent type II farmers (according to the typology previously developed), as these are the ones who primarily use aldrin, chlordane and heptachlor and have cutworm problems.

6.1 No Response to the Regulatory Action

For many farmers (i.e., type III and type IV farmers), the regulatory actions taken against aldrin/dieldrin and chlordane/heptachlor had no effect on their crop production practices. These farmers did not have the cutworm problem and therefore, never had the need to use these insecticides. Hence, when asked about what effect the banning of these pesticides had in 1975, many were not even aware that these pesticides had been banned! Their reply was that it had no impact on them and no effects or changes in their practices were foreseen in future growing seasons. That is, they perceived that their practices would continue as they had been performed in the past, with no problems whatsoever.

6.2 No Change in Current Pest Control Practices

For those farmers who had heavily relied upon aldrin prior to the regulatory action (i.e., type I farmers), many responded in 1975 by continuing to use aldrin. This response was contingent upon obtaining aldrin which implied that carry-over supplies of aldrin had to be already in hand or found early enough in the season. This required some monetary resources and therefore, only the medium to high resource type I farmers exhibited this response in 1975.

Additional adjustments or responses which can be understood largely as a function of this transition period (i.e., the time between the banning of the pesticide and when all carry-over supplies are gone) were also noted. For example, shopping around for available supplies and lowest prices appears to be more frequent now than in the past. While this change from sole reliance on "the family dealer" is no doubt based on several changes (shortages due to the petroleum crunch and higher prices due to inflation, among others) in the operating environment, the "scramble" for available supplies seems at least partially due to EPA bans. Stockpiling and use of "anti-termite aldrin" were also noted and can be viewed as transitional adjustments, in that they simply "buy time" for the farmer and delay the necessity of some more profound adjustment.

During the current growing season (i. e., 1976) only a few high resource type I farmers indicated that they would continue to respond to the pesticide ban in this manner. The primary reason for this is that these are the only farmers who still have carry-over supplies of aldrin! This again supports the finding that until carry-over supplies of a banned pesticide are no longer available, the first adjustment has been to expend extra efforts to obtain the banned chemical, as opposed to any change in agricultural practices.

The occurrance of this response, may, to some extent, be due to the messages received by the farmers from the institutional setting. For example, the extension services in Iowa and Missouri (and consequently pesticide dealers) continue to recommend carry-over supplies of the banned pesticides, dealers have tried to stockpile the banned pesticides, and some financial lenders expect pesticides to be used in the crop production process.

6.3 Use of New Chemical Pesticides

A change from aldrin to heptachlor (and sometimes chlordane) in 1975 was exhibited by those farmers who were, for the most part, unable to get aldrin. Primarily low and medium resource type I farmers and medium resource type II farmers switched to this alternative, enabling these farmers to continue their basic approach to growing corn. That is, the type I farmers continued their non-contingent preventive type strategy with no change in other pest management practices and the type II farmers were able to continue their contingent use of a preventive type insecticide with no additional changes in pest control strategy.

However, the shift from aldrin to heptachlor or chlordane did entail several other adjustments. First, these pesticides were in short supply* and farmers did have difficulty obtaining adequate supplies of

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*This is partially due to the fact that in the past, pesticide dealers in the area primarily dealt with the aldrin distributor rather than the heptachlor distributor and thus experienced some problems in having their heptachlor orders filled. The petroleum crunch of 1974 may have also contributed to this problem.

this alternative pesticide. Many farmers, as a result, took early delivery but by doing so had to pay for them earlier since dealers now require payment within thirty days. This has increased the need for credit and may be seen as a stress in the farmer's operating environment.

In addition, the lower concentration of heptachlor formulations and the higher application rate required with chlordane (both relative to aldrin) required that the application equipment be recalibrated. This is an "empirical" task requiring a trial and error approach, sometimes entailing several "trials". For example, one farmer applied chlordane as if it were aldrin, obtained poor control and had to replant his crop.

Moreover, farmers indicated that because of the greater volume which must be handled, increased trips to the dealer may be required, greater storage capacity is needed (particularly significant in light of the previously mentioned trend to early delivery), and an increased number of containers must be disposed.

The farmers also indicated that the cost of these alternatives were greater than aldrin and some farmers did not feel that heptachlor and chlordane gave as good control as aldrin.

Nevertheless, this response is seen as one that will continue with greater frequency in 1976 (and in 1977 if carry-over supplies are still obtainable). Those farmers that used aldrin in 1975 and could not get any for 1976, had either put in orders for heptachlor or chlordane or were planning to. In addition, one type IV farmer, who never used pesticides before, planned on using chlordane in 1976 since he experienced some cutworm damage in 1975.

6.4 "Take a Chance"

Some farmers who tried and were unable to get either aldrin or heptachlor in 1975 decided to "take a chance" and used no cutworm insecticide in their pest management strategy. Others decided to "take a chance" because they could not get aldrin. They did not seek out a source of heptachlor because they either: (1) did not know that heptachlor was an alternative, (2) thought that it was also banned, or (3) did not think it was as good as aldrin. Farmers exhibiting this "take a chance" response tended to be low to medium resource type I farmers, although one high resource farmer took a chance because he did not think heptachlor was as good as aldrin.

Associated with this response were a number of considerations for the farmer. Should he incur cutworm damage, he must then decide if he will replant, and if so, what crop. Some farmers said that they would replant corn. However, weather and the time of year are important. If the weather is unfavorable and it gets too late in the season (e.g., June 15), corn is not desirable to plant. Moreover, some farmers said that the time it takes to plant the first crop is also a factor; that is, some of the larger farmers are still planting their first corn crop in early June and thus would not have time to replant with corn. Others said that they would not risk planting corn a second time unless some preventive type insecticide could be found before replanting. For these reasons, soybeans may become an alternative crop on replanting. However, if this is done, farmers must be sure not to use Atrazine (a corn herbicide) on their corn crop because it will kill the replanted soybean crop. In addition, the farmer must weigh the additional cost of replanting and the expected income to be derived, versus the reduced income caused by the reduced yield he would get if he did not replant.

Indications were received that this "take a chance" strategy may increase during the 1976 growing season, as well as during subsequent growing seasons. As one farmer put it, "everyone will take a chance until they get wiped out once". Thus, the frequency of replanting may also increase as a result of this strategy.

6.5 Use of Early to Moderate Maturing Varieties and/or Early Planting

Only a few farmers interviewed indicated the use of early to moderate maturing corn varieties or early planting as a mechanism to minimize cutworm damage. These were high resource type I and type II farmers and it is significant that this adjustment is not widely discussed and may not be perceived as "available" by many farmers.

Part of this explanation may come from the fact that the Iowa and Missouri extension services do not promote this response as a way to specifically minimize cutworm problems. Another factor is the weather. Gumbo soil drains very poorly and a crop cannot be planted until the soil sufficiently drains. Thus, if the soil is still wet in early spring, a delay in planting the crop may result.

No indication was received as to whether this strategy will increase in popularity in future years.

6.6 Reallocation of Crop Acreage

A number of medium to high resource type I and type II farmers indicated that in 1975 they reallocated their crop acreage as a result of not being able to get adequate quantities of aldrin or heptachlor. For example, alternative crops to corn, such as soybeans, wheat, or milo, were planted in fields having gumbo soil (i.e., fields that were believed to have somewhat predictable propensities for cutworm damage) and could not be treated with aldrin or heptachlor due to shortages. It should be noted that these same areas were frequently placed in the Soil Bank before this program was repealed.

Although no major obstacles were indicated in switching to these crops, it was indicated that growing milo and wheat are not as common as growing corn or soybeans. As a result, the local institutions are not as familiar with milo and wheat as they are with corn and soybeans. For example, milo cannot be insured in Fremont County, Iowa, whereas the other crops can, and the extension service in both counties provides more detailed information on corn and soybean production practices in comparison to the others. Thus, some farmers may need to acquire some skills prior to growing these crops and may encounter some difficulties in doing so.

In addition, milo can also be irritating to the eyes and skin and some farmers said they could not grow milo because of prior allergic reaction. Moreover, it is important that it be harvested within three days after a freeze, with one grain elevator suggesting that a farmer not plant milo unless he has his own harvesting equipment. Finally, the farmer must be sure to find an elevator that will handle these alternate crops. This latter problem, however, was not found in the study site but was merely suggested as one constraint on the viability of wheat and milo.

Some type I and type II farmers indicated that in 1976 and particularly in later years, more shifting of crops away from corn could be likely if no alternative to aldrin and heptachlor was available. That is, many said that wheat, milo, or soybeans would be planted in their problem areas (those fields susceptible to cutworm problems) and they

would "take a chance" with corn on the rest of their crop acreage. However, a number of farmers indicated that they would not grow corn unless an alternative as effective as aldrin came along, or unless the risk warranted it (i.e., the price was favorable), while one farmer took an opposite view and said he would grow continuous corn and feed it to his cattle.

6.7 Intensive Use of Scouting

It is important to make the point that intensive use of scouting, leading to contingent use of rescue insecticides, has not been found in the study area nor was it suggested as a possibility for future years, although the Iowa and Missouri extension services do include rescues in their recommendations. A number of reasons are available to explain this phenomenon in this area.

Corn farmers are accustomed to using aldrin, a preventive type insecticide they believe to be 100 percent effective. With this insecticide, farmers never expected nor experienced cutworm damage and therefore never saw the need to scout their fields. Thus, it is a practice that is without history or institutional basis and foreign to them. Consequently, they currently lack the knowledge to effectively scout their fields, and in addition, may not be willing to accept a given level of cutworm damage that is necessarily associated with the use of scouting.

Furthermore, the successful use of rescues was reported by several research entomologists to be contingent upon not only scouting, but an understanding of the cutworm's life cycle. Thus, the extension services' and research institutions' admittance that they lack knowledge concerning the cutworm's life cycle makes the appropriate use of rescues uncertain to these institutions.

Finally, pesticide dealers are reluctant to stock rescues because their shelf life is at most one growing season and it is difficult to anticipate demand. Thus, they are not available to the farmer as a viable alternative.

7.0 CONCLUSIONS

In light of the schedule of the aldrin/dieldrin and chlordane/heptachlor suspensions relative to the time period of field work, the rather minimal adjustment responses observed as of March, 1976 (i.e., primarily continuing to use aldrin for as long as possible and after that, changing from aldrin to heptachlor or chlordane) are quite important for they indicate that very little in the way of preparatory or anticipatory adjustment has been undertaken on the part of the individual farmer. Indeed, supporting this contention are several indicators:

- Unusual efforts have been expended to obtain aldrin, including stockpiling on the part of farmers as well as pesticide dealers and the use of aldrin labeled for anti-termite use; and

- Little or no knowledge that heptachlor and chlordane have been suspended was found to exist amongst farmers.

A number of factors can be delineated to explain the responses and problems described in Chapter 6.0. Knowledge that a regulatory action is pending or has actually occurred is, of course, a precondition to the response process. As already discussed, the current study found that the corn farmers in the study site may become aware (i.e., hear ("something") of a regulatory action via the news media. However, they do not become fully knowledgeable of a regulatory action (i.e., receive detailed information, take the messages seriously, and attend to it) and view it as problematic until they come into contact with their pesticide dealer and find that carry-over supplies of the banned pesticide are or will be tight. Indeed, pesticide supply appears to be the primary stimulus for the farmer to change his pest control and production practices and not awareness of a regulatory action itself, i.e., learning "something" about a pesticide regulatory action.

An important consideration for the individual farmer in determining his response is his personal resources e.g., his past practices to pest control (i.e., tradition), his financial resources (cash and/or credit), his information seeking activities, his managerial skills and his contact with pesticide dealers. For example, those farmers who heard of the aldrin ban through the news media and stay in contact with information sources such as the extension service, have good dealer contacts, and

have adequate financial resources,* were best able to stockpile aldrin in order to maintain their current pest control practices. Indeed, some dealers contacted their long time better customers shortly after the ban was announced to warn them that carry-over supplies were tight and to urge them to place their orders early.

Those unable to stockpile or locate a source of aldrin when the 1975 growing season approached, were forced to adopt an alternate strategy. A farmers personal resources and his ability to absorb a succession of poor crop years, i.e., poor crop yields, are again important considerations in the response chosen. The lower resource farmers tend to respond in the way that is least costly and/or least risky to their overall crop production process. Thus, simply a pesticide substitution, e.g., aldrin to heptachlor, was one response if heptachlor could be found. For many who could not get heptachlor, a "take a chance" strategy was utilized. The higher resource farmers, on the other hand, who can more easily absorb a poor crop year will, on occasion, utilize strategies that may be more costly and/or more risky in that they depart somewhat from their past practices. For example, crop substitution (assuming no allergic reaction to the alternate crop) or the use of earlier maturing varieities were practiced by a limited numberof such farmers. However, the high resource farmers, who may be more likely to take risky alternatives than the low resource farmers, also tend to have access to a wider range of information sources and so are more likely than the low resource farmers to adapt in a fashion they regard as successful, regardless of the response alternative chosen.

However, the study found that the institutional network within which the corn farmer has to operate is most critical, both for dictating available response options as well as alleviating associated problems. When faced with replacing a banned pesticide, the farmer looks to the institutional setting to provide an answer just as he does when he is faced with a pest resistance situation. That is, the buildup of pest resistance to a particular pesticide has, in the past, initiated cooperative research activity from numerous institutions (e.g., agricultural experiment stations, extension services, chemical companies, etc.) to develop alternative pest control strategies (chemical or other) for the problem pesticide and to disseminate these alternatives to the farmer through his local information sources (e.g., the pesticide dealer). In addition, pest resistance to certain pesticides has created new institutions (e.g., professional scouting, professional pesticide application, etc.) to help in this adjustment process, when necessary.

*This description fits those who are typically the higher resource farmers.

The withdrawal of a pesticide calls for this same type of responsiveness from these same institutions; however, the time factor can be more critical with a pesticice regulatory action, in that pest resistance to a pesticide is noticeable and usually evolves over a long period of time, whereas the knowledge of a pesticide regulatory action may not be known far in advance and will impact in a shorter time period. Moreover, the removal of a pesticide may sufficiently increase the risk of growing the crop to warrant a crop substitution. In this case, the ability of the institutions to provide services similar to those that they provide for other crops (e.g., educational information, operational loans, crop insurance, markets to sell the crop), is important if crop substitution is to be a viable alternative.

Consequently, the available response options open to a farmer and the ease with which he can adjust to a pesticide regulatory action are, most definitely, dictated by institutional responsiveness and institutional foresight vis-a-vis EPA regulatory decisions. In the corn study site, the above mentioned institutions were found to be unprepared to meaningfully help the farmer cope with the regulatory actions and consequently, they were slow to react. As a result, the individual activities and resources of farmers became that much more important. Moreover, the viability of new pest control practices, particularly alternative crops and intensive use of scouting with contingent use of rescue insecticides, were hindered or even precluded, largely due to these institutional constraints, as already detailed in Sections 6.6 and 6.7.

Finally, the user adjustment response process is contingent upon uncontrollable and/or confounding conditions unrelated to the regulatory decision. For example, pesticide supply shortages caused by a petroleum crunch, weather, market conditions and levels of pest infestation, all had an influence on both the response options open to corn farmers and the subsequent problems, as already described in Chapter 6.0.

Part II - COTTON CASE STUDY RESULTS

8.0 COTTON CROP PRODUCTION SYSTEMS AND PEST CONTROL STRATEGIEIS

In order to appreciate the user adjustment process exhibited by cotton growers faced with the cancellation of DDT, it is necessary to first have an understanding of the factors bearing on their decision to produce cotton. Once this is accomplished, it is important to look at the strategies (i. e., production systems) used by different farmers in growing cotton, paying particular attention to their insecticide use strategies.

8.1 Factors Determining Cotton Production by Farmers

A number of factors enter into the farmer's decision of whether or not to grow cotton in certain fields that they farm. One important factor is tradition, i. e., farmers who have grown cotton all of their lives will continue to do so and make a go of it because they feel it is prestigious to grow cotton. Many of the farmers that were interviewed grew nothing but cotton, and those that grew both cotton and soybeans stated that their better land would be planted to cotton and the rest of their land (or most of it) to soybeans, indicating that these farmers have designated their land as either "cotton land" or "soybean land".

However, there are other important factors that the farmer considers before making a final decision to grow a particular crop. Two inter-related factors are the price of the crop and the cost of producing the crop. For example, over the last 2.5 years, cotton prices were at their lowest in late 1974 and early 1975* and the cost of producing the crop had increased significantly during the 1974 growing season due to various factors, including the weather, inflation, pesticide shortages and the ban of DDT. As one farmer who dropped producing cotton in

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*USDA, ERS, Cotton and Wool Situation, CWS-4, March 1976, p. 12.

1975 put it: "The cost of raising cotton changed my mind more than anything else. It's too damn expensive!" Thus, for some farmers, the low cotton prices, coupled with high production costs, led them to grow alternate crops in 1975.

Another important factor that the farmer must consider is the weather, which he has no control over. Ideally cotton should be planted around May 10.* Peak yields can be expected from cotton planted around this time. Furthermore, reductions from full yield will be less for cotton planted before May 10 than for cotton planted after May 10. Therefore, if farmers cannot get their cotton crop planted by May 10 or soon thereafter, i.e., by June 1, alternative crops may be planted by farmers.

In addition to these factors dictating a farmer's decision to grow a particular crop, farmers can receive messages from a number of sources, which in some way may affect their crop decision and subsequently their pesticide use decisions. As our field work uncovered, these sources may include:

- Neighbors and friends (i.e., other farmers in the community);
- Landlord (if a tenant);
- County extension agents;
- University extension publications;
- Agricultural chemical dealers;
- Implement and supply dealers;
- Trade and promotional meetings;
- Pesticide manufacturers' representatives;
- Professional scouts;
- Professional applicators;
- Cotton ginners;
- Cotton buyers;
- Pesticide label;
- Radio;
- Television;
- Farm magazines; and
- Local bankers, production credit association, or Farmers Home Administration.

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*Burch, T.A., When to Plant Cotton in Louisiana, Cooperative Extension Publication Number 1743, Louisiana State University, January, 1973.

Some of these sources are more influential than others and most farmers do not receive messages from all of the above sources, but rather from some subset of them.

In order to give an indication of when farmers would receive information from these various sources vis-a-vis the production of cotton, a one year timeline of crop production can be developed with these sources superimposed on that timeline. Such a timeline appears in Exhibit 8.1.

Assuming the weather conditions are proper, ground preparation begins in January. If any stalks are left in the field to be cut and disked, this would be carried out first. During all of February and into March, crops, equipment and other agricultural components are financed. As a general rule most farmers have decided what crops they will be raising and how they will be financed by March 1st. Some farmers have also purchased their pesticides by the end of February. Extension meetings and chemical promotions also occur during the first part of the new year.

In theory, planting can begin as early as April 10th, although this is regarded by most as only an "acceptable" time of planting. April 20th is a much preferred date of planting since by now, ground temperatures are rising. May 10th is perceived as an ideal time for planting, in terms of obtaining a peak yield since ground temperatures are now most favorable.

All throughout April and early May, trap-cropping* (although not practiced primarily due to the increase in production costs) could be carried on (in theory) as an insect control measure. By late May and early June, most crops will have reached the two leaf stage or hopefully will have matured even more so. When plants average at least three half grown or larger squares per plant, boll weevil control is recommended if 25 percent of the squares have been punctured by boll weevils.

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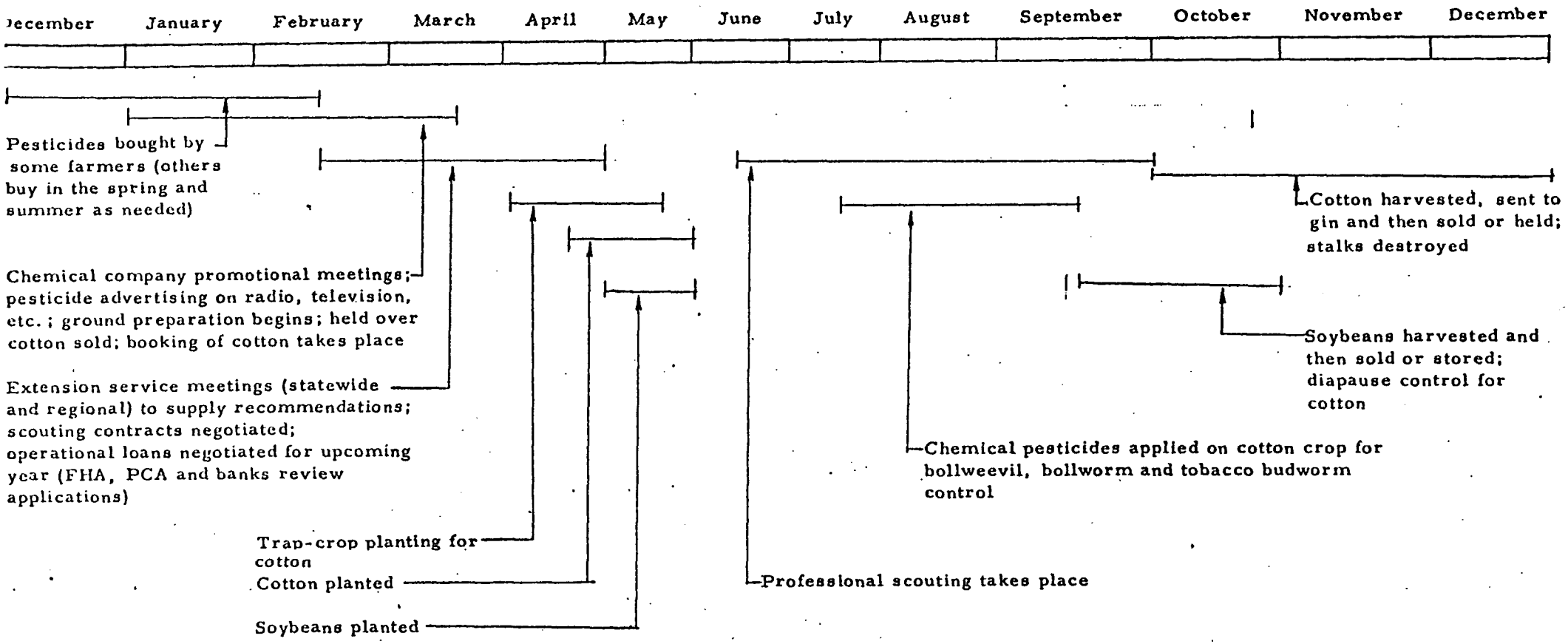
*Trap-cropping refers to the practice of planting strips of 8 to 16 rows of cotton along field borders in known boll weevil "hot spots" to attract and concentrate overwintered weevils. This should be done 3 weeks before planting the main cotton crop. When the plants are at the "pinhead" square stage, 5 applications of a boll weevil insecticide are to be applied at 5 day intervals to kill the overwintered weevils before they spread over entire fields.

Exhibit 8.1: Timeline of Crop Production



However, most farmers are more conservative and begin applying insecticides when 10 to 15 percent damage occurs. In the early part of July, preferably around the 10th, bollworm and tobacco budworm treatments can also begin, according to extension service recommendations. At this time the cotton squares are at least one third grown and plants are setting bolls. Bollworm and budworm treatment as such is dictated if 15 percent of these squares or bolls are damaged. Also around July 10th, plantbug and fleahopper treatments can begin with generally an unspecified terminal date. However, pest control via means of beneficial insects, is encouraged by the extension service into late July and possibly August, all factors permitting, because as soon as chemical pesticides are used, they must be continued because the first chemical pesticide application will kill the beneficials. All growing season insect control methods extend up until approximately the end of August or early September.

Diapause control should begin at the time growing season insecticide control ends; this control generally being a reapplication of "growing season insecticides" based upon a 10-14 day cycle, rather than a 5-day cycle. Diapause application should continue, in theory, until the stalks are cut or killed, or the end of October. Many farmers indicated that they could not afford diapause control. Others who would have applied diapause treatments did not do so, saying that it would not be effective unless their neighbors also participated in diapause control.

The picking of cotton can be intermingled with the diapause sequence, for those who practice it. Stalk destruction should proceed immediately after picking but is sometimes delayed until the latter part of the year or early the following year, as indicated previously. One reason given by some farmers for never destroying all of their stalks immediately after picking is that they allow their cattle to graze on the land. Some landlords insist on this and many believe that cotton land is excellent grazing land for cattle. Non-farmers in the community said some farmers would rather go hunting and fishing than chop the stalks, indicating that this practice may interfere with their (the farmers') leisure activities.

Therefore, the end of October is a terminal date for that year's cotton growth, but it may or may not be for the picking, ginning, storing and marketing of cotton. In short, once the growing season has terminated, the sequence from the picking of cotton to the selling of it is more variable and not subject to the schedules which are followed during the growing season.

A further discussion of these sources of information and their influence and impact on the user adjustment process appears in subsequent chapters.

8.2 Cotton Crop Production Systems

Before one can begin to make distinctions between various crop production systems, it is important to note that all farmers growing cotton in northeast Louisiana, the geographic location where this study took place, have been plagued with tobacco budworm problems and they were particularly severe during the 1974 growing season. In addition, inflation was noted as a problem, as well as the weather and pesticide shortages. Thus, all in all, the situation was described as one of desperation. For example, one farmer said "we were just guessing", when referring to the insecticides to use to control the tobacco budworm. This was confirmed by a professional scout when he summed up the situation by saying "the farmers did not know what the hell to use!"

Moreover, it is important to understand that the use of insecticides in cotton production is a way of life with the cotton farmer. That is, in northeast Louisiana, cotton farmers have a long history of using insecticides, particularly DDT, and their practices indicate that when cotton is grown, insecticides are always used. Moreover, the "chemical solution" orientation is such that among farmers, one expects "24 hour kill". Hence, no cotton farmer has suggested total termination of insecticide use, although different farmers have different philosophies about their insecticide use strategy.

Farmers were found to frequently utilize a number of sources for helping them decide what particular pesticides to use, i.e.:

- Extension service;
- Pesticide dealers;
- Professional scouts;
- Aerial applicators; and
- Neighbors, friends, and relatives.

The relative importance of each source can vary am
some choosing a particular pesticide because the
it, and others choosing a pesticide because it
through their dealer.

In order to distinguish between different types of farmers, or crop production systems, a typology of farmers, based upon their insecticide use strategy during the 1975 growing season, was developed. It would have been preferable to distinguish between different types of farmers based upon their insecticide use strategy prior to the DDT decision (i.e., during 1970-1972) in order to see how this affected their subsequent adjustment. However, such a distinction was not possible because almost all cotton farmers had used DDT prior to its cancella- and their recall vis-a-vis their use of other pesticides and pest control practices prior to the DDT cancellation was limited. Nevertheless, the distinction that was used (i.e., their 1975 insecticide use strategy) is a useful one in that it represents various strategies that were adopted by the end of the short term (i.e., three year) adjustment period once carry-over supplies of DDT were no longer available. Three types of farmers (i.e., crop production systems) were identified from those interviewed, i.e.:

- Type I - adopters of "new" pest control approaches to cotton production;

- Type II - users of the more "traditional" approaches to cotton production; and

- Type III - those who dropped cotton production in the 1975 growing season (i.e., "marginal producers").

Type I farmers, adopters of "new" pest control approaches to cotton production, had become more innovative over the past couple of years since the DDT cancellation and were found to exhibit the following characteristics:*

- Many own and/or rent a large amount of land (e.g., up to 2500 acres);

- Cotton acreage in 1974 usually exceeded 500 acres;

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*Based on interviews with 30 farmers designated as of this type.

- Reduced cotton acreage from 1974 to 1975 but 1976 plans indicate cotton acreage will be similar <u>or greater</u> than 1974 cotton acreage;

- Had stockpiled EPN - methyl parathion and DDT, if possible;

- Used EPN - methyl parathion in 1974 and/or 1975 or tried to obtain it;

- Lines up (ahead of time) his insecticide either by reserving it or by buying it;

- Seeks information from extension service, scouts, etc.;

- Beefed up scouting in one way or another with outside information (i.e., a more intensive and higher quality of scouting utilized);

- Adjusts insecticide schedule to match scouting, i.e., tends to apply insecticide only when scouting indicates the need to;

- Indicates tendency to plant earlier;

- Tends to defoliate;

- Practices diapause control, but not extensively;

- Practices stalk destruction, with many of the larger farmers cutting stalks right behind the cotton picker; and

- Cotton yields ranged from 0.44 to 1.3 bales/acre in 1974 and from 0.62 to 1.7 bales/acre in 1975.

Type II farmers, those taking a more "traditional" approach to cotton production, were found to exhibit the following characteristics:*

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*Based on interviews with 9 farmers designated as of this type.

- Owns and/or rents various amounts of land (e.g., 100 to 1000 acres);

- Cotton acreage in 1974 ranged from 50-500 acres;

- Some reduced cotton acreage from 1974 to 1975 but 1976 plans indicate cotton acreage will be similar to 1974 cotton acreage;

- No stockpiling of insecticides and generally no pre-purchasing (i.e., appears to buy insecticides "as needed", one or two applications at a time);

- Seemed to remain with "old standbys", i.e., toxaphene-methyl parathion and endrin;

- Less motivated in seeking out new information;

- No change or only a small increase in level of scouting;

- Sets insecticide schedule, (e.g., every 5 to 7 days) and sticks to it in a firm or nearly firm manner, weather permitting;

- No change in planting dates in recent years;

- Tends not to defoliate;

- Does not practice diapause control;

- Stalk destruction is not practiced at all; and

- Cotton yields ranged from 0.75 to 1.5 bales/acre in 1974 and from 0.5 to 1.25 bales/acre in 1975.

Type III farmers, those who dropped cotton in the 1975 growing season, were found to exhibit the following characteristics:*

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*Based on interviews with 7 farmers designated as of this type.

- Most own and/or rent a small amount of land (e.g., under 350 acres);

- Tends to be the smaller cotton farmer with only 50-250 acres of cotton planted in 1974;

- Planted all their cropland to soybeans in 1975 rather than to cotton and soybeans, citing the excessive costs of cotton production;

- Indicated that they would be planting cotton in 1976; and

- Cotton yields ranged from 0.5 bales/acre to 1.4 bales/acre in 1974.

These crop production systems will be further discussed in subsequent chapters when talking about farmers' responses to these regulatory actions.

9.0 INFLUENCE OF LOCAL AND EXTRA-LOCAL INSTITUTIONS ON COTTON CROP PRODUCTION SYSTEMS AND PEST CONTROL STRATEGIES

Institutions, which represent an integrated set of ideas (i.e., goals, values, norms, etc.), can prescribe, to a given audience on a given subject, what should be done and how it should be done. In Chapter 10.0, a number of sources representing various institutions, were indicated as having an influence on a farmer's representing variouse crop production practices, and more specifically, his pest control strategies. In this chapter, these institutional structures are further described.

These institutions can be broken down into two general types - those having an influence on the input side of the crop production process and those having an influence on the output side. Each type is described with the relationships between institutions explored, as well as some implications for farmer adjustment responses and problems to the DDT cancellation.

9.1 Crop Production Input Factors

In addition to the influence of neighbors, friends and relatives, a number of institutions were shown to have a bearing on the input side of the cotton production systems and pest control strategies practiced by the farmers interviewed in this study. Most important among these institutions are: the extension service, the agricultural experiment station, chemical companies, pesticide dealerships, professional scouting, aerial application, loan institutions, and the mass media. Each is discussed below.

9.1.1 Extension Service

The extension service's primary role is one of education and in the area of pest control, they play a most active role. The primary goals are to make available the recommendations of pest control specialists and to disseminate general educational material in this area.

Every year, a number of regional and statewide meetings are sponsored by the Louisiana State University (LSU) Extension Service to keep cotton farmers and others informed about the latest advances in cotton production and pest control strategies. For example, in mid January, 1976, a "Cotton Growers Marketing Day" was held in Monroe,

Louisiana and a "Cotton Growers Research Day" was held in Alexandria, Louisiana. Each were well attended by farmers. In late March and early April, a four day Pest Management Workshop was held in Alexandria, Louisiana sponsored by LSU. The purpose of this workshop was to instruct farmers, potential scouts, pesticide dealers and others involved with cotton production. The program included topics such as insect identification, proper scouting techniques, herbicides and insecticides, proper application of pesticides, etc.

In addition, each year, in the spring, the university extension service supplies pesticide recommendations for the control of insects and weeds and this information is distributed to pesticide dealers, professional scouts, farmers and others interested in cotton pest control.

The local extension agents in Richland and Franklin Parishes are responsible for disseminating this information to the farmers they serve in their respective parishes. They receive support and supervision from an assistant district agent located in Monroe, Louisiana, who in turn reports to a district agent located in Baton Rouge, Louisiana.

In Richland Parish, this educational material is mailed out to all cotton farmers, pesticide dealers, scouts and anyone else who requests to be on the parish mailing list. Besides the yearly pamphlets describing insecticide recommendations for cotton, the extension agent also mails out weekly postcards during the growing season and other pertinent letters. In addition, local extension meetings are also held each year in late February, March or April after chemical dealers have had their promotional meetings, so that the extension service can present rebuttal evidence, if desired. The meetings are usually scheduled after a heavy rain so that a maximum turnout of farmers can be anticipated. In 1975, one such meeting was held in Richland Parish with fifty farmers attending, representing a cross-section of growers.

In Franklin Parish, the extension agent relies more on the newspaper and meetings (including those sponsored by pesticide dealers) to disseminate the extension information. Extension meetings are generally "worked in" with the chemical meetings (which are larger in number), from March onward and often times the agent is invited to the chemical meeting to supply information and announcements. This summer (i.e., June, 1976) the parish will hold a two day training session on scouting to better educate the farmers or anyone else interested in insect identification, insecticides and the proper use of them, and scouting. An entomologist from LSU will be present.

As indicated above, the extension service is utilized by many farmers and it has been very active in educating the farmer and others in the proper control of cotton insects.* Extension specialists from LSU travel throughout the state and many are personally known by the larger cotton growers. At least as early as 1971, the extension service began warning the farmer that pest resistance to DDT was already becoming a problem, as well as the fear that DDT would not continue to be available. In addition, they began supporting the notion of scouting, use of beneficial insects, and diapause control as a part of an integrated pest management strategy and they began participating in a pilot pest management program in 1972, designed to promote these concepts.

The pest management program recommendations for the 1976 cotton growing season further illustrates their commitment to an integrated pest management strategy and includes:

- Planting trap crops to kill overwintered weevils;
- Planting cotton as early as possible (before mid May);
- Avoiding excessive nitrogen rates;
- Hiring a competent scout;
- Letting beneficial insects combat pests in June and early July;
- Using either EPN-methyl parathion or toxaphene-methyl parathion for bollworm and tobacco budworm control;
- Practicing diapause control; and
- Destroying stalks immediately after harvesting.

However, at the present time, the extension service's primary concern vis-a-vis insecticide recommendations is to have something to recommend to the farmer for tobacco budworm control in the upcoming growing seasons, as the currently registered pesticides are inadequate for optimum cotton production under moderate to heavy bollworm-budworm pressure. Much hope is put on having the new synthetic pyrethroids developed by Shell and FMC and the new organo-phosphates developed by Bayer, registered for the 1977 growing season.

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*Part of this may result from the fact that no agricultural night classes appear to be available at the local level. The only option appears to be at Northeast Louisiana University in Monroe, Louisiana, but these courses are all standard degree oriented courses.

9.1.2 Agricultural Experiment Station

The agricultural experiment station at LSU plays a most important and active role in dictating pest control strategies for farmers to follow. By working closely with the extension service, perceptions of problems are transmitted from the farm level through the extension service to the research entomologists. In addition, the research entomologists themselves stay well in tune with the localized problems by having experiment stations throughout the state (two of which are in the northeast part of the State; one at St. Joseph and one at Winnsboro), and by maintaining contact with local farmers as described above in Section 9.1.1.

Over the years, a great deal of research has been focused on the tobacco budworm problem, not only in Louisiana but in other states as well. In recent years, it has intensified since it has become the dominant species in cotton fields during mid August into September and it is the most feared pest of cotton growers, since adequate insecticides for its control are not currently available.

Each year, in January, a conference on cotton insect research and control is held and is well attended by both extension and research entomologists. The latest information available from the various state agricultural experiment stations is disseminated and pest control strategies for various cotton insects are discussed. Recommendations for controlling the cotton insect complex are made, along with future promising control procedures outlined.

In Louisiana, tobacco budworm research has been adequately funded over the years according to one research entomologist. Research is continual and ongoing every summer at the various experiment stations throughout the state. Research in 1974 and 1975 was the most intensive ever, in several years at LSU. In handling the tobacco budworm infestation, the state legislature appropriated funds which became available in late 1974 and throughout 1975. This funding continues and has allowed for the hiring of two full time entomologists allocated to two experiment stations.

Generally, LSU likes to have experimented with an insecticide (i.e., screened it) for at least two years, and preferably three years, before recommending it to cotton growers. They have not done any major research on the recently registered bollworm-budworm virus insecticide "Elcar", and it will not be recommended for use by cotton farmers.

Currently, the LSU research entomologists are looking ahead five to ten years toward the development of resistant cotton strains and earlier maturing cotton varieties to cope with the tobacco budworm and other cotton insect infestations. Registration of the new synthetic pyrethroids and new organo-phosphates mentioned earlier is viewed only as a short run solution for the next few years, enabling farmers to survive until the new cotton strains are available, since they have recognized cross pesticide class resistance problems. Thus, use of scouting techniques is highly recommended and dependence on insecticides, they feel, must be discontinued.

In all, a sophisticated research entomology operation appears to be at work in Louisiana with an adequate level of resources allocated thereto. They are aware of the farmer's problems and, although they do not have the "cure all" for the tobacco budworm problem, they appear to be capable of responding to emerging pest problems such as the tobacco budworm.

9.1.3 Chemical Companies

The role of chemical companies in pest control strategies and their relationship to other institutions, has been very well described in an NAS study on pest control technologies, i.e.:

> "In general, the primary synthesis and initial testing of pesticides to control weeds, diseases, and insects is done by private companies. Once a product has shown effectiveness with regard to field performance against a pest in a major commodity, it is introduced to university and government scientists at experiment stations and extension services. These researchers, given the material on an experimental basis, field test it. If those tests are positive, it will go into additional large scale field experiments sponsored by government and private firms. Labeling and registration efforts then will proceed.
>
> The Federal Insecticide, Fungicide and Rodenticide Act, as amended in 1972 Federal Environmental Protection Control Act (FEPCA), adds a new dimension to the pesticide situation. It provides authority for the regulation of pesticide application and use. If a pesticide is not labeled for a particular use, then it cannot

legally be recommended and used for that pest problem. Before the FEPCA amendments of 1972, federal regulations provided for the registration of products, and establishment of efficacy, and the definition of permitted residues and tolerances. If research demonstrated that the pesticide controlled pest X, then it could be recommended for that use. However, under the current FEPCA (1972), the material must be labeled for use to control pest X before it can be recommended for that use. This places a constraint on pest control practices. This is especially important in view of the high costs for registering pesticides for specific uses. Several chemical companies estimate that it now costs 7-10 million dollars to register and market a new pesticide. With costs in this general range, companies primarily will proceed to register products for major market use. Registration may not be attempted for effective chemicals against pests of secondary importance, those occurring sporadically, or those affecting only minor commodities."*

As is evident, cooperation between the extension service, agricultural experiment station, and the chemical companies has occurred in the past and continues with relative success today.

With respect to the tobacco budworm problem, a number of chemical companies have been doing research on developing alternative pesticides to those now registered and a number are being field tested at agricultural experiment stations. Many are very promising based on tests conducted at the Louisiana agricultural experiment stations and it is hoped that they will be registered for use in 1977, as indicated previously. Thus, chemical companies are taking an active role in helping to find an alternative pesticide to control the tobacco budworm to those now registered.

At the local level, the chemical company conveys information on its products through sales pamphlets and other literature, through field demonstrations, promotional meetings and expositions, through advertisements in farm journals, in newspapers, on radio and on

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*National Academy of Sciences, Pest Control: An Assessment of Present and Alternative Technologies, Volume II: Corn/Soybeans Pest Control, National Academy of Sciences, 1975, p. 108-109.

television, and through personal contacts between their sales representatives and parties involved in distributing pesticides and pesticide information, particularly pesticide dealers. Only a very small percentage of farmers, typically those with larger operations, will come into contact with sales representatives directly. Most others will receive chemical company information through their pesticide dealer.

9.1.4 Pesticide Dealerships

The primary role of the pesticide dealer is to supply the farmer with pesticides. However, the pesticide dealer has also been mentioned as an important source of information to the farmer about pesticides and is as influential as the extension service, particularly during the growing season. Dealers estimate that over 50 percent and up to 90 percent of the farmers consulted them in deciding what pesticide to use. Although many farmers tentatively decide what to use based on information received from their scout and/or the extension service, the determining factor is the supply, i.e., what is available from the dealer for the problem. This was particularly true during 1974 when pesticide shortages were a real problem. Many farmers simply went to their dealers and asked them what they had left. For example, indications were received from some professional scouts that some dealers sold farmers what they (the scouts) would call "gimmick insecticides", and that this may have played a role in the 1974 and 1975 pest control difficulties.

Some pesticide dealers are also local formulators and in addition to selling pesticides in drums, they maintain 1,000 gallon bulk tanks at the local flying fields (given the popularity of aerial application) where the farmer can purchase a pre-mixed pesticide formulation, if he does not want to carry his pesticide out to the field or wants to have a particular formulation made up by the applicator. These tanks are metered and a ticket is printed for each batch dispersed for application, so that each farmer can be billed separately. Farmers who use the bulk tanks buy pesticides as they use them and cannot reserve pesticides out of the bulk tanks in advance. This is in contrast to those farmers that can stockpile pesticides by buying drums.

In addition to selling pesticides, some dealers also offer their customers free scouting services. This is usually for their older established customers and is done by request only. No formal scouting programs are usually offered. The study did find one individual who was both an active scout and a pesticide dealer; however, pesticides

were not sold to his scouting customers, but rather on a walk in basis and not as a part of any scouting package which the farmer paid for. During 1974, these dealer supplied scouting services were widely used due to the disastrous year farmers were having. These arrangements have continued, particularly with the "loyal" customers of a single dealer.

In 1976, one dealer (who is an ex-scout) will begin offering the farmer a program he terms "programmed planting" (presumably for a fee). In this program he will assist the farmer in selecting cotton seed, herbicides, insecticides and will, if the farmer wishes, suggest competent scouts.

Contact with the farmer is usually on a face-to-face basis although the local media is also used in advertising. During the winter months, some local dealers, including those that are also local chemical compnay formulators, host promotional "catfish dinners" for their regular customers by invitation only. These are thought to be very influential with respect to the pest control strategies utilized during the growing season. A chemical company representative may be the invited speaker and the extension agent may also attend. Pesticide literature will usually be disseminated at the meeting as well. The large farmers (or those having relatives working at the pesticide dealer's) tend to develop these close ties to a single dealer, whereas smaller farmers evidence a propensity to "shop around" for the best prices.

Dealers receive their information about pesticides from both the university extension service -- via extension publications -- and the chemical companies through their company representatives. One professional scout also indicated that he contacted local dealers to inform them about what they would need so that shortages could be prevented, if possible. Thus, the dealer does attempt to stock those pesticides that are recommended by the extension service.

Over the last couple of years, dealers have had to change their ordering, delivery and billing procedures. Until recently, dealers would order their supplies in the early part of the year and sell to customers in the spring and summer. The dealer was not billed by the chemical company until the close of harvest and did not bill his customers until after harvest. In effect, the farmer was given up to nine months to pay for his insecticides.

However, due to the "petroleum crunch" and pesticide shortages in recent years, many dealers have been ordering earlier (i. e., in the

summer) to insure that their order will be filled.* One large dealer indicated that they did not have any problems with having their orders filled. They did say that they "have come close" to not receiving an order but that this has not yet occurred. Smaller pesticide dealers apparently have had some problems in getting their orders filled.

The buying habits of farmers have also changed. More and more farmers that buy pesticides by the drum (as opposed to out of the bulk tank), are placing all or part of their orders in the fall or in the early part of the following year to insure adequate supplies. One dealer indicated that 25 to 35 percent of his insecticide sales within the last two years occurred in December, January and February. Prior to this, most of the buying of insecticides took place just prior to the season or during the season. However, there are many farmers who continue to buy pesticides as they need them, i.e., one or two applications at a time.

Billing procedures have also changed in recent years. Chemical companies no longer will carry dealers, but demand payment when the shipment is received. As a result, the dealers are now requiring their customers to pay within 30 days or incur finance charges. Some exceptions are made, i.e., large dealers with long time customers having large volume accounts will carry these people longer than 30 days. In addition, discounts for buying early (i.e., in the fall or early part of the year) are given by dealers.

9.1.5 Aerial Application

As alluded to above, aerial application of insecticides is a popular method used by cotton farmers for having their insecticides applied. One local pesticide dealer estimated that 90 percent of the insecticides applied, are applied aerially.

Numerous aerial applicators were found in the study area to provide this service and the farmer-pilot relationship appeared to be relatively stable with most farmers reporting at least three years with the

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*One extension agent noted that pesticides are channeled into Texas earlier in the year and cited this as contributing to the pesticide shortages in 1974 and 1975.

current flying service. Some farmers have one half day access to their applicators, while others do not. The former group are typically large growers and/or have relatives working for the aerial applicator. Some aerial applicators are seasonal in that they enter an area just prior to the growing season whereas others maintain residence in the area year round.

Most farmers do not rely on the applicator for pesticide advice in any major way, but rather go to the applicator with their decision already made. Nevertheless, some small scale growers (black farmers in particular) did say that they utilized their flying service for advice on what to apply and when to apply it. This phenomena may have occurred more in 1974 when farmers were asking everybody for advice on what to do. Furthermore, aerial applicators in Richland and Franklin Parishes do not personally sell insecticides, although this practice was reported in other areas of the state (e.g., in Rapides and Caddo Parishes).

Each applicator, however, maintains a relationship with one local chemical formulator and has his bulk tanks out at his flying field. Approximately 50 percent of the farmers go through the bulk tank and the other 50 percent either carry their pesticides out to the flying field from their dealer or their home or have it delivered to the flying field by their pesticide dealer. Farmers usually stay with one or the other over the years. Those that go through the bulk tank cannot request certain pesticide mixtures because the bulk tank contains pre-mixed pesticides, e.g., EPN-methyl parathion (6-3), etc. Those that bring a drum of an insecticide can and do state the mixture they want and many usually stay and watch the insecticide being mixed.

Aerial applicators usually fly the mixtures at a rate of one or two gallons per acre based on what their customer wants, although many professional scouts and the extension service feel that mixtures at the rate of 2 to 3 or 5 gallons per acre are necessary for adequate control. Typical application costs range anywhere from $0.75 - 0.90 per acre for a one gallon mixture per acre and $0.85 - 1.00 per acre for a two gallon mixture per acre. Furthermore, flagging of fields (i.e., placement of flags in the field to aid the applicator in insuring that the pesticides are properly applied), which is recommended by both the extension service and many professional scouts, is not practiced to any great degree by farmers. Many applicators said that they know the fields quite well and also can use landmarks just as well as flags.

Overall, the biggest change that has occurred in application as a result of the DDT cancellation, has been the fact that more farmers now come in with their own "individualized orders". Whereas the applicator used to be able to load up and move from farmer to farmer, he now has to do more individual loading; for example, load up with one type of mixture for a 60 acre plot and then return and reload with a different chemical for another farmer's acreage. In short, this has added much more work to the application business and inherently, more responsibility. One applicator stated he has not increased his prices to adjust for this new "specialization", possibly due to the competitive nature of the application business in the area he serves.

Another big change for the applicator has been his involvement with professional scouts. Many professional scouts make a point of telling the applicator how they would like the pesticides applied (e.g., application rate, use of flags, etc.). Some applicators have voiced concern over this, with one applicator stating that "too much scouting can cause difficulties for the applicator also", implying that the applicators are not happy with the professional scouts telling them what to do and that professional scouts are not happy with some of the practices used by applicators.

9.1.6 Professional Scouting

The primary role of the professional scout -- or pest management consultant -- is to provide individualized information to the farmer concerning insect identification, insect damage, and pest control procedures.

According to one professional scout, professional scouting in the area first began in 1948-1949. The extension service for a long time has pointed out the need to scout fields on a weekly basis, in order to determine what insects are present and when insecticide applications should begin. In recent years, the extension service has strongly supported and recommended that cotton farmers hire competent scouts to identify insects and insect damage. Many of the professional scouts operating in Louisiana hold degrees in entomology from LSU and in some sense can be viewed as an arm of the extension service.

In September, 1975, the Louisiana Pest Control Act of 1975 was passed which requires among other things, that professional scouts be

certified and licensed.* Certification can only be received if the proper education and/or experience is obtained and a scout must be licensed to practice in the state. The law also requires that if scouts supply recommendations, they must be in writing to the farmer and a copy must be retained for their files. Furthermore, the law defines several classes or levels of scouts ranging from the checker to the pest management consultant. More details of the specific requirements are given in Exhibit 9.1, which excerpts the section of the Act pertinent to professional scouting.

The phenomenon of "paid for" scouting is widespread throughout the State of Louisiana and throughout the study site. A large applicator estimated that 50 percent of the planted acreage is professionally scouted in the study area. Usually the larger cotton farmers utilize the service, although some large farmers insist on doing their own scouting, since they have not been sold that the professionals do any better a job.

Some may feel this way given the fact that the quality of scouting has not been consistent in the past. When truly professional scouts were employed, there seems to have been no problems. However, there were those who sought out scouting as a part time job in the summer and possibly had a limited interest in quality scouting. In addition, reports of scouts drinking alcoholic beverages in the field were given by some farmers.

A farmer usually gets associated with a scout by contacting a scout or by having a scout contact him. Thus, it is a two way process and negotiations usually take place in the early part of each year. Scouting costs range from $1.50 - 2.00 per acre for the season which usually begins around June 15 and ends around Spetember 30. The scout will usually check a client's fields once a week and more often if a problem develops or if the farmer requests that they be checked more often. Some scouts limit their business to acreages of at least a certain size (e.g., 200 acres) and others have no minimum requirements.

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*The law was passed with unanimous approval of the agricultural experts at LSU and was highly lauded by the Farm Bureau and other farm organizations. It is administered by the Bureau of Technical Services, State Commission of Agriculture.

Exhibit 9.1: Louisiana Pest Control Act of 1975, Section 1629

§ 1629. Certification of pest management consultants; categories; exemptions; requirements; licensing; field employees; recommendations

A. An individual shall not act or offer to act as a pest management consultant unless he is certified as such. The commissioner shall certify an applicant who satisfactorily demonstrates by written exam or other means authorized by rule or regulation his competence in the specific field of pest management for which he desires certification. This certification shall be valid for one year unless revoked, suspended, or cancelled by the commission, and shall be renewable under rules established therefor.

B. Applicants for certification as pest management consultants shall elect to be examined for certification in one or more of the following categories:

(1) Control of insects, mites, nematodes, or other invertibrates.

(2) Control of plant pathogens.

(3) Control of weeds.

The commissioner may by rules and regulations establish such other categories or subcategories as are necessary to effectuate the purposes of this Subpart.

C. No application for a pest management consultant's certificate shall be accepted unless the applicant furnishes satisfactory evidence that he meets one of the following requirements:

(1) He is currently licensed in the field of entomology, plant pathology, cotton insect control, or sugar cane borer control under R.S. 37:1967:

(2) He holds a masters or PhD. degree from an accredited college or university in an appropriate discipline;

(3) He holds a bachelors degree from an accredited college or university in an appropriate discipline and one year of experience in the field for which he is requesting certification;

(4) He holds a bachelors degree from an accredited college or university with at least twelve semester hours credit or its equivalent in appropriate disciplines and has one year's experience in the field for which he is requesting certification; or

(5) He has three years of experience in the field for which he is requesting certification.

Exhibit 9.1: (continued)

D. A person shall not engage in the business of pest management consulting without first having secured a pest management consultant license. The commissioner shall issue the license upon receipt of an application containing such information on the applicant's qualifications and proposed operations as he may require by rule or regulation. This license shall be valid for one year unless revoked, cancelled or suspended by the commissioner and shall be renewable under rules established therefor.

E. Every field employee of a licensed pest management consultant shall be registered with the Department of Agriculture. This registration shall be valid only as long as the individual is employed by the licensed pest management consultant indicated on the face of the registration certificate.

F. Pest management consultants shall put all recommendations in writing, with two copies each. One copy shall be signed, dated, and furnished to the person for whom the recommendation is being made, and consultants shall retain one copy which shall be furnished to the commissioner upon his request. Where a pesticide use is recommended the recommendation shall include:

(1) The pesticide or pesticides recommended;

(2) The recommended rate of application;

(3) The date on which each application is recommended;

(4) The area to be treated; and

(5) A brief statement of the reason or reasons for the recommendations.

G. Any individual possessing a valid license in the field of entomology, plant pathology, cotton insect control, or sugar cane borer control under authority of R. S. 37:1967 on the date of enactment of this Subpart shall, when that license expires, be granted certification without testing for one year.

H. All state and federal personnel conducting research or demonstrations in their official capacities and checkers shall be exempted from Subsections A and D of this Section.

Each week, the scout will leave a written report containing information on insect counts in each field, i.e., boll weevil counts and tobacco budworm counts. In addition, most professional scouts have their own pest management strategies and will provide insecticide recommendations, including the insecticides to be used, the recommended rate of application, the applicator sequence and the area to be treated. Professional scouts keep abreast of extension service recommendations and, in most cases, their strategies are consistent.

Professional scouts feel that most farmers now follow their advice because they have shown that they know how to produce a good cotton crop.* That is, most of the top notch professional scouts do not sell their service as a way to save on insecticide costs, but rather as a way to increase yields which will, in turn, more than pay for the scouting costs. Moreover, some professional scouts require that their clients follow their recommendations or they will refuse to do business with them.

In cases where the recommendations are not followed, it is usually the application schedule that is altered, due to a difficulty in scheduling the application with the aerial applicator, since their services are scheduled on a first come first served basis. Sometimes pesticides will also be changed if the farmer cannot get a particular pesticide from his pesticide dealer.

9.1.7 Loan Institutions

In order to farm today, large sums of money are needed both for machinery and equipment and for yearly operational expenses. Virtually every producer must obtain a yearly operational loan to pay for some or all of the cost of producing and harvesting a crop, i.e., seed, fertilizer, pesticides, fuel and labor. In addition, equipment loans are also necessary from time to time in order to buy necessary machinery.

In order to borrow the money to operate today, it is necessary for a farmer to have land and/or machinery to use as collateral, or a

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*The implication here is that, in the past, professional scouts have had difficulty getting the farmer, the pesticide dealer and the professional applicator to follow his recommendations to the letter. This may indicate that a role conflict existed between the applicator and the scout (also see page 9.11); however, it did not appear that the adjustment process was significantly hindered by this.

proven credit rating. The building of credit is done much as it is done in the larger city but with the added feature that the bank or other institutions loaning money most likely knows more about the farmer's family background which adds another dimension. One basically is allowed to borrow small sums of money and if there are no problems with returning the loans, credit ratings increase and larger sums are permitted in future years. The additional dimension prevalent in the smaller, rural towns is that the credit rating does not necessarily reflect the ability of the individual as much as it reflects the individual's family and their position and ability to meet loan commitments.

A number of sources are available for yearly operational loans and equipment loans, including local banks, production credit associations and the Farmer's Home Administration. All institutions have competitive lending rates. For real estate loans, the Federal Land Bank Association is usually used.

For those farmers who have been successful in farming for a number of years, or for those farmers who own or inherit land, go into partnership with a relative or have a good family background (i.e., come from families who are respected in the community, who have good credit ratings, etc.), a loan may be secured either from a local bank or a production credit association.

Local banks vary in their exact requirements but all stress that a good credit record and the farmer's production capabilities are of utmost importance. That is, a farmer's credit record is reviewed and his ability to make loan payments in the past is considered. Furthermore, the banks stated that they have been in the area for a long time and most of their customers have been borrowing from the same bank for a good number of years. Thus, they know each customer very well, including his land, soil type, and production capabilities. One bank said that sometimes a pound of lint per acre average for the farmer is used in determining anticipated production. No specific loan limits were mentioned and it appeared that the loan amount was based on the farmer's past credit record and production capabilities. The loan officers do not usually require that their customers diversify their crop and most do not discuss a farmer's pest management strategy or production practices. Most farmers are felt to be knowledgeable and up to date on the latest practices and are left independent. For example, at one bank, the Board of Directors wanted to hire a farm consultant to help their borrowers in seed selection, planting practices, insecticides, etc. The bank president strongly opposed this, saying it would be an infringement upon a farmer's right to make his own management

decisions and the policy was not adopted. Loans are usually negotiated in the early part of the year, and usually the more established farmers borrow from the local banks, although younger farmers and farmers with small operations are also handled by the banks.

The production credit association (PCA) is cooperatively owned and will only make loans to farmers and one must be a stockholder to borrow money. Loans can be made for crop production, equipment, cars, trucks, etc. One becomes a stockholder by purchasing stock and his loan limit is partially governed by how much stock he owns, i.e., the farmer must own enough stock to cover 10 percent of the loan amount. Potential borrowers are evaluated in some detail on both production qualities and personal qualities, e.g.:

- Land size or size of the operation;
- Quality of the farmer's soil;
- Security with which to cover the amount loaned;
- Production record (past and projected);
- Credit record; and
- Personal qualities (e.g., responsibility, morals, attitudes, etc.).

One loan officer said that it is seldom that the farmer has both a strong production record and credit record. If the farmer is just starting out or has incomplete production records, the PCA will rely on his credit record and his personal qualities. If a farmer's credit is questionable, they will rely on the other factors.

The production credit association determines the farmer's loan limit based on a formula (subject to owning enough stock). For cotton, they use a base yield of one bale or 500 pounds of lint per acre (soil permitting), and a price of $0.45 per pound of lint. Thus, given this projected yield, the farmer should be able to earn $225 per acre. If the farmer is going to plant 100 acres of cotton, his expected return would be $22,500. If the farmer wants to borrow this amount, it is referred as a 100 percent loan. If the farmer is established, he can borrow the full amount and possibly more based on any additional security he has (e.g., land ownership). If the farmer is just entering

agriculture or rents entirely, the amount loaned is termed an 80 percent loan and is 80 percent of the expected income. A similar type formula is used for soybeans based on a yield of 12-15 bushels per acre (soil factors considered) and a projected market price of $4.00 per bushel.

The PCA advises their borrowers to diversify their crops and to draw up carefully considered budgets. One PCA loan officer also advises his borrowers to book cotton in advance.* Loans are negotiated in the winter months and farmers of all sizes are handled through the PCA. A major portion of the cotton crop in the area is financed through the PCA (estimates of 60-70 percent of the cotton crop were given).

For most farmers starting out who do not own or inherit land or go into partnership with a relative, and for those farmers who cannot secure a loan by any other means,** it may be necessary for them to get a loan from the Farmer's Home Administration, an agency within USDA, which will tolerate the higher risk. Usually FHA loans are given to family based operations under 300 acres and FHA operational loans can be up to a maximum of $50,000. FHA loan recipients are expected to show improved management skills and increased net income and therefore are expected to build-up a good credit rating and become a feasible risk to the local lending institutions within an average of six years. FHA tries to accomplish these purposes by close supervision of cash flow (see Exhibit 9.2 for statement required) and by encouraging the farmer to attend local extension programs. If the farmer does not utilize the local educational resources and FHA directives and progress isn't made, the next year's loan may not be made and the FHA supervisor may advise the farmer to liquidate.

In assessing a farmer to determine the loan amount, a formula similar to that used by the PCA is applied. For cotton they usually use an average yield between 600-700 lbs. of lint per acre and a projected market price of $0.45 pound with the cost of production being

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*Booking of cotton is the pre-season contract selling of cotton where the farmer contracts the future delivery of a certain amount of cotton (i.e., number of bales) at an agreed upon price.

**Included may be farmers who used to go to the local banks or production credit association, but due to a series of bad crop years were forced to return to the FHA.

Exhibit 9.2

USDA—FHA
Form FHA 431-2
(Rev. 12-1-72)

Position 3

FORM APPROVED
OMB NO. 40-R10/1

COUNTY

FARM AND HOME PLAN

NAME OF HUSBAND	NAME OF WIFE	ADDRESS

AGES OF PERSONS IN HOUSEHOLD	HUSBAND	WIFE	SONS	DAUGHTERS	OTHERS	TOTAL ACRES (OWNED)	TOTAL ACRES (RENTED)	CROP ACRES (OWNED)	CROP ACRES (RENTED)	OPERATED SAME FARM LAST YEAR? ☐ YES ☐ NO	WRITTEN LEASE? ☐ YES ☐ NO

TERMS OF LEASE

PERIOD OF LEASE ____ 19__ TO ____ 19__

A. FINANCIAL STATEMENT AS OF _____, 19__

PROPERTY OWNED			DEBTS OWED					
REAL ESTATE (LOCATION):	ACRES	VALUE	NAME AND ADDRESS OF CREDITOR	FINAL DUE DATE	INTEREST RATE	ANNUAL INSTAL.	AMOUNT DELINQ.	UNPAID BALANCE
FARM		$	LIENS ON REAL ESTATE:					
OTHER REAL ESTATE						$	$	$
TOTAL REAL ESTATE		$						
LIVESTOCK:	NO.	VALUE						
LIVESTOCK HELD FOR SALE		$						
DAIRY COWS			TOTAL LIENS ON R. E.			$	$	
BEEF COWS			LIENS ON CHATTELS AND CROPS:					
OTHER CATTLE						$	$	$
BROOD SOWS AND GILTS								
OTHER HOGS								
EWES								
OTHER SHEEP								
POULTRY								
TOTAL LIVESTOCK		$						
MACHINERY AND EQUIPMENT:								
TRUCK(S): YR. ____ MAKE ____								
TRACTOR(S): YR. ____ MAKE ____								
MAJOR ITEMS OF EQUIPMENT								
			TOTAL LIENS CHATTELS & CROPS			$	$	$
			JUDGMENTS:					
OTHER FARM MACHINERY			TOTAL JUDGMENTS:			$	$	$
TOTAL MACHINERY AND EQUIPMENT		$	TAXES DUE: REAL ESTATE $_____ PERSONAL $_____					
OTHER PERSONAL PROPERTY:	QUAN. OR NO.	VALUE	INCOME & SOCIAL SECURITY $_____ TOTAL TAXES DUE					$
CROPS HELD FOR SALE		$	ALL OTHER DEBTS (DOCTOR, STORE, ETC., DESCRIBE):					
GROWING CROPS								$
FEED								
SEED AND SUPPLIES								
AUTO: YR ____ MAKE ____								
HOUSEHOLD GOODS								
CASH ON HAND								
BONDS AND INVESTMENTS								
ACCTS. OWED US—COLLECTIBLE								
TOTAL OTHER PERSONAL PROP.		$	TOTAL OTHER DEBTS					$
TOTAL PROPERTY OWNED		$	TOTAL ALL DEBTS					$

1. TOTAL OF CASH ON HAND, CROPS AND LIVESTOCK HELD FOR IMMEDIATE SALE, AND INCOME TO BE RECEIVED IN IMMEDIATE FUTURE $
2. DEBTS AND EXPENSES WE WILL PAY FROM ABOVE CASH AND INCOME (Itemize) $
3. CASH CARRY-OVER FOR NEXT YEAR'S OPERATIONS AFTER PAYING THESE DEBTS $

	BEGINNING OF YEAR	END OF YEAR	INCREASE OR DECREASE
4. NET WORTH (TOTAL PROPERTY OWNED MINUS TOTAL ALL DEBTS)	$	$	$
5. TOTAL LAND DEBT			
6. TOTAL DEBTS OTHER THAN LAND	$	$	$

PERIOD COVERED BY PLAN: FROM 19 TO 19

FHA 431-2 (Rev. 12-1-72)

Exhibit 9.2 (continued)

NOTE: All "actual" data to be completed by end of crop year

B. CROPS, PASTURE, ETC.—PRODUCTION AND SALES

PLANNED							ACTUAL						
CROPS, PASTURE, SET-ASIDE PROGRAM PAYMENTS, ETC.	ACRES	YIELD PER ACRE	OPERATOR'S SHARE UNITS FOR: FARM USE	SALE	@	DOLLAR SALES	ACRES	YIELD PER ACRE	OPERATOR'S SHARE UNITS FARM USE	HELD FOR SALE	SOLD	@	CASH INCOME
1.					$	$						$	$
2.													
3.													
4.													
5.													
6.													
7.													
8.													
9.													
10.													
11.													
12.													
13.													
14. FARMSTEAD, GARDEN AND ROADS													
15. TOTAL (ENTER TABLE J. LINE 1)						$							$

C. LIVESTOCK AND PRODUCTS—PRODUCTION AND SALES

PLANNED							ACTUAL						
LIVESTOCK AND PRODUCTS AND WOOL-MOHAIR PROGRAM PAYMENTS	NO.	PROD. PER ANIMAL	OPERATOR'S SHARE UNITS FOR: FARM USE	SALE	@	DOLLAR SALES	NO.	PROD. PER ANIMAL	OPERATOR'S SHARE UNITS FARM USE	HELD FOR SALE	SOLD	@	CASH INCOME
1.					$	$						$	$
2.													
3.													
4.													
5.													
6.													
7.													
8.													
9.													
10.													
11.													
12.													
13. MILK (LBS.)													
14. EGGS (DOZ.)													
15. TOTAL (ENTER TABLE J. LINE 2)						$							$

Exhibit 9.2 (continued)

D. IMPROVEMENTS AND KEY PRACTICES—FARM, HOME, AND FINANCIAL MANAGEMENT

CROPS; SOIL; LIVESTOCK; FINANCIAL MANAGEMENT; MAINTENANCE; REPAIRS; FOOD PRODUCTION AND CONSERVATION; HEALTH, HOME, ENVIRONMENTAL, COMMUNITY AND RURAL DEVELOPMENT ACTIVITIES; ETC.	WHEN TO DO IT	SOURCE OF FUNDS	ACTUAL ACCOMPLISHMENTS
TYPE OF ANALYSIS (_____) MONTH			

E. FAMILY LIVING AND INSURANCE

WE PLAN TO PRODUCE, PROCESS, AND USE FOR OUR FAMILY:

ITEM	PLAN	ACTUAL	ITEM	PLAN	ACTUAL
MILK (GAL.)			GARDEN (SIZE)		
EGGS (DOZ.)			CANNED AND FROZEN:		
POULTRY (NO.)			VEGETABLES (QT.)		
PORK (LIVE WT.-LB.)			FRUITS (QT.)		
BEEF (LIVE WT.-LB.)			DRY STORED VEGETABLES (BU.)		
OTHER MEATS (LIVE WT.-LB.)			DRY STORED FRUITS (BU.)		

TOTAL CASH VALUE OF FOOD ACTUALLY PRODUCED AND/OR PROCESSED FOR HOME USE $_____

TYPE OF INSURANCE	FACE VALUE			TYPE OF INSURANCE	FACE VALUE		
	PRESENT	PLAN	ACTUAL		PRESENT	PLAN	ACTUAL
DWELLING	$	$	$	LIFE	$	$	$
OTHER REAL ESTATE				HEALTH			
CHATTELS				HOUSEHOLD GOODS			
FARM LIABILITY				AUTO			

CHECK IF YOU HAVE					
	☐ RUNNING WATER	☐ REFRIGERATOR	☐ WASHING MACHINE	☐ TELEPHONE	☐ SEWING MACHINE
	☐ FULL BATH	☐ HOME FREEZER	☐ DRYER	☐ TELEVISION SET	☐ WATER HEATER

Exhibit 9.2 (continued)

F. CASH FAMILY LIVING EXPENSES	OTHER CREDIT NEEDED	FHA CREDIT NEEDED	PLANNED EXPENSES	ACTUAL EXPENSES
HOUSEHOLD OPNG.	$	$	$	$
FOOD INCL. LUNCHES				
CLOTH., PERS. CARE				
HEALTH				
HOUSE REPAIR AND SANITATION				
SCHOOL				
CHURCH, RECREATION				
PERS. INSURANCE				
TRANSPORTATION				
FURNITURE & OTHER				
TOTAL	$	$	$	$

G. CASH FARM OPERATING EXPENSES	OTHER CREDIT NEEDED	FHA CREDIT NEEDED	PLANNED EXPENSES	ACTUAL EXPENSES
HIRED LABOR	$	$	$	$
MACHINERY REPAIR				
FARM BUILDING & FENCE REPAIR				
INTEREST				
RENT				
FEED				
SEED				
FERTILIZER				
PESTICIDES & SPRAY MATERIALS				
OTHER SUPPLIES				
LIVESTOCK EXPENSE				
MACHINERY HIRE				
FUEL AND OIL				
PERSONAL PROP. TAX				
REAL ESTATE TAXES				
WATER CHARGES				
PROPERTY INSURANCE				
AUTO & TRUCK EXPENSE				
UTILITIES				
CURRENT OPNG. BILLS (TABLE A)				
TOTAL	$	$	$	$

H. CAPITAL EXPENDITURES	OTHER CREDIT NEEDED	FHA CREDIT NEEDED	PLANNED EXPENSES	ACTUAL EXPENSES
	$	$	$	$
DEBTS REFINANCED (TABLE A)				
TOTAL	$	$	$	$

I. CREDIT FOR:	OTHER	FHA	TOTAL	ACTUAL
FAMILY LIVING		$	$	$
FARM OPERATING				
CAPITAL EXPENDITURES				
TOTAL		$	$	$

J. SUMMARY OF YEAR'S BUSINESS	PLAN	ACTUAL
1. CROP INCOME (*Table B*)		
2. LIVESTOCK INCOME (*Table C*)	$	$
3. CONSERVATION PAYMENTS AND OTHER FARM INCOME		
4. TOTAL CASH FARM INCOME (*1, 2 and 3*)	$	$
5. CASH FARM OPERATING EXPENSES (*Table G*)		
6. NET CASH FARM INCOME (*4 Minus 5*)	$	$
7. NON-FARM INCOME		
8. TOTAL NET CASH FARM & NON-FARM INCOME (*6 Plus 7*)	$	$
9. CASH FAMILY LIVING EXPENSES (*Table F*)		
10. NET CASH INCOME (*8 Minus 9*)		
11. CASH CARRY-OVER (*Page 1, Line 3*)		
12. LOANS AND OTHER CREDIT (*Table I*)	$	$
13. INTEREST (*Table G*)		
14. TOTAL AVAILABLE (*10, 11, 12 and 13*)	$	$
15. CAPITAL EXPENDITURES (*Table H*)		
16. BALANCE AVAILABLE (*14 Minus 15*)	$	$
17. GROSS CASH INCOME (*4 Plus 7*)	$	$

K. DEBT REPAYMENT

TO WHOM OWED	AMOUNT DUE THIS YEAR (PRIN. AND INT.)	PLAN			ACTUAL AMOUNT PAID
		PRIN. AND INT. TO BE PAID	DATE	SOURCE OF FUNDS	
	$	$			$
INCOME AND SOCIAL SECURITY TAXES					
TOTAL	$	$			$

We agree to follow this plan and to discuss with the County Supervisor any important changes that may become necessary.

(DATE) (BORROWER) (WIFE)

(COUNTY SUPERVISOR)

U. S. GOVERNMENT PRINTING OFFICE: 1974—667-776

$100.00 per acre as a minimum. For soybeans, FHA uses a cost of $45.00 per acre with a projected market price of $4.50 per bushel and a projected yield of 20-25 bushels per acre. If a farmer wishes to borrow money for equipment, FHA can loan him 100 percent of the appraised value of his equipment. Usually in the evaluation procedure, FHA makes a complete credit check on the individual and uses a complete financial statement, if one is available. After this, the FHA County Committee (comprised of three retired successful farmers) reviews the application for approval. Generally the amount of equity required can be less for FHA loans than for PCA or bank loans. FHA requires that the farmer diversify his crops (e.g., 50 percent cotton and 50 percent soybeans) which is only a recent policy in light of the poor cotton crops and prices in recent years. In 1974 and 1975, crop diversification was not necessary. In general, loans are made late in the year extending into January and February of the following year. Usually there is only a certain amount available to be loaned to all borrowers. Because of this, a list of least-risk farmers is drawn up and then a letter is sent out to each individual reminding each to visit the FHA office in the near future. Usually the young farmer (18-20 years old) with low credit and assets and the older farmer (55 years and older) with a poor production record and management skills utilize the FHA. Most black farmers in the area also utilize the FHA.

In recent years, with the poor cotton yields obtained by farmers, particularly in 1974, financial problems (i.e., inability to pay back loans) have started to occur and the lending institutions have had to deal with them. In most cases, they went along with the farmer. As a result, the level of indebtedness has increased and many farmers are carrying over their loans from previous years. Many loan officers said that those that are having problems are in trouble because of mismanagement and unnecessary spending on new equipment.

In addition, one local banker said it is usually the younger farmers that went overboard and are having problems. To date there have not been any foreclosures, although the PCA's have turned some customers over to the FHA and the FHA did report that three farmers recently liquidated in Franklin Parish. Some outside investment in Franklin Parish was also indicated.

Thus, it appears that if major setbacks are to occur, they would be within the next couple of years and would be not solely a result of the DDT cancellation.

9.1.8 Mass Media

In previous sections, the use of mass media to disseminate information about pesticides and pest control strategies has been discussed. As indicated, newspapers (including the Delta Farm Press), radio, television, farm magazines and other publications are all used by the various institutions and are all utilized by farmers to keep up on the latest information.

The Delta Farm Press, published every Friday, will usually carry articles prepared by the extension service on a variety of topics ranging from cotton varieties to insecticide recommendations to market forecasts. In addition, all the major chemical companies advertise their products in the newspaper. Local newspapers, published weekly, will also contain advertisements by local pesticide dealers.

Radio and television are also used extensively both to advertise products and to disseminate information by the extension service. In addition, because the area is only represented by a weekly newspaper, the national news on television is used as a means to keep up to date on what is happening of national significance (e.g., cancellation of a pesticide such as DDT).

Farm magazines and other publications -- e.g., extension literature -- are also mechanisms by which the farmer can receive information.

Thus, the mass media, as indicated here and above, does provide information relative to a farmer's crop production and pest control decision process.

9.2 Crop Production Output Factors

On the output side of the crop production process, i.e., in the marketing of the crop, institutions were also found to be influential. Two important factors worthy of discussion are the cotton ginning process and the cotton buying process. Each is discussed below.

9.2.1 Cotton Ginning

In deciding to grow a particular crop, the farmer must consider the facilities available to get his product to the market place. Between the farm and the textile mill door, a most important consideration is the ginning of the cotton, i.e., separating the cotton seed from the lint and packaging the lint into 500 pound bales. This is a most important process because due to the cotton grading process, the price received by the farmer can differ based upon the quality of the ginning.

In the study area, approximately one half of the gins are cooperatively owned, with the other half being comprised of single independent owners or a cluster of owners. The average gin size, in terms of the number of bales produced in a year, is around 6,000 - 7,000 bales per year, although new gins have a capacity for producing up to 22,000 bales per year. There are fewer gins in operation today than 10 years ago, but overall capacity has been maintained or slightly increased. For example, in Richland Parish, 14 gins were in operation in 1965 each with a capacity of 5,000 bales per year. As of 1976, 8 gins were in operation which were more centrally located and could in some cases produce 22,000 bales per year. Generally the smaller gins are combining to form larger more efficient gins. The cost of building gins has increased from $100,000 in 1955 to one million dollars at present.

A farmer selects his gin in the following way. If he is a member of a cooperative gin, he goes to the cooperative gin. If he is not a member of any cooperative gin, he selects the best gin according to how well the ginning is done, how efficiently the cotton is obtained from his field, ginning costs, etc. The cotton seed extracted from the cotton pays for the ginning and also allows for a profit to the farmer. Once the cotton is ginned, it is graded and the farmer receives a bonded receipt from the gin which he can use as collateral.

In recent years, a number of gins have closed due to the lack of cotton to be ginned, as well as being unable to handle the required modifications to meet the new EPA regulations of gin trash burning. In particular, one cooperative gin closed in 1975 because the majority of its members had switched to soybeans and thus there was very little cotton to be ginned. For 1976, the membership is hopeful of reopening since they anticipated planting cotton.

Nevertheless, the closing of particular gins has <u>not</u> been mentioned as a factor in deciding on whether or not to produce cotton. Thus, ginning capacity appears adequate.

9.2.2 Cotton Buying

The final step in the crop production process is the selling of the crop to a cotton buyer. Once the cotton has been ginned and graded, the farmer has two choices if he has not already booked the crop. That is, he may either sell the crop right away or hold it over until the next year hoping for a better price later on. Booking cotton is the pre-season contract selling of cotton where the farmer contracts the future delivery of a certain amount of cotton (i. e., number of bales) at an agreed upon price. If a farmer decides to hold over a portion of the crop, he must be prepared to pay storage costs of approximately $1.00 per bale per month, in addition to having the credit to do this.

A recent marketing notion for cotton is to book one third of the expected crop, hold one third of the expected crop and sell one third of the expected crop. One advantage of doing this is that if a farmer's expected yield is lower than anticipated, he will still be able to meet his contract. Not all farmers agree with booking, selling and holding. Some farmers said that they never have held over a crop into the following year.

In 1973, one buyer said that 80 percent of the cotton was booked with very little left to be sold in late 1973. During 1974, cotton acreage increased but hardly any cotton was booked, probably due to the fact that farmers who booked cotton in early 1973 got "burned" since the price of cotton had significantly increased by the fall of 1973 when they had to meet the contract at a price well below the current market price. One buyer estimated that 35 percent of the 1974 cotton crop was held over into 1975 because cotton prices by the fall of 1974 had again dropped sharply and production costs had been excessive. In 1975, cotton acreage was said to be down 25-35 percent. The cotton that was ginned was either booked or sold in 1975 and some farmers whose yield was lower than expected, found themselves unable to meet their contracts. For 1976, one cotton buyer reported that farmers having contracts with him booked one half to three quarters of their expected crop.

Therefore, over the years, farmers have changed their behavior and appear to be more sensitive to market conditions. However, no correlation or relationship was found between a farmer's pest control strategy (and specifically his adjustment to the DDT cancellation) and his marketing strategy. That is, a farmer's pest control and crop production strategy appeared to be independent of whether he booked, planned to sell or planned to hold his crop in the fall.

10.0 INFLUENCE OF THE FEDERAL REGULATORY TIMETABLE ON CROP PRODUCTION SYSTEMS AND PEST CONTROL STRATEGIES

In this chapter, a brief review of the federal regulatory timetable for the DDT decision is first given, including the mechanisms used to disseminate this information to the local level. With this as a background, the initial reaction of farmers to the knowledge of the pending and the actual cancellation of this pesticide will be discussed.

10.1 The DDT Decision*

Regulatory action on DDT goes back to the late 1950's prior to the formation of the Environmental Protection Agency. For example, in 1957, as a matter of policy, the Forest Service, U.S. Department of Agriculture (USDA), prohibited the spraying of DDT in specified protective strips around aquatic areas on lands under its jurisdiction. In 1958, after having applied approximately 9.5 million pounds of the chemical in its Federal-State control programs since 1945, USDA began to phase out its use of DDT. They reduced spraying of DDT from 4.9 million acres in 1957 to just over 100,000 acres in 1967 and used persistent pesticides thereafter only in the absence of effective alternatives. The major uses of DDT by the Forest Service have been against the gypsy moth and the spruce budworm. The development of alternative pesticides such as Zectran, which was in operation in 1966, contributed to further reduction in DDT use by the Department.

In 1964, the Secretary of the Interior issued a directive stating that the use of chlorinated hydrocarbons on Interior lands should be avoided unless no other substitutes were available. This regulatory measure, as well as others which followed, was reaffirmed and extended in June, 1970, when the Secretary issued an order banning use of 16 types of pesticides, including DDT, on any lands or in any programs managed by the Department's bureaus and agencies.

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*Much of this description was taken from EPA press releases and Environmental Facts on DDT compiled July, 1974 by the EPA.

Between November, 1967 and April, 1969, USDA cancelled DDT registrations for use against house flies and roaches, on foliage of more than 17 crops, in milk rooms, and on cabbage and lettuce. In August, 1969, DDT usage was sharply reduced in certain areas of USDA's cooperative Federal-State pest control programs following a review of these programs in relation to environmental contamination. In November, 1969, USDA initiated action to cancel all DDT registrations for use against pests of shade trees, aquatic areas, the house and garden, and tobacco. USDA further announced its intention to discontinue all uses nonessential to human health and for which there were safe and effective substitutes.

In August, 1970, in another major action, USDA cancelled Federal registrations of DDT products used as follows:

- On 50 food crops, beef cattle, goats, sheep, swine, seasoned lumber, finished wood products and buildings;

- Around commercial, institutional, and industrial establishments including all non-food areas in food processing plants and restaurants; and

- On flowers and ornamental turf areas.

On December 2, 1970, major responsibility for Federal regulation of pesticides was transferred to the U.S. Environmental Protection Agency (EPA).

In January, 1971, under a court order following a suit by the Environmental Defense Fund (EDF), EPA issued notices of intent to cancel all remaining Federal registrations of products containing DDT. The principal crops affected by this action were cotton, citrus, and certain vegetables.

In March, 1971, EPA issued cancellation notices for all registrations of products containing TDE, a DDT metabolite. The EPA Administrator further announced that no suspension of the registration of DDT products was warranted because evidence of imminent hazard to the public welfare was lacking. Because of the decision not to suspend, companies were able to continue marketing their products in interstate commerce pending the final resolution of the administrative cancellation process. After reconsideration of the March order, in light of a scientific advisory committee report, the Administrator later reaffirmed

his refusal to suspend the DDT registrations. The report was requested by Montrose Chemical Corporation, sole remaining manufacturer of the basic DDT chemical.

In August, 1971, upon the request of 31 DDT formulators, a hearing began in Washington, D.C. on the cancellation of all remaining Federally registered uses of products containing DDT. Regional hearings were also held in Dallas, Texas. The hearing ended in March, 1972 and the transcript of 9,312 pages contained testimony from 125 expert witnesses and over 300 documents. The principal parties to the hearings were various formulators of DDT products, USDA, the EDF, and EPA.

On April 25, 1972, the Hearing Examiner issued his ruling, stating that the intent to cancel all remaining Federal registrations of products containing DDT be upheld. The Administrator of EPA heard oral argument on the Hearing Examiner's ruling on May 16, 1972 and on June 14, 1972, the EPA Administrator announced the final cancellation of all remaining crop uses of DDT in the U.S. effective December 31, 1972. The order did not affect public health and quarantine uses, or exports of DDT. The Administrator based his decision on findings of persistence, transport, biomagnification, toxicological effects and on the absence of benefits of DDT in relation to the availability of effective and less environmentally harmful substitutes. The effective date of the prohibition was delayed for six months in order to permit an orderly transition to substitute pesticides. In conjunction with this transition, EPA and USDA jointly developed "Project Safeguard", a massive program of education in the use of highly toxic organo-phosphate substitutes for DDT.

Immediately following the DDT prohibition by EPA, the pesticides industry and EDF filed appeals contesting the June order with several U.S. courts. Industry filed suit to nullify the EPA ruling while EDF sought to extend the prohibition to those few uses not covered by the order. The appeals were consolidated in the U.S. Court of Appeals for the District of Columbia.

On December 13, 1973, the Court ruled that there was "substantial evidence" in the record to support the EPA Administrator's ban on DDT.

However, since the cancellation of DDT, numerous requests have been made to use DDT on an emergency basis. Use of a cancelled

pesticide is made possible by FIFRA, as amended, which permits EPA to exempt any Federal and State Agency from any provisions of the Act if emergency conditions exist. All such requests are considered on a case by case basis.

One such request having direct relevance to the current study was a request by the State of Louisiana in January, 1975, to use 2.25 million pounds of DDT to protect cotton crops from an outbreak of tobacco budworms. Although FIFRA, as amended, did not require an extensive balancing of risks and benefits or a determination of "no unreasonable adverse effects on the environment", EPA decided to hold public hearings and to request public comment on the State's application. The agency said that some consideration of risks and benefits is "desirable" when a significant quantity of a cancelled pesticide is proposed for use. Therefore, EPA held hearings in Baton Rouge, Louisiana on February 27 and 28, 1975 and in Washington, D.C. on March 3, 4, and 5, 1975.

In a March 14, 1975 order, the EPA Administrator denied the State's request, saying that there "is no new substantial evidence on the benefits of DDT". The Administrator said such factors as national overplanting of cotton, cotton subsidies, and changing weather conditions tend to have a greater impact on reduced cotton yields in Louisiana than does the tobacco budworm, and suggested use of such alternatives as Galecron, EPN and methyl parathion, coupled with proper application, timing, and integrated pest management. The State appealed the ruling, but was unsuccessful in having the EPA ruling reversed.

Throughout the entire cancellation procedure, as well as the specific request by the State of Louisiana, EPA kept the public informed through periodic press releases issued in Washington, D.C. and through notices issued in the Federal Register. Major news sources -- newspapers, national news on television and radio, weekly news magazines, etc. -- all covered these developments and disseminated the information in a timely fashion.

Many farmers and those institutions concerned and affected by the decision indicated that the decision was highly publicized and that these major news sources provided them with information about the regulatory action. In addition, some farmers were aware of the DDT cancellation hearings since they testified at the regional hearings. Furthermore, certain institutions (e.g., the extension service and chemical companies), through their involvement in the legal proceedings, were aware of the regulatory actions. However, they typically follow these developments through the Federal Register as well.

Secondary sources -- farm magazines, farm newspapers, pesticide dealers, extension service newsletters, gin meetings, chemical meetings, etc. -- provided additional information and more details about the decision, tailored to the particular interests of their clientele. The extension service, in particular, was cited by farmers and professional scouts as providing much information about the decision.

Neighbors, friends and relatives also served as a source of further disseminating this information when they got together socially, at meeting, or at the local "hangouts", e.g., pesticide dealers, gins, cotton buying offices, etc. Some farmers also said they were "on the look out" for the decision, given the previous restrictions imposed on dairy farmers.

Further details about how the news of the regulatory decision filtered down to the local level (e.g., time lag from the EPA news release to the actual knowledge of the regulatory action) cannot be given due to the limited data that was received and the lack of recall on the part of the respondents. However, some thoughts are suggested below.

10.2 The Reaction of Farmers

A farmer's reaction to a pending or actual decision to restrict the use of a pesticide is, of course, first contingent upon knowing that some kind of regulatory action has taken place. Furthermore, knowledge of a particular regulatory action was found to be highly correlated to the current use of the pesticide affected by the action. Due to the fact that all farmers in the study area had used DDT in cotton production, all were affected by the decision and all said that they had heard about it. This finding must be viewed in light of the fact that the decision was three years old when the field interviewing took place and all farmers have since made adjustments to it.

Nevertheless, even prior to the regulatory action, the extension service had been warning about insect resistance to DDT and the fear that DDT may no longer be available for use. A small number of farmers in the area (with large cotton acreages) had been experimenting with alternatives to DDT (e.g., EPN-methyl parathion), some as early as 1966. However, this was largely because of insect resistance problems to DDT and it appeared that none of them found anything better or as good as DDT. Indeed, when the regulatory action was announced, DDT was still an important and vital element of the pest control strategy for cotton production in the area.

Therefore, once the farmers learned of the decision, they still did not know what the next best alternatives were or what they would use to replace DDT. Some farmers, particularly the larger type I farmers, said that shortly after they heard about the decision, they contacted the extension service, their pesticide dealers, their scouts and/or fellow farmers to learn what could be a good alternative. Thus, it appears as if some farmers were attempting to seek out information on the alternatives prior to the time when all carry-over supplies of DDT would no longer be available.

For the most part, however, farmers did not view the regulatory action as truly problematic until the carry-over supplies of DDT became scarce. For example, one farmer said that he "heard it from several sources, but realized it when DDT could not be bought." Thus, the switch to an alternative seemed to be correlated to the DDT supply. That is, farmers did not wholeheartedly switch to an alternative until their DDT supply ran out. For instance, use of carry-over supplies of DDT that were stockpiled by some farmers was reported during the 1973 growing season and as recently as the 1974 growing season, according to some farmers and pesticide dealers.

Hence, pesticide supply appears to be the primary stimulus for the farmer to change his production practices, and not awareness of the regulatory action itself (i.e., hearing "something" about the regulatory action). Nevertheless, awareness of the regulatory action did prompt some to seek out more knowledge (i.e., new information) and alternatives were being suggested to some of the farmers. Consequently, when the switch had to come (i.e., all of the stockpiled DDT was used), some farmers had done some thinking and planning about what to do. However, for the most part, no preparatory adjustments were made.

The user adjustment response patterns to the DDT cancellation are described in the next chapter.

11.0 USER ADJUSTMENT RESPONSES AND PROBLEMS

In the case of cotton, three years have past since the DDT decision became effective. Thus, sufficient time had elapsed in order to view both the evolution and range of adjustments and problems associated therewith. These will be discussed under the following categories:

- No change in current pest control practices;
- Use of new chemical pesticides; and
- New practices to pest control; e.g.:
  - Use of early to moderate maturing varieties and/or early planting;
  - Reallocation of crop acreage; and
  - Intensive use of scouting.

These categories, it should be emphasized, are not necessarily disjoint empirically. Rather, they are offered as a means of conceptually organizing data from cotton farmers. That is, farmers may have simultaneously exhibited more than one adjustment response described above or may have switched from one response to another.

11.1 No Change In Current Pest Control Practices

Indications were received from both farmers and pesticide dealers that many farmers continued to use DDT for as long as the carry-over supplies still remained. Therefore, although the study did not find anyone currently using DDT, it appears that carry-over supplies of DDT were used during the 1973 growing season (and during the 1974 growing season, but with far less frequency) as an adjustment response to the DDT decision.

This response, however, involved additional activities not practiced by farmers prior to the DDT cancellation. Most notable was the practice of stockpiling. That is, farmers who utilized this approach had to buy adequate supplies of DDT before the chemical could no longer be legally sold. This implies that between June 14, 1972 (when the DDT decision was made final) and December 31, 1972 (when the DDT

decision went into effect) many farmers presumably stockpiled DDT for use in 1973 and for as long as it would last. Adequate financial resources were required (e.g., either cash in hand or the ability to borrow the money from a lending institution), as well as a good relationship with a local pesticide dealer (e.g., a loyal customer with a large volume account or a farmer having a relative at the dealer's).

Thus, it is assumed that only the larger farmers with adequate financial resources (e.g., cash and/or credit) and contacts with pesticide dealers were able to utilize this approach. These farmers would now be found as either type I or type II farmers according to the typology previously developed.

11.2 Use of New Chemicals

One response to the lack of DDT on the part of many farmers was (and still is for many farmers) to continue prior agricultural practices in cotton production and to use the remaining two ingredients in the popular "triple kill" formulation; that is, toxaphene and methyl parathion with the DDT removed. The use of endrin was also mentioned. This approach is also associated with a non-contingent insecticide application style. That is, the farmer sets an insecticide spraying schedule (e.g., every 5 to 7 days) and sticks to it in a firm or nearly firm manner. Professional scouting is also used as it was prior to the DDT cancellation. Overall then, the approach is the more "traditional" one and did not involve new and innovative pest management practices such as early planting, trap cropping, diapause control, and stalk destruction after harvesting.

Farmers who did not stockpile DDT may have utilized this strategy beginning with the 1973 growing season. Others who did stockpile possibly began this strategy beginning in 1974. Those that continued to utilize this strategy in 1975 were designated as type II farmers.

This strategy was not without some reported problems and concerns. Farmers noted that these alternatives to DDT (e.g., toxaphene, methyl parathion) were much more toxic and required more precautions in their handling.* Also, the timing of the application was reported as being more critical. However, pesticide shortages and the lack of tobacco budworm control, culminating in increased production costs (particularly insecticide costs, including both cost per pound and

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*However, no accidents were indicated because farmers and others were made aware of the hazards of the DDT substitute through "Project Safeguard", a joint effort of EPA and USDA to educate the pesticide applicator in the use of highly toxic organo-phosphate substitutes for DDT.

increased number of applications), reduced yields and consequently, reduced incomes and increased debt were noted as primary problems, particularly in 1974. However, most farmers did realize that the cause for this situation was not solely the DDT cancellation. They recognized that weather conditions were such that heavy levels of tobacco budworm infestation (more so than normal) resulted. In addition, they noted that the petroleum crunch created shortages of the DDT alternatives and that this, coupled with the inflation rate, resulted in higher insecticide prices. Thus, although all farmers felt that this alternative strategy to the DDT cancellation created problems for them, the entire blame was not put just on the cancellation. As one farmer stated, "we haven't had a good year to test the alternatives".

Nevertheless, the result of these confounding factors in 1974 was a financial squeeze on some type II farmers, particularly the younger less established ones, eventuating in:

- Carrying 1974 debt into the 1975 growing season;
- Growing relevance of the significantly lower cash requirements of planting soybeans as compared to cotton; and
- Use of rising land values to serve as collateral for mortgages as a source of cash.

11.3 Use of Early to Moderate Maturing Varieties and/or Early Planting

A number of farmers interviewed indicated that they were beginning to plant their cotton crop earlier so that when tobacco budworm infestations would occur (i.e., in late June and again from mid August into September), the cotton plants would be stronger and would be able to better withstand such an infestation. This response was found amongst numerous type I farmers (particularly the larger ones) and appears to be a recent change (i.e., the 1975 growing season may have been the first season where this was done).

Use of earlier maturing varieties is still not an option open to Louisiana cotton farmers. The LSU agricultural experiment stations

are working on the development of such varieties but feel it is still five to ten years away.

No major problems were noted in adopting this strategy, although it is dependent upon weather conditions; if they are unfavorable (e.g., a wet spring), planting may be delayed.

11.4 Reallocation of Crop Acreage

The reallocation of crop acreage was a very common response during the 1975 growing season. Prior to this time, the shifting of crop acreage was not seen as a response solely because of the DDT cancellation. That is, this response can be viewed primarily as a result of the disastrous cotton year of 1974 (partially a result of the DDT cancellation) and the depressed cotton prices (relative to soybeans) in early 1975.

Thus, in 1975, many farmers reallocated some of their land to soybeans and planted less cotton than in 1974. This shift was found both in type I and type II farmers, primarily amongst those farmers who had grown soybeans before. Thus, in effect the soybean to cotton crop acreage ratio increased from 1974 to 1975 for these farmers. Some farmers (i.e., type III farmers) totally dropped cotton in 1975 and planted 100 percent soybeans rather than cotton and soybeans. Again this was in response to the increased cotton production costs and reduced cotton prices. As the experience of 1974 recedes and as the price ratio between cotton and soybeans becomes more favorable to cotton, many of those who dropped cotton in 1975 (either partially or totally) indicated that they would grow more cotton or at least return to cotton in 1976.

It should be noted that the adoption of a mixed strategy (i.e., cotton and soybeans) is encouraged by various lending institutions (in particular, the Farmers Home Administration (FHA) and production credit associations) in the hope of minimizing risk of total loss. This is a recent trend and will be a <u>requirement</u> by the FHA in 1976. Thus those who utilize the FHA must now diversify their crops and those that use the production credit associations will most likely have to as well. It should also be noted that the operating costs associated with an acre of soybeans are drastically lower than that for an acre of cotton (about half according to the FHA); therefore, there may have been a tendency for the financially troubled, in particular, to adopt this strategy.

There was some concern amongst those farmers who shifted to more soybeans and less (or no) cotton. Some older farmers indicated that they would rather grow cotton because they had been doing this for all of their lives. Others were not happy planting their better "cotton land" to soybeans. Still others noted that with the shift to more soybeans, some of their cotton equipment was sitting idle. However, no serious problems were noted by those farmers shifting to more soybeans and less (or no) cotton. Since most of these farmers had been growing soybeans, no new skills were required and the local institutional structures (e.g., extension service, pesticide dealers, lending institutions, etc.) were familiar with this crop. New equipment (or new crop production arrangements) may have been necessary if the acreage shift was significant, but no major problems were noted.

11.5 Intensive Use of Scouting

One response to the lack of DDT on the part of many farmers has been to put additional emphasis on the scouting of fields. Associated with this relatively intensive program of scouting is "discretionary" use of insecticides (which tend to be EPN/methyl parathion). That is, the farmer adjusts his insecticide schedule to match the information he receives from his scouting report and tends to apply insecticides only when the scouting indicates the need to.

In addition, the farmer who adopted this strategy also tended to plant earlier, practice diapause control, defoliate, and destroy cotton stalks after harvesting. Information was also sought through the extension service, their professional scout, etc. Overall then, he was an adopter of the new and innovative pest management strategies advocated by the extension service for cotton production.

The use of the strategy just described was highly noticeable during the 1975 growing season (i.e., all type I farmers utilized this strategy) and it is suspected that this strategy may have taken a number of growing seasons to fully evolve. That is, during the 1973 and 1974 growing seasons, some larger farmers may have slowly begun to lean towards more scouting and more contingent use of insecticides, but it was not until 1975 that the strategy fully evolved into what it currently is. Indeed, by 1975 many more farmers reported the use of professional scouts and those already using professional scouts noted increased contacts with them.

As was the case with those farmers who simply utilized new chemicals (i.e., the strategy described in Section 11.2), a number of difficulties were noted by farmers in utilizing this strategy. One important factor was a farmer's access to a flying service to have the insecticides applied. Those farmers that had "same day" access to a flying service (usually the larger ones) could wait until the last minute to decide on the insecticide application, and with this strategy, this is preferable. That is, if a farmer does not have this arrangement, he may have to anticipate when he would apply the insecticide and then let his applicator know, or he can let his applicator know when he decides he wants his fields treated and hope that the applicator will respond quickly. Either course of action is admittedly less desirable than having "same day" access when discretionary use of insecticides is being utilized.

Moreover, the same concerns and problems voiced by those utilizing new chemicals were noted here as well, i.e., the alternatives were more toxic and required careful handling, the timing of the application was critical, supplies of EPN/methyl parathion were in short supply and were very expensive relative to DDT (more so than toxaphene/methyl parathion utilized by type II farmers), pest management control costs were significantly higher due to increased scouting, diapause control, defoliation and stalk destruction, efficacy was a problem for those utilizing this strategy in 1974 when heavy tobacco budworm infestations resulted, reduced yields and incomes were noted, and increased debt occurred in 1974. Consequently, a financial squeeze, with results similar to those described in Section 11.2, was noted amongst the smaller and less established type I farmers who utilized this approach. However, with this strategy too, the farmers did realize that bad weather, inflation, and the petroleum crunch were contributing factors.

12.0 CONCLUSIONS

Given the 3 year time interval between the DDT decision and the field interviewing in this study, it is not surprising to find that all cotton farmers interviewed had made some adjustment to the regulatory action. However, what is interesting is the variety of adjustment responses and problems described in the previous chapter, and more importantly those factors influential in the farmer user adjustment process.

A precondition to the response process is, of course, knowledge that a regulatory action is pending or has actually occurred. As discussed previously, the current study found that the cotton farmers in the study site may become aware (i.e., hear "something") of a regulatory decision via the news media. However, they do not become knowledgeable (i.e., receive detailed information, take the message seriously and attend to it) and view it as a problem until they find that carryover supplies of the banned pesticide are or will be hard to get. Although some experimenting with alternatives had occurred prior to the decision, this was primarily as a response to insect resistance to DDT and not extension service and research station warnings that DDT may be cancelled. Hence, pesticide supply appears to be the primary stimulus for the farmer to change his pest control and production practices and not simply awareness of a regulatory action itself (i.e., hearing "something" about a pesticide regulatory action).

An important consideration for the individual farmer in determining his response is his personal resources, e.g., his past practices (i.e., tradition), his financial resources (cash and/or credit), his information seeking activities, his managerial skills, and his contact with pesticide dealers. Those farmers who heard of the ban through the news media and stay in contact with information sources such as the extension service, have good dealer contacts, and have adequate financial resources,* were best able to stockpile DDT in order to maintain their current pest control practices.

Those unable to stockpile DDT for the next growing season (i.e., 1973), were forced to adopt an alternate strategy. A farmer's personal resources and his ability to absorb a succession of poor crop years, i.e., poor crop yields, are again important factors in the response chosen. The smaller, lower resource farmers tend to respond in the

*This description fits those who are typically the larger, more established, and higher resource farmers.

way that is least costly and least risky to their overall crop production process. This may involve simply a pesticide substitution or in some cases a crop substitution (e.g., cotton to soybeans). The latter response occurs if the crop production costs are significantly lower with another crop and if growing the alternate crop is less risky than growing the former crop without the banned pesticide. The larger, higher resource farmers, on the other hand, who can more easily absorb a poor crop year will utilize alternate pest control strategies (e.g., intensive use of scouting) which are more costly and possibly more risky. However, the high resource farmers are not only more likely to take risky options than the low resource farmers, but also tend to have access to a wider range of information sources and so are more likely than their less affluent neighbors to adapt in a fashion they regard as successful, regardless of the response option chosen.

However, the study found that the institutional network within which the farmer has to operate is critical both for dictating available response options as well as alleviating associated problems. When faced with replacing a banned pesticide, the farmer looks to the institutional setting to provide an answer just as he does when he is faced with a pest resistance situation. That is, the buildup of pest resistance to a particular pesticide has, in the past, initiated cooperative research activity from numerous institutions (e.g., agricultural experiment stations, extension services, chemical companies, etc.) to develop alternative pest control strategies (chemical or other) for the problem pesticide and to disseminate these alternatives to the farmer through his local information sources (e.g., the pesticide dealer). In addition, pest resistance to certain pesticides has created new institutions (e.g., professional scouting, professional pesticide application, etc.) to help in this adjustment process, when necessary.

The withdrawal of a pesticide calls for this same type of responsiveness from these same institutions; however, the time factor can be more critical with a pesticide regulatory action, in that pest resistance to a pesticide is noticeable and usually evolves over a long period of time, whereas the knowledge of a pesticide regulatory action may not be known far in advance and will impact in a shorter time period. Moreover, the withdrawal of a pesticide may increase the risk of growing the crop sufficiently to warrant a crop substitution. In this case, the ability of the institutions to provide services similar to those that they provide for other crops (e.g., educational information, operational loans, crop insurance, markets to sell the crop), is important if crop substitution is to be a viable alternative.

Consequently, the available response options open to a farmer and the ease with which he can adjust to a pesticide regulatory action are, most definitely, dictated by institutional responsiveness and institutional foresight vis-a-vis EPA regulatory decisions. This was evident in the cotton study site where the institutional network described above was cognizant of expected EPA regulatory actions, was responsive to the farmer's needs, and was able to provide viable alternates to the lack of DDT.* Indeed, well supported and responsive research station programs and extension service staffs had developed. In turn, a sophisticated knowledge base relative to cotton pests and their control had been developed and diffused to farmers and others.

For example, the existence of a "preparatory" response on the part of state extension and research station staffs was apparent both from interviews and documentation. Even before cancellation hearings, state recommendations warned against overuse of DDT and the concommitant prospects for the development of resistance, and further cautioned that farmers ought not assume the continued availability of DDT, while emphasizing the need for scouting and the protection of beneficial insects. Because the importance of scouting had been a major thrust of extension service recommendations prior to the DDT cancellation, a cadre of professional entomologists had developed and was utilized by farmers. Thus, a receptive attitude towards intensive use of scouting was apparent among many farmers.

In addition, a long term perspective seems to guide work at the agricultural experiment station in which work on solving this year's problem occurs in parallel with research having a five to ten year goal horizon (e.g., development of resistant varieties of cotton). Thus, a fairly extensive knowledge base relative to the tobacco budworm and its control was in existence when the DDT decision became effective.

Finally, the existance of a realistic alternative crop (at least in the two parishes studied, soybeans constitute an economically realistic alternative commodity), with appropriate knowledge and institutional base, has supplied one potential adjustment response, although soybeans do not convey the status of cotton for many long time cotton growers who are reluctant to pursue this alternative.

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*Three factors can be suggested in understanding why this institutional responsiveness may have resulted: (1) cotton has major economic importance for Louisiana; (2) cotton production has a history of pest adversity; and (3) control of cotton pests has never been simple.

Nevertheless, the previous chapter did note some adjustment problems to the DDT cancellation. However, noncontrollable and/or confounding conditions unrelated to the regulatory decision were noted as contributory factors. For example, pesticide supply shortages caused by a petroleum crunch, inflation, weather, market conditions, and levels of pest infestation, all had an influence on both the response options open to cotton farmers and the subsequent problems, as already described in Chapter 11.0.

Part III - SUMMARY OF RESULTS AND CONCLUSIONS

13.0 CROSS COMMODITY COMPARISONS

The purpose of this chapter is to provide a summary of some key similarities and differences found in the two case studies performed, i.e., corn and cotton. First, pertinent crop production factors affecting user adjustment are discussed. This is then followed by a presentation of various institutional arrangements and activities found in the two study sites, including some implications for possible adjustment responses and problems.

13.1 Crop Production Factors Affecting User Adjustment

In comparing the two crop-pesticide-pest combinations that were utilized to focus the effort in this study (i.e., corn - aldrin/dieldrin and chlordane/heptachlor - black cutworm, and cotton - DDT - tobacco budworm), a number of significant differences emerge. First, not all corn farmers in the study site had black cutworm infestations and those that did have the problem typically did not have it on all of their corn crop since soil type is a key factor, i.e., black cutworms are found predominantly in gumbo (or alluvial) soil. All cotton farmers, however, were or had been plagued with the tobacco budworm over the past three years. Moreover, black cutworm control traditionally involved the use of preventive type insecticides, whereas tobacco budworm contol was addressed with a series of rescue treatments once a given level of infestation was evident. Finally, in general insect problems and the control of them have typically been more severe in cotton production; that is, a long history of pest control problems (e.g., insect resistance to pesticides) can be found in cotton production (of particular interest is tobacco budworm resistance to DDT), more so than in corn production.

Consequently, the chemical solution appeared to be the primary means of control by those corn farmers having black cutworm infestations as various preventive type insecticides were always available and were regarded as a highly effective means of control. In contrast, cotton farmers have found that sole reliance on insecticides did not adequately control their insect problems (e.g., the tobacco budworm) and preventive type insecticides could not be used. Rather, rescue type insecticides had to be used in conjunction with other crop production practices designed to determine and minimize insect populations (e.g., scouting, diapause control, use of beneficial insects, stalk destruction, etc.).

Weather conditions in each study site deserve mention as well as they affect the level of insect infestation. Dry weather for the past two years in the two corn counties studied has reportedly somewhat reduced the black cutworm infestation levels (and caused another problem - drought), whereas wet spring weather in the cotton counties in 1974 delayed planting and summer rains induced regrowth, thus making cotton extremely attractive to the tobacco budworm from mid August into September when their control is most critical. Moreover fall rains reportedly delayed harvesting and reduced pesticide efficiency. Thus, weather conditions in the cotton study site appeared to favor tobacco budworm infestations whereas this was not the case with black cutworm infestations in the corn study site.

Another area of variation lies in the mechanism utilized by farmers to determine the crops that they will grow. In the corn study site, a rotation plan of corn and soybeans (which dictates each crop in each field each year) appears to be a common practice,* although continuous corn is also grown. Alternative crops such as wheat and milo have also been planted recently, partially due to the aldrin/dieldrin and chlordane/heptachlor suspensions, but also because of the dry weather conditions (i.e., these crops are drought resistant). Thus, the rotation plan, the price and availability of fertilizer and pesticides, and the weather all play a part in the crop selection process. In the cotton study site, however, farmers reported that little crop rotation occurred. Some farmers grew nothing but cotton (i.e., they have grown cotton all of their lives and it is somewhat traditional), while others appeared to designate their better land as cotton land and the rest of their land (or most of it) as soybean land. However, shifting of crops (e.g., to less cotton and more soybeans) was reported, particularly in 1975, due to the favorable prices for soybeans compared to cotton, production costs of the two crops (soybeans are about half that of cotton according to the FHA), the price and availability of cotton insecticides, and the previous bad weather for cotton production.

Finally, it is important to note that many cotton farmers and others in the cotton site reported that once use restrictions on DDT were instituted (e.g., the use of DDT around dairy cattle was restricted by USDA in the late 1960's), they anticipated that further regulatory action against DDT would be likely. Such anticipation amongst corn farmers was <u>not</u> found to be present in the corn site for the aldrin/dieldrin and chlordane/heptachlor decisions, although use restrictions pertaining to milk and meat products were imposed by USDA in the late 1960's. A possible explanation is that a larger number of restrictions

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*An important reason for this is that a corn-soybean rotation plan reduces the likelihood of corn rootworm problems, a common occurrance when continuous corn is grown.

were imposed on the use of DDT than on the use of aldrin/dieldrin or chlordane/heptachlor prior to EPA regulatory action to cancel and/or suspend these pesticides. Also, more publicity about the DDT use restrictions and DDT's harmful effects may be factors to explain this variation.

13.2 Institutional Arrangements and Activities

In each of the two study sites, a number of institutions were found to have an influence on a farmer's crop production practices, and more specifically his pest control practices. Moreover, comparison between these two sites indicated a number of significant differences related to the kinds and amount of information received by farmers from each source, which in turn have implications for adjustment responses and problems.

For example, the extension service in the cotton study site was found to play a very active role in the area of cotton insect control and sought to maintain direct contact with the farmer through the local extension activities. Thus, in addition to state and regional meetings for pesticide dealers, farmers, and others interested in cotton insect control, local agents hold special meetings for area farmers and maintain contact with them throughout the growing season via the local media. In contrast, the extension services in the corn study site, having recognized the close relationship that exists between the pesticide dealer and farmer regarding information about pesticides, hold regional and statewide meetings for pesticide dealers to distribute their pest control recommendations to them. At the local level, the county agents also work with the area pesticide dealers and are available to assist any farmer with any particular problem. They also coordinate educational activities through the local media. Emphasis is put on corn and soybean production (the two leading crops in the study area) and no massive efforts are made to reach every farmer; rather reliance is put on the pesticide dealer to transmit the university extension recommendations.

Closely related to the extension service activity is the agricultural experiment station activity. Indications were received that the aldrin/dieldrin suspension precipitated funding for black cutworm research and that prior to the suspension notice, little research was underway. Moreover, research entomologists did not think that heptachlor, an alternative to aldrin, would be suspended so soon after aldrin, leaving no preventive cutworm alternative to the farmer. Thus, the life cycle

of the cutworm is still not well understood and some feel they are still three or four years away. As a result, although alternatives to preventive cutworm insecticides are available (i.e., rescues), many experts in the study site feel they cannot be used effectively. In contrast to this situation, a rather sophisticated research entomology operation appears to be at work in Louisiana. Funding over the years has been adequate (including funds supplied by the state legislature in late 1974) for tobacco budworm research and the experiment station appears to have adopted a long range (5 to 10 year) perspective to cotton insect control with the hope of developing resistant cotton strains and earlier maturing varieties. Moreover, the experiment station, as well as the extension service, warned the farmer of pest resistance to DDT and its likely cancellation, as early as 1971.

Variations in the research activities undertaken by the chemical companies were also noted. For the black cutworm, little research was found to be underway on developing new preventive type insecticides as the chemical companies appeared to be content in marketing already registered rescue insecticides. For the tobacco budworm, however, development of a number of promising new pesticides to replace DDT and other tobacco budworm insecticides is underway by the chemical companies. These products are also being field tested at agricultural experiment stations and the extension service hopes that they will be registered for the 1977 growing season. Thus, cooperation between the extension service, agricultural experiment station and chemical companies (with the farmer benefiting as a result) appeared greater in the cotton study site than in the corn study site. That is, in the corn study site the farmer was placed in a dilemma, with the extension service and agricultural experiment station indicating that rescues could not be used effectively as yet and desiring a new preventive type insecticide as an interim solution. However, the chemical companies remained idle on further cutworm research and content with marketing the already registered rescue products and preventive type insecticides, although the latter did not amount to much.

As previous research has shown* and as indicated above, pesticide dealers in both study sites were found to be an important source of information to the farmer regarding pesticide usage and they (the dealers) too were in close contact with the chemical companies, (as

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*For example, see RvR Consultants, Farmer's Pesticide Use Decisions and Attitudes on Alternate Crop Protection Methods, Report prepared for the CEQ and the EPA, Contract Number EQC 325, July, 1974.

well as the extension services) for information, so that their product line and advice reflected the latest recommendations.* In both study sites, promotional dinners were held in the winter for their regular customers to present their product line for the upcoming season and these meetings were thought to be very influential with respect to the pest control strategies utilized during the growing season. Moreover, in the cotton study site, some dealers offered informal scouting services to their long time customers if requested to do so.

In addition, the phenomenon of formal scouting by professionals (which included pesticide recommendations and application schedules) was widespread throughout the cotton study site. These consulting entomologists can be seen as links between state research entomologists and the individual farmer, as well as an arm of the extension service, since they are commonly former students of the LSU entomology department and have earned the respect and friendship of the state experiment staff. Moreover, the State of Louisiana has taken legislative cognizance of these professionals and regulates their activities. In contrast, scouting as an institution does not exist in the corn study site and few farmers were found to have a great deal of knowledge about scouting because they never felt the need to scout their fields given the insect problems and the availability of preventive insecticides, which were thought to be highly effective. Thus, there is evidence of a higher degree of specialization among the cotton service institutions (e.g., professional scouting) as well as more direct lines of contact to the farmer.

Professional pesticide application was also widespread in the cotton study site, whereas the individual farmer applied his own pesticides in the corn study site. When professional applicators are used, it is not uncommon for them to consult with the farmer's scout to verify application schedules and recommendations.

In the area of financial arrangements, both study sites were somewhat similar. Local banks, production credit associations and the Farmer's Home Administration (FHA) were utilized to obtain operational loans. The financial institutions usually did not request detailed information about a farmer's pest control strategy, although all expected that good management practices would be used, including the use of pesticides if past history indicated the need to. The FHA, in particular, closely supervised their customers' overall cash flow and encouraged

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*Note should be made, however, that pesticide dealers in the corn study site did not stock large quantities of the recommended (or any) rescue insecticides.

the farmer to attend local extension programs. In the cotton study site, the production credit associations strongly recommended that their customers diversify their crops (i.e., plant both cotton and soybeans) and the FHA made this a requirement for the 1976 growing season in light of the poor cotton crops in previous years. Specifically related to the pesticide regulatory actions, the lending institutions have not yet reacted because they will continue to carry the farmer so long as loan limits are not reached and payments are received.

Farmers can use their Federal Crop Insurance (FCI) as collateral when securing a loan, although FCI was not commonly bought by cotton farmers in the study site. In the corn study site, it was utilized but was not obtainable for certain crops such as milo, making this alternative crop less desirable than others.

Other institutions (e.g., marketing institutions - grain elevators, cotton buying, etc.) were found to have little influence on a farmer's pest control strategy and consequently on his adjustment response because the farmer did not have difficulty finding a local elevator to handle any particular alternative crop. Nevertheless, this is an important consideration vis-a-vis the viability of alternate crops.

Finally, the mass media (i.e., radio, television, farm magazines, farm newspapers, etc.) was heavily relied upon by the farmer in both study sites for information and, consequently, was used by the various institutional representatives. In particular, farm magazines were utilized by farmers for pesticide recommendations.

Overall then, it was observed that the components of the institutional network providing the farmer with information are quite different for each study site. In the corn study site, pesticide dealers, the pesticide label, farm magazines, and neighbors, friends and relatives were utilized most often for pesticide information. In the cotton study site, pesticide dealers, professional scouts, professional applicators, the extension service, and neighbors, friends and relatives were widely mentioned for obtaining information concerning which pesticides to use and how they should be applied. Indeed, cotton farmers receive information from a larger number of professional sources and this information is tailored to their specific pest control problems. Whereas the pesticide dealer in the corn study site was found to be the farmer's primary institutional source of information for pesticide recommendations supplied by the extension service and chemical companies, a number of institutions (as indicated above) were found to provide the cotton farmer with this information and at a more detailed level and on a more personal basis.

14.0 THE USER ADJUSTMENT RESPONSE PROCESS

In the previous chapter, a number of crop production factors and institutional arrangements and activities were described which have an underlying influence on the farmer's user adjustment response process. In this chapter, a comparison of the user adjustment responses for each of the two case studies is first presented followed by a discussion of those forces influential in the adjustment process. The final section highlights those issues evolving from the analysis which should be of special concern to EPA.

14.1 Comparison of User Adjustment Responses and Problems

Presenting a comparative analysis of the user adjustment responses for the two crops and sites is made difficult by the phase difference between the two. In the case of cotton, three years have past since the DDT decision became effective. Thus, sufficient time had elapsed in order to view both the evolution and range of adjustments and problems associated therewith. For the corn farmers, the full impact of the EPA regulatory decisions has yet to be felt in that carry-over supplies of similar products (i.e., aldrin/dieldrin and chlordane/heptachlor) had not run out and therefore adjustment responses to date (i.e., as of March, 1976) had been minimal.

The problematic nature of this contrast should not be overdrawn, however, as the phase difference allows the delineation of response problems at different stages in the post-regulatory decision period. Moreover, similar user adjustment response trends that have occurred over the three year period since DDT was cancelled appear to be beginning for the aldrin/dieldrin and chlordane/heptachlor decisions. More specifically, the user adjustment responses to these regulatory actions can be categorized as follows:

- No response to the regulatory action (i.e., no reaction to the regulatory decision because the affected pesticides were not used);

- No change in current pest control practices (i.e., continued use of the banned pesticide);

- Use of new chemical pesticides (i.e., switch to alternatives to the banned pesticide);

- "Take a Chance" (i.e., attempt to grow the study crop without the use of any insecticides for the problem pest); and

- New practices to pest control, e.g.:

  - Use of early to moderate maturing varieties and/or early planting to reduce the damage from the problem pest;

  - Reallocation of crop acreage (i.e., switch to alternate crops); and

  - Intensive use of scouting with contingent use of rescue insecticides when necessary and use of other practices designed to minimize pest populations (such as beneficials, stalk destruction, etc.).

It should be emphasized that these categories are not necessarily disjoint empirically, but rather are offered as a means of conceptually organizing data from corn and cotton farmers. That is, farmers may have simultaneously exhibited more than one adjustment response described above or may have switched from one response to another.

Exhibit 14.1 on the following page presents a summary of the adjustment responses and key problems voiced by farmers and other community sources as adjustment response concerns. Also presented are the derived resource contingencies underlying these response concerns, the types of farmers (from both a production/pest control orientation and a resource class orientation) exhibiting each user adjustment response and the institutional inducements for each user adjustment response. The reader should also note that throughout the exhibit, the phrases utilized were chosen so that they would (hopefully) succinctly summarize, and be reflective of, the key similarities and differences found in the two study sites.

In reviewing this exhibit, it is significant to point out that an attempt is made to associate a production planning management orientation with a pest control orientation. Although this combined orientation offers some explanation to user adjustment responses and problems,

EXHIBIT 14.1: Summary of Regulatory Adjustment Response and Problem Perceived by Pesticide Users

User Adjustment Response to EPA Regulatory Action	Corn Study Site				Cotton Study Site			
	Consensus of Key Problems Voiced by Farmers and Other Community Sources as User Adjustment Response Concerns	Derived Resource Contingencies Underlying Concerns Attending User Adjustment Responses	Types of Farmers Exhibiting User Adjustment Response: Production/Pest Control Orientation	Resources Classes of Farmers Selecting User Adjustment Response and Institutional Inducements for User Adjustment Response	Consensus of Key Problems Voiced by Farmers and Other Community Sources As User Adjustment Response Concerns	Derived Resource Contingencies Underlying Concerns Attending User Adjustment Responses	Types of Farmers Exhibiting User Adjustment Response: Production/Pest Control Orientation	Resource Classes of Farmers Selecting User Adjustment Response and Institutional Inducements for User Adjustment Response
"No change" in current pest control practices (e.g., for corn-use of aldrin; for cotton-use of DDT).	Supply shortages and higher prices for restricted product (i.e., aldrin).	Personal resource limitations: inability to stockpile aldrin. Confounding conditions: petroleum crunch; inflation.	Non-contingent users of the restricted product.	Resource classes: medium to high resource farmers. Institutional inducements: extension service recommendations to use any carry-over supplies; knowledge of dealers stockpiling aldrin; credit sources expectations that pesticides will be used.	Supply shortages and higher prices for the restricted product (i.e., DDT).	Personal resource limitations: capital and storage facilities, limitation for stockpiling insecticides.	Both adopters of new pest control practices and pest control traditionalist.	Resource class: higher resource farmers. Institutional inducements: personal ties to dealers with supplies of the restricted product.
"New chemicals" (e.g., for corn - heptachlor and chlordane; for cotton-use of methyl parathion and aldrin).	Supply shortages, early buying, higher prices for new chemicals and increased debt/credit problems. Local transportation and storage problems. Recalibration of equipment. Comparative efficacy.	Personal resource limitations: operating capital deficiencies. Institutional constraints: pesticide dealerships requiring payment within 30 days of shipment; pesticide dealerships having difficulties in getting new chemicals from distributors. Confounding conditions: petroleum crunch; inflation.	Non-contingent users of the restricted product.	Resource classes: low and medium resource farmers. Institutional inducements: advice from pesticide dealer stocking alternate chemical (e.g., heptachlor); credit sources expectations that pesticides will be used.	Supply shortages and increased cost of new chemicals. Critical timing of applications. Comparative efficacy. Handling complications due to acute toxicity of alternatives. Increased debt.	Personal resource limitations: operating capital deficiencies. Confounding conditions: petroleum crunch; inflation; weather.	Pest control traditionalists.	Resource class: lower resource farmers. Institutional inducements: advice from pesticide dealers, application services and scouts.
"Take a chance" (i.e., do not treat for the problem pest in question with insecticides).	Replanting may be necessary if damage occurs. Planting schedule may preclude replanting. Weather may preclude replanting. The inability to replant or the production costs of replanting may increase debt liability.	Personal resource limitations: operating capital deficiencies; time constraints. Confounding conditions: weather.	Non-contingent users of the restricted product.	Resource classes: low and medium resource farmers. Institutional inducement: dealer reluctance to stock rescue insecticides; lack of suggested alternatives.	Not applicable.	Advice from the extension service, professional scouts, and some dealers.	No farmers exhibited this response.	Not applicable.
"New pest control practices" 1) Reallocation of crop acreage (e.g., corn shifting to soybeans, wheat and/or milo; cotton shifting to soybeans).	Ignorance of production technology of alternate crops. Allergic reactions to alternate crops. Increased financial risk in growing alternate crops.	Personal resource limitations: time available for education in deficient skill areas. Institutional constraints: unavailability of crop insurance and marketing facilities.	Both non-contingent and contingent users of the restricted product.	Resource classes: medium to high resource farmers. Institutional inducements: dealer reports of supply shortages of the restricted pesticide; knowledge of drought conditions governing corn.	Most would prefer to remain "cotton planters". Cotton production equipment sitting idle and possibly deteriorating.	Personal resource limitations: operating capital deficiencies. Institutional constraints: loss of prestige implied in not producing cotton; credit availability.	Both marginal producers and pest control traditionalist. Also, some adopters of new pest control practices temporarily shifted some (not all) cotton acreage to soybeans due to the market slump in cotton prices, the poor cotton yields in recent years, and the lower production costs associated with soybeans.	Resource class: high and low resource farmers. Institutional inducements: credit organizations requiring crop diversification as a loan condition.
2) Pest avoidance planting practices (use of early to moderate maturing varieties and/or planting earlier).*	Land must be drained sufficiently by early spring before planting can proceed.	Confounding conditions: weather (spring rain levels).	Both non-contingent and contingent users of the restricted product.	Resource class: high resource farmers.	Land must be drained sufficiently by early spring before planting can proceed.	Confounding conditions: weather (spring rain levels).	Adopters of new pest control practices.	Resource class: higher resource farmers. Institutional inducements: advice from extension service agents and professional scouts.
3) Intensive use of scouting.	Not applicable.	Practice is without history or institutional basis in study site. Rescue insecticides are not stocked. The value of the approach is questioned by the extension service and agricultural experiment stations.	No farmers anticipated making this response nor had any made it previously.	Not applicable.	Supply shortages and increased costs of new pesticides. Critical timing of applications. Handling problems due to acutely toxic substitutes. Comparative efficacy. Increased debt.	Personal resource limitations: operating capital deficiencies. Institutional constraints: access to "same-day" crop dusting services. Confounding conditions: petroleum crunch; inflation; weather.	Adopters of new pest control practices.	Resource class: higher resource farmers. Institutional inducements: advice from pesticide dealers, extension service agents, professional scouts, and pr[illegible] applic[illegible]

*For Louisiana cotton farmers, early to moderate maturing varieties do not yet exist.

a farmer's resource class is also a necessary (and it appears a more powerful) explanatory variable. That is, a farmer's personal resources -- past practices to pest control (i.e., tradition), level of financial resources (i.e., cash and/or credit), information seeking activities, sophistication (i.e., managerial skills), and friendship ties with pesticide dealers -- are linked to adjustment responses and problems. Moreover, it is important to note that various institutional activities either preclude or alleviate various responses and problems. Indeed, the magnitude or seriousness of a farmer's adjustment problems (i.e., the degree to which a particular adjustment problem affects his ability to adapt to a new pest control option with confidence), was found to be influenced by both his personal resources and the ability of the institutional network to supply timely supplementary resources for responding to a regulatory action. Thus, different problems and/or concerns voiced by farmers in adapting to a particular response can be equally serious for different farmers. For example, a farmer with good pesticide dealer contacts but poor credit may find the higher prices of alternative pesticides more serious than the limited supplies. A farmer who has good credit but lacks pesticide dealer contacts, may find the reverse to be true.

It is also significant to note that intensive use of scouting was not a response found by farmers in the corn study site nor was it suggested for future years largely because of institutional constraints and no prior use of the practice. In 1975 (the first growing season affected by the aldrin decision) most farmers interviewed either maintained current pest control practices (i.e., used carry-over supplies of aldrin) or used a new chemical (e.g., heptachlor) in a similar way. Some responded by "taking a chance" and few responded by adopting new pest control practices. However, many farmers indicated that the use of new pest control practices, specifically reallocation of crop acreage and/or "taking a chance", would increase in the 1976 growing season and in subsequent years as carry-over supplies of heptachlor and chlordane become exhausted.

In the cotton study site, those with adequate financial resources and pesticide contacts were able to stockpile DDT and maintain their current pest control strategies for at least the first growing season affected by the ban (i.e., the 1973 growing season). Once these supplies ran out, they tended to become more innovative and had by 1975 (3 years after the decision), adopted a strategy based on a more intensive use of prior scouting practices. Other farmers unable to stockpile DDT, simply began to use the new chemicals in 1973 with little

other changes and are continuing this more traditional practice today. In 1975, reallocation of crop acreage was employed by almost all farmers particularly those plagued by financial problems. However, this response was not solely because of the DDT decision as indicated in Exhibit 14.1.

Thus, it is significant to note that the use of a banned pesticide tends to persist until the supply runs out and the supply may have been augmented by the individual farmer (i.e., stockpiling of the banned pesticide is common). When the favored (banned) pesticide is no longer available, a common first adjustment has been to simply substitute an alternative pesticide for the banned pesticide. Less likely is the adoption of new pest control practices, e.g., a major change in pest management strategy (such as intensive scouting if not used before) or a change in the crop grown.

14.2 Influential Forces in the User Adjustment Response Process

In the above section, a number of factors were indicated as having a key influence on the user adjustment response process.

Knowledge that a regulatory action is pending or has actually occurred is, of course, a precondition to the response process. Moreover, the current study found that such knowledge is highly correlated to the current use of the pesticide affected by the decision (e.g., aldrin/dieldrin, chlordane/heptachlor or DDT). Farmers who have never used or have not used the pesticide in recent years tend to know nothing or very little about the pending or actual regulatory action; this phenomenon was found in the corn study site but not in the cotton study site for reasons cited earlier. Those who have used the pesticide tend to know little about a pending regulatory action (unless information is supplied to them by knowledgeable sources with whom they come into contact with, e.g., the extension service); rather they hear and learn about the actual regulatory action via the news media, in farm magazines and (more so) when they come into contact with their pesticide dealer and find that carry-over supplies of the pesticide are or will be scarce.

That is, farmers do not become fully knowledgeable of a regulatory action (i.e., receive detailed information, take the message seriously and attend to it) and view it as being problematic until they

have difficulty in getting what they used to use (i.e., the banned pesticide). Therefore, farmers tend to do little experimenting with alternatives until carry-over supplies run out. Some pre-cancellation experimenting with alternatives to DDT was indicated in the cotton site, but primarily as a result of insect resistance to DDT and not the knowledge of a pending regulatory action. Hence, pesticide supply appears to be the primary stimulus for the farmer to change his pest control and production practices and not awareness of a regulatory action itself (i.e., hearing "something" about a pesticide regulatory action).

The various changes in production practices (i.e., responses) that the farmers employed have been described in Section 14.1. Again, important considerations for the individual farmer in determining his response are his personal resources, e.g., his past practices to pest control (i.e., tradition), his financial resources (cash and/or credit), his information seeking activities, his sophistication (i.e., managerial skills), and his friendship ties with pesticide dealers. Those farmers who heard of the ban through the news media and stay in contact with information sources such as the extension service, have good dealer contacts, and have adequate financial resources,* were best able to stockpile the banned pesticide in order to maintain their current pest control practices. Indeed, some dealers contacted their long time better customers shortly after the ban was announced to warn them that carry-over supplies were tight and to urge them to place their orders early.

Those unable to stockpile or locate a source of the banned pesticide when the growing season approached was forced to adopt an alternate strategy. A farmer's personal resources and his ability to absorb a succession of poor crop years, i.e., poor crop yields, are again important considerations in the response chosen. The smaller, lower resource farmers tend to respond in the way that is least costly and least risky to their overall crop production process. This may involve simply a pesticide substitution (e.g., aldrin to heptachlor), or in some cases a crop substitution (e.g., cotton to soybeans). The latter response occurs if the crop production costs are significantly lower with another crop and if growing the alternate crop is less risky th growing the former crop without the banned pesticide. The large higher resource farmers on the other hand, who can more easily a poor crop year will utilize alternate pest control strategies (

*This description fits those who are typically the larg established and higher resource farmers.

intensive use of scouting) which are more costly and possibly more risky. However, the high resource farmers, who are more likely to take risky options than the low resource farmers, also tend to have access to a wider range of information sources and so are more likely then their less affluent neighbors to adapt in a fashion they regard as successful, regardless of the response option chosen.

However, the study found that the institutional network within which the farmer has to operate is critical both for dictating available response options as well as alleviating associated problems. When faced with replacing a banned pesticide, the farmer looks to the institutional setting to provide an answer just as he does when he is faced with a pest resistance situation. That is, the buildup of pest resistance to a particular pesticide has, in the past, initiated cooperative research activity from numerous institutions (e.g., agricultural experiment stations, extension services, chemical companies, etc.) to develop alternative pest control strategies (chemical or other) for the problem pesticide and to disseminate these alternatives to the farmer through his local information sources (e.g., the pesticide dealer). In addition, pest resistance to certain pesticides has created new institutions (e.g., professional scouting, professional pesticide application, etc.) to help in this adjustment process when necessary.

The withdrawal of a pesticide calls for this same type of responsiveness from these same institutions; however, the time factor can be more critical with a pesticide regulatory action, in that pest resistance to a pesticide is noticeable and usually evolves over a long period of time, whereas the knowledge of a pesticide regulatory action may not be known far in advance and will impact in a shorter time period. Moreover, the withdrawal of a pesticide may increase the risk of growing the crop sufficiently to warrant a crop substitution. In this case, the institutions' ability to provide services similar to those that they provide for other crops (e.g., educational information, operational loans, crop insurance, markets to sell the crop), is important if crop substitution is to be a viable alternative.

Consequently, the available response options open to a farmer and the ease with which he can adjust to a pesticide regulatory action are, most definitely, dictated by institutional responsiveness and institutional foresight vis-a-vis EPA regulatory decisions. Indeed, it appears that certain historical production conditions bearing on production related institutions of each study crop, have rendered farmers for one study crop (e.g., cotton) better able to cope with pesticide regulatory actions than farmers for the other study crop (e.g., corn).

Finally, the user adjustment response process is contingent upon noncontrollable and/or confounding conditions unrelated to the regulatory decision and the actions of farmers and organizations at the community level. For example, pesticide supply shortages caused by a petroleum crunch, inflation, weather, market conditions and levels of pest infestation, all influence both the response options open to farmers and the subsequent problems that may develop. Nevertheless, the nature of the relationships between the farmer and the various institutions will, to varying degrees, mitigate or soften the effects of these otherwise uncontrollable conditions in the production operating environment.

14.3 Important Concerns for EPA

In reviewing the farmer adjustment responses and problems and the influential forces associated therein, a number of conclusions are pertinent for providing EPA with a better understanding of the process associated with replacing a banned pesticide in the short-term (i.e., within a three year time period):

> Although farmers may become aware (i.e., "hear something") of a pesticide regulatory action near the time Federal decisions are made via the news media, they do not necessarily act on this information (i.e., take the message seriously, attend to it, solicit and receive detailed information, etc.). Indeed, the regulatory restriction does not become problematic until carry-over supplies of the banned pesticide become scarce. Thus, little experimenting with alternatives is done prior to this time and no preparatory or anticipatory adjustments are made.
>
> The initial user adjustment response amongst farmers is usually an attempt to maintain their current pest control practice and hence they continue using the banned pesticide. Indeed, many farmers augment their supply by stockpiling and are encouraged to do so through advice received in the community-based institutional service network.
>
> User adjustment responses that simply entail the substitution of the banned pesticide with a new

chemical are also fairly common, but the adoption of new pest control practices not utilized in the past (e.g., alternate crops, intensive use of scouting with contingent use of rescue insecticides, etc.) are met with greatest resistance by the farmer and are usually only adopted by the larger, more established and higher resource farmers in the short term.

These user adjustment responses are not without their reported difficulties by farmers. Most of their concerns center around matters that could inhibit yield and profit; less concern for health or environmental side effects is apparent. The following user concerns are in evidence: pesticide shortages, increased cost and reduced efficacy of alternate chemicals (the latter partially caused by improper application) resulting in increased production costs, reduced yields, reduced income and increased debt; allergic reactions and the lack of institutional services for alternate crops; and the lack of institutional services for adjustment responses involving new pest control practices (e.g., intensive use of scouting).

Farmers look to an institutional service network in their surrounding community for alternate courses of action when faced with replacing a banned pesticide (e.g., the extension service, the agricultural experiment stations, chemical companies, pesticide dealers, lending organizations, professional scouts, neighbors, friends and relatives, etc.). However, institutional constraints which impede responsiveness to the pesticide regulatory action can preclude otherwise possible responses by the farmer.

A farmer's past practices (i.e., tradition) and his beliefs about what kinds of pest control strategies are effective for a particular pest, influence his adjustment responses in the sense that they restrain the range of attractive options.

Financial resources (e.g., cash and/or credit) also constitute a significant attribute with respect to a farmer's response and problems associated therewith. That is, those farmers that can weather one or two poor crop years while the community based support institutions seek viable alternatives to the banned pesticide are least likely to have serious adjustment problems.

Noncontrollable confounding conditions such as inflation, the weather, fluctuating market conditions for alternate crops, prior and expected levels of pest infestation, and pesticide shortages caused by raw material shortages (e.g., a petroleum crunch), all influence both a farmer's response to a pesticide regulatory decision and the subsequent problems that may develop. Nevertheless, the nature of the relationships between the farmer and the various support organizations will, to varying degrees, mitigate or soften the effects of these otherwise uncontrollable conditions in the production operating environment.

Hence, the magnitude or seriousness of a farmer's adjustment problems (i.e., the degree to which a particular adjustment problem affects his ability to adapt to a new pest control option with confidence) is influenced by <u>both</u> his personal resources (i.e., past practices to pest control, financial resources, information seeking activities, managerial skills, and friendship ties with pesticide dealers) <u>and</u> the ability of the institutional service network to provide timely, supplementary resources for responding to a regulatory action. Curiously, the interphase of these two resource factors means that adjustment problems can be equally serious for different farmers in the same geographical locality.

In summary, a period of three years appears to be a reasonable definition for describing "short term" transitional user adjustment problems. This study found that during the first growing season affected by a regulatory action, many farmers will attempt to "buy time" by stockpiling the banned pesticide. For some farmers, such

stockpiles may be sufficient to carry them through the second growing season as well. However, in the third growing season affected by a regulatory action, few carry-over supplies of a banned pesticide exist and, thus, most, if not all, farmers are forced to make an additional adjustment response. Nevertheless, the available response options (i.e., alternate pest control strategies), the extent to which each is chosen, and the difficulties anticipated in adopting each option are, of course, influenced by a complex set of personal and community institutional resource conditions. Therefore, the response options open to the farmer and adopted by him in the "short term" (i.e., three years) will vary both between farmers of the same commodity sector, as well as between farmers of different commodity sectors.

15.0 RECOMMENDATIONS

15.1 Procedural Recommendations for Pesticide Regulatory Actions

In light of the discussion in the preceeding two chapters, a number of activities should be incorporated into EPA's benefit/risk analyses (particularly those performed as part of the rebuttable presumption against registration (RPAR) process), in order to determine the localized (i.e., county level) potential short-term adjustment problems when an EPA regulatory action is contemplated.

Initially, the knowledge bases relative to the target pest, alternative pest control strategies and alternative crops in question need to be assessed as these are the critical areas that dictate adjustment responses and problems. Key factors related to the target pest are the degree to which the basic etiology and epidemiology of the pest is known by the research institutions. In addition, the real viability of alternative pest control strategies needs to be viewed in terms of:

- The financial and skill requirements for activities contrary to past practices (e.g., scouting of fields for insect damage when the practice is without history or institutional basis, use of rescue insecticides when preventive type insecticides were commonly used previously, planting of early maturing crop varieties, etc.);

- The need for services in the local institutional setting that are currently unavailable (e.g., professional scouting, professional pesticide application, chemical company incentives to market pesticides for alternative pest control strategies, stocking of pesticides not previously carried by pesticide dealers, etc.); and

- The conditions under which control of the target pest is tenuous (e.g., heavy pest infestations, pest resistance to alternative pesticides, etc.).

Furthermore, the real viability of alternative crops needs to be viewed relative to:

- Requisite skills and knowledge;
- Machinery;
- Educational information services;
- Marketing structure;
- Lending institutions;
- Crop insurance; and
- "Other" (e.g., potential for allergic reaction).

That is, in reviewing the real viability of alternative pest control strategies and alternative crops in terms of the above dimensions, an overall assessment of the existing institutional service network and the interrelationships between its components must be made vis-a-vis their activities on these dimensions, since farmers rely on this network when seeking alternate courses of action when faced with replacing a banned pesticide. Indeed, regulatory decisions must be contemplated with recognition of the fact that there are real differences in institutional and, therefore, farmer coping capacities. It is also particularly important to assess the ability for low resource farmers to adopt alternative pest control strategies or alternative crops since financial resources and the ability to weather one or two poor crop years appear important in reducing serious adjustment problems.

Once all the above assessments are made, appropriate "signals" will need to be sent to the various institutions impinging on the local agricultural community (particularly the educational and research components) when, if, and where the knowledge bases or existing activities are found lacking, so that corrective action can begin. That is, contacts in and services to the various components of agricultural institutions, including those at the county level, should be developed, so that information on impending decisions can go directly to financial institutions, county extension agents, pesticide dealers, etc., as well as to state educational and research organizations.

In addition, if "signals" have to be sent, this should be noted in the RPAR risk/benefit analysis because sufficient lead time and intensity of the "signal" are also important. For example, research on new pest control strategies for a banned pesticide can take 5-10 years

(according to estimates received in this study) if little work prior to the ban has taken place. In this instance, much lead time would be needed and a strong signal must be sent to the appropriate institutions. On the other hand, if an alternative crop is not viable simply because crop insurance is unavailable, this may be corrected much more readily.

However, simply sending these "signals" may not be sufficient to counteract a "business as usual" attitude on the part of the institutions. Thus, consideration must also be given to providing financial and technical resources to these institutions to insure that they can and will react in a way that will serve the best interests of the farmer.

Finally, in view of the 1975 amendments to FIFRA and the corresponding FY '77 appropriations in pesticide to USDA, it is not appropriate to imply that EPA "should consider doing everything" indicated here. Rather the EPA, the USDA and the appropriate state agencies should cooperatively effect the recommendations indicated above. Additional comments in this area are provided in Section 15.2 below.

15.2 Areas for Future Work

The preceding topics may be viewed as potential components of a model of the local agricultural system and its processes. In order to better understand the potential impact of future regulatory decisions, the development of such simulation models would be highly instructive. Indeed, the exercise of developing such a model could be as useful as the operating model itself. In sum, the learning experience during the empirical phase of this study indicates the need for further theoretical work.

More specifically, in light of the user adjustment responses and problems found in this study, a number of areas for future work that would have optimal policy benefit to EPA can be suggested:

- An understanding of why certain institutional service networks can be more responsive than others in facilitating the user adjustment response process should be determined. This study has implied that historical production conditions involving a pest that is a widespread threat to an economically significant crop for

which control has never been simple, tends to stimulate the appropriate institutional responses. This hypothesis should be further explored (e.g., a comparative study of agencies operating in various commodity sectors would be appropriate). In so doing, ways to make institutional networks more responsive can be delineated, including technical assistance and financial assistance.

- Mechanisms to promote experimentation (amongst farmers) with alternatives (chemical and other) to a pesticide that is likely to be banned should be explored so that some preparatory or anticipatory adjustments can be hoped for, rather than simply attempts to "buy time" by stockpiling the banned pesticide once the regulatory action has been taken.

- Ways to assist farmers in adjusting to the impacts of a regulatory decision (particularly those farmers with limited resources) should be explored, including technical assistance as well as financial assistance.

In pursuit of these activities, it is again not appropriate to imply that EPA should consider doing everything mentioned above. EPA, in cooperation with the USDA and the appropriate state agencies, should embark on these areas. Furthermore, to insure that each agency is participating in an optional way, additional research may be appropriate to determine the capabilities, resources and preferences of each. Thus, EPA should explore, with the USDA and the appropriate state agencies, the responsibilities each should take in mitigating short-term agricultural user adjustment problems.

15.3 Methodological Concerns

In addition to the preceding recommendations, the following methodological discussion is of worth. The experience gained in the contrasting styles of work during the first week of field work in the cases of cotton and corn is instructive. That is, in the cotton case study, the two days of meetings with state level people in both the extension service and research station prior to entering the study site were very helpful for various reasons:

- The "quick education" regarding cotton culture and pest problems gave depth to information previously gained through readings;

- Having met with the "elite" served to legitimate the field team in the eyes of people at the county level; and

- Subsequent contacts with state people elicited responsive cooperation on numerous occasions.

Hence, the overall style of the first week's effort in Louisiana seems worthy of emulation in future efforts.

Moreover, the use of a very flexible ethnographic design in the current effort seems well justified in terms of two points:

- If a traditional survey research undertaking had been utilized, an understanding of the user adjustment response process would have been obscured due to the rigid nature of the research questions and the design that would have necessarily been dictated; and

- Much of the most important information (in terms of the conclusions generated) came from people other than farmers.

The conjunction of the above two points makes clear that the number of respondents will not be predictive of the quality of the results. What is important is the depth and mix of relevant data sources (including personal interviews), such that the production system and its operating environment are understood. Hence, an emphasis on gathering data concerning relevant institutions is appropriate -- which is not to say, for example, that every banker in a county needs to be interviewed.

CONSAD is confident that sufficient learning has been accrued in the process of the current study that significant efficiencies can be effected in similar, future studies.

APPENDIX A: Demographic and Agricultural Profile of the Corn Study Site Counties

1. Fremont County, Iowa*

Fremont County, Iowa is located in the extreme southwest corner of the state, bordered by the Missouri River on the west and the State of Missouri to the south. It has a total land area of approximately 335,232 acres or 525 square miles. Sidney, the county seat, is located 40 miles south of Council Bluffs, Iowa.

The population of Fremont County was 10,282 in 1960 (5,296 town and 4,986 rural) and 9,282 in 1970 (5,155 town and 4,127 rural), and is 99.8 percent white. Coupled with a natural increase of 150 persons during the decade (i.e., births exceeded deaths by 150 persons), a net out migration of 1,150 persons occurred, not uncommon in this region of Iowa. An age-sex breakdown of the county population in 1970 appears below:

Age	Male	Female	Total
0-17	1,514	1,399	2,913
18-64	2,327	2,480	4,807
65 and over	696	866	1,562
Total	4,537	4,745	9,282

The dependency ratio (i.e., number of persons under 18 and over 65 per 100 persons between 18 and 65) in 1970 was 93.1 compared to 92.1 in 1960. For the State of Iowa, dependency ratios were 91.2 in 1960 and 88.4 in 1970.

There are four school districts in Fremont County. The average daily membership for the school year 1970-1971 was 2,288 pupils.

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*Information for this section taken from: 1969 Census of Agriculture-State and County Data; Iowa Crop and Livestock Reporting Service, Iowa Annual Farm Census 1972, Bulletin No. 92-AH, Iowa Dept. of Agriculture and USDA; Iowa State Cooperative Extension Service, The Council Bluffs Area: Past, Present, and Future, CRD 93, September 1973; and data obtained from field work performed in this study, e.g., conversations with extension service personnel and others.

The median family income in 1960 and 1970 for Fremont County was $3,762 and $7,805, respectively. This compares to $5,069 in 1960 and $9,018 in 1970 for the State of Iowa.

Employment in Fremont County has been strong over the last six years with the unemployment rate ranging from a low of 2.6 percent in 1974 to a high of 5.2 percent in 1975.

Farming is the main enterprise in the county and in 1969, farm land accounted for 95.4 percent of the total land area in the county or approximately 320,000 acres. Total cropland was 276,123 acres and harvested cropland totaled 165,425 acres in 1969. Corn and soybeans have been the two major crops grown in the county, comprising over 90 percent of the harvested acreage in the county. The remaining acreage is devoted to hay, alfalfa, clover, wheat, popcorn, white corn, oats and sorghum. Both cash-grain and general farming are dominant. The principal livestock are beef cattle and hogs.

Approximately 20 percent of the land in Fremont County can be described as gumbo type soil, i.e., soil characterized by poor drainage, dark in color, located along river and creek beds and subject to flooding.* Large cash-grain operations are typically found on this type of soil, where the black cutworm has been a continual problem. Smaller sized farms are found in the hills and typically have livestock operations. However, in cool wet weather, cutworms can also be found in these lighter soils. This has not occurred in the past couple of years, as the area is experiencing a drought. However, cutworm problems have also been found to be more susceptible on gumbo soil if corn is planted after soybeans and if minimum tillage is used.

The farming trends in Fremont County during the decade from 1959 to 1969 have been similar to those in the State of Iowa. In this ten year period, larger and fewer farms have been the results. In 1959, Fremont County has 1,198 farms in all and 1,110 commercial farms (i.e., farms with over $2,500 in yearly product sales). In 1969,

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*Clark, L.A. et al., Soil Survey of Fremont County, Iowa, USDA Soil Conservation Service in cooperation with Iowa Agriculture and Home Economics, Experiment Station, Iowa Cooperative Extension Service and Iowa Department of Soil Conservation, July, 1975.

there were 976 farms total and 876 commercial farms and in 1972, there were 872 commercial farms. Approximately 18.6 percent of the commercial farms are class 1 farms (i.e., farms with yearly product sales of $40,000 and over), 24.1 percent are class 2 farms (i.e., farms with yearly product sales of $20,000 - $39,999), 28.8 percent are class 3 farms (i.e., farms with yearly product sales of $10,000 - $19,999), 16.7 percent are class 4 farms (i.e., farms with yearly product sales of $5,000 - $9,999), and 11.9 percent are class 5 farms (i.e., farms with yearly product sales of $2,500 - $4,999). The average size of all farms in Fremont County was 301.1 acres in 1964, 327.6 acres in 1969 and 357 acres in 1972.

In 1969, 39.4 percent of all farm operators were full land owners, 30.7 percent were part land owners and part renters and 29.8 percent were tenants. In terms of farmland, 22.4 percent of the land was farmed by full land owners, 44.2 percent by part land owners and part renters, and 33.4 percent by tenants.

The average age of the farm operator in Fremont County, was 50.6 years in 1969, with 11.9 percent under 34 years of age, 73.0 percent between 35 and 64 years of age, and 15.1 percent 65 years or older.

2. Atchison County, Missouri*

Atchison County, Missouri is located in the extreme northwest corner of the state, bordered by the Missouri River on the west and the State of Iowa to the north (i.e., Fremont County, Iowa and Atchison County, Missouri are adjacent to one another). It has a total land area of approximately 351,488 acres or 549 square miles. Rock Port, the county seat, is located approximately 55 miles north of St. Joseph, Missouri.

The population of Atchison County was 9,213 in 1960 (4,740 town and 4,483 rural) and 9,240 in 1970 (5,401 town and 3,839 rural) and is 98.9 percent white. Coupled with a natural increase of 257 persons

*Information for this section taken from: 1969 Census of Agriculture-State and County Data; Denney, Hugh (editor), Northwest Missouri Regional Profile, MP 362, Extension Division, University of Missouri-Columbia, 1974; and data obtained from field work performed in this study, e.g., conversations with extension service personnel and others.

during the decade, a net out migration of 230 persons occurred, which was the lowest net out migration in the northwest region of the state. An age-sex breakdown of the county population in 1970 appears below:

Age	Male	Female	Total
0-17	1,364	1,276	2,640
18-64	2,615	2,526	5,141
65 and over	614	845	1,459
Total	4,593	4,647	9,240

The dependency ratio in 1970 was 79.7 compared to 86.8 in 1960. For the State of Missouri, the dependency ratio was 82.5 in 1970.

Atchison County has four school districts. In 1971-1972, 2,099 pupils were enrolled in the schools. As of 1970, the median school year completed was 12.1 for males 25 years and older and 12.3 for females 25 years and older. This compares to 11.7 years for males and 11.8 years for females, for the state overall.

The median family income in 1960 and 1970 for Atchison County was $3,557 and $7,305, respectively. In the State of Missouri, these figures were $5,127 and $8,914, respectively.

Atchison County has been described as a good healthy county as far as employment goes. The unemployment rate has been consistently low over the last 30 years, ranging from 4.9 percent in 1940 to 1.3 percent in 1950 and most recently 2.0 percent in November, 1975.

As is the case with Fremont County, farming is the main enterprise in Atchison County. According to the 1969 Census of Agriculture, farm land accounted for 104.0 percent* of the total land area in the county or approximately 365,608 acres. Total cropland was 304,272 acres and 161,706 acres were harvested in 1969. Corn and soybeans have been the two major crops grown in the county and comprised approximately 85 percent of the harvested average in 1969. Other crops grown in the county include wheat, hay, sorghum, oats and other small grains. Cash-grain and general farming are practiced in the county and the principal livestock are beef cattle and hogs.

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*This is not a typographical error. This is the figure given in the Census!

As in Fremont County, much of the soil in Atchison County can be designated as gumbo type soil, susceptible to black cutworm infestations, which occur annually. This soil is predominant in the bottomland areas of the county, along the Missouri River and the Tarkio River, where the farm operations tend to be large and are cash-grain. Smaller farm operations are in the hills and typically contain livestock operations.

Atchison County, as well as the northwest region of Missouri has experienced a decline in the number of farms coupled with an increase in the size of the farms. For example, in 1959, there were 1,004 farms in Atchison County, compared to 946 in 1969, of which 821 are commercial farms. Approximately 22.3 percent of the commercial farms are class 1 farms, 27.8 percent are class 2 farms, 22.8 percent are class 3 farms, 14.7 percent are class 4 farms, and 12.4 percent are class 5 farms. The average size of all farms in Atchison County was 369.2 acres in 1964 and 386.4 acres in 1969.

In 1969, 46.1 percent of all farm operators were full land owners, 25.4 percent were part land owners and part renters and 28.5 percent were tenants. In terms of farmland, 29.8 percent of the land was farmed by full land owners, 38.4 percent by part land owners and part renters, and 31.8 percent by tenants.

The average age of the farm operator in Atchison County was 49.5 years in 1969, with 15.9 percent under 34 years of age, 68.8 percent between 35 and 64 years of age, and 15.3 percent 65 years or older.

APPENDIX B: Demographic and Agricultural Profile of the Cotton Study Site Parishes

1. Richland Parish, Louisiana*

Richland Parish, Louisiana is located in the northeast part of the state bordered by Franklin Parish to the south. It has a total land area of approximately 368,832 acres or 576 square miles. Rayville, the parish seat, is located approximately 20 miles east of Monroe, Louisiana.

The population of Richland Parish was 23,824 in 1960 (72.4 percent urban and 27.6 percent rural) and 21,774 in 1970 (68.5 percent urban and 31.5 percent rural). The parish is approximately 60 percent white and 40 percent non-white. A net out migration of 5,672 persons occurred during the decade from 1960 to 1970, of which 1,434 were white and 4,238 were non-white. The greatest numbers were in the 20-29 age group for both whites and non-whites. An age-sex breakdown of the parish population in 1970 appears below:

Age	Male	Female	Total
0-17	4,419	4,228	8,647
18-64	4,849	5,636	10,485
65 and over	1,177	1,465	2,642
Total	10,445	11,329	21,774

The dependency ratio (i.e., number of persons under 18 and over 65 per 100 persons between 18 and 65) in 1970 was 107.7, compared to 115.3 in 1960.

School attendance in 1970 numbered 6,551 persons in the parish. The median years of school completed in 1970 was 8.9, compared to 10.8 for the state.

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*Information for this section taken from: 1969 Census of Agriculture-State and County Data; Louisiana Crop and Livestock Reporting Service, Louisiana Cotton: Acreage, Yield, and Production (various years), Louisiana State University; Public Affairs Research Council of Louisiana, Inc., Statistical Profile of Richland Parish, Baton Rouge, Louisiana, 1973; Bowles, G.K. et al., Net Migration of the Population, 1960-1970, by Age, Sex, and Color-Part 5: West South Central States, USDA (ERS), University of Georgia (Institute for Behavioral Research), and NAS (RANN) cooperating, December, 1975; and data obtained from field work performed in this study, e.g., conversations with extension service personnel and others.

The median family income in 1959 and 1969 for Richland Parish was $2,286 and $4,868, respectively. This compares to $4,272 in 1959 and $7,530 in 1969 for the State of Louisiana.

Unemployment in the parish increased in the ten year period from 1960 to 1970. In 1970, the unemployment rate was 6.0 percent compared to 2.7 percent in 1960.

Farming is the main enterprise in the parish, and in 1969, farm land accounted for 71.5 percent of the total land area in the parish or approximately 264,000 acres. Total cropland was 187,751 acres and harvested cropland totaled 136,316 acres in 1969. Soybeans and cotton have been the two major crops grown in the parish, comprising over 90 percent of the harvested acreage in the parish. Other crops grown in small quantities include field corn, sorghum, wheat, hay and vegetables. Both cash-grain and general farming are dominant. The principal livestock are beef cattle and hogs.

Cotton acreage increased over the last ten years in the parish until 1975, when cotton acreage was drastically reduced and replaced with soybeans. For example, in 1964, 49,553 acres of cotton were harvested and in 1974, 88,500 acres were harvested. However, for 1975, exact figures are not known, but based on planted acreage, which was reduced significantly (i.e., 25 to 35 percent), harvested acreage would be similarly affected. Factors influencing this reduction included poor weather conditions, pesticide shortages, cotton prices and tobacco budworm problems. For 1976, indications were received that more cotton would be planted given the return of cotton prices.

The farming trends in Richland Parish in recent years have been to fewer and larger farms. In 1964, Richland Parish had 1,417 farms in all and 791 commercial farms (i.e., farms with over $2,500 in yearly product sales). In 1969, there were 1,146 farms total and 686 commercial farms. Approximately 7.9 percent of the commercial farms are class 1 farms (i.e., farms with yearly product sales of $40,000 and over), 10.5 percent are class 2 farms (i.e., farms with yearly product sales of $20,000 - $39,999), 17.9 percent are class 3 farms (i.e., farms with yearly product sales of $10,000 - $19,999), 21.4 percent are class 4 farms (i.e., farms with yearly product sales of $5,000 - $9,999), and 42.3 percent are class 5 farms (i.e., farms with yearly product sales of $2,500 - $4,999). The average size of all farms in Richland Parish was 175.1 acres in 1964 and 230.2 acres in 1969.

In 1969, 53.2 percent of all farm operators were full land owners, 32.1 percent were part land owners and part renters, and 14.7 percent were tenants. In terms of farmland, 27.0 percent of the land was farmed by full land owners, 60.0 percent by part land owners and part renters and 13.0 percent by tenants.

Black operated farms comprised 15.4 percent of all farms and 4.3 percent of all farm acreage in 1969. For black operated farms only, in 1969, 54.0 percent of all farm operators were full land owners, 12.5 percent were part land owners and part renters, and 33.5 percent were tenants. In terms of farm land, 37.8 percent of the land was farmed by full owners, 40.3 percent by part land owners and part renters, and 21.8 percent by tenants.

The average age of the farm operator in Richland Parish was 52.1 years in 1969, with 11.3 percent under 34 years of age, 74.2 percent between 35 and 64 years of age, and 14.4 percent 65 years or older. For black farm operators only, the average age was 54.1 years, with 7.9 percent under 34 years of age, 73.9 percent between 35 and 64 years of age, and 18.2 percent 65 years or older.

2. Franklin Parish, Louisiana*

Franklin Parish, Louisiana is located in the northeast part of the state bordered by Richland Parish to the north. It has a total land area of approximately 414,528 acres or 648 square miles. Winnsboro, the parish seat, is located approximately 35 miles southeast of Monroe, Louisiana.

The population of Franklin Parish was 26,088 in 1960 (83.0 percent urban and 17.0 percent rural) and 23,946 in 1970 (77.7 percent urban and 22.3 percent rural). The parish is approximately 65 percent

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*Information for this section taken from: 1969 Census of Agriculture-State and County Data; Louisiana Crop and Livestock Reporting Service, Louisiana Cotton: Acreage, Yield, and Production (various years), Louisiana State University; Public Affairs Research Council of Louisiana, Inc., Statistical Profile of Franklin Parish, Baton Rouge, Louisiana, 1973; Bowles, G.K. et al., Net Migration of the Population, 1960-1970, by Age, Sex, and Color-Part 5: West South Central States, USDA (ERS), University of Georgia (Institute of Behavioral Research) and NAS (RANN) cooperating, December, 1975; and data obtained from field work performed in this study, e.g., conversations with extension service personnel and others.

white and 35 percent non-white. A net out migration of 5,343 persons occurred during the decade from 1960 to 1970, of which 1,181 were white and 4,162 were non-white. As in Richland Parish, the greatest numbers were in the 20-29 age group for both whites and non-whites. An age-sex breakdown of the parish population in 1970 appears below:

Age	Male	Female	Total
0-17	4,994	4,710	9,704
18-64	5,384	6,140	11,524
65 and over	1,229	1,489	2,718
Total	11,607	12,339	23,946

The dependency ratio in 1970 was 107.8, compared to 116.5 percent in 1960.

School attendance in 1970 numbered 7,024 persons in the parish. The median years of school completed in 1970 was 8.9 compared to 10.8 for the state.

The median family income in 1959 and 1969 for Franklin Parish was $2,094 and $4,171, respectively slightly lower than in Richland Parish. This also compares to $4,272 in 1959 and $7,530 in 1969 for the State of Louisiana.

Unemployment in the parish slightly increased over the ten year period from 1960 to 1970. In 1970, the unemployment rate was 6.9 percent compared to 5.9 percent in 1960.

Farming is the main enterprise in the parish, and in 1969, farm land accounted for 78.8 percent of the total land area in the parish or approximately 327,000 acres. Total cropland was 252,722 acres and harvested cropland totaled 187,002 acres in 1969. Soybeans and cotton have also been the two major crops grown in the parish, comprising over 90 percent of the harvested acreage in the parish. Other crops grown in small quantities include field corn, sorghum, wheat, hay and vegetables. Both cash-grain and general farming are dominant. The principal livestock are beef cattle and hogs.

As in Richland Parish, cotton acreage had increased over the last ten years until 1975, when cotton acreage was also drastically reduced and replaced with soybeans. For example, in 1964, 59,849 acres of cotton were harvested and in 1974, 84,000 acres were harvested.

However, for 1975, exact figures are not known, but based on planted acreage, which was reduced as in Richland Parish, harvested acreage would be similarly affected. Factors similar to those in Richland Parish caused this reduction, but for 1976, indications were received that more cotton would be planted, again due to rising cotton prices.

The farming trends in Franklin Parish in recent years have been to fewer and larger farms as in Richland Parish. In 1964, Franklin Parish had 2,094 frams in all and 1,254 commercial farms. In 1969, there were 1,701 farms total and 1,032 commercial farms. Approximately 4.5 percent of the commercial farms are class 1 farms, 9.9 percent are class 2 farms, 19.8 percent are class 3 farms, 26.9 percent are class 4 farms, and 39.0 percent are class 5 farms. The average size of all farms in Franklin Parish was 146.0 acres in 1964 and 192.1 acres in 1969, lower than the average size in Richland Parish.

In 1969, 52.4 percent of all farm operators were full land owners, 32.1 percent were part land owners and part renters, and 15.5 percent were tenants. In terms of farmland, 32.3 percent of the land was farmed by full land owners, 53.1 percent by part land owners and part renters and 14.6 percent by tenants.

Black operated farms comprised 11.3 percent of all farms and 3.4 percent of all farm acreage in 1969. For black operated farms only in 1969, 45.6 percent of all farm operators were full land owners, 24.9 percent were part land owners and part renters, and 29.5 percent were tenants. In terms of farmland, 33.8 percent of the land was farmed by full owners, 43.8 percent by part land owners and part renters, and 22.3 percent by tenants.

The average age of the farm operator in Franklin Parish was 51.5 years in 1969, with 11.5 percent under 34 years of age, 75.5 percent between 35 and 64 years of age, and 13.0 percent 64 years or older. For black farm operators only, the average age was 52.9 years, with 6.2 percent under 34 years of age, 81.3 percent between 35 and 64 years of age, and 12.4 percent 65 years or older.

APPENDIX C: The Field Manual

FIELD MANUAL FOR

SHORT TERM AGRICULTURAL USER ADJUSTMENT PROBLEMS ASSOCIATED WITH MAJOR PESTICIDE REGULATORY RESTRICTIONS

Contract Number 68-01-1917

Prepared by:

CONSAD Research Corporation
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December 17, 1975

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INTRODUCTION

The purpose of this field manual is to assure common understanding of the field-related tasks to be undertaken as a crucial portion of CONSAD's study--Short Term Agricultural User Adjustment Problems Associated with Major Pesticide Regulatory Restrictions for the Environmental Protection Agency (Contract Number 68-01-1917). The set of persons for whom this manual is prepared, therefore, includes the field staff and field director, as well as other project staff, CONSAD consultants and Enivornmental Protection Agency staff. Finally, this field manual will supply the consumer of the final report with an appreciation of the operations which eventuated in the field data on which that report will be based.

The organization of the manual tends to be from the general to the specific. In an opening statement (Purposes of the Study) we articulate a set of objectives along with their relative priority rankings. This section is of particular importance to the field personnel who have not shared in the development of the project and are joining in "late." The second section addresses some overall methodological issues and will serve to orient the reader to the bias or stance adopted vis a vis knowledge in general and, more particularly, the processes by

which social science information and knowledge are accrued. Section three is a discussion of specific data sources and their uses. Field persons ought pay special attention to the multiple uses a single data source may have in determing an efficient route through the real-world maze. The fourth section, Phasing of the Field Work, supplies a time-defined guideline for field activities as well as exemplifying the temporal ordering of these activities. Section five, Data Recording Procedures, deals with the mundane (and oft overlooked) issue of transferring the insights and intuitions (as well as perceptions) onto paper by means of which these idea elements may be stored reliably and shared to the degree such things can be shared. In conclusion, section six offers specific suggestions for field personnel.

Additional Materials

The Discovery of Grounded Theory, Barney Glaser and Anselm Strauss: Chicago, Aldine Publishing, 1967.
Chapter III--Theoretical Sampling
Chapter XI--Insight and Theory Development

Analyzing Social Settings, John Lofland: Belmont, CA, Wadsworth, 1971. pp. 101-108--Field Notes.

The Research Act, Norman Denzin
Chapter 4--Problems of Sampling

Information Packet:

1. Opinion of the Administrator, EPA, on the Suspension of Aldrin/Dieldrin.

2. EPA Cancellation of Chlordane/Heptachlor: Economic and Social Implications (prepared by Criteria and Evaluation Division, OPP, EPA, May 1975) - selected sections.

3. Environmental Reporter, excerpts on Aldrin/Dieldrin, Chlordane/Heptachlor and DDT decisions.

4. Selected "Environmental Facts" on the pesticide regulatory process and on the regulatory decisions and use histories of the above pesticides.

5. Selected Federal Register excerpts on the above regulatory decisions.

1.0 PURPOSES OF THE STUDY

Under law, the Environmental Protection Agency (EPA) is charged with the protection of man and the environment from deleterious effects of pesticide use. The law requires, however, that decisions the Administrator makes governing the use of pesticides determined to produce "unreasonable, adverse" environmental effects, shall be made with an awareness of the prospects for "unreasonable, adverse" social, economic and environmental effects resulting from that decision.

Data documenting short-term (i. e., less than three year period) transitional problems experienced by agricultural firms faced with the problem of replacing a suspended pesticide is one of the areas in which more knowedge is needed. Short-term user problems can become long term problems for society, especially if major regulatory decisions are made with out an adequate understanding of the scope and magnitude of problems.

The type and magnitude of adjustment problems experienced is unknown, but they may include shortages of substitute supplies, problems associated with the attainment of application skills, occupational health problems stemming from the use of unfamiliar products, etc.

Preliminary inquiry, by CONSAD, into the types of short term agricultural user adjustment problems experienced by farmers when

faced with the situation of replacing cancelled or suspended pesticides, has indicated that all farmers do have to make some adjustments in the production of their crop when faced with such a situation.

Additionally, while some of these adjustments appear to cause little problem for the farmer, others appear to be of great concern. Moreover, an adjustment which is problematic for one farmer can be relatively easy for another. Consequently, answers to questions such as, "What makes some adjustments easy for farmers and other adjustments difficult?" and "What causes a given adjustment to be difficult for one farmer but easy for another?" also become important. These questions suggest the need to explore the nature of the adjustment process and the need to determine those conditions (including the imbedding social and other institutional contexts) that ameliorate or intensify the adjustment problems. Because of these considerations we would emphasize "reason analysis." That is to say, we are very much concerned with understanding the perceptual set and dynamic logic which guide the producer through the real-world maze of alternatives. Such analysis requires an understanding of the "reasons" given for decisions and actions on the part of respondents, independent of the interviewer's views of the world.

Thus, given the limits imposed by the relative lack of knowledge regarding user responses to pesticide withdrawals and the reasons for

those responses, the focus of the present study is to identify the representative range of "on the farm" user adjustment problems associated with major pesticide regulatory decisions, as well as to create a testable theoretical framework for explaining user adjustment problems and responses to those problems.

There are essentially three major descriptive questions that are key to the process of discovering "short term user adjustment problems" and understanding their behavioral basis. The first question is one of the timing of the response patterns of various classes of users to major regulatory actions. At what point vis a vis the schedule of Federal regulatory decision do producers become aware of regulatory action, and at what point are decision for various responses reached? The second major question should focus on the target producers (firms) problem definition process. That is, at what point do various producers come to define their production process vis a vis a new pest control regulation as problematic? The third question of major descriptive concern is the identity of user adjustment problems from the point of view of the user. That is, just what are the problems users feel are a function of the regulatory decision in question?

In sum, the purposes of the field work can be summarized as: 1) identification of user adjustment responses -- particularly those which are problematic and (2) development of an understanding concerning

the problematic responses in terms of user type, user group-network, and institutional factors.

2.0 SOME GENERAL METHODOLOGICAL VIEWS

Within this section, a general orientation of healthy skepticism and doubt is, hopefully, to be fostered. Put another way, we wish to argue:

- a: hypotheses are not necessary to research, and
- b: pure objectivity is pure bunk.

To start, let us examine a statement by the historian of science, Thomas Kuhn, who uses the term "paradigm" to denote a set of shared (and largely unarticulated) assumptions about the world by the members of a "scientific community":

> Examining the record of past research from the vantage of contemporary historiography, the historian of science may be tempted to exclaim that when paradigms change, the world itself changes with them. Led by a new paradigm, scientists adopt new instruments and look in new places. Even more important, during revolutions scientists see new and different things when looking with familiar instruments in places they have looked before. It is rather as if the professional community had been suddenly transported to another planet where familiar objects are seen in a different light and are joined by unfamiliar ones as well. Of course, nothing of quite that sort does occur: there is no geographical transplantation; outside the laboratory everyday affairs usually continues as before. Nevertheless, paradigm changes do cause scientists to see the world of their research-engagement differently. In so far as their only recourse to that world is through what they say and do, we may want to say that after a revolution scientists are responding to a different world. (T. Kuhn, The Structure of Scientific Revolutions, Chicago: University of Chicago Press, 1962, p. 111).

Kuhn's argument then, is that with a change in the assumption-set (paradigm) the object of the scientist's inquiry is changed and with it

the type of questions posed. Moreover, elsewhere, Kuhn typifies "mature" sciences as those with a single paradigm whereas "immature" sciences are those with numerous, competing, paradigms--if any at all. With respect to the social sciences, then, we must generally classify ourselves as "immature" in that we are lacking in a single, dominant, paradigm or assumption set. It is not without reason, then, that those who differ in terms of basic assumptions about people and their societies also tend to differ in terms of what are termed "important issues," appropriate research techniques and modes of data reduction and analysis. Put another way, just as questions constrain the range of acceptable answers so too do the assumptions and research tools.

Coombs, who focuses on information, data, and analytic models argues this point persuasively:

> The method of analysis, then <u>defines</u> what the information is and may or may not endow this information with certain properties. A "strong" method of analysis endows the data with properties which permit the information in the data to be used, for example, to construct a unidimensional scale. Obviously, again, such a scale cannot be inferred to be a characteristic of the behavior in question if it is a <u>necessary</u> consequence of the method of analysis.

> It therefore becomes desirable to study methods of collecting data with respect to the amount and kind of information each method contains about the behavior in question as distinct from that imposed. Similarly, it becomes desirable to study the various methods of analyzing data in terms of the characteristics or properties each method imposes on the information as a necessary preliminary to extracting it. (C. Coombs, "Theory and Methods of Social Measurement," in L. Festinger and D. Datz (eds.), Research Methods in the Behavioral Sciences, New York: Dryden, 1953, pp. 471-472.

A few pages later, Coombs goes on to become even more specific with respect to this concern over distinguishing between what is discovered and what is imposed and closes with an admirably pithy statement of the sort all too rare in the literature of social science:

> Almost anyone is willing to say that any given set of data contains some error, but just what is to be classified as error depends a good deal on the level of measurement assumed to hold in the data.
>
> The social scientist is faced by his dilemma when he chooses between mapping his data into a simple order and asking his data whether they satisy a simple order. By selecting a strong enough system, the social scientist can always succeed in constructing an unidimensional scale of measurement, commonly an interval scale, thus requiring a portion of the data to be classified as error. By not requiring a strong system, the social scientist permits the data to determine whether a simple unidimensional solution is adequate. Unidimensionality, obtained by a method of analysis which guarantees it, obviously cannot thereby be shown to be a characteristic of the behavior in question. This is merely a special case of a more general principle that no property of data can be said to hold unless the methods of collecting and of analyzing the data permit alternative properties to exhibit themselves. The problem of the social scientist, in blunt terms, is whether he knows what he wants or whether he wants to know. (Coombs, op. cit., pp. 486-487)

To summarize the relevance of all this for the current effort, we may make the following points:

- Data do not speak for themselves, however, the observer can enter a situation with more or less structure through which events are filtered.

- At certain stages in the field-observation process, certain insights or "working hypotheses" may emerge. These should be articulated and the evidence for them explicated and thought through.

- As hypotheses are developed, one should resist the temptation to invest self or ego in them; rather, one ought continue searching for alternatives.

- At an advanced stage in the field work, the field observers, in cooperation with other project staff, should begin deveoping a full-blown model of the adjustment process.

The observer's running field notes* will serve as a chronological record of the process by which the observer moves from initial stages to fruition.

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*Discussed in Section 5.0.

3.0 SPECIFIC DATA SOURCES AND THEIR USES

Three broad classes of information are required by this project:

- the nature of the institutional context for agricultural activities,
- the nature of the social and political environments of the counties to be studied, and
- views and activities of individual farmers.

During the first few weeks of the field work, in particular, emphasis is to be placed on documenting the (county) environments and the institutional context for agricultural activities. While field staff will also make contact with individual producers (i.e., farmers) during this early phase, emphasis will be placed on "community study" sources of information.

The social and political environments may be assessed through contacts with such persons as:

- newspaper editors,
- radio station personnel,
- local elected officials (e.g., mayor, sheriff),
- post master,
- librarian,
- school principal,
- social welfare workers,

- county commissioners,
- ministers,
- service clubs,
- chamber of commerce officials, and
- directors of voluntary organizations (Red Cross, Boy Scouts).

In addition to this "a priori" list, field staff must be sensitive to other --perhaps unique--sources of information in their respective counties. The newspaper editor and librarian may be particularly helpful in identifying local influentials and information sources. Those persons who seem most helpful upon initial contact should be contacted on an ongoing basis and can serve as a check upon other information sources. Indeed, the utilization of multiple data sources as a basis for "triangulation" is crucial to the success of this field effort.

The nature of the institutional context for agricultural activities is assessed by establishing contacts with the various "institutions" or collectivities oriented toward agriculture. An understanding of the nature of this context will factilitate both recognition of adjustment problem areas as well as serve to qualify certain conclusions which may be reached (i.e., the formulation of boundary conditions or scope statements). Specifically, the following types of people should

two areas, greater emphasis will be placed on farmer interviews. Initially, contacts with farmers may well be little more than self-introductions to inform the producer community of your presence and purpose while acquiring some initial feeling for the range of diversity in in producers (size of operation, nature of equipment, general practices, individual "sophisitication"). Subsequently, producer interviews will become far more focused.

In summary, all the data to be generated during the field effort should mesh to yield an understanding of the producer's responses to a dynamic environment, specifically with respect to EPA pesticide decisions. We should emphasize that by collecting data in three conceptually defined domains we hope to leave open the possibility of substantive conclusions about adaptation mechanisms at several levels --i.e., we have not "over-determined" the nature of the answers to our questions.

Some further comments are now in order concerning how the field interviewer should present himself and the study , and how he should conduct each interview. The overall problem is to convey to the person you wish to interview, in a quick and concise communication, who you are, what you are doing, and why. Although a more business-like approach might be to tell the prospective interviewee first exactly

what kind of information you are after, there are some problems with such an approach. First, that approach might tend to give you the image of a poll-taker or an investigator for an insurance company, or a CIA agent. One of the objectives of an informal interview process is to encourage openness on the part of the respondent. One way to do this is to give some evidence of openness on your (the interviewer) part.

Another problem with the direct, businesslike approach is that it tends to raise questions in the respondent's mind, such as "Who is this guy?" or "How can I get rid of him?" An alternative approach should be possible which conveys the impression that you need help and thay you would be grateful for the respondent's cooperation, and that you are not a con-artist, crack-pot, or panhandler. It is highly desirable to convey the impression that you are legitimately employed in a rational endeavor which is part of doing your job - i.e., what you make a living at, and that you have no need to be defensive about it. Moreover, while some of the most angry respondents are likely to inform you that they don't wish to talk on the topic of their ire, you can usually elicit their cooperation by pointing out that their non-participation can lead to a "whitewash." Thus, be sure to point out that you wish to hear all types of opinions and experiences, particularly the negative ones.

In devising and using such an approach, in which you convey some notion of what you are doing and why, there is a serious danger of overdoing your presentation. The respondent is not likely to be sympathetic or responsive to the underlying sociologic theory behind your research, nor is he likely to care about the various bureaucratic, legal, contractual, and organizational mechanisms which have combined to thrust you into his presence. In other words, the statement of what you are doing and why probably should be down-to-earth in terms of what the study is about and how it is being conducted.

Before presenting the idea of what the study is about, you may want to identify yourself. Although you will be carrying project identification (see page 6.3), it is probably not necessary to show this unless you are requested to provide documentation of your authenticity. To begin with, you may want to give your name and idenfity yourself as a "consultant", field consultant", or field interviewer", employed by a consulting company, a research company, or an economic consulting firm. Terms such as "observer" and "reporter" are less accurate and convey the image of a prober, investigator, or axe-to-grinder. Be careful of the term "field representative" which may connote someone from a farm machinery or pesticide company.

This kind of identification, especially your name, is really enough. You may want to add some elaboration, either as part of your introduction, or during the interview. This kind of elaboration might include the fact that you go around and talk to different people as part of your research. Other facts about you that would help to give you an identity would include what your hometown is, some fact about where you are presently "staying" (county, town, street, rooming house, etc.), how long you have been on this project, the fact that you were previously a student, /or worked on a farm, /or worked in a dairy, / or were unemployed etc.) and what branch of the military service you were in, if any.

A more immediate kind of identification might be given by a few remarks about how you operate and what kind of project organization you are in. You talk to various people in the community, the county, and other counties, including those involved in farming, and/ or livestock, plus other community people such as school-teachers, car dealers, and ministers. You make notes about life in the community, especially about economic conditions, and you send reports to your supervisor, not about people in particular, but about how life is in the town (county, area, valley).

For each interview, you will need to think about how to explain why you are talking to the particular respondent, particularly when they are individual farmers. If you can say that he was suggested by the county agent or the college extension specialist, and give the names of these people, then the problem is solved. For some respondents, you may have advance information that you should reference one of these officials, but not certain others, and from some respondents, you will have advance word not to mention any connection with any of the farm advisory officials. The rule is to try to hold as closely as possible to the exact truth, since the respondent is going to hear some of it anyway, from someone. If you did use a random list, or did in fact "just happen to be driving by",* say so, but be prepared to give a few more facts about where you got your random list, or who some other people you have interviewed are.

After a fifteen to thirty second introduction of yourself, you will probably find it useful to give some description of the overall project you are working on. Do not be in a hurry to mention any titles or names of agencies, since you are not trying to impress anyone. You will probably want to mention that you are part of a team assigned to three states; Missouri, Iowa, and Louisisana. Each field interviewer

*"Dropping in" on farmers, and others for that matter, should be avoided. Arrangements to talk with these people should be made in advance, whenever possible.

has several communities in a region to study, and you all send your reports back to your supervisor, who then sends them or a summary of them, to the Environmental Protection Agency.

You can say further that your project team, including your supervisor, are employed by a private company in Pennsylvania, under contract to EPA. This project is a research study to obtain general (overall, background) information about farm and community life in areas where insects are a serious problem and pesticides often have to be used. The EPA needs to be able to tell how important any one pesticide is to a community, and how the cancellation of a pesticide might impact on the community, since Congress has given EPA a major role in pesticide approval and disapproval decisions.

During this project description, which should take no more than thirty seconds, you should try to communicate three specific points to the respondent:

1. You, the interviewer, are part of a team working for CONSAD, a private consulting company.

2. The company is under contract to EPA, who is paying for the study,

3. The purpose of this information is to enable EPA to understand the effects on farm and community life of approvals and disapprovals of pesticides.

There are many ways of conveying the above information without making such bad mistakes as emphasizing company or agency names, implying that a devastating decision is imminent, or indicating that you want to know the name and address of anyone who is complaining. Below is a sample introductory statement that may prove useful when talking with farmers:

> Good afternoon, I am Tom Jones, and I've been assigned to this area as part of a research study on how people's lives in farming areas are changing, and what are some of the problems and impacts related to recent changes, and in particular, the cancellation and/or suspension of chemical pesticides. I'll be in this area for several weeks, and I've got an apartment over in Nowheresville. I'm part of a team and we are going around to different parts of the U.S. We talk to people in farming areas, but not just to people on farms. We also talk to other people in the community, so that we can get a broad picture of the effects of recent pesticide decisions on peoples' lives. I work for CONSAD Research, an economic research company, but the study is actually paid for by a Federal agency, the Environmental Protection Agency. The agency is studying farming areas because it has to ensure that people have a healthful environment, and the agency is required by Congress to help approve and disapprove pesticides. Mr. Silas Marner, the county agent, have me your name as someone who was concerned about pesticide decisions and their economic and environmental effects.

In order to explain the nature of the research project further, you may wish to take another minute to elaborate on the types of changes, or effects, of pesticide approvals or disapprovals which EPA seeks to understand. You do not need to explain the EPA mechanisms of approval and disapproval, although you should be prepared to answer basic questions about pesticide registration, notices to suspend and cancel, and suspension and cancellation processes. You should also, incidently, be familiar with the chronology and current status of Aldrin, Dieldrin, Chlordane, Heptachlor, and DDT, as well as have a good knowledge of the farm production technology used for either field corn or cotton, whichever is applicable.*

The above will probably lead the respondent to comment on some of the types of changes (effects) which he has observed or which he expects to occur. In other words, the introductory description of the study will contain implied questions for the respondent. The responses to these implied questions are the information desired for this research, at least as an initial data set. The introductory remarks of the interviewer should thus lead to discussion of a series

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*Background material concerning these topics has been supplied to the field interviewers.

of general topics including the respondent's occupation, family circumstances, and community activities. It will be difficult, but of considerable importance, for the interviewer to detect recent or current changes in these variables.

To this end, the interviewer should have a facility for encouraging the respondent to discuss changes, impacts, and effects, without making the respondent think that he is being psychoanalyzed. You, the interviewer, may want to use phrases such as "So you didn't used to do that?" or "So you don't do it that way any more?" to encourage the respondent to elaborate on how his life has been changing. You should not act as a trial lawyer by trying to pin the witness down on specific points. Conclusive statements are not necessary for you to develop your data, so that you don't need to, and should not, say things such as "So therefore your selling your farm was directly due to the pesticide suspension?" or "So that means that the heavier pest infestation directly caused you to sell your car?"

An entire series of topics ("probes") specifically related to the pesticide issue is available for discussion:

- In what quantities and on what crops had the pesticides been used?
- What was the price paid for the pesticides and the resultant cost per acre or per unit of output?
- How long had the farmer utilized the pesticides in question?

- Where had the farmer purchased the pesticides?

- What storage precautions or procedures were followed in utilizing the pesticide?

- What application equipment was utilized and what did the equipment cost?

- How efficacious was the pesticide application in the farmer's opinion? To simultaneously measure the product's strength in terms of user demand for the particular pesticide in question, we would provide appropriate scaling for responses.

- Did the farmer know that the pesticide being cancelled was under review by EPA?

- How did the farmer first learn of EPA's decision to cancel the pesticide?

- Where did the farmer receive information on the pesticide -- newspapers, magazines, fuel dealers/distributors, county extension agents, other advertising, manufacturers representatives, other farm organizations? What other information channels provide the farmer with information on the pesticide in question?

- Did the farmer utilize the pesticide right up until the notice of cancellation was given or did he make an effort to find alternative pesticides or means for maintaining crop yeilds prior to cancellation?

- Prior to the time of cancellation, did the farmer know of other pesticides which could be used to control the pest in question?

- What portion of the farmers total cost of production was accounted for by the pesticide, i.e., one percent or less, 2-5 percent, etc.?

- What crop losses or yields were attainable in the farmers mind, with the pesticide in question, assuming infestation and no infestation?

- Was the decision to use the pesticide in question mandated due to crops insurance requirements?

- What reaction did the farmer have upon learning of the decision to cancel the pesticide, i.e., wrote to his local Congressman, complained to local newspapers, was simply disgusted, felt this was one more example of the government's meddling in the affairs of private citizens, etc., etc., etc.?

- What steps did the farmer follow in selecting an alternative pesticide or production pattern once he had learned of the pesticide cancellation? Did he consult local entomologists, agricultural extension service agents, university sources, product catalogues, or information provided by pesticide producers?

- What information or factors primarily influenced his present course of action?

- Is the new material/pesticide purchased from the same supplying source? If not, what changes were made?

- What is the differential effectiveness of the new alternative pesticide as compared with the cancelled pesticide? Actual experience will permit such comments; however, if the product change-over is recent and the crop yields are still unproven, the users comment on anticipated results can be solicited.

- Has the use of the new pesticide or alternative production techniques affected changes in the types of crops grown and the acreage devoted to such crops? If so, why, and in what manner?

- Has the farmers crop yields, or net income changed appreciably as a consequence of EPA's registration/cancellation decision? How and in what manner?

- Has the economic impact of the cancellation decision forced or created other life style changes, i.e., sold the farm, changed jobs, divorce, etc.?

- What application equipment is required for the next best alternative pesticide?

- Do you own such equipment? Can you rent it?

- How difficult is it to set the application equipment up to properly dispense the new pesticide relative to the pesticide being cancelled?

- Are there significant differences in the timing of application of the pesticide being cancelled and alternative pesticides?

- Were there any problems in making the change-over? Did the farmer correctly apply the new product?

- Is the new product more toxic to humans than the cancelled product in the farmer's opinion?

- Did changes in pesticides being applied result in any other technical costs or impacts? Are crop losses due to technical factors?

- Has there been any evidence of new pests as a consequence of changing pesticides or production techniques?

During some interviews, you will have difficulty deciding whether the respondent is wandering hopelessly far from the information you wish to obtain. For example, he may be talking about how the EPA is bringing about a change in the weather or climate because of its decisions, or about how the EPA uses the CIA to implant root-worms in his fields. This information should be recorded, but sooner

or later you will need to bring the respondent back to changes in his own opinions and activities. You can use phrases such as "How is the hired help situation here?" or "Do you think your town has grown much in the past few years?"

Some respondents will want to know what you actually do with the things they tell you. They will want to know what kind of information you write down, and how accurate they have to be in what they tell you. (Their own judgments or estimates are close enough.) You should emphasize that EPA is interested in an overall picture of life in the region and how it is changing, rather than in the details of any one family's activities and attitudes. Your reports will describe how "most people" are thinking and planning, and how various groups or segments of the population are different from others in their attitudes and plans.

Sooner or later you will have to make a specific concrete response to the question of whether an individual respondent's name will be reported with his answers to your questions. You should point out that you do not use a questionnaire form, that you take only an occasional note during the interview, and that you are not tape-recording anyone's statements. You can also repeat that you are mainly interested in developing general reports on how various groups are thinking. If the respondent presses you about the confidentiality of what he is saying,

you should be prepared to describe in a clear simple way exactly how you keep your respondent lists, interview records, and other materials, and what form they are in when you submit them.* Furthermore, point out that EPA will not see any individual responses associated with their sources.

You can also mention that although CONSAD is under contract to EPA, the company is a private firm which has conducted field surveys and research for nearly fifteen years, and has always been able to keep the identities of respondents separate and unconnected from their answers and statements. You will have to admit, if asked, that the Privacy Act, now in effect, perhaps requires you to obtain a signed release from him before obtaining personal information, but you can also mention that you are not a government official, and that he does not have to discuss any topic with you which he prefers not to discuss. If he does give you any personal information, it will not become part of any personal file or record connected with his name, which is what the Privacy Act relates to.

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*Section 5.0 deals with these issues more fully.

Finally, the following two pages contain some variables of potential utility in typifying farms, farmers and communities. They are offered, not in the role of a mandatory checklist, but as examples of some of the dimensions along which variability may occur and thus, this may prove fruitful for an explanatory scheme of user adjustment responses.

1. Farm situation

   a. Farm size in acres
   b. Acres allocated to specific crops, by year
   c. Annual cost per acre per crop, and cost components; e.g., labor, machinery, seed, pesticides, fertilizer, fuel
   d. Marketing costs, including storage, shipping, grading
   e. Financing data: amounts of loans, mortgages, interest rates and payment sizes, sources of loans, collateral used
   f. Revenues from crops and other sources, and non-money income
   g. Livestock data, sizes of herds, growth rates, feed costs, losses due to illness, reproductive failures, strays
   h. Membership and use of cooperatives.

2. Family situation, farm and farming community

   a. Family living costs: food, clothing, recreation, transportation, education, home repairs and mortgage payments
   b. Family characteristics: number living at home, number of non-immediate dependents, such as grandparents, uncles, aunts, former wives or husbands, step-children, children by previous marriages, and where they are living
   c. Dependents in college, if any, and where
   d. Travel patterns, both daily, weekly, monthly, and yearly, including method of travel, duration, and costs, who went
   e. Recreational activities, and costs
   f. Visits to neighbors, especially if they are farmers, and frequency
   g. Illnesses: type, length, costs of treatment, time of occurrence, possible source of contagion

h. Accidents or other misfortunes, costs of treatment, damages to car or other household items, rats, termites, snakes, snakebites, roaches, and costs of treatments

3. Community business and economic situation

a. Employment, farm and non-farm, in county and communities
b. Labor force characteristics, including ages of people working and lookingfor work, sex of people working and looking for work, heads of households, farm and non-farm, who are employed off the farm, marital status of women who are employed
c. Number of firms other than farm, and other than farm-related, and business volume and employment of each type, including service, retail, wholesale, manufacturing
d. Clientele and service areas of retail and service businesses, expectations of growth and expansion
e. Capital investment of the community and county, road improvements, water supply and sewerage improvements planned, needed, or recently in progress
f. Public services and facilities: size of hospital and recent improvements, number of people on welfare, living in institutions, amount of medicare and medicaid payments, infant death rate, number of midwives, public transportation, police, fire department, farm and other insurance rates
g. Property tax rates, real property valuations, turnover rates, monthly real estate sales, acreage converted to and from farm use

4. Community and farm social structure and attitudes

a. Occupations of relatives of farm owners, community and county officials
b. Occupations and relatives of owners and managers of newspapers and radio stations
c. Distribution of wealth by number of families and size of family
d. Facts about the environment and other issues published in media
e. Types of attitudes toward Federal government, and frequency expressed

f. Household saving and investment activity; amount invested in U.S. savings bonds, stock market, etc.

g. Indicators of racial and religious prejudice.

h. Attitudes toward growth and change, ratings of media items, and frequency of various types of attitudes expressed in interviews

4.0 PHASING OF THE FIELD WORK

Whereas a "lock-step" approach to the sort of theoretic field work intended here may seem inappropriate, the period of two months allocated for field work needs some agreed upon schedule. Moreover, it would be unfair to the field staff were they to be instructed simply "to find out what's going on."

In week one, you will be involved with setting up house keeping and this process should not be overlooked as a means for introducing yourself to the community. Your land lady (or lord), grocer, resteranteur, etc. are contacts within the social system which you intend to explore. Therefore you should introduce yourself for what you are, a social researcher concerned with the general dynamics of an agricultural community specifically interested in adjustment problems associated with pesticide cancellations and /or suspensions. Additionally, you should seek out some of the contacts specified in section 3.0 of this manual.

During week two, you will make further contacts with those prominent persons in the community concerned with the production of the target commodity (county extension agents, farm equipment and pesticide dealers, etc.) as well as influentials (elected officials, bankers, journalists, etc.). In addition, during week two you will begin to interview producers of the target commodity and make your presence known.

Weeks three through six should find you focusing your efforts on interviews with producers while continuing contacts with local influentials and others representing the institutional context within which producers operate. This period is the most important phase of the field work and the study itself, as it is the producer's (i.e., farmer's) adjustment process which is the focus of our efforts.

Weeks seven and eight are available for "mopping up". It will also be useful during this final phase to produce a completed set of field notes with hunches and hypotheses clearly presented and the evidence in their support -- as well as counter examples -- organized.

5.0 DATA RECORDING PROCEDURES

Various sorts of information covering broad conceptual areas, as indicated in section 3.0, are requested from the field staff. Given some admittedly open-ended requests for information (i.e., "Determine the social and political environments of the counties to be studied"), something akin to a questionnaire is not feasible. The emphasis, instead, has been placed on the formation of a high calibre field unit with common understandings of the goals and strategies of the study. Certain standardized data recording practices are here presented in order to aid commonality and quality data.

Every piece of information should be associated with its source, with one exception to be discussed below. Identification of interviewees in terms of name, address, telephone number, producer/non-producer* status, should be obtained and the date of acquisition should always be supplied so that record linkage over time may be effected, as well as insuring the possibility of additional probing of an area later on.

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*Non-producers include contacts with all people other than farmers.

The exception to the rule of identifying information directly with its source occurs in the area of sensitive data (e.g., illicit use of a pesticide). Rather than assuring confidentiality of all interview information,* it is more practical, within the confines of the current project, to omit any sensitive information from inclusion in a particular interview write-up. This information should, instead, be noted in a notebook containing your running field notes in a manner to insure the respondent's anonymity.

You are being supplied a portable cassette recorder for field use. It is not our intent that interviews be recorded, although in some rare cases you may feel this to be worthwhile. The purpose of the recorder is as your "memo pad" for use immediately following an interview, when writing out extended notes would be too time consuming. Thus, during a relatively brief period (i.e., a day) you might conduct a series of interviews, dictating a complete summary of each interview upon its completion based upon notes taken during the interview. Later, at home, you can then use the tape to enable you to fully write up each interview. In short, the recorder is supplied in order to assist you. If it is of no assistance, don't use it.

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*It is CONSAD's understanding that under the Freedom of Information Act, confidentiality can not be completely assured to the respondent. However, it is CONSAD's intention to keep all information confidential in the sense that the EPA will not receive individual information with its source named. This should be so stated to the respondents.

A major concern with the sort of field work being employed in this project is that the field staff will develop hunches, hypotheses, conceptual models, etc. These are given very high priority although they should be kept separate from data recording. As a mechanism for reporting hunches, etc. as well as summarizing data acquisitive activities, a weekly report will be required.

Legibility of field notes and interview write-ups is, of course, crucial. When in doubt you may wish to type. Moreover, timelieness is very important both because recall is fallible and morale--particularly out in the field--can be severely affected by a back log. For further elaboration on the topic of field notes, see the pages excerpted from John Lofland's Analyzing Social Settings.

When alternative interpretations or ambiguities arise, please communicate them as rapidly as possible by telephone to the field director or project director.

6.0 SOME FINAL, SPECIFIC, SUGGESTIONS

Successful field work is a craft which is dependent upon sensitivity and good judgment as much as anything which can be articulated within the confines of a "hard copy" manual. What follows is a series of suggestions which may assist the field operative to appreciate that craft.

That you are an "intruder" into a pre-existing social system with certain values and patterns of behavior is an important recognition. The "pushy" outsider is almost certainly doomed to failure within this context. Development of an understanding for the indigenous culture is both a necessary <u>means</u> for the successful conduct of the field work <u>and</u> constitutes an important <u>product or outcome</u> of that work. Moreover, your role as an outsider does not end with the work day.

You cannot completely guarantee confidentiality for the bulk of the information you receive from respondents (the previously discussed sensitive information, aside) but you should be unwilling to facilitate information transfer among the members of the community—i.e., <u>don't be a blabbermouth.</u>

Within any community, you are likely to encounter the town malcontent who is quite willing to talk, should he have an available listener. The use of such informants can be quite productive, although

you should take care that other community members do not come to identify you with such persons.

Taking care of certain practical matters can greatly simplify your life and streamline the field work process. CONSAD will supply you with mailing envelopes, memo pads, etc. Should you feel the need for other such items please express them directly to the field director or project director so that we may assist you.

You should remember that you are part of an organized research effort rather than a "stand-alone" inquirer. Thus when the unanticipated occurs, you should immediately report it to the field director or project director. Crises may revolve about personal and familial affairs, natural disasters or a sudden unwillingness on the part of respondents to participate. Most such problems, particularly when caught early enough, can be handled by reallocation of project resources.

You have been supplied with project identification (facsimile on following page) which you should always have with you. Indeed, the statement on the card that anyone is welcome to check either with CONSAD or EPA is an important one for your purposes.

FIELD OPERATIVES'S IDENTIFICATION

CONSAD Research Corp. is under contract to the Environmental Protection Agency to study producer problems associated with pesticide suspensions. _____ is a CONSAD employee working on this project. Should questions arise, please contact:
Dr. Douglas Stewart, Field Director,
Mr. Alan Bernstein, Project Director,
or Mr. Peter Clark, Vice President
(412-363-5500).

The EPA contract number is 68-01-1917 and the project monitor is Dr. Robert Reynolds (703-557-7346).

YOUR COOPERATION IN THIS EFFORT IS SINCERELY APPRECIATED D Stewart