THE DEVELOPMENT OF DATA REQUIRED FOR REGISTRATION OF PESTICIDES FOR SPECIALTY AND SMALL ACREAGE CROPS AND OTHER MINOR USES

Report Prepared

By

The University-EPA-USDA Ad Hoc

Subcommittee

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THE DEVELOPMENT OF DATA REQUIRED FOR REGISTRATION OF PESTICIDES FOR SPECIALTY AND SMALL ACREAGE CROPS AND OTHER MINOR USES*

I. INTRODUCTION

In recent years there has developed a significant increase in public awareness of our environment. Of great concern is the overall decrease in quality, especially when caused by things people do. Indifference is gradually being replaced by the realization that we have only one environment. Serious problems are being discussed and solutions sought. Fortunately, thinking and concerned people do not just talk about problems; they attempt to bring about solutions. And with only one environment for all, people realize the importance of working together toward common goals for mutual protection and benefit.

Pesticides, which are absolute necessities to provide our growing population with high quality food in sufficient quantity, are one area of concern. Even though the scientific development and use of pesticides is one of the great contributions to the progress of mankind, their effects on the environment are being given much attention. Research is underway to find better and safer pesticides. Laws and regulations are in force which regulate the safe and proper use of pesticides in order to protect people, plants, animals and wildlife as well as the overall environment. A great deal of attention is now being given to pesticide related problems. This subcommittee study and report is directed at one aspect of the problem: developing the data needed for the registration of pesticides for specialty and small acreage crops and other minor uses.

A. Parent Committee.

An interdisciplinary committee, titled "The University-EPA-USDA Coordinating Committee for Environmental Quality Research, Monitoring and Extension Education", was organized and first met in April, 1972. The committee consists of high-level administrative officials from the three organizations with Dr. Leland D. Attaway of EPA as Chairman. One of this parent committee's initial objectives was to identify priority research and extension needs as well as opportunities for further cooperation and coordination amongst the three organizations.

The committee came up with an initial list of 21 individual priority needs. Out of this list, four topics were identified as high priority items for early action in coordinating plans and programs, and four ad hoc subcommittees were established to deal with these topics. This study and report is the product of one of those four ad hoc subcommittees.

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*The term "minor use" as referred to herein is defined as any essential use of a pesticide that is unprofitable for the producer or distributor to obtain a tolerance for or register for use.

B. Subcommittee.

This subcommittee was established by the parent committee to consider the area of "research to develop the data required for registration of pesticides for production of specialty and small acreage crops". A shorter title suggested in the charge was the "Specialty Crop Pesticide Subcommittee".

The parent committee designated three people as representatives of the three organizations to constitute an executive committee of the subcommittee. They are: Dr. Howard H. Wilkowske (Universities), Chairman; Dr. William Upholt (EPA); and Dr. Fred H. Tschirley (USDA). Addition of other members to the subcommittee was left to the discretion of the executive committee.

The subcommittee soon discovered that the problem of getting pesticides registered for specialty and small acreage crops is primarily a problem of it being unprofitable for the producer or distributor to obtain a tolerance for the pesticide or register it for use. Thus, the subcommittee took on a study of this problem as it relates to all minor uses (defining minor use as any essential use of a pesticide, agricultural or otherwise, that is unprofitable for the producer or distributor to obtain a tolerance for or register for use). Accordingly, the executive committee expanded the membership and broadened the base of the subcommittee (see Appendix 1 for names and titles of subcommittee members).

For purposes of this study and report the term pesticide includes any pesticidally active chemicals and/or other chemical materials for human, animal or plant pest or disease control which requires legal clearances through registration as pesticides. Examples are: insecticides, herbicides, fungicides, bactericides, acaricides, nematocides, molluscicides, rodenticides, pesticides (and drugs used as pesticides) in fish and wildlife, plant and animal growth regulators, hormones, attractants, repellents, dessicants, microbials, viruses, biological controls and others. This report will simply refer to all of the above collectively when the term "pesticide" is used herein, unless otherwise specified.

C. The Problem.

The basic problem with which this subcommittee study and report deals is the urgent need for establishing clearances of numerous minor uses of pesticides for efficient agricultural production and other special needs. The term "clearance" includes all efforts directed toward obtaining officially and legally approved pesticide registrations. In other words, a pesticide is cleared after a tolerance or exemption from a tolerance has been established and a pesticide label registered. These clearances must obviously comply fully with present laws and regulations and at the same time provide maximum protection of commodities, the users and consumers, wildlife and especially the environment.

A fundamental objective of registration is to insure that pesticides be used only for those specific pest controls which they are designed to achieve. Thus, the benefits of registration far outweigh the potential risk of "unregistered" use or non-use if needed for protection of resources. There is a critical need to obtain not the minimum but the maximum number

of approved and legal registrations in order to reduce unregistered uses, since to be registered indicates requirements for safety and effectiveness have been met (which may not be true when used illegally).

The problem has been magnified as registration requirements have increased. To meet the added requirements, much greater expenditures of time, manpower and funds are now required.

At a time when the agricultural chemical industry, for various legitimate economic reasons, is contributing less to the clearance and registration of pesticides in minor uses, the public agencies have not fully evaluated the situation nor adequately taken on the responsibilities of solving the problems. As costs of new pesticide development and registration continue to grow, there are indications that the pesticide manufacturers and formulators are concentrating their efforts in those fewer areas where profits are still possible, leaving more and more of the unprofitable registrations uncompleted.

A major problem--lack of registered pesticides for many necessary but minor uses--is developing as a result of current trends and a shift of emphasis in the pesticide chemical industry. Public agencies for the most part have been unable to muster the needed additional support to expand their research efforts in order to clear more pesticides for these minor uses, including many uses needed by the public agencies themselves. The result is an increasing lack of needed registered chemicals, due to a severe backlog of needed toxicological data, metabolite studies, environmental impact information, field performance evaluations and residue and other data required for clearances and the establishment of tolerances.

A sizable research effort is needed to provide the data required for registration of pesticides for minor uses, minor crops and other specialty pest control needs.

D. Objectives of this Report.

The overall objective of the subcommittee's study and this report is stated in the charge to the subcommittee from the parent committee: "to consider the problems associated with developing the data required for registration of pesticides for production of specialty and small acreage crops and other minor uses."

More specifically, the objectives can be stated as follows:

1. To identify the nature and magnitude of the problems associated with obtaining pesticide registrations for minor uses, both within and outside of agriculture;

2. To contrast the problems with the procedures currently being used by the various public agencies and other organizations to clear minor use registrations, and assess any deficiencies in these current approaches;

3. To consider alternative methods for solution of the problems; and

4. In the form of a written report, to make specific recommendations to appropriate agencies and organizations of actions they could take to aid in solving the problems. The agencies and organizations to which this report is addressed are the state agricultural experiment stations, the U. S. departments of Agriculture, Defense and Interior, the Army Corps of Engineers and the U. S. Environmental Protection Agency.

II. PESTICIDE REGISTRATION REQUIREMENTS

One cannot begin to appreciate the complexities of the problems involved with developing the data necessary to clear pesticides for registration unless the requirements of (the laws and regulations relating to) pesticide registration are fully comprehended. Thus, this report first devotes space to a brief history of the development of laws and regulations followed by a concise but comprehensive look at current pesticide registration procedures.

A. History of the Development of Laws and Regulations.

In the United States we have had laws affecting pesticide development, sale and use for almost 67 years, dating back to the original Federal Food and Drug Act (June 30, 1906). Through these 67 years several subsequent laws were passed which resulted in stricter, more comprehensive and more specific regulations. The most recent and most comprehensive of all is the Federal Environmental Pesticide Control Act, which was signed into law on October 21, 1972. The major provisions of the bill are as follows:*

-- will be administered by the Environmental Protection Agency;

-- requires all U. S. pesticides to be Federally registered or approved;

-- classifies pesticides for general or restricted use, the latter--because of hazard to the individual or the environment--to be applied only by or under the supervision of certified applicators;

-- establishes State applicator certification programs (with farmers certified as private applicators) and cooperative enforcement programs;

-- prohibits the misuse of pesticides (any use inconsistent with the label is a crime, whether or not personal or crop injury results or residue exceeding the tolerance is found at harvest), adds civil to increased criminal penalties, and otherwise strengthens enforcement;

-- shortens administrative review procedures;

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*A brief chronological history of the pertinent laws (from 1906 up to 1972) affecting the development of agricultural chemicals and their use on food is presented in Appendix II.

-- requires pesticide producing establishments to be registered and to regularly submit information on production and sales volume;

-- authorizes indemnification of certain owners of pesticides which are suspended, then cancelled; and

-- authorizes the EPA Administrator to establish pesticide packaging standards, regulate pesticide and container disposal, issue experimental use permits, conduct research on pesticides and alternatives and monitor pesticide use and presence in the environment.

All provisions of FEPCA must be effective within four years, and a task force to formulate regulations to implement the provisions of the Act has already been established by EPA. All proposed regulations will be published in the Federal Register at which time comments will be solicited.

B. Pesticide Registration Procedures.

1. Why.

The law requires the registration of pesticides for two primary purposes:

a. to ensure that the product will be effective for the purposes claimed on the label when used in accordance with the directions, and

b. to ensure that the product will pose no safety hazards to humans or unreasonable adverse effects to the environment when label directions and precautions are followed.

2. How.

The various forms and data which are required by EPA of an applicant are discussed in detail in "Guidelines for Registering Pesticides in the United States". Copies of the latest printing of this document are available from Pesticides Regulation Division, Office of Pesticides Programs, EPA, Washington, D. C. 20250. It will suffice just to highlight a few of the requirements here.

Four basic types of data areas are normally required in obtaining a clearance so that a tolerance may be established. They are: (1) performance data or field testing, including information on the pesticide formulation, pests, crop and the exact use; (2) residue data, including pesticide residue levels for the exact use and metabolite studies with an analytical method suitable for enforcement; (3) environmental data including residue toxicology information on wildlife and possible pollution in soil, water and air; and (4) toxicology data, including acute and chronic toxicity studies on rats, dogs and other organisms depending on the use of the control agent.

Any person or manufacturer who has applied for registration of a pesticide under FIFRA submits a petition proposing establishment of tolerance levels for the particular pesticide. The petition is accompanied by data in the four areas listed above.

A tolerance is the maximum residue level allowed for a particular pesticide on a particular raw agricultural commodity. The tolerance is based on the maximum residue expected from the proposed use. A tolerance level must be a safe level, i.e., there must be a practical certainty that residues on the food within the tolerance level will impose no health hazard.

Prior to December 2, 1970, the Food and Drug Administration, under the authority of the Federal Food, Drug and Cosemtic Act, was responsible for the establishment of tolerances (or exemptions from tolerances) for pesticide residues in human food or animal feed intended for interstate shipment. While EPA now establishes the tolerance, as prescribed by FEPCA, FDA is still responsible for enforcing tolerances.

Petitions are requests for the establishment or exemption (or revocation) of tolerances. Tolerances are established after review of petitions. Most petitions are submitted by pesticide manufacturers, but they also come from formulators, government agencies, user groups, or other interested parties. Each petition must be accompanied by a fee as prescribed by the regulations. However, fees are usually waived for petitions submitted by universities or government agencies upon request. The types of data required in a petition are spelled out in the guidelines.

Once a tolerance has been established, application for registration may be submitted for additional uses of the pesticide on the same commodity provided they do not leave residues in excess of the safe tolerance level.

3. Types of Registrations.

a. New Registrations.

Registration of new applications may be for two types of products:

(1) "New Chemicals": products comprised of, in whole or in part, chemicals not previously registered for any purpose.

The level of review effort for a new chemical product calls for maximum of 45-60 man-days of scientific review including safety, efficacy and usefulness of the product and the overall impact of the use of the product on the ecology. Generally, multiple contacts with the company are required to assemble and clarify data. This can have considerable influence on total review time.

(2) The second classification of new products is one not previously registered for the particular company submitting the application, although similar or identical products have already been registered for other companies.

Except where a new use is involved, products in this category need considerably less scientific review time than new chemicals because of the already documented safety and efficacy data assembled on similar or identical products already registered by other companies.

b. Renewal Registrations.

Regulations issued under FIFRA require registration renewal every five years. Under these regulations 3,200 products become eligible for renewal in FY 1971, and nine thousand renewals were due in FY 1972 from an original eligible 11,200. This activity was suspended during early 1972 due to restricted pesticides. These renewals are expected to be processed at the time of classification and re-registration of all products under the new legislation. An expected registration lapse of 20 percent is expected each year. Applications for renewal are subject to any new or revised standards since the product was registered and have not been applied to the registration during the period. Although the review may not always be as extensive as for a new product, it would include information not available with a new product such as use experience over the preceeding five years including accident and incident reports and information on environmental safety. Follow-up investigational samples of these marketed pesticides for chemical and biological analyses which has been almost negligible in the past will be increased as pesticide field investigators are established in regional offices.

c. Amendments to Existing Registrations.

These include a variety of registration changes and may involve review time ranging from one-half a man-hour to several man-hours or man-days.

Amendments include the following:

a. added or deleted uses

b. minor changes in formulation

c. changes in directions for use on a label

d. modifications in warnings and cautions in labeling

e. other modifications in labeling, i.e., company name, product name, etc.

4. How Many Petitions Per Year.

During calendar year 1972, over 320 petitions to establish tolerances were received by EPA. The backlog of petitions pending over 90 days was reduced from 88 at the beginning of the year to one at the end of the year. It is anticipated that petitions will continue to be received at a rate of between 20 and 30 per month.

5. How Many Applications for Registration Per Year.

Approximately 35,000 applications for registration are processed each year. As of the end of calendar year 1972, there were 32,223 products registered by 3,372 registrants. The backlog of applications pending over 90 days was drastically reduced during CY 1972: at the beginning of the year, 463 such applications were pending as compared to 17 at the end.

At present, there are no concrete projections for the amount of registration of intrastate products which will be required by the FEPCA. It is assumed that, excepting the applications which will be generated by the new provisions of that bill, applications will average between 2,000 and 3,000 per month.

6. Temporary Tolerance.

A temporary tolerance or temporary exemption may be requested. These are usually granted for a period of 1 year to run concurrently with a temporary permit to cover experimental use of the pesticides on a specified number of acres in specified geographic locations. The temporary permit allows the petitioner to test the pesticide on a relatively large scale without destroying the crop. It also allows the treated crop to be marketed legally. Since consumer exposure will be quite limited, the toxicity and residue data required for the granting of a temporary tolerance are usually less than for a permanent tolerance.

7. Clearance and Labeling.

Once a tolerance has been set, a pesticide is considered cleared for use on the particular crop against a certain pest as indicated in the application for registration. However, before the chemical can be marketed and used it must be labeled. FIFRA requires that pesticide products be properly labeled prior to being introduced into interstate commerce. And now, with the amendments contained in FEPCA, products sold in intrastate commerce must have a federal label as well.

Labeling is generally defined as all labels and other printed or graphic matter attached to or accompanying the pesticide product, or to which reference is made on the label or accompanying literature. The requirements to be met for label approval are detailed in the "Guidelines for Registering Pesticides in the United States".

8. Public Announcements and Dissemination of Information to Users.

Under FEPCA, the pesticide user should have much more registration information available and options to act upon than in the past. The Act requires that the EPA Administrator publish several kinds of notices, starting with the registration or denial of registration of a particular pesticide and including items such as any change in classification and any proposed cancellation. The notices, by and large, are required by the Act to be published in the Federal Register.

III. IDENTIFICATION OF THE PROBLEM

A. The Problem in Agriculture.

Agricultural researchers are concerned with the ever-increasing problem of food crop production, as well as with non-food crops that enhance our environment. With the ever-increasing pressures of population and decreasing amounts of tillable land, the Agricultural Experiment Stations (AES), the United States Department of Agriculture (USDA) and the State Departments of Agriculture (SDA) are faced with the potential problem of a decreased food supply. To retain and/or increase our variety of food, feed and fiber the government or the public sector provides expert assistance through the AES, USDA and SDA to both the large and small growers.

More than ever the small growers or specialty growers need expert help in our complex society. Overall, society would benefit significantly from the clearance of pesticides needed for minor crops. Even with the large producers, certain pesticide uses on major crops are very minor and the manufacturers must limit their clearance expenditures in this area.

Without pesticides the great variety of vegetables and other food products available to us would be in critically short supply and the cost would be exorbitant. The basic need is for the production of wholesome food without losing the many different varieties we now enjoy. Many types of pesticides are required under good agricultural practices to produce a wide variety of crops. Agriculture requires pesticides because of the ever limiting space and the intensive type cropping which provide the opportunity for hostile attacks by pests. Pesticides are often the most important pest management tools of a profitable grower's operation.

1. Why There Are Fewer Registrations for Minor Uses.

a. Increasing costs of development of information for both new registrations and reregistrations for each use where new residue and tolerance data is necessary has been one cause of fewer registrations.

Prior to 1966 many pesticides were registered on a "no residue" basis if applied to a non-food crop, to the non-food bearing portion of the crop, or to the soil. Many herbicides and fungicides were registered on this basis. In addition, many

herbicides and fungicides were thought to be "safe" as compared to insecticides and residue studies were not required even when the pesticide was applied to the crop -- i.e., maneb, zineb, etc. Residue and toxicity data for these uses are now necessary to establish the necessary tolerances. Many registrations have been dropped because of the cost of obtaining this information for a limited use, or to expedite the registration of other uses which would provide greater monetary returns to the registrant.

b. More stringent standards and the longer time required for development has caused fewer registrations.

c. The relatively low financial return in proportion to cost and time required to register may in some cases cause the company not to register for a particular use.

d. A disproportionate crop liability ratio in proportion to the amount of product used on the crop has also been the cause for some registrations to be dropped.

In some cases uses formerly registered and still listed (and legal) in the EPA Compendium of Registered Uses have been dropped from the label because of possible liability hazards which are out of proportion to the quantity of product used for that purpose. For example, Diazinon for cabbage maggot, 2,4-D wax bar for use in grape vineyards and dimethoate on many ornamentals are examples of uses restricted by the manufacturer.

e. Expiration of patent rights and loss of protection afforded for return on investment, or public service patents which discourage commercial development unless some protection has been provided, have resulted in the loss of some important pesticide uses.

In some cases the patent rights on the product had expired and no one was interested in developing the information. The use of rotenone on livestock for the control of ectoparasites was cancelled because of the lack of an adequate analytical method to determine residues. This is a prime example of a material with a long record of safe use that has been lost.

f. Insufficient room on the label for all uses due to the large number of registered uses, or loss of space due to increasing space required for other purposes (hazards, storage, disposal, etc.) or uses providing greater sales and use of product have contributed to the loss of many minor uses.

g. Loss of many registered uses resulting from restriction of formerly widely used products has been a major contributor to the loss of many minor use registrations. Materials such as DDT, aldrin, dieldrin, maneb and zineb were effectively used against many minor use problems in addition to major uses. The sudden loss of many of these minor uses has produced some situations more critical than the loss of the corresponding major uses, because

there are not adequate substitutes for many of the minor uses nor much incentive to find substitutes on the part of industry.

2. The IR-4 Project*

Presently the Interregional - No. 4 (IR-4) Project is a public sponsored vehicle for assisting in obtaining pesticide clearances, especially for minor uses and other specialty needs. The IR-4 Project, "Evaluation of Current Data and Needed Research to Determine Tolerance Limits of Chemicals for Minor Uses on Agricultural Products," was initiated in 1964. The IR-4 Project Technical Committee includes an experiment station director (administrative advisor) and a technical representative from each of four regions in the United States, plus one representative from USDA-CSRS and one representative from USDA-ARS. There also is a coordinator and assistant coordinator located at the New Jersey Agricultural Experiment Station, New Brunswick, and special consultants from the State of California, Environmental Protection Agency and the USDA (Agricultural Research Service). In order to have this project function satisfactorily on a national basis, one individual in each state reserves as the IR-4 liaison representative from his respective state.**

The IR-4 Project is unique among the regional and interregional efforts supported by regional research funds of the Hatch Act in that it is a research service effort with the primary objectives of evaluating and coordinating the assembly of necessary data required by the Environmental Protection Agency to obtain tolerances and label clearances for pesticides used on minor crops and for minor uses of pesticides on major crops. The term "minor crops" as referred to in the IR-4 project title may be defined as an essential use of a pesticide that is unprofitable for the producer or distributor to obtain a tolerance for or register for use. In addition to facilitating individual pesticide clearances for minor uses, the IR-4 committee is continuously evaluating more effective procedures for assembling essential data in order to accelerate future pesticide clearances.

3. Agricultural Pesticide Uses and Needs in the States.

The problem is simply that there are many critical pesticide uses and needs for food crop protection which are not presently registered. These uses are documented in more detail in this section.

a. Types of Pesticides.

The pesticides needed for these uses fall into two categories: non-proprietary compounds and proprietary compounds. The latter are under patent by the private sector (industry) while the former are not. As the problems associated with obtaining registrations for them differ, they will be discussed separately.

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*Though not necessarily part of the problem as such, the IR-4 Project must be briefly explained here, as it is referred to several times in subsequent sections of the report.

**A more detailed description of the IR-4 Project, including cooperating agencies and personnel, can be found in Appendix III.

1) Non-proprietary Compounds.

Non-proprietary compounds are control agents not under patent by the private sector. They range from newly synthesized chemicals to currently used ones which have been around for a long time. Anyone with the necessary registration data can register a non-proprietary compound. But it is best to have the seller who is the basic manufacturer, formulator or distributor register the use(s). However, the public sector is often faced with gathering the necessary data for registration if the use is minor.

The industry's interest in the new minor uses of non-proprietary compounds has been marketably depressed. Normally, industry will not clear a minor use as a public service, and many non-proprietary compounds are imported at a cheaper rate than at what an American manufacturer can profitably produce them. Even with the 5 to 10 completely new proprietary compounds being developed as pesticides every year, growers still require many of the older non-proprietary pesticides.

The extensions over the past 6 years provided agriculture the opportunity to develop data for tolerances on the previously registered non-proprietary compounds. Many of the old uses were cancelled but the ones required by agriculture were extended over the years until many were cleared by the IR-4 Project.

An example of one of these uses is the use of DNOC on apples as a blossom thinner. This chemical has absolutely no value to the manufacturer but is very important to the growers in the Northwest for use on certain varieties. Each time additional data were required by the regulatory agencies, another year or season's production was required to gather it. The last requirement (90 day feeding study on a non-rodent) was received from EPA in May, 1972. This requirement necessitated the development of funds and contracting with a commercial toxicology laboratory. The $14,000 has been obtained and the contract let to Hazleton Laboratories. To develop these required data will take 6 months (4 months to conduct the experiments and 2 months to develop the report). Even with the extension time, the necessary development of data still must rely on the limitation of living organisms, growing seasons and good weather. A poor crop year will not give the necessary performance data required for a clearance.

Other examples of minor use needs of non-proprietary compounds and the impact if the uses are not registered include:

(a) Streptomycin The use is essential on 2,000 acres of hops in Oregon and Washington. Without this clearance 2,000 acres of hops will not be produced during years of pest fungi pressure. The growers must rely on every year as a good crop year in order to stay in business.

(b) Naphthalene acetic acid (NAA) - Its use is essential as a growth regulator in mandarin oranges and tangerines. NAA is a non-proprietary compound which is essential to control fruit set. If not controlled, alternate years of production would yield small unmarketable fruit. The growers are financially supporting the development of data to clear this use.

(c) Sodium chlorate - This material is used as a dessicant or harvest aid on sorghum and rice in the South. The alternative to not having sodium chlorate cleared on sorghum was a $10 million loss in 1972.

And the problem is further compounded by present general use of several items which are not registered specifically as pesticides or for the specific use even though they are used as such. Most of these are in common use in non-agricultural operations and thus are available at any food or hardware store, but under FEPCA they must all be labelled as pesticides. Examples of these are:

-- HCN which is used on citrus as a fumigant. Presently no manufacturer sells HCN as a liquid formulated pesticide but it is sold for mineral mining operations.

-- Trisodium phosphate and sodium hypochlorite which are used as seed treatment materials. These chemicals are manufactured for sale as laundry and cleaning aids, not as pesticides.

-- Many ornamental uses of pesticides which are not presently registered.

-- Petroleum solvents which are commonly used as herbicides These compounds can be bought at gas stations and other outlets where a pesticide label is not necessary.

2) Proprietary Compounds.

Proprietary compounds are control agents under patent by the private sector. Industry does restrict the type of uses to be registered where economics, liability or the public image may be endangered. Where economics is the problem, many companies will allow registration of their product if all necessary data are developed by an outside agency. Where there

is a probability of a liable suit from the product's use, the company often will not allow the use to be registered.

Without the cooperation of industry, registration of a proprietary compound cannot be obtained. In such cases, the public sector should be able to assume liability, develop the necessary data and have a working agreement with industry for the latter to produce the compound for the public sector use

Examples of minor use needs of proprietary compounds and the impact if the uses are not registered include:

(a) Producers of small fruits (blueberries, cranberries, elderberries, blackberries, etc.) require various pesticides to continue production. The small fruit grower has a large investment in the crop similar to apples which require many years before profitable production is realized. The small fruit grower in many cases could not grow other crops, because of soil and climate (e.g., blueberries are grown on a sandy acid soil). And growers have large investments in land, crop and equipment which would also restrict the small growers in substituting other crops.

(b) Growers of forage crops grown for seed (e.g., Trefoil) could go out of business if data are not developed on certain insecticides and herbicides in the next year or two.

(c) Crops limited mainly to specific areas (e.g., chili peppers and yams in Louisiana; sweet peppers in the Delmarva peninsula; spinach in areas where soil and climate and other conditions are favorable for production; mint in Oregon, Washington and Indiana; and tropical fruits in Puerto Rico, Hawaii, Florida and California) are important, both socially and economically, to the people of these areas.

(d) Crops used for flavorings or condiments are minor crops used in very small quantities in our diet. Examples of condiment crops are anise, fennel, basil, caraway, garlic, celery seed, coriander, dill, paparika, sage, thyme, tumeric, chives, leeks, mushrooms, horse-radish and mint. The lack of legal pest control agents for these crops would decrease the yield and effect higher cost to the consumer.

(e) Some tropical crops in Hawaii, Puerto Rico and parts of California and Florida are minor crops. Examples are papaya, mango, avocado, mangosteen and taro. With the anticipated commercialization of these crops, pesticides are essential for maximum production per acre. Without pesticides, these crops will not come into commercial production.

(f) Oil crops such as apricot, castor oil, rape, sesame, mustard, plum, safflower, sunflowers, avocado and domestic olive oil are minor yet important parts of our diet. They all have pesticide needs which are presently unregistered.

(g) Root crops such as rutabaga, parsnips, carrots, bursock, Jerusalem artichoke, celeriac, taro, yams, chufa, water chestnuts, Oyster plant, radish, salsify and yautia are minor crops. Many needs for pesticide uses are associated with these crops.

(h) Chinese vegetables such as Pakchoc, Kaichoy, Chinese cabbage, Garchoy, Chinese turnip, Gai lan, Gow kee, Chinese pea, Ongtoy and Lobok, are minor crops and very important to the chinese people. There are essentially no registered pesticide uses at present.

(i) Most cole crops, such as land and watercress, are considered minor and have critical pesticide clearance needs.

(j) Greenhouse vegetables are minor crops that need pesticide clearances, because the conditions of use are very different from uses in the field.

(k) Metaldehyde is essential as a slug and snail control agent. In the humid Northwest slugs and snails are destructive pests on many crops. Strawberries could not be produced without the foliage application of metaldehyde.

(l) Pesticides are essential in urban areas. Household pests such as rats, bats, roaches, ticks and lice are potential health hazards. Storage pests destroy valuable food and feed and provide avenues for other pests, e.g., fungi and bacteria, to invade foodstuffs. Many of these pests present hazards to public health, yet the pesticide uses go largely unregistered.

(m) Mushrooms are a minor part of our diet. The mushroom growers were losing over $1 million a year due to a fungus. IR-4 petitioned for the use of benomyl and obtained the clearance. The alternative to not having this essential use was a sizable drop in mushroom production and the partial disappearance of this minor but esthetically valuable crop from the marketplace.

(n) Commercial fish farmers are in need of several control agents. The alternative is a decline in this increasingly importance source of protein-rich food.

(o) In the non-food area, ornamentals provide environmental and aesthetic value to the public. There would be a great loss to the public if registered pesticide uses were not available for commercial growers of ornamentals.

b. FEPCA of 1972.

The 1972 Federal Environmental Pesticide Control Act (FEPCA) provides that all labels presently registered by the State regulatory bodies must be registered by the federal government in two years from the effective date of the new law. This poses a problem if the registrants, especially local formulators, delete many of these small uses from its label. Since all uses must be registered by the federal regulatory agencies, a great number of minor uses (especially ornamentals, seed treatments and other minor uses on minor and major crops) will be legally unavailable to the grower.

c. Typical Costs of Clearance of Minor Uses.

The development of a new pesticide costs industry up to $5 million and 6 years before it can be marketed. A minor use problem usually involves the cost of collecting data up to the point of registration in order to get a new use added for a chemical which has label clearance for another use.

IR-4 Project personnel have provided some average cost figures that bear consideration. The cost for a single food crop use where the toxicology is satisfactory normally runs $20,000. This would include the development of specific clean-up methods and metabolite identification and analysis for the particular crop situation. Where the method is satisfactory, the development of the samples and analyses costs $5,000 to $10,000 depending on the crop. In the nonfood area, costs vary but start at $1000. The basic cost for every potential clearance is the time of the researcher in developing performance data by designing and setting out plots and collecting samples for analyses. The analyst analyzes the necessary samples at a normal cost of $50 per sample. Analysis for a normal use where all parts of the crops are analyzed in a sufficient statistical number would cost $5000.

In some cases where toxicology is required for a negligible tolerance, the development of toxicology data from a 90 day feeding study on rats costs $13,000 (minimum price) and on non-rodents--normally dogs--another $13,000 (minimum).

All in all it adds up to a sizeable cost, even if the chemical is previously registered for a major use.

d. Impact of Not Registering Essential Minor Uses for Agriculture From IR-4's Vantage Point.

Without pesticides cleared for use on minor crops, many speciality crop growers would be placed in a position of losing their crops and income every year that a pest outbreak is not contained (and eventually going out of business), or of using the pesticides illegally. The social implications are overwhelming when segments of our population are restricted in the use of essential pest management tools because they are growing minor crops. Furthermore, some of the minor crops are actually major factors in certain states' economies.

It has often been said that farmers in the recent past have used many pesticides which were not cleared for the specific use in mind. If this was ture, the farmer has now been placed in an even more difficult position. And he has no control over registering a use except through other groups, such as industry or IR-4. If the grower cannot control pests on specialty crops, and even on major crops in certain geographic areas, he is at a disadvantage with other sections of the country not having a similar pest problem. If the grower cannot control the pest, a loss is expected for both the grower and for the consumer. The cost for the clearance of a control agent is relatively small compared to a crop loss year after year. If a crop is harvested after a uncontrolled pest outbreak, the returns are less, the quality is poor, storage capability is lowered and toxic substances are sometimes produced by the fungi and bacteria attacking the stored commodity.

Due to the value of land, the grower requires maximum production to offset taxes and retain open space for agriculture and the public. And with the higher cost of labor, pesticides are required to fill the labor void. If a grower cannot grow a speciality crop or a major crop because of pest problems considered minor, he may be forced to quit growing crops and be socially incapable of doing urban work.

e. Essential Minor Use Needs - Beyond IR-4's Vantage Point.

The IR-4 Project has been effective and is now being expanded with the addition of a third staff member at Rutgers University. The problem is not with the IR-4 Project, but with the states who must develop the research information -- efficacy of control data, toxicity data when the company cannot supply it, analytical methods if necessary, and the residue data. It is often just as costly and time consuming to register a minor crop or minor use as it is a major one, and the potential monetary return to industry is much less. The costs are equally great, if not greater, for government than for industry. Efforts of experiment stations, like those of industry, tend to be directed toward the major uses. Money and time are both critical, and the number of needed uses are increasing at a rapid rate.

The IR-4 Project regional technical committee representatives are now compiling a complete list of required minor use clearance needs, with priorities, across the country. When this list is completed, as has recently been done in at least a couple of states,

it appears that the size of the problem will stretch beyond most everyone's imagination.

For example, the staff of the College of Agriculture and the Agricultural Experiment Station at Cornell University recently compiled a list of the minor uses which are needed to control pest problems on food, feed, forage and livestock in the state of New York and comply with FEPCA under strict interpretations (See Appendix IV). In addition to these 197 food uses needing registration, they estimate that there are approximately 230 needed but presently unregistered uses on trees, shrubs and ornamentals. Thus, under strict interpretation of FEPCA and following the tentative timetables, the state of New York has approximately 425 minor uses which will be needed but may not be available to the user in 1975.

The above summarizes the situation in one state. If this detailed type of list were prepared for all 50 states, it would no doubt dramatize the magnitude of the problem that exists.

As additional evidence, Appendix V A details some specific examples solicited from various specialists in the state of California. It is by no means an exhaustive survey, such as the one in Appendix IV for New York. Appendix V B likewise lists the most important minor use pesticides needs, largely for food crops, in Michigan.

4. Extent of Pesticide Uses and Needs in the USDA.

a. Animal and Plant Health Inspection Service (APHIS).

In carrying out day-to-day operation, the Animal and Plant Health Inspection Service finds itself in the position of trying to meet the requirements of the Federal Plant Quarantine Act, Federal Plant Pest Act, and the Animal Health Acts of May 29, 1884, February 2, 1903 and March 3, 1905, as well as the requirements of the new Federal Environmental Pesticide Control Act of 1972. As a regulatory agency, APHIS fully understands and supports the Secretary of Agriculture's Memorandum No. 1799 dated February 1, 1973 (Appendix VI).

Occasionally, APHIS personnel find it necessary to use unregistered pesticides in order to bring into compliance certain articles, animals or animal products moving in international or interstate commerce. These are pesticide uses for which there has been no opportunity to check for tolerances or residues because of the rare or unusual occurrence of the pest associated with the unrestricted items. In these instances, inspectors must be guided by experience when treating these articles. If some unusual pests are found on an article and there is nothing in the literature or if there is no past experience with this pest, they may use a fumigant such as methyl bromide which is known to kill a similar type pest under similar conditions.

There is no way of predicting exactly what pest will occur on any particular item; therefore, it will be necessary for APHIS personnel to occasionally rely on the emergency provisions of Section 18 of FEPCA (short-term permission for an unregistered use) in carrying out their obligations. However, if the pest problem occurs with any frequency, an attempt will be made to clear a use specifically designed for the problem.

Appendix VII lists the pesticides used and needed in Plant Protection and Quarantine Programs by APHIS personnel that are presently unregistered. These are essentially all minor uses. Domestic programs uses (infested product originating within U.S.) are found in Appendix VII A and foreign programs uses (infested product originating outside of U.S. boundaries) in Appendix VII B.

Note that of the 38 pesticides presently used in PPQP's domestic programs, 12 are unregistered. In the foreign programs, four pesticides are not registered at all while 19 others are registered for some but not all of the uses for which they are needed.

APHIS prefers that the manufacturer or formulator request from the Environmental Protection Agency the label for the use for all materials used by APHIS. However, in many instances, the use will be restricted primarily to APHIS personnel in the enforcement of the Acts under which APHIS operates. This use may be infrequent, and it will not be economically feasible for a company to take the time or spend the funds in order to have the material registered. Thus, such uses can be classified as minor and yet they are essential to protect our nation's agriculture from the introduction or unduly rapid spread of serious plant and animal pests. APHIS is in a special category here.

b. Forest Service (FS).

1) Extent of Forest Service Needs for Registered and Non-registered Uses of Pesticides Major and Minor Uses.

The Forest Service, often in cooperation with the States, conducts programs designed to manage or regulate animal and plant pest populations. These programs often involve the use of pesticides. Where pesticides are required, it is policy to use only materials which are registered for the specific use intended. All too often, however, situations arise which require rapid action but for which there are no registered pesticides available.

To illustrate continuing major and minor needs, control projects carried out in fiscal year 1972 on National Forest lands, other Federal forest lands and on State and private lands are shown in Appendix VIII A (Major Forest Service Control Projects in FY 1972) or described below. The major

target pests were spruce budworm, gypsy moth, bark beetles, the tip moth/cone insect complex in pine seed orchards, diseases in forest nurseries and unwanted vegetation in forested, range, and road/utility rights-of-way areas. Lesser quantities of pesticides were used for controlling insects, unwanted vegetation and noxious arthropods in special use areas, fumigation of soils for weed, nematode and soil pathogen control, bird and rodent control, site preparation, aquatic weed control, trash fish control, and range improvement.

2) Limited Uses of Registered or Non-registered Pesticides by the Forest Service.

Outbreaks of native and/or exotic forest and range pests in the United States occasionally reach such levels that action must be initiated promptly to protect forest resources from significant damage and at the same time avoid environmental degradation. In some instances, a pesticide may be available that is specifically registered for use against the particular pest. A number of alternative registered materials may also be available which permit the manager to select the most environmentally safe material. In other cases, however, registered pesticides may not be available for the pest involved, for the section of the country in which it occurs, or for the plant species which serve as host(s). Ecological conditions may dictate that normally acceptable registered materials or other control methods be excluded from consideration (e.g., outbreaks bordering waterways, primitive areas). Under these circumstances, alternative non-registered pesticides may be required to promptly and effectively deal with the outbreak and to minimize potential resource losses.

Examples of problems which require timely action include outbreaks of such introduced pests as the gypsy moth, balsam woolly aphid, and larch casebearer which tend to reach explosive population levels as they spread into new areas. Among the native insects, the Douglas-fir tussock moth and bark beetles reach outbreak numbers in 1-2 years. Severe infestations of the latter pests may occur over extensive areas then decline rapidly after killing or reducing the growth of thousands of trees. Root or foliage diseases may develop rapidly in a forest tree production nursery and threaten the death of millions of seedlings scheduled for regeneration programs.

Problems have arisen in dealing with these pests. Lindane is registered for use in controlling balsam woolly aphid on individual trees from the ground. However, spraying of large areas appears impossible and is presently warranted only in accessible areas supporting relatively high-value trees. Other practical controls are, therefore, needed.

No chemicals are currently registered for control of the Douglas-fir tussock moth. Zectran has provided erratic results in field tests and other promising chemical or microbial agents are not yet ready for operational use.

The use of lindane or ethylene dibromide in a unilaterial approach to controlling bark beetles has been challenged on the basis of undesirable environmental effects and lack of long-term effectiveness. The use of alternative toxicants integrated with other pest population manipulative techniques must be considered.

These and other problems, often involving relatively minor pesticide uses, are of continuing concern to the Forest Service and challenge its responsibility to provide both short- and long-term protection for the Nation's forest resources.

The Forest Service is also responsible for the detection and evaluation of pest problems on the U. S. Department of Interior land. However, USDA is responsible for the actual suppression efforts (see below).

3) Responsibility for Registration of Pesticides.

The Forest Service feels that the primary responsibility for developing and presenting efficacy, toxicological and labeling information to support the registration of pesticide uses rests with the manufacturers or formulators of these materials. Where companies hold patents on specific chemical materials, they generally have sufficient incentive to register uses, particularly where large continuing market opportunities exist.

It is recognized, however, that some uses of pesticides in forestry do not have the potential for providing a reasonable return to a commercial registrant. Examples include limited or infrequent uses of pesticides for localized pest outbreaks, minor uses of attractants, microbial agents and other highly selective materials, special uses in controlling vegetation and mammals, and uses for improving fish habitat.

For these special uses, the Forest Service will determine the values at stake, the alternatives that are available and, if necessary, may have to accept the responsibility for developing any or all of the data needed to insure the availability to forest and rangeland managers of critically needed registered pesticides. This may involve development of the necessary efficacy and safety data to support the registered use of safe, effective pest control methods and materials.

If a commercial producer is unwilling to bear the costs of a use (new or supplemental use) which is deemed important to

the success of forest or rangeland management operations, the Forest Service might have to become the registrant. In such cases, it might be desirable that, as a condition of registration, operational uses of the pesticide be carried out by, or under the supervision of, Forest Service personnel or qualified personnel responsible for pest control programs on forested or rangelands.

One need only to look at the list of minor use materials presently needed by the Forest Service (Appendix VIII B) to see the seriousness of the problem associated with satisfactorily managing forests and rangelands.

c. Agricultural Research Service (ARS).

The Agricultural Research Service has a broad responsibility for developing new and improved methods of pest control. This may involve the use of currently registered pesticides, new formulations of registered chemicals or new chemicals with no known or established pesticidal activity. Thus, problems could result if ARS research scientists are not recognized as a group to be distinct from growers and farm workers. They need sufficient flexibility in using pesticides to develop the data necessary to secure registrations. Technological innovations by ARS personnel have made major contributions to U.S. agriculture The flexibility to pursue such research must not disappear.

ARS also operates regular farming operations in conjunction with several of its research facilities. The pesticide use needs on these farms are no different from those on private farms.

d. Extension Service (ES).

Extension's role in registration of pesticides is one of general involvement rather than functioning in a primary way to actually gather the necessary data for securing registrations. Extension works as an information and education unit acting in a catalytic or liaison role. It is concerned with creating a proper understanding of and need for the registration of pesticides and their use. This involves coordinating activities, concerns and decisions of regulatory agencies, research, the chemical industry and other agri-businesses, users of pesticides, and the general public. The following points briefly outline Extension Service involvement in pesticide registration:

1) Only in extreme emergency or disaster situations would Extension become highly involved or take any leadership in requesting registration of a pesticide. Two examples of this are: (a) initiating action to get clearance to use an insecticide for mosquito control during the Rapid City, South Dakota flood, where a public health problem could have developed; and (b) obtaining clearance to use an insecticide for greenbug control in Oklahoma where farmers were faced with an epidemic outbreak with supplies of present registered materials becoming unavailable. In

both of these situations Extension used its personnel to involve public and private agencies in getting response to carry out a mission.

2) Extension has an obligation to represent agricultural producers and other concerned individuals by reporting the need for registration of a pesticide for a given situation. This request is directed to research and private industry who gather the necessary information and to regulatory agencies who approve registration. This is especially important in minor uses or where products should be reevaluated and registration reinstated. An example is rotenone for cattle grub control on dairy animals.

3) Extension has a responsibility to explain the purposes and need for registration of pesticides to the general public. They must have an understanding of the Federal Environmental Pesticide Control Act as it relates to food production, public health and the environment, so they are in support of those public and private agencies involved in making decisions on pesticide use.

4) Extension has an obligation to users of pesticides (farmers, other people in agribusiness and homeowners) to assist them in keeping abreast of changes in registration, interpreting and adapting practices, understanding limitations and restrictions, and practicing proper pest management programs.

5) Quite often, Extension encourages the responsible agencies to register a pesticide in sufficient time to be available for use when needed. The seriousness of a situation is so often only felt at the local level or source of the problem, and concerned parties must be represented. Natural and man-made envrironmental conditions change and do not wait for man-made procedural or legal decisions to be made. As a result, more complex problems sometimes develop. In some cases the problem may be an adverse effect on the environment.

6) Finally, Extension has a role in evaluating the implementation of a registration practice or use of a registered pesticide--to determine its practicability, feasibility or performance, and to request clarification of definitions and modification of application in order to make the use acceptable to all.

B. The Problem Outside Agriculture.

The problem of securing registrations of pesticides for minor uses (as defined at the bottom of page 1) extends far beyond agriculture and the USDA to involve other federal agencies. As FEPCA is being implemented, some control situations requiring the use of presently unregistered

pesticides by federal personnel are becoming critical. These problems are detailed in this section.

1. U. S. Department of Defense (DOD).

a. General Information.

Pesticides are used extensively by the various services in the Department of Defense to protect the health and welfare of personnel and prevent damage and deterioration by the myriads of pests which occur worldwide on installations. A commonly quoted estimate is that approximately 30 pesticides in 100 formulations are routinely used to control 800 pest organisms. The military, with more than 1000 installations staffed with civilian and military personnel and their dependents, has a multi-billion dollar investment to protect.

All three services (Army, Navy and Air Force) maintain pest management programs. While they vary from service to service, in general each service divides the responsibility so that the medical services are responsible for disease vector control and the engineering services are responsible for economic pest control and the operation of shops, equipment and pesticide application. The services share responsibilities in training pest control personnel who are required to become recertified every two years after initial certification. Under this system approximately 1300 pest control personnel maintain shops and perform a full range of pest control operations: ordering, formulating and applying pesticides. Operations are monitored for safety by monthly reports reviewed by area or command entomologists who guide installation programs and make annual onsite program reviews. Pesticide selections are made from recommendations in a tri-service military handbook, annual recommendations published by the Navy Bureau of Medicine and normal information sources as salesmen and product labels.

Within the Navy, for example, approximately 200 stations perform pest control with a labor force of 570 personnel, mostly civilians. In FY-72 they reported nearly a million manhours and a minimum of 25,000 pest control operations or applications. The quality of their training is such that 95% of them could pass the existing state certification examinations (where they exist).

Many types of pesticides are used by the military services. In addition to the traditional uses of insecticides, fungicides and herbicides, avicides and rodenticides are used--both indoors and out. Special problems exist in the western states with the control of ground squirrels, a problem which is already critical since an executive order was issued to prevent use of toxicants with secondary poisoning potential to non-target animals on federal lands.

Many of the pesticides having specific uses have lost their registration or are under review. Alternatives are not always available and significant damage may be incurred before another appropriate substitute is found.

b. Unregistered Uses.

A number of unregistered uses currently in practice in DOD pest control programs are listed in Appendix IX. The listing is followed by comments regarding each of the uses to illustrate the seriousness of the problem.

2. U. S. Army Corps of Engineers (COE) - Aquatic Herbicide Uses.

a. The Need for Aquatic Herbicides.

Excessively large or dense populations of aquatic plants may be highly detrimental and reduce the usefulness of a water resource for purposes of navigation, flood control, drainage, agriculture, fish and wildlife conversation, public health, recreation and other purposes. It is imperative for the operation of these resources to obtain registration of aquatic herbicides to permit their use for vegetation management where needed.

1) Obnoxious Aquatic Vegetation.

Morphological forms of aquatic vegetation range from microscopic plankton to large vascular plants such as cattail (Typha spp.) and waterhyacinth (Eichornia crassipes (Mart.) Solms). Under certain environmental conditions and water quality criteria, all of the forms are capable of creating problems in water.

2) Problems Caused by Aquatic Vegetation.

(a) Agriculture.

A consistent, readily available supply of water is becoming increasingly important in agriculture, as irrigation becomes more and more widespread. There are cases where vegetation has blocked reservoirs and irrigation canals, leaving growers without water until costly, time-consuming repairs are made. Algae and other aquatic plants also lodge in water outlets, siphons, pumps, sprinklers, trash racks and other structures, causing lost time, inefficient use of water, and large maintenance expense. According to statistics from the Agricultural census, there are more than 2 million farm ponds and reservoirs (many used for irrigation), 189,000 miles of drainage ditches, and 173,000 miles of irrigation canals in the United States. A survey of weed problems on irrigation systems in 17 western states reported 63 percent of the 144,000 miles of irrigation canals infested with aquatic weeds. Also, more than 75 percent of 530,000 acres of canal

banks were infested with a variety of weeds. Similar weed problems occur in other areas of the United States.

(b) Recreation.

Most of the streams and natural and artificial water impoundments are multiple purpose resources. Swimming, water skiing, and pleasure boating are not entirely suited to waters managed primarily for fishing or waterfowl production. Aquatic vegetation is a serious problem affecting recreational uses of water. While aquatic plants are a natural and essential component of the aquatic environment, they can despoil this environment simply by their presence in excessive numbers and in areas where they are undesirable.

(c) Property Values.

Clear weed-free or relatively weed-free lakes and streams have always had a high priority for location of waterfront homes and vacation facilities. Serious infestation by aquatic weeds subsequent to development of such areas drastically reduces the desirability and value of water-front property.

Property values may also be affected by the presence of mosquitoes and other insects, snakes, vermin, dead fish, foul odors, and other conditions associated with excessive growths of aquatic vegetation. Other examples of depreciations in value and damage of property area are: clogging of navigable streams; washing out of bridges, boat docks and other structures; flooding and altering of water courses; and damage and loss of boats, motors, and other fishing equipment.

(d) Wildlife Management.

Whereas many species of aquatic plants are valuable food or habitat for certain mammals, reptiles, amphibians and birds, the manipulation and control of weed species with herbicides is basic to wildlife management. Herbicides are used for creating open areas, manipulating species composition of ecotones, controlled secondary succession of particular species, and density of plant growth. Each form of wildlife has specific habitat requirements and often certain aquatic plants may adversely affect its quality.

Public use of wildlife areas requires maintenance of access routes, boat landings, water movement channels, and canals; and protection from flooding, safety hazards, noxious insects, and vectors of diseases. Beneficiaries of these wildlife management programs are hunters, bird watchers, wildlife photographers, and nature walkers.

(e) Fisheries Management.

Environmental quality dictates the existence of acceptable fisheries, and control of plant life is the fundamental basis for fisheries management. Uncontrolled growth of vascular plants and algae can divert solar energy and nutrients from food chain organisms or other desirable plant life. Excessive plant density adversely affects predator-prey relationships and can result in fish kills, block fish migration or inhibit distribution, spawning failtures, and undesirable changes in water chemistry. Herbicides and algicides promote stabilization of ecological conditions and are essential in integrated systems of fishery management involving dynamic biological, chemical, and physical environmental factors. Stagnation and degradation of water quality, nutrient availability, and radiant energy often determine the value of fishery habitats, the occurrence of desirable species of fish, and the quality and economic values of recreation and fish products. By the year 2000, it is expected that the present 82 million acres of inland fishing water will increase to 92 million acres--primarily in the form of warm water reservoirs that are subject to the greatest weed problems. Thus, even more intensive fishery management (and use of pest control chemicals) will be required.

(f) Potable Water Supplies.

Algae, especially the blue-green species, commonly cause undesirable flavors in potable water supplies. Water treatment processes do not remove these flavors and the only recourse available to improve the palatability of the water is heavy chlorination. Vascular aquatic plants also contribute to the poor quality of potable water. Death and decay of large masses of plants create pollution conditions similar to those of sewage and industrial wastes It has been estimated that the oxygen-depleting pollution load of one acre of growing waterhyacinth is equivalent to the sewage produced by 40 people.

(g) Navigation.

Interruptions of and inconvenience to navigation, except on a limited scale, occurs primarily in waters of the Southern and Southeastern United States. Inland waterways of the coastal areas of these regions form an extensive network that is vital to the transport of materials to and from the areas. Considerable economic loss occurs when this traffic is delayed or stopped by accumulations of aquatic vegetation. In addition to interference with both commercial and pleasure navigation, costly damage occurs to boats and bridges. Drifting mats of waterhyacinth, when piled up against bridge supports, have been known to move and shift the entire structure. Logs and other

obstructions concealed by the plants provided additional hazards to navigation. It is estimated that without adequate control of aquatic plants, navigation (and considerable land traffic) would almost cease in these waterways within a three year period.

b. Aquatic Vegetation Management with Herbicides.

The aquatic vegetation management problems and the chemicals need to adequately solve each problem are detailed in Appendix X.

c. Alternative Methods of Aquatic Vegetation Management.

Various non-chemical methods have been designed and tested in attempting to manage troublesome growths of aquatic plants. Space limitations prevent a detailed discussion of them in this report. They are simply listed, as follows:

1) Mechanical.

(a) Underwater cutters to sever submersed vegetation.

(b) Devices for cutting swaths from floating vegetation.

2) Biological.

(a) Fish, snails and other aquatic animals.

(b) Insects.

(c) Pathogens.

(d) Competitive Vegetation.

3) Ecological Modification.

d. Advantages and Disadvantages of Chemical Methods.

There are few instances in which the efficacy of chemicals has not exceeded that of presently available alternatives for aquatic plant control. Covering or enclosing irrigation distribution systems in pipe is an effective means of eliminating weeds in irrigation canals. In the narrow band of the southern United States to which it is climatically suited, the Agasicles beetle has proved superior to chemicals for control of alligatorweed. However, outside this narrow range, populations of the beetle do not reach the levels necessary to hold alligatorweed in check. Underwater cutters and harvesters are unable to clear more than a few acres of weeds per day and are restricted to unobstructed areas. Fixed wing aircraft, helicopters, and boat mounted sprayers are capable of treating many times this area. During mechanical removal of weeds, the plants are usually fragmented. The fragments are often moved about by wind and

currents and initiate infestations in areas not already afflicted with troublesome growths of weeds. Chemicals are for the most part nonselective in the plants removed. Also, they are difficult to confine to specific areas, and frequently partial treatment of a body of water results in temporary but total removal of all the aquatic vegetation. Water level manipulation, as an alternative to herbicides, is an effective control measure. Unfortunately, water levels in few bodies of water or streams can be varied to this extent. Weed growth in the shallows of some TVA impoundments can be eliminated by manipulating the water levels at certain periods. Preventing eutrophication and reducing the levels of nutrients in water, while not effective in eliminating plant growth, would reduce the rates of growth of weeds and the total mass of plant material present in the water at any given time. Most sources of nutrients are runoff from farmland, domestic sewage, and certain industrial wastes. It is unlikely that plant nutrients from these sources will be curtailed or elminated significantly in the near future.

In spite of current alternative control measures, chemical control methods will be necessary as part of any realistic pest management program that involves integrated systems of mechanical, cultural, biological or ecological modification as techniques. Thus, a continued source of effective, registered aquatic herbicides is vitally important, even though many of them fall into the minor use category as defined earlier.

3. U. S. Department of Interior (DOI).

The Department of Interior uses, in its operational pest control programs and with cooperating agencies, a number of chemical pesticides The DOI is also responsible for assisting in the testing of chemical pesticides that may be used by the public to control damage caused by vertebrate pests. The listing of areas where DOI uses chemical pesticides is long and varied for it includes chemicals for controlling damage caused by birds, mammals, fish and reptiles. It also includes chemicals that are needed to control fish diseases and pest plants. Specific DOI minor use pesticide problems are documented in Appendix XI.

Up to the present, DOI's pesticide program has been limited mainly to efficacious screening of chemicals for use as tools in managing fish and wildlife. Unfortunately, many DOI uses of these chemicals are considered by industry as "minor uses". The DOI has no program designed to synthesize and discover new chemical pesticides and materials that are used or are the exclusive property of private industry even though it has cooperated in screening these for specific use as needed in resource management. Therefore, commercial products have been used for the major portion of DOI's pesticide applications.

Unfortunately, the cost of registration of any compound is high, and in the case of minor use chemicals, economic incentive by private industry is often lacking regardless of the merits the DOI sees in a use of the compound. Many of these materials are for specific uses and they may lack registration or at best have old registrations that will soon be reviewed. Reviews will show that much more information is needed before new reigstrations can be granted and it is doubtful that private industry will seek re-registration because of cost.

Industry is presently meeting the DOI's need for pesticides in only a few instances. Apparently, economic return dictates the amount of interest generated by industry and only those problems that are broad in scope (commensal rat control and weed control on croplands) or can be solved with broad spectrum compounds that are registered for other uses are of interest. In addition, some industries refuse to give the DOI authorization to procede with the registration of the compounds even though the compound appears to be effective and more selective. Also, the public often attaches in aesthetic stigma to vertebrate pest control and aquatic uses of pesticides ("pollution"), and many private companies now avoid adverse publicity by refusing to register or supply needed compounds.

FEPCA will require even more detailed data for registration and make this problem even more serious. Thus, the DOI anticipates that many of the minor use pesticides will no longer be available under commercial labels because of the investment required by the registrant. Accordingly, it will be necessary for the DOI to do much of the groundwork, and perhaps even seek its own labels if it wishes to continue using these materials and/or register new ones. This will create the same monetary pinch on DOI that it has on industry.

IV. CURRENT PROCEDURES AND DEFICIENCIES

A. Agriculture in the states.

1. Current Procedures.

The present mechanism for securing minor use pesticide registrations to solve agricultural pest control problems is the IR-4 Project. The IR-4 project operates on funds budgeted from Regional Research Funds by the Committee of Nine. No funds are allocated for the development of residue performance data but only to coordinate acquisition of data by state and other laboratories. Limited funding which exceeds the IR-4 budget has been obtained for various specific clearances through grower organizations and other sources. The cost of development of performance and residue data by the agricultural experiment stations (AES) and grower organizations far exceeds the IR-4 budget. IR-4 relies on State and Federal expertise to determine clearance needs; they are in touch with extension, regulatory and grower needs at the local level.

IR-4 attempts to assume responsibility for all pesticide clearance requests received from the AES and USDA. Such clearances may be for

tolerances or exemptions. Upon receipt it is necessary to determine the status of the chemical and the use. Industry must be contacted to determine interest. If industry will handle the clearance, IR-4 coordinates the activities between AES and industry. If the compound can't be registered because it is a carcinogen or can't be registered except with a large expenditure, IR-4 notifies the requestor and attempts to provide knowledge on a pesticide that will control the same pest but which would require less expenditure. In some cases industry may have the necessary data on file but would not submit it in a petition. IR-4 determines if any other state or states requested the use. Once the exact use required is determined by the requesting state or USDA, IR-4 will suggest a protocol after consultation with regulatory agencies for clearance purposes. If funding is necessary, IR-4 will attempt to obtain a source. Once the necessary data are received, IR-4 will proceed to develop the petition as prescribed by law and submit it to the regulatory agency. If any petition amendments are necessary in four months from the time of submission, IR-4 will proceed to answer the questions raised by the regulatory agency.

Once a tolerance is established on a food crop use IR-4 proceeds to have industry register (label) the use. No tolerance is necessary when a use is ruled non-food, but a registered label is required. The necessary data for a label includes toxicology, residue data including metabolites, phytotoxicity, organoleptics, environmental and efficacy information. Essentially the same amount of data are required for minor uses as major uses. Normally industry develops the data on all these areas to clear the major uses of a pesticide; therefore, the states normally provide residue (including metabolites), phytotoxicity and efficacy data on each formulation and use.

2. Deficiencies in Current Procedures.

Demands for registration of pesticides for minor agricultural uses are not being met by industry or agriculture because of the lack of adequate residue, performance, environmental and toxicological data. Presently agriculture's (IR-4's) primary need is for residue and performance data. Agriculture is generally in need of minor use control agents which are already cleared on major uses; therefore, the toxicological and environmental data are already available from industry (if they will release them).

The research to develop the residue and performances data for minor uses is just not being conducted at the agricultural experiment stations, and funds from the public sector to support such research are limited. At the same time, industry will not support this research because the costs and/or risks outweigh profits.

If the seller of a proprietary pesticides does not want to accept the liability involved in registering a minor use, the grower is deprived of the use. Anyone can register a specific pesticide use

with sufficient data, but to be useful a manufacturer or formulator must eventually place the use on his label. A registered label must be obtained by the manufacturer in order for the pesticide to be shipped and used in both interstate and intrastate commerce. Hence, registration without the cooperation of the seller is meaningless unless the public sector can accept the liability, production and distribution requirements.

Any formulator can register a non-proprietary pesticide with the necessary data. If no non-proprietary pesticide is available for the use and the manufacturer will not register the proprietary pesticide which will do the job, then another mechanism must be developed to remedy the problem.

With the advent of the new regulations in FEPCA, industry will proceed to do even less in clearing minor uses for economic reasons. Eventually if a chemical is not usable on either meat, corn, soybeans, or cotton, industry may not take the chemical through the necessary tests for eventual clearance.

Another area of concern is the necessity of clearing more than one pesticide to control a particular pest. Agriculture shouldn't have to restrict itself to one pesticide for a particular pest since resistance may develop. The protection of minor crops is in danger because of the limited number of cleared pesticide uses. Each minor crop should have more than one pesticide for each pest complex. The total amount of residue would not be increased because of the substitution.

To increase the problem of pesticide uses being cleared by industry, chemicals will be used in a more limited quantity in the future in some situations because of increased use of integrated controls. And integrated control programs are designed to minimize the environmental impact of pesticides. If such programs are to succeed, however, the registration of uses of the specific pesticides that are part of the programs is all the more important.

B. USDA.

1. Animal and Plant Health Inspection Service (APHIS).

a. Current Procedures.

APHIS prefers that the manufacturer or formulator request from the EPA the label for the use for all materials used by APHIS. In cases where industry will not pursue registration of a "minor use" needed by APHIS, APHIS personnel take the initiative to have the pesticide registered.

If a product is registered by APHIS, it is preferred that the label will indicate that it is to be used under the direction of APHIS personnel only and is not to be made available to the

general public. APHIS prefers to have the approved use on the label of the pesticide. However, if EPA wishes to maintain a file with the necessary information in the file and use APHIS's manuals as part of the labeling this is acceptable.

b. Deficiencies in Current Procedures.

If for no other reasons than economics and increased efficiency by avoiding unnecessary duplication, APHIS would like to use the IR-4 structure in securing registration for minor use pesticides.

2. Forest Service (ES).

a. Current Procedures.

Forest Service pesticide research and development activities are presently concerned with all classes of pesticides and span the range of tasks from screening and bioassaying candidate materials against specific pests to conducting operational programs. Thus, it is sometimes able to provide most of the data needed to support registration. However, it does not have a major, organized program effort to obtain such registrations.

The U. S. Forest Service feels that IR-4 is presently inadequately staffed and financed to meet the needs of the Forest Service and other agencies in USDA for registering minor uses of both existing pesticides and of new classes of materials. Financed through USDA funds administered by CSRS for regional research, IR-4 has functioned primarily in helping state and certain USDA agencies to obtain pesticide clearances. The focus of attention has been on pesticide uses on agricultural crops where the monetary return from the sale of the pesticides has been too small to warrant the expense involved in developing data required to establish tolerances and register the use through regular industry channels.

b. Deficiencies in Current Procedures.

In an increasing number of cases, outside assistance is being sought from other Federal agencies, universities, or other cooperators in obtaining data on chemistry, toxicology, or other aspects for which the expertise and/or equipment and facilities do not exist in the Forest Service. Availability of funds limits the scheduling and intensity of this outside effort. Thus, there are potential opportunities for working with IR-4 to use data already available in their files or to obtain needed information from other sources, possibly at limited expense to the government, at least in terms of avoiding duplication.

3. Agricultural Research Service (ARS).

ARS currently carries out research to assist in developing the data necessary to secure minor use pesticide registrations.

ARS facilities devoted primarily to pesticide research are identified in Appendix XII. (Note: Since the compilation of this information, there has been a reorganization within USDA. Thus, some of the research listed is not applicable to the minor use problem.)

b. Deficiencies in Current Procedures.

The main concern, as FEPCA is being implemented, is that ARS scientists have sufficient freedom, flexibility and financial support to carry out the necessary research relating to minor use of pesticides.

C. Department of Defense (DOD).

The Department of Defense and the various services do not have staff capabilities to register pesticides. Where the need exists the only recourse available is for a tri-service body, the Armed Forces Pest Control Board, to petition the Environmental Protection Agency for specific exception. It is doubtful that this will continue to be done with the greater concern and enforcement expressed by the Federal Environmental Pesticides Control Act of 1972. Considerable research is funded for the military and conducted by the U.S.D.A. at several laboratories. Smaller short term projects are sponsored by the various services through their research groups but application to registration is not likely. In short, a procedure to secure minor use pesticide registrations within the DOD does not presently exist.

D. Corps of Engineers (COE).

1. Current Procedures.

As with other agencies and groups, the COE would prefer that the manufacturer or formulator register the uses needed by the COE. However, in cases where industry would not pursue registration of a needed minor use, the COE has taken the initiative to attempt to have the pesticide registered.

For example, the COE (in cooperation with the DOI) has spent about $300,000 toward the registration of 2.4-D for use in irrigation ditches, ponds, lakes and navigation systems. Although residue tolerances have been established for certain uses in irrigation ditches, further work is needed for the other uses.

2. Deficiencies in Current Procedures.

Though the COE has been pursuing some registrations, financial support for this activity has been somewhat difficult to justify to the COE's administrators. In addition, it appears that there is considerable duplication of effort and expertise. Could IR-4 be of assistance?

E. Department of Interior (DOI).

1. Current Procedures.

As stated before, the DOI does not have a program designed to synthesize or discover new pesticides. Therefore, it must rely upon industry for its supply of new compounds. As they become available they are screened for biological activity most often by laboratories of the Bureau of Sport Fisheries and Wildlife. If compounds show promise, agencies within the Department that would most benefit from the use of the compounds attempt to convince the owners of the compounds to conduct further research and development leading to registration.

When new compounds are under investigation, private companies initially assist in gathering information for registration. The degree of assistance varies with companies but in general much of the basic laboratory information is provided by private industry. Information related to the efficacy of the compound is most generally a joint effort with government and industry. It is when residues, analytical methods, environmental impacts, and human health information is necessary that difficulty occurs. Unless the compound has a major use, the owner of the compound is not generally interested in registration. In these instances the Department must secure this additional information needed for registration and hopefully, the owner of the compound will then register the compound or allow the Department to do so.

Much the same procedure occurs with registered compounds that can be put to new uses. Information gathering and new use registrations of these materials is left up to the agency that would utilize the compounds.

2. Deficiencies in Current Procedures.

The need for registration of new compounds or uses has not been met by industry or the DOI. Industry does not meet this need because economic return is not great and the Department fails to meet the need because funding is limited and not specifically programmed for this activity. Bureaus within the Department do use funds for registration but for the most part the Department has relied upon industry to discover, develop and register compounds used in agency programs. This type of attitude has prevailed for many years and has resulted in the development of those pesticides now currently available. However, with more strict registration requirements and corresponding increases in costs, industry has refused to register new compounds or uses for old compounds. In addition, non-registered compounds could be and were used by governmental agencies under the old FIFRA amendment. This will no longer be the case.

V. RECOMMENDATIONS

A. Agriculture (in the states) - to state experiment station and extension directors:

Recalling both the problems identified in this report and the mechanism (IR-4) by which, when appropriate information is developed, registration can be obtained, the following recommendations are made to state agricultural experiment station and extension directors:

1. Identify your local expertise in each category of data needed to clear minor use pesticides for registration. There is some concern that there may not be enough expertise around the country to handle all of the needed research. This information in turn should be compiled regionally and sent to one national coordinating agency--perhaps the Cooperative State Research Service of USDA.

2. Assemble an interdisciplinary group (residue chemists and appropriate pest control and crop experts, including extension specialists) in each state charged with the responsibility of systematically reviewing various crops and their present and potential pest problems (this has already been initiated in some states). This group would identify pest control measures that can be applied, including the use of chemicals. When an unregistered chemical is needed to solve a particular pest problem, the group could develop a plan for a program by which the needed data would be obtained. Having planned programs to achieve registration of the needed chemicals, priorities could be assigned depending on the seriousness of the problem and the probability of its early outbreak.*

3. Be concerned that your experiment station research scientists do not unduly shy away from applied research on minor crops because of the relative lack of economic importance of the crops to the state's agricultural production. It would be unfortunate and disastrous for minor crop growers if each experiment station were to take the strictly cost/benefit approach that industry has taken.

4. Consider a regional approach to solving some minor use problems, involving agricultural experiment stations, commodity groups and the chemical industry from three or four adjacent states with common minor use pesticide needs. This would result in more efficient use of laboratory facilities, experimental plots and, most important of all, station research scientists. And commodity groups might be able to provide more significant financial support for minor use clearances if they could pool their resources. The funds could be divided among the cooperating state experiment stations for field work, and a certain amount given to one state for the necessary residue work. With this type of cooperation, the chemical industry might be more likely to contribute as well.

5. State Extension Directors in particular should begin an educational program for growers in regard to the misuse of chemicals and other

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*Some activity along these lines already has been requested of state agricultural experiment station directors and state IR-4 liaison representatives by the Cooperative State Research Service.

implications of the new law. (This already has been initiated in some states.)

6. Consider the feasibility of the IR-4 project being expanded to become a coordinating mechanism for all public sector pesticide registration activities.

B. USDA - to top USDA administrators:

1. A crucial question is:

   To what extent should the USDA become involved in actually being the registrant for certain minor uses of pesticides, in cases where the manufacturer is not willing to register the use regardless of who develops the necessary data for clearance? Some decision will have to be reached regarding departmental policy.

2. The problem of coordinating USDA registration activities in the future (and perhaps all public sector activities including other federal agencies as well as those activities currently handled by IR-4) is a very real one. What are the alternatives?

   a. Restricting the IR-4 project to requests from state agricultural experiment stations and handling USDA activities separately. Within this option, there are further alternatives:

      1) Having the various USDA services (APHIS, FS, ARS) each handle their own minor use pesticide registration problems.

      2) Coordinate these activities with the USDA, with one group of interservice personnel handling all requests.

      3) Coordinate these registration activities with those of other federal agencies (DOD, COE, DOI). Perhaps an interagency coordination staff for pesticide registration activities could be created.

   b. Expanding the role of and support for IR-4 to include all (at least all agricultural) minor use pesticide registration activities. This choice is attractive, if it would permit more expeditious handling of requests for assistance in obtaining pesticide clearances (as well as reduce unnecessary duplication of qualified personnel). APHIS, FS and ARS are willing to at least consider working with and supporting the IR-4 project. This might conceivably lessen the need for the USDA to budget for all of the tasks needed to establish efficacy and safety and thus speed the registration of needed minor uses. It might also eliminate <u>some</u> of the need for the USDA to become the registrant for a variety of minor uses.

C. Department of Defense - to top level administrators:

The Department of Defense through the various services has a definite need for the continued registration of specific pesticide uses and new registration

or exception for several other pesticidal compounds. In a few situations annual losses due to alternate methods of control or absence of any control will amount to tens of thousands of dollars and present significant hazards to human health and welfare.

DOD has no established capability to register pesticides, but does have a central body to coordinate needs, and requirements. This body is the Armed Forces Pest Control Board (AFPCB). Perhaps registration actions could be coordinated by the Board and conducted by the USDA (but this point has not been discussed with the Board at the time of this writing).

In view of the above, it is recommended that:

1. A staff capability be established to validate the registration of current DOD pesticide uses.

2. The AFPCB consider the problem of unregistered uses and develop a protocal for registering materials or locating sources for having the work conducted. Included in this protocol should be answers to the following questions:

   a. To what extent should the DOD become involved in actually being the registrant for certain minor uses of pesticides, in cases where the manufacturer is not willing to register the use regardless of who developes the necessary data for clearance?

   b. Should the DOD develop its own staff to coordinate minor use pesticide registration activities, should it develop one jointly with other federal agencies, or should it support the expansion of the IR-4 project to coordinate all U. S. requests for minor use pesticide registrations?

D. Department of Interior - to top level administrators:

This report documents the seriousness and consequences of the problem of obtaining registrations for minor use pesticides, including those vital uses needed by the DOI. Industry does not have incentive to to register minor use compounds, a great majority of DOI oriented pesticide programs are minor use programs, considerable funds are needed to secure data for registration, and the DOI will probably have to accept responsibility for registration of many compounds.

In view of the above, it is recommended that:

1. The DOI program adequate funding for pesticide registration. Perhaps this funding should be programmed at the Bureau level.

2. Since a program of discovery does not exist in the DOI, reliance still must be placed on industry to provide new compounds. A system of this type, to be successful, requires complete cooperation between industry and the Department. Because industry is the discoverer and owner of new compounds, commitments must be made by industry to the Department before extensive development is begun. Three basic

questions must be answered:

a. Will the owner register the compound?

b. If not, will he give the DOI the right to register?

c. Will the owner supply the material and give the Department marketing rights if the compound is registered?

3. The DOI should also be asking whether it should maintain its own staff to coordinate minor use pesticide registration activities, or develop one jointly with other federal agencies or support the expansion of the IR-4 project to coordinate all U. S. requests for minor use pesticide registrations.

E. Corps of Engineers - to top level administrators:

The recommendations under D. above for the Department of Interior apply equally well to the Corps of Engineers.

F. Environmental Protection Agency - to administrators in the Office of Pesticides Programs:

This report has generated several concerns which can be translated into recommendations for the EPA.

1. EPA should consider the extension of tolerances and registration to minor crops while reviewing petitions from basic manufacturers for related major crops. For instance, while reviewing a petition for apples and pears, EPA could consider quinces and, if appropriate, establish tolerances and register the uses on apples, pears and quinces together. Also, already established uses on major crops should be reviewed in order to consider extensions to related minor crops.

   Many agricultural scientists would like to see a modification of the requirement on food and forage crops that demands data for each specific use on each crop. This would allow group registration. A system of classification similar to those to classify foods into groups for common tolerances within the groups for pesticide residues might be satisfactory.* A number of such group tolerances already exist--beans, citrus, grasses, poultry, meat, etc. Tolerances within groups are often established at the same level for all commodities within groups. In many cases the pest problem is the same or very similar with the same pesticides and number of applications being used. If a group tolerance is satisfactory in protecting the consumer, it would seem equally logical that registrations for use could also be similar without unduly threatening the user, the environment, or the consumer. Such a grouping of registrations would go far in resolving present problems of registration and labeled uses for minor crops and minor uses. In addition, simplifying registration in this manner

*Mr. R. E. Duggan, retired Associate Commissioner for Compliance, Food and Drug Administration, has conducted a study, under contract, to develop food classes for pesticide residue tolerances. The study is completed and is presently being evaluated by EPA.

would greatly relieve the problem for growers, greatly reduce the developmental research load for the experiment stations and the industry, reduce the mass of paper work in EPA and provide time for research work on problems of considerably more impact and of higher priority to all of us. Present methods were acceptable for conditions at the time they were established, but time and requirements have changed.

Another possible approach would be to consider reorganization of the basis for registering food crops to one using total or average daily diet intake as a criterion. Establish tolerances for each specific crop only on those crops comprising 70-80% of the diet. Group the remaining crops to expedite registration, yet still provide protection for the consumer.

2. EPA should consider the feasibility of a mechanism for registering proprietary and especially non-proprietary compounds not intended for registration by the manufacturers.

   The problem is that even after registration is obtained, industry may not choose to include the particular use on the label of their product because of the nature of the liability problem. If not on the label it might still be a misuse and subject to penalty, unfavorable publicity, etc. Some mechanism must be found to cope with this problem. Possibly some arrangement might be developed which would compel registration by the company under some sort of an arrangement which might free the company from the liability risk.

3. Although EPA has participated in the IR-4 program in the past to a limited degree, it could consider increasing the emphasis which could help produce a more effective communication with the experiment station community. Perhaps more scientists in the Criteria and Evaluation Division and the Registration Division could participate. This would help bridge the flow of information between the agricultural sector and EPA.

4. EPA should consider and react to the possibility that one coordinating agency (such as the IR-4 project) could perhaps handle all public sector registration requests.

5. States will need more financial support to speed up the development of data for minor uses for which no chemical company has the incentive to do the necessary research. Considerably more resources will be needed in existing AES analytical facilities for residue data on minor use pesticides. Additional resources will also be needed to fund efficacy evaluations, toxicological studies (especially for biological control agents such as parasites and pathogens) and the processing of data for pesticide clearances.

   A clarification is needed of how state experiment stations and land grant colleges can support work necessary for registration. Requirements

are federal, is support funding to be federal? Funding is an essential part of the resolution of many minor use registration problems. The states are receiving less USDA research funding. Without funding, information for registration by the states cannot be accomplished. Perhaps it is feasible that EPA could encourage grants for the development of data for minor uses.

6. Consider establishment of standards for meeting environmental requirements. Once these have been met, permit registration for ornamental trees, shrubs, turf and other non-food use on a broad category basis without residue data. In most cases it will be almost impossible to include specific pests for each species of tree or shrub on the label because of the space requirement. Additional label attachments get lost, misplaced and generally have been unsatisfactory.

7. Consider using pesticides classified in the safest category of our labeling classification system (Category IV - no signal word required) to provide broad uses on food and forage crops, ornamentals, etc., without labeling for each specific use. This could be done after standards for safety for the user, consumer or environment have been met. This would go one step further than 6. Either, both, or a similar category, would go far to relieve the problem of minor uses registration and without undue hazard to man, animals, or the environment.

8. Finally, some immediate needs should be studied as they will at least help resolve the complicated problem of minor uses.

   a. Clarification of time schedule relative to:

      1) Conversion of state registrations to federal registrations.

      2) Registrations on trees, shrubs and ornamentals where all present registrations cannot be determined because there is no complete summary and where the uses are so numerous that it will be impossible to obtain the necessary registrations within two years tentatively being considered.

   b. Clarification of what is meant by "inconsistent with the label".

      1) If it means only uses on the label, are all uses to be listed? Parathion has 1528 registered uses and carbaryl has 1147 registered uses listed in the EPA Compendium as of March 19, 1973. Complete listing appears impractical because of the difficulty of the user finding the information needed.

      2) If it means uses do not have to be on the label, how will the user know whether his use is "inconsistent" or "consistent" with the label?

3) If a use is not listed on a particular proprietary product label but is known to be labeled on a similar product which is not immediately available, is user to be deprived of use?

4) Some products are packaged and marketed under different names for different markets but the product is otherwise the same. Is the user to be forced to purchase (at possibly higher prices) the product with the use listed on the label?

c. Clarification of the status of a registration presently listed in the EPA Compendium and formerly carried by a company on its product label, but which now has been dropped from the label because of liability risks which the company deems out of proportion to the amount and value of the product sold for that particular use. And some special effort is needed to recall all outstanding labels and make the appropriate corrections.

d. Recognition of the impossibility of having meaningful labels that are going to meet every contingency, and provide for the necessary flexibility to permit the handling of problems which may arise on short notice such as short supply of a registered product; a new insect, disease, or weed; the development of resistance, etc. In providing this flexibility, parameters should be established for the states to protect the consumer and processor from excessive residues, and the environment from undue threat of pollution or hazard.

The flexibility to control new pest problems through quarantine and regulatory work is also needed by APHIS. Regarding Section 24 of FEPCA, APHIS personnel must be allowed to use materials which might be banned in a particular State where an emergency occurs. It appears that there are provisions under Section 18 for a Federal Agency to use a pesticide under these conditions. This point should be spelled out in the regulations issued by EPA under Section 24 so as to avoid problems or misunderstandings when emergencies occur.

VI. SUMMARY

This report is the result of a study by an ad hoc interagency (University-EPA-USDA) subcommittee assigned to consider the problems associated with developing the data required for registration of pesticides for the production of specialty and small acreage crops and other minor uses. Non-agricultural as well as agricultural uses are considered. The problem has been magnified as registration requirements have increased, particularly with the passage of the 1972 Federal Environmental Pesticide Control Act. To meet the added requirements, much greater expenditures of time, manpower and funds are now required. And the result is fewer and fewer registrations of pesticides for minor uses.

There are actually several reasons why the agricultural chemical industry is registering fewer minor uses. Perhaps number one is economics. The

relatively low financial return in proportion to cost and time required to register is more and more resulting in lack of registration. Also, disproportionate crop liability in proportion to the amount of product used on the crop has been a reason for some registrations being dropped. Further, many of the pesticides for which registrations have expired or are expiring are non-proprietory compounds. There is very little incentive for industry to obtain the data necessary to reregister these materials.

At a time when the chemical industry is contributing less to the clearance and registration of pesticides for minor uses, the public agencies have not fully evaluated the situation or at least have not taken on the responsibilities of solving the problems. Public agencies for the most part have been unable to muster the needed additional support to expand their research efforts in order to clear more pesticides for these minor uses, including many uses needed by the public agencies themselves.

Within agriculture at the state level, a mechanism (the IR-4 Project) exists for assisting in obtaining clearances for minor uses. The problem seems not to lie with the IR-4 Project but with the states who must develop the research information--efficacy of control data, toxicity data when the company cannot supply it, analytical methods if necessary, and the residue data. The research is not being conducted at the necessary level.

Outside of agriculture at the state level, a variety of attempts are being made within different federal agencies (U.S. Departments of Agriculture, Interior and Defense, and the Army Corps of Engineers) to improve their ability to clear minor uses of pesticides, both for their own intragency use and for the general public. There seems to be a significant lack of interagency coordination and a resulting considerable amount of duplication.

The problems can be solved only by the combined efforts of the several groups and agencies involved, and several specific recommendations for action are made to: state agricultural experiment station and extension directors, and to top level administrators of the U. S. departments of Agriculture, Defense and Interior, the Army Corps of Engineers and the U. S. Environmental Protection Agency.

APPENDIX I

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APPENDIX II

HISTORY OF LAWS AND ACTIONS AFFECTING THE DEVELOPMENT OF AGRICULTURAL CHEMICALS AND THEIR USE ON FOOD

June 30, 1906 - Original Federal Food and Drug Act.
This act was intended to prevent the manufacture, sale, or transportation of adulterated, misbranded, poisonous, or deleterious foods, drugs, medicines and liquors. Administered by Food and Drug Administration of Dept. of Health, Education and Welfare.

April 26, 1910 - Original Federal Insecticide Act.
An Act to prevent the manufacture, sale or transportation of adulterated or misbranded insecticides and fungicides. Administered by USDA.

June 25, 1938 - The revised Federal Food, Drug and Cosmetic Act.
Enacted to prohibit the movement in interstate commerce of adulterated and misbranded food, drugs, devices and cosmetics, this law charged the Food and Drug Administration (FDA) with the responsibility of keeping poisonous insecticides, as well as insects, out of food products. It included provisions for setting tolerances for poisonous ingredients, if they could be justified, but the procedure was cumbersome and often time-consuming and expensive.

The law did not provide for advance clearance of safety of food additives. It left it up to the FDA to discover their use, and to make tests to prove them "poisonous or deleterious" to the satisfaction of the court when action was required to remove them from the market.

1945 and 1946 - Many new insecticides (organic) appeared on the market. Legal tolerances were not announced, indicating to many that the ponderous tolerance procedures of the Food, Drug and Cosmetic Act could not handle the flood of new materials. In addition, the labeling requirements of the 1910 Insecticide Act were obsolete.

June 25, 1947 - The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA).
This act extended the scope of the 1910 Act to include rodenticides and herbicides and required for the first time premarketing registration of products to be shipped interstate. It thus set up the system of label claims and registration. It provided that a complete copy of the label and a statement of all claims to be made for the material must be submitted to the Secretary of

Agriculture and must be approved before the material is registered for sale (in interstate commerce). It also provided a system of fees to support the procedures involved. The act was enforced by the USDA, Agricultural Research Service, Plant Pest Control Branch, Pesticide Regulation Section.

1950 - The continued flood of new materials emphasized the need for residue tolerances. According to the provisions of the 1938, supporting evidence for the tolerances had to be established at public hearings. Accordingly, hearings were started on January 17, 1950, and were completed in September 15, 1950. Such a mountain of evidence was presented that several more months were required to digest it.

1951 Growing public concern over the addition of chemicals to food products led to the appointment of the Delaney Committee, known formally as the House Select Committee to Investigate the Use of Chemicals in Foods and Cosmetics.

June, 1952 The Delaney Committee submitted its report to the 2nd session of the 82nd Congress. The report was in three parts: (1) a majority report, indicating that present laws were inadequate and new laws were needed, (2) a minority report, indicating that present laws were adequate but needed streamlining, and (3) a supplementary report indicating that one of the most important hazards involved was in the use of pesticides in the home garden, on materials intended for home consumption. It was pointed out that this particular hazard is beyond the reach of law and is susceptible only to education of the general public.

November, 1952 - The Food Protection Committee of the National Research Council published a comprehensive report, dealing with the use of chemicals in food. This report considered the present and future food needs of the nation and stressed the vital role that chemicals play in meeting these needs. It pointed out that the losses from hazards involved in using chemicals are rather minor compared to the losses involved in not using them.

March 26, 1953 - Rep. A. L. Miller introduced a bill, H.R. 4277, which provided for the regulation of pesticides and tolerances. This bill was heralded by the industry as a basis upon which a workable law could be built.

January 11, 1954 - Rep. Miller submitted a new bill, H.R. 7125, (a revised H.R. 4277 of the previous session). It was referred to the House Committee on Interstate and Foreign Commerce and became known as the Miller Pesticide Residue Amendment, since it was introduced as an amendment to the Federal Food, Drug, and Cosmetic Act.

July 22, 1954 - The Pesticide Chemicals Amendment (The Miller Pesticide Residue Amendment), amended the Federal Food, Drug and Cosmetic Act to provide for a system of fees to support the procedures involved, became Public Law 518 of 83rd Congress. It became effective for new chemicals a year from the date of signing, and was effective for tolerances established as a result of the 1950 and subsequent hearings.

It established new and more expeditious procedures for obtaining tolerances for exemptions for pesticide chemicals. Though administered by HEW, it specifically assigned to the Secretary of Agriculture the determination of usefulness of a chemical for all, any or none of the uses for which tolerances or an exemption are sought. And it required the USDA to express an opinion as to whether proposed tolerances are reasonable and whether residues are likely to result from proposed patterns of use.

September 6, 1958 - Food Additives Amendment to the Federal Food, Drug and Cosmetic Act (Public Law 929 of 85th Congress). It established procedures, principles and appeals procedures for obtaining regulations from HEW prescribing safe conditions of use for food additives. A food additive was defined as any substance the intended use of which may reasonably be expected to result directly or indirectly in its becoming a component of or otherwise changing the characteristics of any food. The law specifically excluded pesticide chemicals, pesticide residues on crops (raw agricultural commodities) and pesticide residues in processed food when such residues result from legal uses of pesticides on crops. These pesticides are regulated under Public Law 518 (The Miller Amendment).

This food additives amendment included the Delaney clause on carcinogens: no additive shall be deemed safe if it is found to induce cancer when ingested by man or animals.

March 27, 1962 - Declaration of Certain Forms of Plant and Animal Life and Viruses to be Pests. Thus, it extended the scope of the Federal Insecticide, Fungicide and Rodenticide Act to cover some kinds of pesticides not previously subject to the Act.

May 12, 1964 - An Amendment to FIFRA eliminating registration under protest. This amendment provided that the registrant could request an advisory committee or public hearing when registration of his product was refused, cancelled or suspended. The Secretary of Agriculture was also given the authority to require, by regulation, the USDA registration number of the label.

October 21, 1972 The Federal Environmental Pesticide Control Act (FEPCA) of 1972.
It significantly amended the FIFRA of 1947 and is administered by the Environmental Protection Agency (EPA). The major provisions are summarized on pages 8-10 of the text of the report.

APPENDIX III

THE IR-4 PROJECT ORGANIZATION

Box 231 - 134 Blake Hall
Rutgers University - The State University of New Jersey
New Brunswick, New Jersey 08903

1. PROJECT: IR-4 Evaluation of Current Data and Needed Research to Determine Tolerance Limits of Chemicals for Minor Uses on Agricultural Products

2. COOPERATING AGENCIES AND PRINCIPAL LEADERS:

TECHNICAL COMMITTEE

Technical Advisory Committee	Region
Dr. C. H. Van Middelem, Chm., Florida	Southern
Dr. V. H. Freed, Oregon	Western
Dr. G. E. Guyer, Michigan	North Central
Dr. B. R. Wilson, New Jersey	North Eastern
Mr. K. C. Walker, USDA-ARS	

Administrative Advisory Committee (States)	
Dr. H. H. Wilkowske, Chm., Florida	Southern
Dr. W. C. Kennard, Connecticut	North Eastern
Dr. J. P. Mahlstede, Iowa	North Central
Dr. L. W. Rasmussen, Washington	Western

USDA

Dr. R. C. Riley, USDA - CSRS

Consultants

Dr. John W. Swift, California
Dr. W. D. McClellan, USDA-ARS-PSRD
Dr. K. R. Hill - USDA-ARS-ENT
Mr. C. L. Smith EPA - Labels
Mr. D. M. Baker, Jr., EPA - Tolerances

Project Leaders

Dr. C. C. Compton, Rutgers N. J. Coordinator
Mr. G. M. Markle, Rugers - N. J. - Asst. Project Coordinator (Recording Secretary)

In addition to the Technical Committee a State Experiment Station Staff member appointed by the Experiment Station Director for each of the 50 states and Puerto Rico serves as a liaison person for the IR-4 Project at the state level.

APPENDIX IV

NEW YORK STATE'S MINOR USE PESTICIDE NEEDS ON FOOD, FEED FORAGE AND LIVESTOCK

PRIORITY SUMMARY SHEET (APRIL 6, 1973)

Insecticides	Uses Required
1. chlorpyrifos (Dursban)	3
2. endosulfan	2
3. carbofuran	15
4. dimethoate	7
5. Diazinon	7
6. Dylox	3
7. parathion	4
8. phosalone (Zolone)	1
9. Phosdrin	3
10. TEPP	8
11. methyl parathion	1
12. carbaryl	1
13. Guthion	2
14. Kelthan	2
15. malathion	2
16. demeton (Systox)	1
17. rotenone	2
18. ethion	1
19. B. thuringiensis	4

Livestock Insecticides	
1. Ciodrin	3
2. Vapona	2
3. ronnel	3
4. Rabon	2
5. methoxychlor	1
6. carbaryl	1
7. rotenone	1
8. dimethoate	1

Fungicides	
1. benomyl	13
2. Dexon	1
3. chlorothalanil (bravo)	4
4. Kocide	6
5. maneb	8
6. zinc-ion-maneb	2
7. Morestan	3
8. Terrachlor	1

Fungicides (Cont'd.)	Uses Required
9. sodium hypochlorite	1
10. Difolatan	1
11. Botran	1
12. Streptomycin	8

Herbicides	
1. dinoseb	14
2. 2,4-DB	6
3. silvex TP	6
4. 2,4-D	7
5. CIPC	5
6. terbacil	1
7. simazine (Princep)	5
8. amitrole	1
9. diuron	3
10. 2,4,5-T	4
11. Eptam	1
12. dalapon	1
13. trifluralin	1
14. TOK	1
15. Paraquat	1

Growth Regulators	
1. neodecanoic acid (onion top killer)	1
2. endothall	1
3. Rindite	1
4. silvex (TP)	1
5. Evik	1
6. gibberellins	2

Rodenticides	
1. zinc phosphide	1

TOTAL	
NR no action taken	173
Ext., IT, or Pet. filed	24
	197

KEY TO SYMBOLS

NR = not registered
Reg or R = registered on crop; but not for specific use requested
Pet. filed = petition filed
IN = already submitted
IT = interim tolerance
Tol. Est. = full tolerance established

INSECTICIDES

	CROP	PEST	REGISTRATION
chlorpyrifos (Dursban)			
	beans	seed corn maggot	NR, need seed treatment slurry
	crucifers	cabbage maggot	NR
	onions	onion maggot	NR
endosulfan (Thiodan)			
	endive	aphids	NR
	grapes	grape phylloxera	Reg. on grapes; NR for phylloxera
carbofuran (Furadan)			
	crucifers (cole and root)	cabbage maggot, flea beetles	NR
	cabbage		
	cauliflower		
	broccoli		
	Brussel sprouts		
	kale		
	kohlrabi		
	turnip greens		
	Chinese cabbage		
	turnips		
	rutabagas		
	radishes		
	potatoes	nematodes	NR; pet. filed on potatoes 6/29/71
	alfalfa	snout beetle	Reg on alfalfa; NR for snout beetle
	birdsfoot trefoil	plant bugs	NR
	crownvetch	plant bugs	NR
dimethoate (Cygon)			
	Brussel sprouts	aphids, cabbage maggot	NR
	carrots	aster leafhopper	NR
	Chinese cabbage	cabbage maggot	NR
	blackberries	tarnished plant bug	NR
	raspberries	tarnished plant bug	IN
	strawberries	tarnished plant bug	IN
	birdsfoot trefoil	plant bugs, leafhoppers, aphids	NR

Insecticides (Cont'd.)

	CROP	PEST	REGISTRATION
Diazinon			
	cabbage	cabbage maggot	Reg. Not on label for seed furrow
	cucumbers	seed corn maggot	NR for maggot; reg. on cucumbers
	melons	seed corn maggot	NR for maggot; reg. on melons
	pumpkins	seed corn maggot	NR
	rutabagas	cabbage root maggot	NR
	squash	seed corn maggot	Reg. on squash; NR for maggot
	birdsfoot trefoil	cutworms, leafhoppers, aphids, plant bugs	NR
Dylox (trichlorfon)			
	onions	onion maggot	NR
	birdsfoot trefoil	cutworms, plant bugs, leafhoppers	NR
	crownvetch	cutworms, plant bugs, leafhoppers	NR
parathion			
	asparagus	Asp beetles (2 sp.)	NR
	parsley	aphids	NR
	parsnips	aphids, leaf feeding worms	NR
	birdsfoot trefoil	aphids, leafhoppers, plant bugs	NR
phosalone (Zolone)			
	grapes	mites	NR; reg. in California
Phosdrin			
	endive	aphids, leaf feeding worms	NR
	escarole	aphids, leaf feeding worms	NR
	birdsfoot trefoil	aphids, plant bugs	NR
TEPP			
	cole (general)		
	broccoli	aphids	NR
	Brussel sprouts	aphids	NR
	cabbage	aphids	Ext. with IT
	cauliflower	aphids	Ext. with IT
	kale	aphids	NR
	kohlrabi	aphids	NR
	turnip greens	aphids	NR
	Chinese cabbage	aphids	NR

Insecticides (Cont'd.)

	CROP	PEST	REGISTRATION
methyl parathion			
	birdsfoot trefoil	aphids, plant bugs	NR
carbaryl (Sevin)			
	birdsfoot trefoil	cutworms, plant bugs, leafhoppers	NR
Guthion			
	currants	gooseberry, fruit worm, imported currant worm	NR
	gooseberries	gooseberry, fruit worm, imported currant worm	NR
Kelthane			
	currants	two spotted mite	NR
	gooseberries	two spotted mite	NR
malathion	parsnips	aphids, leaf feeding mites	NR
	birdsfoot trefoil	aphids	NR
demeton (Systox)			
	endive	aphids	NR
rotenone	rhubarb	curculio	NR
ethion	leeks	maggot	NR
Bacillus thuringiensis			
	Brussel sprouts	loopers, worms	NR; Tol est 2/28/73
	endive	leaf feeding worms	NR
	escarole	leaf feeding worms	NR
	parsley	aphids, leaf feeding worms	NR

LIVESTOCK

	ANIMAL	PEST	REGISTRATION
Ciodrin			
	Horses	biting flies, face flies	R for emergency use only
	calves	cattle lice	R for cattle; NR for calves under 6 mo.
	dairy cattle	cattle lice	R for cattle; NR mist application
dichlorvos (Vapona)			
	Horses	biting flies, face flies	R for emergency use only
	calves	cattle lice	R for cattle: NR for calves under 6 mo.
ronnel			
	Horses	biting flies, face flies, lice	R on horses; NR for flies, lice
	sheep	keds, lice	R on sheep; NR sprinkling can
	poultry	Northern fowl mites, lice	NR
Rabon			
	poultry	Northern fowl mites, lice	R for poultry; NR mist application
	poultry	house fly, little house fly	R for poultry; NR low gallonage machine larviciding
methoxychlor			
	Horses	biting flies, face flies, lice	NR
carbaryl			
	poultry	Northern fowl mite, lice, mites	Ext on eggs; No IT
Rotenone			
	livestock, cats, dogs	grubs, lice, fleas	NR
dimethoate (Cygon)			
	livestock	stable flies	R for agricultural buildings; NR on label for stable flies.

FUNGICIDES

	CROP	PEST	REGISTRATION
benomyl (Benlate)			
	beans (lima)	white mold	NR
	beets	root rot; Rhiz., Pyth.	NR
	Brussel sprouts	sprout rot	NR
	cabbage	post harvest application	NR
	celery	Septoria blight	NR; Tol est 12/7/72
	lettuce	Rhizoctonia	NR
	onions	Botrytis leaf blight, root disease	NR
	pumpkins	powdery mildew	NR
	black raspberry	powdery mildew	NR
	blackberries	Botrytis fruit rot	NR
	blueberries	mummy berry	NR
	grapes	powdery mildew	NR; Pet filed 1/26/72
	raspberries	powdery mildew	NR
Dexon			
	beets	root rot complex	Reg on beets; NR for root rot
chlorothalanil (Bravo)			
	lettuce	Rhizoctonia	NR
	onions	Botrytis leaf blight	NR
	radish	downy mildew	NR
	rhubarb	leaf spot	NR
Kocide			
	broccoli	black rot	NR
	Brussel sprouts	black rot	NR
	cabbage	black rot	NR
	cauliflower	black rot	NR
	parsnips	leaf spot	NR
	spinach	bacteria soft rot	NR
maneb			
	dill		NR
	horseradish	white rust	NR
	parsnips	leaf blight	NR
	radish	downy mildew	NR
	rhubarb (not GH)	leaf spot	NR
	rutabagas	downy mildew, anthracnose	NR
	Swiss chard	mildew	NR
	grapes	downy mildew	Reg. on grapes; NR for downy mildew

Fungicides (Cont'd.)

	CROP	PEST	REGISTRATION
zinc-ion maneb (Dithane M-45)			
	onions	seed treatment (in furrow)	Reg on onions; NR for seed treatment
	radish	downy mildew	NR
Morestan			
	black raspberries	powdery mildew	NR
	grapes	powdery mildew	NR
	raspberries	powdery mildew	NR
Terrachlor			
	lettuce (GH)	Botrytis rot	NR
sodium hypochlorite			
	peppers	seet treatment	NR
Difolatan			
	blueberries	Fusicoccum canker	NR
Botran			
	endive	Botrytis grey mold	NR
streptomycin			
	broccoli	seed treatment	NR
	Brussel sprouts	seed treatment	NR
	cabbage	seed treatment	NR
	cauliflower	seed treatment	NR
	lettuce	seed treatment	NR
	pepper	seed treatment	Ext with IT
	potato	seed treatment	Ext with IT
	tomato	seed treatment	Ext with IT

HERBICIDES

CROP	PEST	REGISTRATION
dinoseb (DNBP, Premerge)		
cucumber	weeds	Ext with IT
melons	weeds	Ext with IT
pumpkins	weeds	Ext with IT
squash	weeds	Ext with IT
alfalfa	weeds	Ext with IT
barley	weeds	Ext with IT
birdsfoot trefoil	weeds	Ext with IT
clovers	weeds	Ext with IT
crownvetch (seed crop only)	post-emergence weeds	Ext with IT
oats	weeds	Ext with IT
wheat	weeds	Ext with IT
forage grasses		
timothy	weeds	NR
brome	weeds	NR
orchardgrass	weeds	NR
2,4-DB		
barley	weeds	NR
oats	weeds	NR
wheat	weeds	NR
forage grasses		
timothy	weeds	NR
brome	weeds	NR
orchardgrass	weeds	NR
silvex		
apples	specific weeds	Ext with IT
pears	specific weeds	NR
forage grasses		
timothy	weeds	Ext, No IT
brome	weeds	Ext, No IT
orchardgrass	weeds	Ext, No IT
pasturegrass	weeds	Ext, No IT
2,4-D		
cherries	specific weeds	NR
peaches	specific weeds	NR
strawberry	specific weeds	NR (has negligible res. tol)
pasture grasses	weeds	Ext with IT
forage grasses		
timothy	weeds	Ext with IT
brome	weeds	Ext with IT
orchardgrass	weeds	Ext with IT

Herbicides (Cont'd.)

	CROP	PEST	REGISTRATION
CIPC			
	lettuce	weeds	NR
	onions	weeds	NR; Pet filed
	alfalfa	chickweed	Ext; No IT
	birdsfoot trefoil	chickweed	Ext; No IT
	red clover		NR
Terbacil (Sinbar)			
	strawberries	specific weeds	NR
simazine (Princep)			
	rhubarb	broadleaf weeds	NR
	elderberries	weeds	NR
	grapes	weeds	Reg. on grapes; NR on grapes under 4 years
	birdsfoot trefoil (seed only)	perennial weeds	NR
	crownvetch	perennial weeds	NR
amitrole			
	potatoes (seed)	potato volunteers	NR
diuron (Karmex)			
	cherries	specific weeds	NR
	grapes	weeds	Reg on grapes; NR on grapes under 4 years
	peaches	specific	NR; Tol Est 11/29/72
2,4,5-T			
	forage grass		
	brome	weeds	Ext; No IT
	orchardgrass	weeds	Ext; No IT
	timothy	weeds	Ext; No IT
	pasturegrass	weeds	Ext; No IT
Eptam (EPTC)			
	crownvetch	weeds	NR
dalapon			
	rhubarb	quckgrass	NR
trifluralin			
	eggplants	weeds	NR

Herbicides (Cont'd.)

	CROP	PEST	REGISTRATION
TOK	parsnips	weeds	NR
Paraquat	crownvetch (seed crop only)	quackgrass	NR

GROWTH REGULATORS

neodecanoic acid (Onion Top Killer)	onions	top killer	NR; Pet filed 3/16/72
endothall	potatoes	vine dessicant	NR; Tol Est 12/8/72
Rindite	potato seeds	break dormancy	NR
silvex (TP)	apples	preharvest drop control	Ext with IT
Evik	beans	defoliant	NR
gibberillins	peaches		NR
	pears		NR

RODENTICIDES

ainc phosphid	grapes	rodents	NR

APPENDIX V A

SELECTED MINOR USE PESTICIDE NEEDS IN CALIFORNIA

California has many minor crops for which there are definite pesticide usage problems, due to lack of an established tolerance and registration.

1. Food Uses

   a. Insecticides & Miticides

   Virtually all of the vegetable seed crops (cruciferous seed plants, carrots, table beets, chard, celery, lettuce and onion seed plants) are minor crops which lack the necessary registered insecticides and miticides. Practically no new chemicals are registered for these seed crops, leaving only a few of the older established chemicals on a few of them - such as malathion, parathion, systox (one crop), lindane (one crop) toxaphene and trichlorfon.

   Safflower, a major vegetable oil crop, has a few presently registered insecticides that can be recommended, namely malathion, trichlorfon, endosulfan, lindane (seed treatment) and dimethoate. However, growers also need oxydemetonmethyl for aphids and methidathion (Supracide®) for lygus, thrips and mites. Performance and residue data for these latter two chemicals has been obtained and forwarded to the companies, Dr. Swift (California Pesticide Coordinator) and the IR-4 Project, with no results to date.

   Sunflower is a very important minor crop in California, grown primarily at present for the edible seed market but being researched extensively for future production as an oil crop. The sunflower moth is the major pest and the only insecticide registered to date for use against it is endosulfan. California needs a tolerance and registration for the very effective chemical, methidathion (Supracide®) for which they have also forwarded considerable performance and residue data to IR-4.

   California grows about 11,500 acres of Globe artichokes, almost 100% of the U. S. production. Insect control at the present revolves around the application of parathion at one pound of actual material per acre every two weeks for practically the entire year. During 1972, many of the applications were made without any noticeable control. It is still unknown whether the problem is resistance or an inadequate application method.

   During the past four years, California entomologists have been unable to get any other material registered for artichokes. Artichoke is a minor crop, yet one with a rather major pesticide use.

b. Herbicides

The following are major needs for herbicides in minor crops in California:

Crop	Chemical(s) Needed
established asparagus	2,4-D amine terbacal
direct seeded asparagus	chlorobromuron terbacal
peas	chloroxuron tenoran
onions	tenoran
spinach	phenmedipham
orchard crops (almonds, walnuts, peaches, pears, apples, apricots, cherries, prunes, plums, etc., approx. one million acres)	2,4-D acid, O.S. amine or amine

2. Non-food Uses

a. Insecticides & Miticides

Crop	Chemical(s) Needed
ornamental oak trees	carbaryl, Orthene and Gardona (for control of defoliating caterpillars)
Christmas trees	Plictran (for control of Oligonychus spider mites
Ornamental Acacia	dimethoate (for control of Psylla uncatoides)

b. Herbicides

Container ornamentals (only one chemical registered at present)	Treflan, Ronstar, Lasso & Dacthal

In general, all low acreage, high risk crops face the same problem. Even if herbicide residues are not a consideration (container grown ornamentals), there often is not a registration of a herbicide for these uses. In container-grown ornamentals, for example, an acre of gallon containers might cost $150,000 whereas $30 of herbicide might be sold per acre. How can any company take the risk of injuring an acre let alone 250-300 acres of a grower's ornamentals? Yet these growers need herbicides.

APPENDIX V B

SELECTED MINOR USE PESTICIDE NEEDS IN MICHIGAN

Crop	Chemical	Pest	Comments
Apple	Silvex	weeds	
Apricots	Dursban	Lesser Peach Tree borer	Handgun drench treatment to trunk
Asparagus	Lannate	Cutworms	Bait
	Lenuron	weeds	
Blueberries	Benlate	Mummyberry disease	ground application, seasonal program
	Cygon (Am.Cy.)	Aphids	ULV air and ground application
	Difolatan	Fusicoccum & Phomopsis canker	ground application
	Sodium Pentachlorophenate	Mummyberry disease	Pre-bloom application
Cherries	Dursban	Lesser Peach Tree borer	Handgun drench treatment to trunk and scaffold limbs
Maple, Beech	Carbaryl*	Saddled Prominent	Aircraft
	Trichlorfon*	Saddled Prominent	Aircraft
Mint Oil	Lannate**	Loopers & Flea beetles	Foliar application
Nectarines	Dursban	Lesser Peach Tree borer	Handgun drench treatment to trunk and scaffold limbs
Onion	Parathion*	Onion maggot adults	Foliar application
	Diazinon*		
Oak	Carbaryl*	Red Humped Oakworm	Aircraft
	Malathion*	Red Humped Oakworm	ULV Aircraft
	Trichlorfon*	Red Humped Oakworm	Aircraft
Oats	Carbaryl	Cereal Leaf Beetle	Foliage spray
	Propuxur (Baygon)	Cereal Leaf Beetle	seed treatment
Peaches	Dursban	Lesser Peach Tree Borer	Handgun drench treatment to trunk and scaffold limbs

Crop	Chemical	Pest	Comments
Plums	Dursban	Peach Tree Borer	Handgun drench treatment to trunk and scaffold limbs
Scotch Pine	Azinphosmethyl*	Pine Needle Scale	Aircraft
	Furadan*	Pine Shoot Borer	Granular
	Temik*	Pine Shoot Borer	Granular
Radish	Nitrogen	weeds	
Snap beans	Sevin (carbaryl)	Corn borer and green clover worm	Foliar application
Sweet potatoes	Thiodan	Aphids	Foliar application
Strawberries	Dursban (Dow)	Strawberry Weevil (Clipper)	Pre-bloom ground or air applications
Taxus	Furdan*	Black Vine Weevil	Granular

*Supportive research or research data are available for Michigan conditions.

**IR-4 obtained a tolerance in mint hay but mint oil is equally (or more) important Clarification is needed.

APPENDIX VI

UNITED STATES DEPARTMENT OF AGRICULTURE
Office of the Secretary
Washington, D. C. 20250

February 1, 1973

SECRETARY'S MEMORANDUM NO. 1799

U. S. D. A. Policy on Pest Control

It is the policy of the Department of Agriculture to practice and encourage the use of those means of practicable, effective pest control which result in maximal protection against pests, and the least potential hazard to man, his animals, wildlife, and the other components of the natural environment.

Nonchemical methods of pest control, biological or cultural, will be used and recommended whenever such methods are economically feasible and effective for the control or elimination of pests. When nonchemical control methods are not tenable, integrated control systems utilizing both chemical and nonchemical techniques will be used and recommended in the interest of maximum effectiveness and safety.

Where chemicals are required for pest control, patterns of use, methods of application and formulations which will most effectively limit the impact of the chemicals to the target organisms shall be used and recommended. In the use of these chemicals, the Department has a continuing concern for human health and well-being and for the protection of fish and wildlife, soil, air, and water from pesticide contamination.

In keeping with this concern, persistent pesticides will not be used in Department pest control programs when an equally safe and effective nonresidual method of control is judged to be feasible. When persistent pesticides are essential to combat pests, they will be used in minimal effective amounts, and applied only to the infested area at minimal effective frequencies.

In carrying out its responsibilities, the Department will continue to:

-- Conduct and support cooperative research to find new, effective biological, cultural, and integrated pest control materials and methods;

-- Seek effective, specific, nonpersistent pesticides and methods of application that provide maximal benefits and are least hazardous to man and his environment;

-- Cooperative with other public and private organizations and industry in the development and evaluation of pest control materials and methods, assessment of benefits and potential hazards in control operations, monitoring for pesticide residues, and dissemination of pesticide safety information.

All users of pesticides are strongly urged to heed label directions and exercise constant care in pesticide application, storage, and disposal for the protection of people, animal, and our total environment.

The Department commends this policy to all who are concerned with pest control.

Earl L. Butz
Secretary of Agriculture

With this issuance, Secretary's Memorandum No. 1666, dated October 29, 1969, is hereby superseded.

APPENDIX VII A

PESTICIDES USED AND NEEDED IN DOMESTIC PROGRAMS OF THE PLANT PROTECTION AND QUARANTINE PROGRAMS OF APHIS BUT PRESENTLY UNREGISTERED*

Pesticide	Used for Following Pests
Aldrin	Mormon cricket
BHC	Whitefringed beetle
Carbaryl	Giant African snail, West Indian sugarcane root borer, and whitefringed beetle
Dibrom	Mediterranean fruit fly, Melon fly, and Oriental fruit fly
Dieldrin	West Indian sugarcane root borer
Dimethoate	Citrus blackfly
Ethylene dibromide-434	Japanese beetle
Hydrocyanic acid	Pink bollworm
Malathion	Beet leafhopper, black grass-bug, and khapra beetle
Sevin-4 oil	West Indian sugarcane root borer
Treflan	Witchweed
2,4,5-T	Witchweed

*Of the 38 pesticides presently used in PPQP's domestic programs, 12 (listed here) are unregistered.

APPENDIX VII B

PESTICIDES USED AND NEEDED IN FOREIGN PROGRAMS OF THE PLANT PROTECTION AND QUARANTINE PROGRAMS OF APHIS BUT PRESENTLY UNREGISTERED (PART I) OR REGISTERED FOR SOME USES BUT NOT ALL (PART II)

PART I

Pesticides	Used on Following
Acrylonitrile	
Formaldehyde	
Mercuric chloride	
Sulfuric acid	

PART II

Aluminum phosphide	Barley, corn, millet, peanuts, oats, rice, rye, sorghum, and wheat
Captan	Nursery stock dip
Carbon disulfide	Barley, corn, oats, popcorn, rice, rye, sorghum (milo), and wheat
Carbon tetrachloride	Barley, corn, oats, popcorn, rice, rye, sorghum (milo), and wheat
Chloropicrin	Barley, buckwheat, corn (including popcorn), oats, rice, rye, grain sorghum, and wheat
Copper sulfate--Lime	
DDT/Carbaryl	Micronized dust--aircraft
Ethylene dibromide	Barley, beans (string), bitter melons, cantaloups, Cavendish bananas, cherries, citrus fruits, corn, cucumbers, guavas, litchi fruit, litchi nuts, longan fruit, mangoes, oats, papayas, peppers (bell), pineapples, plums (fresh prunes), popcorn, rice, rye, sorghum (milo), wheat, and zucchini squash

Pesticide	Used on Following
Ethylene dichloride	Barley, corn, oats, popcorn, rice, rye, sorghum (milo), and wheat
Ethylene oxide	Black walnut meats, copra, and whole spices
Hydrogen cyanide	Allspice, almonds, anise, barley, basil, bay, beans (dried), black pepper, buckwheat, caraway, cashews, cassia, celery seed, chili, cinnamon, cloves, cocoa beans, coriander, corn (including popcorn), cumin, dill, ginger, mace, marjoram, milo (grain sorghum), nutmeg, oats, oregano, paprika, peanuts, peas (dried), pecans, poppy, red pepper, rice, rosemary, rye, sage, savory, sesame, thyme, tumeric, walnuts, wheat, white pepper
8-Hydroxyquinoline sulfate	
Mercuric chloride	
Methyl bromide	Alfalfa hay, almonds, apples, apricots, asparagus, avocadoes, barley, beans, beans (green), beans (lima), beans (snap), black-eyed peas, Brazil nuts, bush nuts, butter nuts, cabbage, cantaloupes, carrots, cashew nuts, cherries, chestnuts, cipollini bulbs, citrus citron, cocoa beans, coffee beans, copra, corn, cottonseed, cucumbers, cumin seed, eggplants, filberts (hazelnuts), garden beets (roots), garlic, ginger roots, grain sorghum (milo), grapes, grapefruit, hickory nuts, honeydew melons, horse-radish, Jerusalem-artichokes, kumquats, lemons, limes, mangoes, muskmelon, nectarines, oats, okra, onions, oranges, papayas, parsnips (roots), peaches, pears, peanuts, peas, pecans, peppers, pineapples, pimentos, pistachio nuts, plums (fresh prunes), pomegranates, popcorn, potatoes, pumpkins, quinces, radishes, rice, rutabagas, rye, salsify roots, soybeans, strawberries (from use before harvest), sugarbeets (roots), summer squash, sweetcorn, sweet potatoes, tangerines, timothy hay, tomatoes, turnips (roots), walnuts,

Pesticides	Used on Following
Methyl bromide (continued)	watermelons, winter squash, yams, and zucchini squash
Nemagon	Almond hulls, almonds, apricots, bananas, blackberries, boysenberries, broccoli, brussels sprouts, cabbage, carrots, cauliflower, cherries, celery, citrus fruits, cottonseed, cucumbers, eggplants, dewberries, endive (escarole), English walnuts, figs, grapes, lettuce, lima beans, loganberries, melons, nectarines, okra, parsnips, peaches, peanuts, peppers, pineapples, plums (fresh prunes), radishes, raspberries, snap beans, soybeans, strawberries, summer squash, tomatoes, turnips
Pyrethrum mixtures	G1152/G1701 (aerosol spray)
Sulfuryl fluoride	
Zineb	Nursery stock dip

APPENDIX VIII A

MAJOR FOREST SERVICE CONTROL PROJECTS IN FY 1972

Pest organism or problem	Location and extent of problem	Pesticide and extent of treatment
Spruce budworm	Maine - 3 million acres	Zectran - 500,000 acres
Gypsy moth	Northeastern States - 1.342 million acres	Carbaryl 111,600 acres in Pa., N.J., and N.Y.
Tip moth/cone insect complex	Seed orchards in Southern States	Dimethoate 322,800 trees
Bark beetles	Localized areas in Western and Southern States	BHC, lindane, EDB - 66,900 trees
Fusiform rust	Forest nurseries in Southern States	Ferbam - 90,000 trees
Brown spot	Localized areas in Southern States	Bordeaux mixture - 6,000 trees
Unwanted vegetation	Management units on National Forest System lands	2,4-D; 2,4,5-T; 2,4,5-TP - 172,000 acres

APPENDIX VIII B

LIST OF MINOR USE PESTICIDES NEEDED BY FOREST SERVICE

Fungicides or fumigants	Use
Benomyl	Nursery diseases, wilt diseases
Bordeaux and other copper fungicides	Foliage diseases
Busan	Seed and seedling diseases
Captan	Seed and seedling diseases
Daconil 2787	Foliage diseases of seedlings
Difolatan (captafol)	Foliage diseases of seedlings
Maneb	Foliage diseases
Methyl bromide	Building, greenhouse, soil fumigation
Peniophora gigantea	Biological for annosus root rot
SMDC (Vapam)	Nursery soil fumigation
Thiram	Seed and seedling diseases
Herbicides	
Amitrole	Road rights-of-way
Amizine	Soil sterilant, weed control
Bromacil	Weed control
Cacodylic acid	Timber stand improvement work
Cotoran (fluometuron)	Grass and weed control
Dicamba	Brush and noxious weed control
Dichlobenil (Casoron)	Weed control in nurseries
Dichlorprop	Site preparation
Diquat	Aquatic weed control
EPTC (Eptam)	Weed control

Herbicides (Cont'd)	Use
Linuron	Grass and weed control
MH-30 (Maleic Hydrazide)	Brush control
MSMA (Silvisar 550)	Timber stand improvement work
Paraquat	Weed control in nurseries
Picloram	Weed and brush control (inc. areas grazed by domestic livestock)
Picloram + 2,4-D + 2,4,5-T	Timber stand improvement work, road rights-of-way
Prometone (Pramitol)	Grass and weed control
Simazine	Weed control in nurseries
Sodium cacodylate	Weed control
Trifluralin (Treflan)	Grass and weed control
Trysben (trichlorobenzoic acid)	Weed control
2,4-D and Tandex (karbutilate)	Brush control

Insecticides	Use[1/]
Aldrin	Native subterranean termites, pales weevil
Bacillus thuringiensis (Dipel, Thuricide HPC)	Bagworm, fall cankerworm, spring cankerworm, eastern tent caterpillar, forest tent caterpillar, gypsy moth, elm spanworm, fall webworm, Great Basin tent caterpillar, redhumped caterpillar, California oakworm
Azinphosmethyl (Guthion)	Aphids, oystershell scale, Putnam scale, cone midge, cone moth (Dioryctria spp.), European pine shoot moth, Nantucket pine tip moth, black pine-leaf scale, European elm scale, juniper scale, slash pine seedworm, mimosa webworm, spruce spider mites

Insecticides (Cont'd)	Use[1/]
Carbaryl (Sevin)	Aphids, bagworm, elm leaf beetle, willow leaf beetle, boxelder bug, fall cankerworm, eastern tent caterpillar, forest tent caterpillar, lacebugs, birch leaf miner, oak leaf miner, gypsy moth, saddled prominent, mimosa webworm, Great Basin tent caterpillar, western tent caterpillar
Diazinon	Aphids, bagworm, eastern tent caterpillar, forest tent caterpillar, cottony cushion scale, fall webworm, mimosa webworm, Great Basin tent caterpillar, western tent caterpillar, hemlock chermes, European pine shot moth, loblolly pine sawfly, pine needle scale
Dimethoate (Cygon)	Bagworm, juniper scale, fir cone midge, European pine shoot moth, Nantucket pine tip moth, Zimmerman pine moth, loblolly pine sawfly, pinyon needle scale
Disulfoton (Di-Syston)	Aphids, elm leaf beetle, birch leaf miner, holly leaf miner, European elm scale, mimosa webworm, Nantucket pine tip moth, spruce spider mites
Dursban	Bagworm
Gardona	Aphids, elm leaf beetle, fall cankerworm, forest tent caterpillar, spiny elm caterpillar, oak leafroller, birch leaf miner, European elm scale, oak leaf tier, juniper webworm, mimosa webworm, pine sawflies (?)
Imidan	Gypsy moth, elm spanworm, spring cankerworm, birch leaf miner

Insecticides (Cont'd)	Use[1/]
Malathion (Cythion)	Aphids, bagworm, western budworm, eastern spruce budworm eastern tent caterpillar, forest tent caterpillar, birch leaf miner, hemlock looper, larch casebearer, European pine shoot moth, European pine sawfly, red-headed pine sawfly, oyster shell scale, pine needle scale, pine tortoise scale, Saratoga spittlebug, lodgepole needle miner, pine needle sheath miner
Trichlorfon (Dylox)	Bagworm, forest test caterpillar, gypsy moth, Nantucket pine tip moth, Zimmerman pine moth
Zectran	Aphids, western budworm, eastern spruce budworm, eastern tent caterpillar, forest tent caterpillar, spiny elm caterpillar, yellow-necked caterpillar, birch leaf miner, Great Basin tent caterpillar, jack-pine budworm, European pine shoot moth, red pine sawfly

Repellents	Use
Anthraquinone	Bird repellent
Endrin + Arasan	Seed protectant[2/]
Thiram (Arasan)	Seed protectant and animal repellent

1/ Registered ornamental and/or forest was irrespective of host or geographic limitations.

2/ Presently registered for use as an insecticide, not for protection of seed against rodent depredation.

DEPARTMENT OF DEFENSE PEST CONTROL: UNREGISTERED PESTICIDES AND UNREGISTERED PESTICIDE USES

Item	Department	Target Pest	Pesticide	NOT REGISTERED			
				for target pest	Method	Site	Other
1	Navy	Woodchucks Gophers	Aluminum phosphide	X	burrow fumigation	Pacific	
2	Army, Navy	Powder post beetles Drywood termites	Aluminum Phosphide	X			
3	Army	Clover mites	Baygon			Interior	
4 5 6 7	Army, Navy, Air Force	German and American cockroaches	Diazinon or Baygon or Malathion or Dursban			food handling areas	
8	Army, Navy, Air Force	Subterranean termites	Paris green	X	tube treatment		
9	Air Force	Mosquitoe larvae	Paris green granules	X	aerial		
10	Army, Navy	Bed bugs	Diazinon	X			
11	Navy	Mosquitoe larvae	Abate		plaster briquettes		
12	Army	Webworms	*Bacillus thuringiensis*	X		on pecans	
13	Army, Navy, Air Force	Pigeons	Fenthion	X	Grease formulation		Experimental registration suspended
14	Army, Navy	Ground squirrels	1080				Registration suspended

Item 1. In the Pacific area, the Navy has found aluminum phosphide to be a very good rodenticide for burrow fumigation. The dosage is usually one tablet per burrow and then cover the hole to prevent the escape of the phosphine. Soil moisture is usually adequate to initiate the reaction. It would seem that this application would be useful for rats and other burrowing rodents as well throughout the United States. Although CACN is registered and suitable, there is an advantage to handling one tablet vs a long handled tablespoon. The Navy alone conducts more than 264 man days annually on burrow fumigation with cyanide. Any acceptable method for improving this operation would be desirable.

Item 2. Control of powder post beetles and drywood termites is currently done with MB or perhaps sulfuryl flouride. It would be an advantage to have AlPh available too.

Items 3 and 12 are very minor in terms of total use, but desirable for program fexibility.

Items 4, 5, 6 and 7. The use of these residual materials in food preparation areas is not registered, but in comparison to other types of pest control, it is the most important. Treatment of food preparation areas - galleys, mess halls and associated facilities, is necessary to reduce the population of German and American cockroaches. To be effective, and to stay within the registered uses, continual treatment would be required. Current practice is to remove food, cover utensils and food preparation surfaces and spot treat. Flushing agents may be used simultaneously or immediately after laying down the residual. The galleys are "washed" down daily which negates the use of residuals in some situations. Loss of these materials for use in food handling areas would have considerable impact on military pest control costs. It is estimated that the Navy alone expends more than 100,000 man hours or $1.2 million on this type of control annually. In many situations, no alternative chemicals would be employed due to the cost and the insects would increase significantly and almost immediately. Timed dispensers have been used in a few situations, but are not favored due to higher cost and the factor of constant exposure. Use of dusts and bait granules would not be able to achieve sufficient control.

Item 8. Paris green has been effective in controlling subterranean termites by introducing a small amount of the insecticide into the tubes. This use is one of the main methods of control in Hawaii and other Pacific areas. Its use is minor but effective and safe for both the applicator and non-target organisms. Loss of this use would immediately multiply the cost of termite control by ten to twenty fold although soil poisoning has a longer service life.

Item 9. Paris green is useful in mosquito control programs for treatment of sanitary fill areas. Aerial application of granules is effective in getting the control agent into the cracks in the ground. Alternate materials require considerable care to avoid harmful effects on aquatic organisms.

Item 10. The use of diazinon for bedbugs has been extremely effective. The material is spot treated on the bed frames, springs, cracks, and other areas where the insects take shelter. The residual is necessary to provide control for subsequent hatchs of eggs. Loss of this use would require immediate substitution of another material because military housing and barracks are frequently infested with bedbugs.

Item 11. Abate plaster briquettes and other forms of slow-release for mosquito control are very suitable at military installations. The Army Environmental Health Agency at Edgewood, Maryland has done considerable study on compounding insecticide in rubber pellets. The savings in labor costs alone make this operation valuable. At one Navy installation the PCO spots and treats shallow inaccessible ponds by dropping briquettes from a helicopter. The practice is not quite so suitable for large mosquito programs, but appears environmentally sound. Procedures for making the blocks have been developed by Navy entomologists.

Item 12. (See Item 3).

Item 13. Under military situations where PCOs are (a) trained, (b) highly supervised, and (c) maintain tight security over various sites the use of fenthion can be safely used for control of pigeons. An experimental product, "Queletox", was available a few years ago but has since lost its registration. It was highly effective and in a few cases was the only suitable material. The product is needed for use where pigeon problems exist and certified PCOs are available to put down the toxicant, watch it and remove residues along with the affected birds. Bird control is highly specialized and each situation is different so it is difficult to assess the value of using fenthion in this manner.

Item 14. Considerable study has been carried out on the use of 1080 for the Beechey ground squirrel in California. It has been found that the squirrel is a real threat to military operations, base maintenance, agricultural losses and human health. Annually, several California military installations suffer from power outages, broken springs on vehicles, reservoir damage and failure, claims for crop destruction and road subsidence and pavement repair. All from the burrowing and feeding habits of ground squirrels. Dollar value is estimated to be between $40,000 and $100,000. No value can be placed on inconvience and loss of recreational use, etc... Several installations have ground squirrel populations with endemic plague. Plague at an Army base required the reencampment of several hundred soldiers and their equipment when the epizootic was found in a local squirrel population. The cost of the subsequent burrow dusting program (one mile square) is unknown but can be imagined.

Ground squirrels prey heavily on leaf, grain and nut crops. The military base commander is in an awkward position when squirrels living on military property damage adjacent agriculture and he has at best, only partially effective control methods available to him. The reason for this situation is the loss of the use of 1080 on federal lands by executive order. Originally intended to remove 1080 from predator control, this action has put a clamp on one of the most useful, effective and, under proper supervision, environmentally safe control programs available. Alternate methods either have similar risks or totally impractical labor costs.

APPENDIX X

MINOR USE HERBICIDE NEEDS FOR AQUATIC VEGETATION MANAGEMENT (CORPS OF ENGINEERS)

A. Algae.

1. Copper Sulfate Copper sulfate is widely used for control of algae in almost all situations requiring chemical control of these pests.

2. Dichlone This compound (2,3-dichloro-1,4-napthoquinone) is effective primarily on blue-green algae.

3. Dichlobenil - The macroscopic alga Chara is especially susceptible to dichlobenil (2,6-dichlorobenzonitrile).

4. Other Herbicides Other herbicides that will eliminate all or certain species of algae are acrolein, aromatic solvent, diquat, and endothall. These are broad spectrum herbicides and are usually used to control one or more species of vascular weeds. The control of algae is for the most part incidental to this use.

B. Floating Weeds. Floating weeds are particularly troublesome in the Southern States. The most serious problem species such as waterhyacinth alligatorweed, waterlettuce (Pistia stratiotes L.), and waterferns (Azolla spp., Salvinia rotundifolia Willd.) are for the most part from the tropics or subtropics. They do not die back during the winters, although their rates of growth decrease. Hindrances to navigation arise primarily from the excessive growth of floating weeds. With the possible exception of alligatorweed, they are more easily controlled than most submersed vegetation.

1. 2,4-D - This herbicide ((2,4-dichlorophenoxy)acetic acid) can be used to control most of the species of floating aquatic weeds. Waterhyacinth is particularly susceptible; alligatorweed is most resistant and treatment rates may be increased.

2. Silvex - While silvex (2-(2,4,5-trichlorophenoxy)propionic acid) may be used widely for control floating vegetation, its principal use is as a substitute for 2,4-D in control of alligatorweed. Field tests have shown that silvex will provide longer lasting control of this weed.

3. Diquat - Where circumstances make it undesirable or unsafe to use 2,4-D, diquat (6,7-dihydrodipyrido(1,2-a:2',1'-c)=pyrazinediium ion) may be used to control duckweed, waterhyacinth and waterlettuce.

C. Submersed Weeds.

1. Irrigation Canals and Ditches - Aquatic vegetation in irrigation conveyance systems is difficult to control. The water is constantly flowing (usually at a fairly high velocity) which results in the transport

of herbicide chemicals from the site of application. In order to provide adequate contact time for lethal dosages to be absorbed by the vegetation, herbicides must be applied continuously to the water for periods known to be effective. Consequently, large volumes of water must be treated at considerable expense. In addition, herbicides must usually be applied to water that will in a short time be diverted onto cropland. In irrigated areas, water is a scarce commodity and not be wasted. During the time of season when weeds are most troublesome, the canals of water required to satisfy the needs of the farmers. Thus, it is impractical to interrupt the flow of water to cropland by shutting down the flow in the canals or by denying diversion of water to crops.

a. Acrolein. Acrolein is usually used as a contact herbicide in large irrigation canals where aromatic solvents do not perform well.

b. Aromatic Solvent. Aromatic solvents (almost exclusively xylene of not less than Grade B) have been used in irrigation canals of up to 100 cfs of flow for more than 25 years. Aromatic solvents, like acrolein, are contact herbicides and are effective on algae as well as vascular aquatic weeds.

c. Copper Sulfate. The continuous-feed method of using copper sulfate for control of submersed aquatic plants has been used only rarely, and mainly on experimental bases.

d. Diquat - This herbicide has had limited use in irrigation systems, being restricted to situations where there is virtually no movement of the water. Diquat is ineffective in turbulent water and in water containing appreciable quantities of suspended solids.

e. Endothall. The restrictions concerning the use of the sodium and alkylamine salts of endothall (7-oxabicyclo=(2.2.1)heptane-2,3-dicarboxylic acid) are the same as for diquat.

f. Monuron. This herbicide (3-(p-chlorophenyl)-1,1-dimethylurea) is not useful for control of aquatic weeds in the main channels of irrigation systems. Its principal use is for control of vegetation in lateral ditches that carry water intermittently and directly to irrigated fields. Since herbicides used in these ditches are not linked directly to other water systems, they are only of secondary importance.

g. Diuron. The use of diuron (3-(3,4-dichlorophenyl)-1,1-dimethylurea) is the same as for monuron.

2. Drainage Ditches Many of the factors and conditions governing the uses of herbicides in irrigation canals and ditches apply equally to drainage ditches. In some drainage ditches fish may be of considerable importance, in others they may be nonexistent or of little importance. Also, some drainage ditches may have sizable water flows, while others have essentially no flow during much of the year. Drainage ditches commonly empty into water impoundments or into streams. Water from drainage ditches is also used occasionally for irrigation. In treating drainage ditches for control

of vegetation, the precautions that must be observed are dependent upon the circumstances that apply to the specific situation.

a. Acrolein.

b. Aromatic Solvent.

c. Copper Sulfate. May be used infrequently in drainage ditches where the vegetation is predominantly algae.

3. Lakes, Ponds, and Reservoirs - It is in lakes, ponds, and reservoirs that aquatic vegetation problems are most numerous; and it is from here that we can anticipate much greater demand for improvement in the environment through management of aquatic plants. The nation is experiencing wholesale development of almost all available waterfront property. In many areas where natural bodies of water do not exist, they are being constructed as integral parts of residential developments. At the same time, recreational uses of water have increased greatly. For various reasons, the quality of water in lakes, ponds, and reservoirs has deteriorated and continues to become poorer. Algae problems now exist in waters where they were never observed previously. Vascular aquatic weeds frequently pollute and reduce the usefulness of waters valued for generations as favored fishing and other recreational sites. Awareness of the problems, and knowledge that methods are available that may be used to alleviate these even temporarily or in part, will undoubtedly result in pressures to improve the aquatic environment through vegetation management. Permanent solutions, if there are any, must include measures to prevent pollution and enrichment of the water.

a. Dichlobenil. When used as a broadcast treatment on exposed bottoms or over the water surface, the granular formulation of dichlobenil provides excellent control of vascular aquatic plants and Chara.

b. Diquat.

c. Endothall. The various derivatives of endothall are broad spectrum herbicides. The disodium and potassium salts are active on most submersed species of aquatic plants. They are notably ineffective on elodea.

d. Fenac. Present uses of fenac ((2,3,6-trichlorophenyl)=acetic acid) are limited to situations in which water can be drawn down to expose the bottom soil of ponds and lakes.

e. 2,4-D. Various derivatives of 2,4-D are used for control of submersed aquatic vegetation.

f. Silvex. The potassium salt of silvex is applied as a liquid or used occasionally in granular or pelleted formulations.

g. Other Herbicides. Other herbicides used infrequently for control of submersed weeds in ponds, lakes, and reservoirs are acrolein and aromatic solvents. Because of their toxicity, they are normally used for spot treatments in these bodies of water. Simazine and diuron have been used experimentally in extensive testing to control pH and reduce plant biomass responsible for oxygen depletion hazards in ponds used for fish production. Increases in pH and oxygen levels are highly desirable and appreciable toxicology and residue research is being conducted on these herbicides to support registration for their uses.

D. Emersed and Marginal Weeds. Emersed weeds are common to shallow bodies of water and shallow slow moving streams. Because most are littoral species; they are an important component of the habitat for fish and other aquatic animal life, and play an important role in the aquatic food chain. Their location makes them especially undesirable to lakeside homeowners, swimmers, and other water users.

1. Broadleaved Plants.

a. 2,4-D. It is commonly recommended as a general control for most marginal and emergent broadleaf vegetation.

b. Silvex. It is used in the same manner as 2,4-D above.

2. Grass and Grass-like Species.

a. Dalapon. It is used for most grasses and grass-like species including cattails and bulrushes.

b. 2,4-D. It may be substituted for dalapon in the control of bulrushes and cattails.

c. MSMA and TCA. Neither MSMA (monosodium methanearsenate) nor TCA (trichloroacetic acid) is registered for use in and around water. Both have been field tested extensively and both appear to have desirable uses for control of ditchbank grass weeds.

APPENDIX XI

SELECTED MINOR USE PESTICIDE NEEDS BY U. S. DEPARTMENT OF INTERIOR (DOI)

A. General Observations.

Within the Department of Interior there are several specific pesticide needs which are classified as minor uses. Examples can be found in each of three DOI agencies below.

1. Bureau of Reclamation.

Bureau of Reclamation project facilities include about 304 storage reservoirs; 60,000 miles of canals, laterals and drains; and 16,000 miles of transmission lines. Chemicals are used to control algae and aquatic weeds in water distribution and drainage systems. (Some of these needs have been documented in more detail in Appendix X).

2. Bureau of Sport Fisheries and Wildlife.

A number of chemicals are used in fish and wildlife management programs for disease control in fish cultures, fish eradication, habitat improvement, population sampling, and stream and pond reclamation. A number of wildlife damage control toxicants are also used to aid in protecting crops and livestock; human health and safety; urban structures; and forest, range and wildlife resources.

3. Bonneville Power Administration

The Bonneville Power Administration uses herbicides to control vegetation on powerline rights-of-way in the Pacific Northwest. A presently non-registered formulation provides the best control.

B. Specific Problems

Documented below are some of the specific use problems that relate to the general observations above.

1. Avicides - for protection of fruits, small grains, and feedlots from bird damage, all minor uses. One new repellent and one new toxicant have been registered by private companies during last 6 years. All current registered compounds are due for review.

   a. Methiocarb - a repellent that can be used to protect fruit, sprouting corn, rice from birds - not registered. The DOI has spent over $200,000 trying to convince the company that the material is effective and should be registered.

b. Avitrol a bird repellent that can be used to protect field corn, sunflowers, table corn from birds. The company registered the material with DOI assistance ($400,000) for field corn. Other registrations will probably require data obtained by DOI.

2. Rodenticides - are used to protect agricultural crops, forest products, urban areas from rodents Industry interest generally only with commensal rats and mice.

   a. Zinc phosphide an old compound. The registration of new uses is needed. One residue tolerance has been secured through a joint registration effort by DOI and the Hawaii Sugar Can Grower Association cost $200,000.

   b. Gophicide - specific for certain rodents. It is registered for use on pocket gophers without a residue tolerence. The owner of the Compound did not renew the registration when a residue tolerence was required - $200,000 cost to Department.

3. Predacides needed for protecting livestock from predators. None are now available and any new materials will probably have to be developed and registered by the DOI or other governmental agencies.

4. Herbicides are used in weed control on croplands in such volume that industry considers them a major use and has assumed responsibility for registration. However, those needed in or near aquatic situations are considered minor uses and registration has become the responsibility of the user agency. These needs have been detailed above in Appendix X. (U. S. Corps of Engineers - Aquatic Herbicide Uses).

   Registration of these minor uses has, where possible, been assumed by the DOI, and active cooperation of industry and other federal agencies (such as U. S. Corps of Engineers) is required. For example, government agencies have spent about $300,000 toward registration of 2,4-D for use in irrigation ditches, ponds, lakes and navigation systems Although residue tolerences have been established for certain uses in irrigation ditches, further work is needed to obtain a label for registration for other uses.

5. Algaecides are used to maintain algae free irrigation systems and erradicate bluegreen algae that are toxic to fish and wildlife. These materials are also used to reduce algal blooms that result in taste and odor problems, clog screens and water conveyance structures, and cause problems with noxious growths in ponds, lakes, marshes, flowages, streams and raceways involving fish that are propagated and managed. Again, the problem was detailed above in Appendix X.

6. Disinfectants, fungicides, parasiticides and disease control agents are needed for fish propagation and require registration when used in water or soil treatment and in the sanitization of facilities. Thus,

the present uses of malachite green, formaline, acriflavine, potassium permanganate, copper sulfate, Dylox®, Baytex®, di-n-butyl tin-oxide, dibutyl tin dilaurate, Roccal®, Hyamine 1622 (and other Hyamines), methylene blue, furpyrinol, wescodine (for Betadine) and even salt and acetic acid (vinegar) for these purpose are without full registration status. Many of these will also require dual registration as both a drug (with FDA) and a pesticide according to specific uses claims or intention of the applicator.

7. Piscicides - are major tools for restoration of fish populations used by fishery management biologists. The lampricide "TFM" used to control the parasitic sea lampray in the Great Lakes is a piscicide. The Great Lakes Fishery Commission in cooperation with the Canadian government, States, Provinces and the Bureau of Sport Fisheries and Wildlife have conducted a $600,000 registration oriented research program for obtaining clearance and registration of TFM and the synergist "Bayer 73." The DOI has also conducted cooperative studies with industry on formulations of antimycine A, rotenone, squaxin and certain salicylanilides that are needed for selective removal of undesirable fishes, renovation of fish populations, and for collecting or harvesting target species in management operations.

ARS FACILITIES DEVOTED PRIMARILY TO PESTICIDE RESEARCH*

Beltsville, Md.	PSRD - Crops Protection Research Br.	Pesticide Behavior in Soils
	ERD - Insect Physiology Pioneering Lab	Hormonal insecticides
	ERD - Pesticide Chemicals Branch	Aerosols
	ERD - Pesticide Chemicals Branch	Analytical Methods
	ERD - Pesticide Chemicals Branch	Insecticides-efficacy
	ERD - Pesticide Chemicals Branch	Insecticides-residues
	SWCRD - Northeast Branch	Pesticides fate in soil and water
College Station, Texas	VSRD - Vet. Tox and Entomology Lab.	Veterinary and insect toxicology
Duran, Oklahoma	SWCRD - Southern Plains	Pesticides fate in soil and water
Fargo, N.D.	PSRD - Crops Protection Research Br.	Pesticides metabolism in plants
	ASRD - Swine Research Branch	Pesticide metabolism in farm animals
Gainesville, Florida	ERD - Pesticide Chemicals Branch	Insecticides-efficacy
Kerrville, Texas	ERD - Insects Affecting Man & Animals	Veterinary toxicology & Insecticides-residues
Morris, Minnesota	SWCRD - Northcentral Branch	Pesticides fate in soil and water
Savannah, Georgia	MQRD - Stored-Product Insects Research Branch	Insecticides-efficacy and residues
Stoneville, Miss.	PSRD - Crops Protection Research Branch	Weed Control
Tifton, Ga.	ERD - Pesticide Chemicals Branch	Insecticides-residues
Yakima, Washington	ERD - Pesticide Chemicals Branch	Insecticides-residues

*This was the situation under ARS prior to the most recent reorganization.