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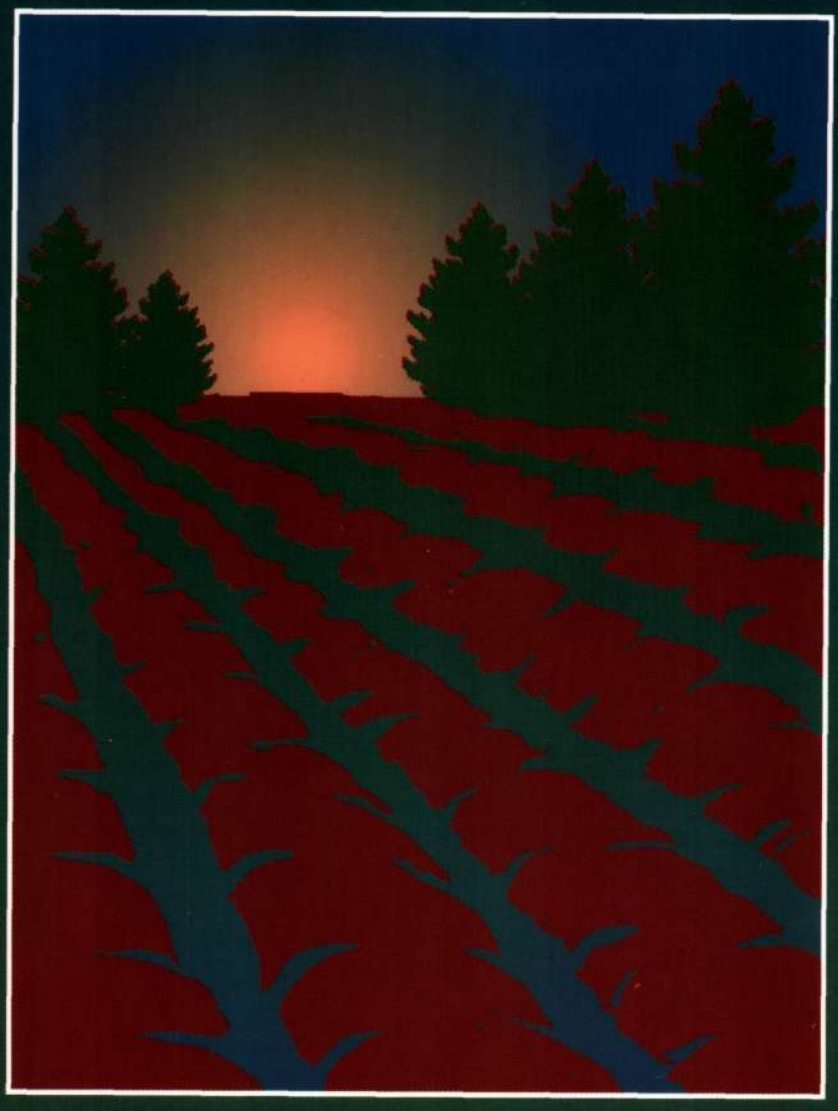
AGRICULTURAL SUMMIT I



An Assessment of Future Trends for Pesticide Use in Michigan

Michigan State University

Michigan Department of Natural Resources

Michigan Department of Agriculture

Michigan Commodity Associations

AGRICULTURAL SUMMIT I.

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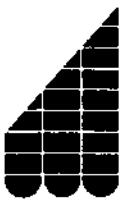

CONTENTS

Where Do We Go from Here?

Executive Summary

Consumers are primarily concerned about pesticide residues in food whereas growers and the agrichemical industry are additionally concerned about the availability and use of pesticides. Answers to both concerns need to be based on science, not on individual perceptions or fears.

The task of assessing pesticide use, risks, registration, and regulation as well as alternative pest management techniques is rapidly evolving with pressure from the Green movement, General Agreement on Tariffs and Trade (GATT), North American Fair Trade Agreement (NAFTA), consumers, the ag industry, and environmental regulations. To address this situation in Michigan, Agricultural Summit I brought together representatives of commodity and farm associations, agribusiness, state and federal government, environmental organizations, and universities to review the risks and benefits of continued pesticide use and develop strategies for maintaining agricultural productivity in light of new state and federal pesticide reduction regulations. The objective was to explore safer pesticide alternatives, improved technology, integrated pest management (IPM) strategies, and other options.

The Summit addressed ways of developing and supporting the use of effective and profitable pest management strategies at the farm level and examining the public perception of pesticides in the environment and as a threat to human health. The appropriate follow-up actions were also identified: 1) set priorities, 2) locate funding, 3) identify and cultivate leadership, 4) clarify the role of university faculty and other state and federal agencies and organizations, and 5) develop and support an IPM program for Michigan.

A common theme among speakers representing government agencies was the need to reduce the risk or use of pesticides while maintaining a profitable, competitive agriculture. Many recognized the challenges of accomplishing this with high quality commodities and a safe environment. For the Michigan Department of Agriculture (MDA), Director Bill Schuette described the four initiatives now implemented under MDA, e.g., Michigan Clean Sweep to collect unused and canceled pesticides, the Pesticide Container Recycling Project, the Michigan Groundwater and Freshwater Protection Act, and Michigan Clean Stream. The USEPA representative, Kennan Garvey, described the statutory responsibility of USEPA to reduce risk associated with pesticide use. He indicated a close partnership among USEPA, USDA, and FDA to develop and implement new policies designed to reduce pesticide use.

At the state level, the Michigan Department of Natural Resources (MDNR) was not historically involved in agricultural issues. However, since 1972 the shift from point to nonpoint source pollutant control has brought the MDNR into closer association with the agricultural community. The goal is to provide a management approach, working with the farmers to minimize the need for regulatory enforcement through voluntary management programs that mitigate pesticide impacts on natural resources, especially water quality.

To preserve water quality, the Coastal Zone Management Act addresses five areas; agriculture, forestry, urban runoff, hydromodification, and marinas. The goal is to control pollutants through economically achievable management measures. Under the Great Lakes Toxics Reduction Initiative, the intention is to reduce loadings of toxic pollutants into the Great Lakes ecosystems. In addition, EPA is mandating that the state develop a management plan for pesticides with the potential to leach into groundwater.

Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), priorities in regulations have changed since 1970, when jurisdiction for pesticides was transferred from USDA to USEPA. EPA has subsequently required manufacturers to prove that their pesticide products will not cause an unreasonable adverse effect on human health or the environment. These new standards for all previously registered products and re-registration standards had to be applied to more than 50,000 pesticides, resulting in the loss of many products in agriculture. Particularly "minor use" crop pesticide sales do not support the re-registration costs. These high value/high input minor pesticide use crops contribute significantly to the Michigan economy annually.

As representatives from various state and federal agencies outlined recent legislation and various interpretations, other speakers reported on related topics. For example, the lack of pesticides for minor crops is not a new problems, and the IR-4 Project has helped with pesticide registrations since 1963. This group works with farmers, industry representatives, agricultural scientists, and extension personnel to conduct research and obtain tolerances for specific pesticide uses as needed by minor crop producers. Also, the Agricultural Chemical Source Reduction Workshop of July 27-28, 1993, developed the theme that certain pesticide uses could be reduced without adversely impacting Michigan agriculture, but this process may require extensive changes in production practices.

From one leading food processor's point of view, reduced pesticide use has already occurred and has helped insure the high quality food standards maintained by the Gerber Products Company. Their concern is with processed or cooked food rather than raw agricultural commodities. Crop histories are kept to insure that a minimum detection limit (MDL) is achieved in all products. In the Gerber Total Systems Approach crop histories are taken and pesticides are tracked from the field to the finished product.

Related to this, pesticide use has been dramatically reduced in American agriculture due to research and technological advances. The persistence of the agrichemical industry in responding to the needs of its customers and free market competition has also contributed to the reduction, according to the National Agrichemicals Association (NACA). NACA is also participating in an effort around the world to develop an International Manufacturing Code for pesticides which will coordinate pesticide laws and facilitate international trade.

Another voluntary effort, this time on the part of growers, is the program developed by the Florida Fruit and Vegetable Association (FFVA). Representatives participate in state and regional planning councils that impact land use decisions, regional water management districts, wetland utilization, and consumptive water use. Besides being involved in legislative development, grower associations like FFVA stress education, not only their own but that of the regulatory agencies and the public as well.

Education and research were also major themes of conference speakers. In a Minor Use Pesticide Report published by Michigan State University, pesticides were ranked based on the potential dollar loss to the state, lack of alternatives, and the likelihood of being eliminated. However, current farming practices require insecticides, fungicides, and other pesticides to produce high quality, inexpensive food and fiber products and the United States enjoys the safest, most abundant food resources and contributes substantially to the rest of the world. Yet less than two percent of the total American population is involved in the production, processing, distribution, or marketing of food products. Therefore, land grant university agricultural agents must explain the benefits and risks of agricultural chemicals to consumers. Consumers are primarily concerned about pesticide residues in food whereas growers and the agrichemical industry are additionally concerned about the availability and use of pesticides. Answers to both concerns need to be based on science, not on individual perceptions

or fears. Some pesticides have been withdrawn because of pest resistance (development of immunity), others because the risk to human beings or the environment is deemed to be too great; but opportunities for reducing insecticides, fungicides, and other pesticides differ for various crops and regions.

Consumer attitudes toward pesticides represent an area often speculated upon but not thoroughly researched or understood. When over 1000 randomly selected Michigan households were surveyed in 1992, more than two-thirds of the respondents agreed that food supplies would decrease and not look as attractive if plants were not protected from insects, diseases, or other pests. This suggested that most Michigan consumers perceive benefits from protecting crops from pests, but over 75 percent of the sample did not agree that pesticides are the only effective way to protect crops, and many thought effective alternatives to pesticides were already available. The public is not likely to support the research needed to produce these alternatives unless an effort is made to educate them about the realities of pest damage control. However, many consumers in the survey were willing to accept some level of pesticides on foods certified to be safe if the price difference were favorable. Because of the diversity of opinion among consumers about the risks and benefits of pesticides, it was concluded that a single approach to pest management is unlikely to please everyone.

After a multitude of diverse issues were identified by the speakers, participants divided into groups according to their specific commodity interests: row crops, tree fruit, small fruit, vegetables, and landscaping. Each working group considered which issues were important to them and decided on their priorities. Then they considered goals, opportunities and barriers, and related matters such as the need for leadership. Many of the conclusions drawn appeared to be similar. For example, the needs for research, education, funding, and leadership were identified in one way or another in all groups. However, the interpretations of these needs varied significantly, e.g., what kind of research and education were needed, and how funding should be obtained and allocated.

Research on alternatives to pesticides was the primary concern for row crop and vegetables representatives, while integrated pest management was the top priority of the tree fruit group. Related to research were concerns about how it would be funded. Education was the second priority of the tree fruit and row crop groups. Regulation was the first priority for small fruit growers and third for tree fruit participants. The need to maintain profitability was expressed in various ways as well. In addition, concern was expressed that if American growers were stringently regulated then this requirement must apply to food and fiber imported from foreign countries as well.

Participants' concerns could be grouped into two large categories. The first included research and funding, regulation, and profitability. The second was communication, which included education and linkages, e.g., among groups and with leaders and others. For instance, education was perceived to be important by all groups; but they varied on who should be educated, including consumers and representatives of government and regulatory agencies, and producers. The groups frequently indicated that MSU and Michigan state agencies should have leadership roles not just in research, funding, and regulation, but also in coordinating group interactions and linkages. The commodity producers demonstrated a willingness to cooperate on integrated pest management methods when it was apparent there was a need, and suitable techniques were available to maintain high quality foods at competitive prices. Overall, participants developed a greater understanding of the complexity of the issues and the need and desire to work with one another.

Foreword

The task of assessing pesticide reduction, risks, registration, and regulation as well as alternative pest management techniques is still in a highly evolutionary phase. The speakers and discussion groups who participated in this Agricultural Summit I made a major contribution to the understanding of current issues and suggesting future directions. This conference reflects an interim phase in the redefining needed for research and regulation. It was very successful in generating a spirit of cooperation among representatives of groups with diverse and sometimes even conflicting interests to recognize the importance of directing future developments to improve the quality of life for all.

To assess the Future Trends for Pesticide Use in Michigan, Agricultural Summit I was sponsored by the Michigan Agricultural Experiment Station (MAES) and Michigan State University Extension (MSUE) in cooperation with the Michigan Department of Agriculture (MDA), the Michigan Department of Natural Resources (MDNR), and the Michigan Commodity Association on February 22-23, 1994. A primary goal was to present a balanced view of the broad range of pesticide reduction issues facing Michigan agriculture and the nation and to provide an opportunity for discussion and exchange of information and ideas. Speakers included representatives from the U.S. Environmental Protection Agency (EPA); Michigan Department of Agriculture; Michigan Department of Natural Resources; the National Agricultural Chemical Association; the Gerber Products Company; the Florida Fruit and Vegetable Association; the Michigan Cherry Marketing Institute; McDermott, Will and Emery, P.C., Washington, D.C. law office; environmental groups; and academia.

Among the more than 150 participants of the conference and interactive working groups were representatives of commodity associations, farm associations, agribusiness industry, state and federal government, environmental organizations, and universities. They engaged in dialog to:

1) Review the risks and benefits of continued pesticide use and develop strategies for maintaining agricultural productivity in light of new state and federal pesticide reduction regulations.

2) Explore how high risk pesticide use can be reduced through safer pesticides, improved technology, integrated pest management (IPM) strategies, and alternatives.

3) Explore ways of developing and supporting the use of IPM strategies at the farm level.

4) Provide a forum to examine the public perception of pesticides as a threat to the environment and to human health.

5) Determine the scope and variety of MSU faculty participation in research, outreach, and teaching on pest management strategies.

6) Discuss the appropriate roles of Michigan State University (MSU), MAES, MSUE, and other agencies and organizations in developing and supporting an IPM strategy for Michigan.

In many respects this conference was a follow-up of the Agricultural Chemical Source Reduction Workshop held at the University Club on July 27-28, 1993. That workshop, sponsored jointly by the MAES, MSUE, MDA, and

MDNR, stressed the need for cooperation to address pesticide use, especially in light of the required FIFRA re-registration process and the need to develop agricultural practices with less pesticides but continued agricultural economic viability.

The conference sponsors hope that these proceedings raise questions to expand the information base on the complex issues related to pesticide reduction initiatives. These proceedings offer some varying perpectives for agricultural producers, state and federal agency personnel, legislators, researchers, environmentalists, and interested citizens struggling to interpret new pesticide regulation policies and/or implement management guidelines for the safe use of pesticides in the future.

Acknowledgments

The success of this endeavor was due to the interest, dedication, and support of the participating organizations: the Michigan State University College of Agriculture and Natural Resources, Michigan Agricultural Experiment Station, Michigan State University Extension, Michigan Department of Natural Resources, the Michigan Department of Agriculture, and the Michigan Commodity Association. Financial support was contributed by the Michigan Agricultural Experiment Station, Michigan State University Extension, the Michigan Department of Natural Resources, and the Michigan Department of Agriculture. Neither the Agricultural Summit I nor publication of the proceedings would have been possible without the support and cooperation of these organizations and a number of dedicated individuals.

Special thanks are extended to Dr. Fred L. Poston, Vice Provost and Dean, College of Agriculture and Natural Resources; Dr. Robert G. Gast, Associate Vice Provost and Director, Michigan Agricultural Experiment Station; Dr. Gail L. Imig, Associate Vice Provost and Director, Michigan State University Extension; Mr. Bill Schuette, Director, Michigan Department of Agriculture; Mr. Rolly Harmes, Director, Michigan Department of Natural Resources; and Mr. Phil Korson, Executive Director, Cherry Marketing Institute, Inc. They recognized the need to address the pesticide reduction issue in agriculture and encouraged the convening of this conference and publication of this document.

Grateful appreciation is also extended to the authors who contributed their time, effort, and counsel to make the conference a success and this publication possible. Invaluable help was provided by the Agricultural Summit I Steering Committee: Mr. Mark Arney, Mr. Keith Creagh, Dr. Frank D'Itri, Mr. Harry Foster, Dr. Ian Gray, Dr. Robert Hollingworth, Mr. Phil Korson, Mr. Ben Kudwa, Dr. David Lusch, Mr. Steve Miller, Ms. Vicki Pontz, Dr. Karen Renner, Ms. Marilyn Shy, Dr. Christine Stephens, Dr. Pete Vergot, and Dr. Mark Whalon. They shaped the conference format and selected the speakers, moderators, and facilitators.

Other contributors to the success of this conference include Dr. Ian Gray and Dr. Christine Stephens for the overall leadership and coordination of the conference; Dr. Robert Hollingworth and Dr. Richard Harwood for their roles as moderators; and Dr. Harvey J. Liss for facilitating the interactive working groups in their deliberation sessions.

The Institute of Water Research under its director, Dr. Jon F. Bartholic, also contributed to the overall Agricultural Summit I by assembling and editing the papers and preparing the proceedings. In this regard, Ms. Liz Bartels, deserves special thanks as she coordinated correspondence, assisted at the conference, processed and typed the manuscripts, and made editorial and format suggestions that made the editor's task substantially easier.

I appreciate and thank all these contributors.

Introductory Remarks

Pesticide use has been under attack for the last 30 years and the impact, especially on minor use crops, has been substantial.

This Agricultural Summit is the first in a series of summits that Michigan State University plans to host over the next few years on topics of importance and interest to agriculture.

We can start this one by asking why this particular topic is under discussion. In fact, pesticide use has been under attack for the last 30 years and the impact, especially on minor use crops, has been substantial. During the last few years, especially since about 1988, the regulatory constraints have become restrictive; and 1988 was significant because of an amendment to FIFRA that demanded re-registration of all pesticides and set a time table. In truth, EPA really has not canceled that many products since 1988, but the chemical companies have dropped 28 active ingredients and over 5,000 pesticide formulations. It's not profitable for them to re-register.

Considering new pesticide costs over that time, and the latest estimates are for a new pesticide, we're looking at $80 to $120 million to register a product. Therefore, the re-registrations are only taking place for pesticides used on major crops, e.g., corn, soybeans, and wheat, not minor use crops such as fruits and vegetables.

Over this period, some of the products that are presently registered have also been voluntarily withdrawn by producers and processors because of public concern about their safety. An example would be EBDCs (ethylenebisdithiocarbamate) or other fungicides on crops processed into baby food, but there are a number of others, too.

Also during this time some other interesting things have been taking place. One, I'm certainly not happy about is the fact that over the past ten years the IPM program at MSU has been in a state of decline and we have lost the ability to either manage or coordinate these programs across the state of Michigan. In fact, of the organized IPM programs on the farms, especially those implemented in a farmer's field, the number has decreased, not increased over the past ten years.

Likewise, during this period an interesting phenomenon has been taking place in commodity groups, especially in the minor use crops in that they have largely developed a resistance to change mentality. When the issue of reducing pesticide use comes up within many commodity groups, the discussion immediately turns to what they are not going to do instead of what they are going to do about the problem. In fact, over this period we've allowed agriculture to become the target for a number of environmental and consumer groups. Some of these groups need to fight a dragon to continue to exist and we've allowed ourselves to be defined as that dragon.

What can we do about the pesticide use problem? We can get ourselves organized. Why? Because many of us would like to farm in the next century. We can begin to talk about what we will do about some of these problems instead of what we won't do. What will we do to ensure a safe food supply and environment, and how can we implement the necessary changes? We can become a friendly dragon.

Dr. Fred L. Poston, Vice Provost and Dean
College of Agriculture and Natural Resources
Michigan State University
East Lansing, Michigan

As a strategic target for that activity, we really have fundamentally three choices. First, we can reduce pesticide use by decreasing the amounts used. Second, we can implement IPM programs which will help. Now, we ought to be interested in doing this not only because it reduces pesticide usage, but it also saves dollars, and they're all too scarce today in terms of profit in agriculture. It also makes the few registered pesticide products last longer by cutting down on the development of plant resistance and other problems. Nothing revolutionary about that, but there is an incentive to reduce. Third, we can reduce risk to the public and to ourselves by shifting, in some cases, to less toxic materials or implementing alternatives to synthetic chemical pesticides. The latter activity should put a smile on the public's face and pull the teeth of our friendly dragon. In the longer term, we can reduce our reliance on pesticides, especially in the minor use crops. We can develop more alternatives through research and we can develop better IPM programs and implement them.

To help focus this effort, I asked the faculty and staff in the MAES and MSUE to develop the Michigan Specialty Crops Minor Use Pesticide Report. All the commodity groups have received and reviewed draft copies of the report and an Executive Summary is included in Appendix 1. We expect the report to be published and available about mid-July, 1994. In this process we asked that the faculty and staff categorize the available pesticides relative to minor use crops according to their vulnerability to loss. That vulnerability was really based on a couple of general factors, how the pesticide impacted on both human health and the environment. Included are various ratings or assessments for each pesticide based upon re-registration, carcinogenicity, groundwater contamination, toxicity, worker protection, and so on.

We asked the faculty and staff also to identify alternatives are available to any pesticides at risk. That's a sobering experience. Also we asked them to identify current research efforts in this area, what's coming along both at Michigan State University and at other universities across the country, and especially what we can do to apply this research that might help with some of these problems. And we asked them to prioritize the most important needs within each commodity so that we could begin to focus and better organize our activities in research and education.

Now, obviously this Agricultural Summit I is a first step relative to this report. It has to be discussed and modified before it can be used, but I know it's the right first step. The reason I know is because I've received substantial amounts of mail from people in two categories. From the environmental side, one woman told me that she was convinced that my goal in doing this was largely to call agriculture to arms, to fight with the environmental groups. Now, one might find some humor in that except to sum up the other side of the argument from the agricultural commodity groups, what I've been hearing is that what we're doing is naively targeting EPA's activities for the next round of pesticide cancellations. I find great irony in both of these opinions. I would like to believe that I could lead EPA in any direction, but I assure you that I cannot; but it's an intoxicating thought, nonetheless.

What we need to do while we're here is begin to pluck the teeth out of our friendly dragon. This is not a place to complain about what was. This is a place to make some kind of a different beginning and so to start I ask one question. What are we going to do about this problem, now and in the future?

Today's Agricultural Challenges

All of us must work to make sure Michigan agriculture is viable and profitable in the future.

It's a pleasure for me to be here as we talk about future trends in the uses of pesticides across the state of Michigan. I certainly have to give great credit to the lead partner, Dean Poston and Michigan State University for bringing us all together. Fred, I'm delighted with your leadership on this. I also am very proud that the Michigan Department of Agriculture (MDA) is one of the partners with other members of state government and farm groups and commodity groups across the state of Michigan, coming together to peek across the horizon to challenges that face agriculture and agribusiness in Michigan whether you're a producer or an environmentalist, whether you till the fields or whether your priority is to make sure we have clean waters in the future. All of us have a shared and common value.

Obviously the backdrop is complicated, whether it's the state, local or federal level. Agriculture faces huge challenges against the backdrop of the Coastal Zone Management Act, the Clean Water Act reauthorization, and new state legislation. Sometimes townships are also taking a new and keen look at rules and regulations. All of us must work to make sure that Michigan agriculture remains viable and profitable in the future.

Now, agriculture faces two key challenges as we move into the 21st Century. One concerns land, the fixed costs. A farmer with seed corn needs land and nutrient inputs to make this corn grow. Land is the fixed cost and inputs are the variable costs. With respect to land, Dean Poston at Michigan State University, Director Rolly Harmes at the Michigan Department of Natural Resources, and many other people in Michigan are going to be looking at this challenge of suburbanization of the rural landscape, the need to protect prime agricultural land, to protect private property rights to ensure that agriculture has the economies of scale and the land mass and the efficiencies to grow our product, export our crops, and increase farm income. That's a subject for another time. But today, this conference at MSU will look at the variable cost side, inputs, how fertilizers and pesticides are used, the cornerstone of our efforts. A question in terms of the critical issue is how we can minimize adverse risks of pesticides in the state of Michigan. There are many approaches to this. One of these is from the agricultural perspective. We need to minimize adverse risks of pesticide use.

Now, how have we tried to approach that at the Michigan Department of Agriculture? We have a quartet of initiatives. First, Michigan Clean Sweep picked up unused and cancelled pesticides from across the countryside, thus preventing their release into all lakes from Superior to Erie. Second, our Pesticide Container Recycling Project involves shredding plastic jugs to conserve the limited space in landfills. We also went forward with the third element of our quartet, probably the most aggressive and proactive education based, voluntary legislation in the nation, the Michigan Groundwater and Freshwater Protection Act. Then, fourth, Michigan Clean Stream is an off-the-shelf model and a product of various interest organizations from environmental groups to state

Mr. Bill Schuette, Director
Michigan Department of Agriculture
Lansing, Michigan

government to the private sector. They all want to make sure that when there are sensitive watersheds, sensitive lands and soils, that we can have a proactive approach to minimizing adverse risks of pesticides.

Now, that's just an approach we've taken at the Michigan Department of Agriculture, but it makes the point that you can't have agriculture cops on every acre. There are not enough people, there is not enough money; and, frankly, it doesn't do the required amount of good in terms of solving the problem. Rather, what we've tried to do, and I'd offer this as a suggestion for discussion, whatever resolution you come to is obviously the will of the body; but it seems to me the approach ought to be incentives, not mandates, if we want to make work; and we ought to stress education not overregulation.

I happen to think Michigan is a very special place; and we've been blessed with an abundance of natural resources, waters and soils. We've been uniquely situated in this world. And we've always been pioneers with lumber, with automobiles, and with agriculture. In productivity, we're the most diverse state in the nation, second to California; and we've been pioneers in terms of education. The flagship land-grant institution of America is right here at Michigan State University. And certainly we have the pioneering spirit, being reasoned and thoughtful; as we try to put into place a practical framework for minimizing adverse risks of pesticides.

U.S. EPA's Perspective on the Assessment of Future Trends for Pesticide Use in the United States

Increasing the public's confidence may mean the loss of some pesticides or uses, or reduced tolerances on others.

On behalf of EPA, I want to express my appreciation for the opportunity to speak to you today on our perspective for future trends in pesticide uses in the United States. In my remarks, I will focus on legislative and other policy initiatives that will strongly influence pesticide use in this country.

We appreciate what you and your counterparts in other states have done to make America the agricultural marvel of the world. America has been a world leader in both food and fiber production and in environmental protection. Even so, there is room for improvement; and a broad spectrum of the public is interested in improving linkages among agriculture, food safety, and environmental protection.

It is our statutory responsibility to find ways to reduce risk associated with pesticide use. It is also our responsibility to work with USDA to provide farmers with access to the tools and methods they need to sustain the world's most productive agricultural system.

Vice President Albert Gore has asked the government to focus on its customers. Under the current system of regulating pesticides, all of our customers are underserved. The general public is concerned that its health and the environment may not be adequately protected. the pesticide industry feels that the regulatory system takes too much time and is unpredictable. Farmers are anxious because they believe they cannot count on products being available as needed. Our goal is to improve service to our customers by addressing these concerns.

The Clinton Administration is committed to moving forward on pesticide regulation in a new way.

1. We need strict restrictions but flexibility in how to achieve them. One size does not fit all.
2. We need to understand how a sustainable environment and a healthy economy work together. In the case of pesticides, this means that the USDA and EPA must work closely with farmers to do the right thing. We have been working very closely with USDA over the past year and have agreed to proceed on some major pesticide initiatives.
3. We must consider the impacts on state and local governments. This is an interest so important to President Clinton that he issued an Executive Order requiring us to do this for every regulation.
4. We are committed to the goal of environmental justice, to protecting the most exposed and most vulnerable segments of our society.
5. We must consider pollution prevention in all of our actions.

The past year has been eventful, as the Administration has moved to develop concrete initiatives to implement these goals. The major initiatives are:

Mr. Kennan Garvey
Office of Pesticide Programs, Policy Staff
U.S. Environmental Protection Agency
Washington, D.C.

Reduced Pesticide Use

The Administration announced an initiative in June, 1993, to reduce the use of pesticides nationwide, focusing on higher risk pesticides. For the first time ever, the federal government is committed to real reductions in pesticide use and risk. Reducing unnecessary use and risk prevents pollution and saves money. The initiative is designed to reduce the risk associated with high risk pesticides, not simply to reduce the volume of all pesticides.

One notable feature of the initiative is the unprecedented solidarity of the three federal agencies involved: EPA, USDA, and the Food and Drug Administration (FDA). These agencies have entered into a close partnership to develop and carry out new policies related to the initiative. We are cooperating as never before to make certain that things happen quickly, consistently, and efficiently.

As part of this effort, EPA and USDA will promote sustainable agriculture and IPM practices, including biological and cultural control systems, setting a goal of developing IPM programs for 75% of the total crop acreage in the U.S. in the next seven years.

We are going through a planning process with extensive public input, especially from growers. The goal is to develop a plan by October, 1994, with commodity-specific goals for reducing pesticide use by the year 2000.

The plan will take into account local and regional conditions, as well as currently available and potential pest control strategies, both chemical and non-chemical. I attended a workshop several weeks ago at which many agricultural and environmental participants discussed essential elements of a reduced use/risk policy. Our hope is that, by including farmers, environmental groups, and other interested parties, these goals will be developed with the input of those most affected to achieve real risk reduction. This cannot work without the participation and input of growers, who collectively have the knowledge to help us in this process.

Nothing has been decided at this point. No commodities have been targeted; no mandatory use reductions have been proposed, and no chemicals have been targeted for removal solely because of this initiative. EPA and USDA are looking for help in designing the program.

Michigan is wisely planning ahead to determine what is feasible in reducing pesticide risks and use. Many of you met last summer for the Agricultural Chemical Source Reduction Workshop to discuss this issue (see Appendix 2). The Michigan Agricultural Stewardship Association has farm-based demonstration projects showing the real potential for significant risk and use reduction. We encourage you to continue technical and policy discussions on the feasibility of setting pesticide use and risk reduction goals for Michigan's diverse crops. Your efforts will place you in the lead among states and regional commodity groups in having meaningful input into the commodity-specific reduction strategies.

Risk reduction is a growing international concern. I work with the Organization for Economic Cooperation and Development's new pesticide program. OECD has begun a project to determine its role in risk reduction, prodded by environmental organizations and European countries that are already achieving significant risk reduction.

National Academy of Sciences Report

The National Academy of Sciences (NAS) issued their report, "Pesticides in the Diets of Infants and Children," in June, 1993, immediately after the Administration's reduced use/risk initiative. The timing of the Administration's initiative was not coincidental. The report heightens concerns about pesticides in the diets of infants and children, finding that infants and children may have significantly different exposure and response to pesticides from adults.

EPA has assembled a team of experts from USDA, FDA, Department of Health and

Human Services (HHS), the Department of Commerce, the Census Bureau, and state regulatory agencies into six work groups to address the NAS report recommendations regarding tolerance-setting, toxicity testing, uncertainty factors, food consumption data, pesticide residue data, and risk assessment.

The prompt federal response has done much to allay public concern about risks to children. We have an opportunity to respond carefully to these recommendations and have already responded to some, including building special provisions into the Administration's food safety legislative proposals. We are also close to issuing guidelines for new types of toxicity testing, including immunotoxicity and visual systems testing; and we will also propose making neurotoxicity testing a standard requirement for all food-use pesticides.

Delaney Clause

EPA is implementing the Ninth Circuit Court of Appeals' decision on the Delaney Clause, a decision which requires a strict interpretation of zero cancer risk for pesticides that concentrate in processed foods. The matter is not fully resolved, and it may be remedied by the legislative proposals I will discuss next. This is a controversial statutory requirement that could eliminate farmers' use of many food related pesticides.

Legislation

The Administration has announced a major Food Safety legislative initiative and is working closely with Congress to develop legislation. This legislative proposal would change considerably the way we do business. It is premised on public concern about food safety and the need to restore public confidence in the food supply. You have seen the disruptions that can occur in markets because of pesticide concerns related to food safety. Our goal is to avoid unplanned disruptions that provide no time for adjustments.

An important element of the proposal is to have a consistent "negligible risk" standard for cancer. This means an increased risk over a lifetime of one in a million or less, instead of the Delaney "zero-risk" level.

The new legislation will not only "fix" the Delaney problem but will, more importantly, fundamentally strengthen our ability to protect food safety through a more scientifically, medically, and reasonably sound process. Our package affects pesticide registration, enforcement, and tolerance-setting, including:

1. establishing a strong health-based standard for all pesticides on all foods;
2. applying the new standard in the review of all existing tolerances over a seven-year period, ensuring that children are protected at every turn;
3. renewing pesticide registrations and tolerances periodically, just like car registrations--we are proposing a 15-year cycle;
4. providing incentives for the registration of lower risk pest control methods by giving registration applications of this class of products priority review within the USEPA and extending the exclusive use of data rights; and
5. providing incentives for registrants to support important minor uses in the re-registration process.

These are only a few of the major elements of the legislative proposals. The package is balanced to give the public better food safety, give registrants more scientifically-based registration and tolerance criteria and clear USEPA priorities, and give farmers more tools for pest management and more stable markets.

Other Initiatives

I have indicated a few of our major initiatives in the pesticides area. However, this

just suggests the surface of the rapidly flowing waters of change in environmental regulations affecting agriculture. Let me just quickly mention some other activities to give you a better idea of the new directions for EPA:

1. Reduced Risk policy for expedited registration of lower-risk substitutes for existing higher-risk pesticides.
2. Support for registration of biological pesticides which, as a class, pose lower risks than traditional pesticides--the majority of new pesticide registrations in recent years have been for biologicals.
3. Implementation of new worker protection standards, strengthening protection for the people most directly exposed to pesticides.
4. Planned issuance of a final rule on the reporting of new adverse effects data. Pesticide residues exceeding tolerance levels in food crops, and important ground or surface water contamination will be reportable.
5. Our re-registration program is accelerating rapidly. Over 10% of cases (54 of 408) have re-registration eligibility decisions, and all have data call-ins issued. We project 40 to 50 decisions annually over the coming years.
6. EPA Air program action to restrict and phase out the use of methyl bromide as an ozone depletor. This is an indication that EPA will use the full range of its statutory authority to address serious environmental risks. This trend makes the agricultural community's task of keeping up with emerging legislation and regulations much more complex. It is no longer possible to track principally the Agricultural Committees' action in Congress. Many other committees and EPA offices must now be followed as well.
7. Recent announcement of Clean Water Act legislative changes will also affect farmers by strengthening regulation of nonpoint source pollution.
8. Work closely with USDA/State IR-4 program to ensure that minor uses of concern to growers that lack only residue data are supported, using IR-4's expanded budget.
9. Ongoing efforts to implement Vice President Gore's National Performance Review, including cutting the number of supervisors in half and reinventing core processes. Look for changes ahead in how EPA conducts its business.

Effect on Farmers and Use of Pesticides

How will all of this activity change your lives? I believe that over time you will benefit significantly. We have worked closely with USDA in developing the food safety legislation, and EPA and USDA jointly support the Administration's proposal. USDA has found that farmers benefit most when the public is assured of the safety of the food supply. The reality of food safety must be coupled with public confidence in the food supply.

Increasing the public's confidence may mean the loss of some pesticides or uses, or reduced tolerances on others. These changes should occur without having as many of the abruptly implemented regulatory changes as you have seen in the past for individual pesticides. Over time, pesticide companies will begin to bring safer products on the market, and alternative control technologies will be developed. As public confidence increases, agriculture will benefit by having open markets, both domestically and internationally.

EPA Administrator Carol M. Browner has said to Congress, "The need for change is urgent." She and Lynn Goldman, our new Assistant Administrator, have placed protecting our country's food supply at the forefront of EPA's agenda. EPA believes that we can continue to have an abundant and diverse food supply while doing more to ensure its safety.

I have attempted to cover a lot of ground in a short period of time. I hope this gives you a feeling for the challenges facing all of us. Too often farmers and environmentalists have been at odds, and you have seen gridlock in Washington. It is time to work together to protect the environment and the economy. The health of our nation depends on our efforts.

Reference

NAS. 1993. Pesticides in the Diets of Infants and Children. Board on Agriculture and Board on Environmental Studies and Toxicology, National Research Council, National Academy Press, Washington, DC, 386 pp.

The IR-4 Perspective on the Future Trends for Pesticide Use in the United States

A significant consideration in the loss of pesticides is due to economics because companies cannot afford to re-register them for such small uses.

Interregional Research Project Number 4 (IR-4) might better be called the USDA Minor Crop Pesticide Registration and Re-registration Project. Maybe that would be a little more clear, because that's what IR-4 is, and it has to do specifically with minor crop pesticide registration and re-registration.

The lack of pesticides for minor crops is not new. Back in 1963, the directors of the State Agricultural Experiment Stations saw that problem and cooperated with the USDA and developed the IR-4 Project to obtain labeled or so-called registered pesticides.

How does this affect the Michigan growers, and what is a minor crop? If you grow fruits, vegetables, nuts, herbs or spices, or a number of nursery crops, you grow a minor crop; and so all of our fruit and vegetable people are growing minor crops. If you grow only cotton or corn or soybeans or some types of grains such as wheat and oats and rice, you may not be a minor crop grower; and I say "may not" because certain limited pesticide treatments, even on large acreages of cotton or corn or soybeans or rice, can be called minor use if they are for sporadic problems and localized uses. At any rate, all the Michigan fruit and vegetable growers as well as nursery and turfgrass growers produce minor crops, so we're all in that boat in Michigan. Minor crops, by the way, really aren't very minor when you look at their value nationally, which is over $24 billion. They're minor only in the number of acres that are planted compared with crops like cotton, soybeans, and corn.

So why is registering and re-registering pesticides for these minor crops such a big problem? Why can't the chemical companies do it? In most cases, of course, they do; but for minor crops, in many cases, they cannot. It's simply because the volume of a pesticide in most minor crop uses is not sufficient to justify the cost by the manufacturer to obtain the registration. No business can afford to operate at a loss for long; only farmers seem to be able to do that! The companies can't afford to spend roughly tens of millions of dollars to get these pesticides re-registered when the usage is not going to be that great.

Remember Sinbar (Terbacil) on strawberries? At one time Sinbar was one of our major herbicides for strawberries. It's much less often used now, but at that time we had something like 8,000 to 10,000 acres of strawberries in Michigan; and we used a quarter of a pound of Sinbar per acre. If all the acres were treated, that would amount to about 2,000 to 2,500 pounds of Sinbar at a price of $10 a pound. The manufacturer made a whopping $20,000 or $25,000 on strawberries demonstrating why they can't afford to register a product for that small a use. Many minor crop uses are not as minor as Sinbar on strawberries; but it illustrates the problem pesticide manufacturers/formulators are facing. As more stringent regulations come on line, the cost of registering or re-registering pesticides continues to go up and up. This situation really

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became serious when the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) of 1988 was amended. It required that by 1997 all pesticides had to be re-registered for all uses that were registered before 1984.

So what is the IR-4 project? The purpose is to work with farmers, industry representatives, agricultural scientists, and extension personnel to carry out research and petition EPA to obtain tolerances for specific pesticide uses as needed by minor crop producers. IR-4 is a USDA group, and they are very cooperative and interested in our problems. IR-4 has been, in my opinion, greatly underfunded for a number of years at about $3.5 million. This year (1994), the budget was raised to about $6.75 million and and the Administration recommendation for 1995 is $10.8 million. This is still not a very high dollar figure for what needs to be accomplished in such a short time on a national basis.

IR-4 now also includes the clearance of pest control agents like microbials (bacteria and viruses) and what they call biochemicals, which are pheromones and growth regulators that are important in IPM programs.

IR-4 is a grower friendly group, not like some agencies that we've all dealt with at one time or another. What does IR-4 do? IR-4 is a federal agricultural program. They carry out the research needed to register or clear pest control substances applied to minor crops. IR-4 prepares and submits petitions to EPA requesting tolerances or exemptions for pest control products used on minor crops. IR-4 receives funds from both the USDA Cooperative State Research Service (CSRS) and also from the Agricultural Research Service (ARS). Cooperating scientists, many with universities such as Michigan State, conduct the field trials. They collect residue samples and develop safety data. Fruit and/or vegetable samples are analyzed for pesticide residue in IR-4 regional laboratories located at state Agricultural Experiment Stations and also at federal analytical laboratories.

The IR-4 headquarters is at the New Jersey Agricultural Experiment Station in New Brunswick and is headed by Dr. Richard Guest, a very fine gentleman and a very capable individual. IR-4 works because it's an alliance of state and federal agricultural scientists working cooperatively with private industry in response to the needs expressed by growers.

What do farmers do if they have a minor crop or minor use pesticide need? As pest control materials are withdrawn, they may end up with no substitute necessary to grow a quality product. In many cases the loss of pesticides may be result in economic losses, and so what do you do? Almost anybody can initiate a call for help with IR-4. Individual growers can go to them. Grower groups, such as the Michigan Apple Committee or the Michigan Cherry Committee or the Potato Council or Vegetable Council can, too. Nurserymen, an agricultural scientist, or personnel from Extension Service at a university can contact their local state liaison representative who contacts the regional coordinator. Your regional coordinator is Dr. Satoru Miyazaki at the Michigan State University Pesticide Research Center.

We have just initiated a request from the cherry industry to keep Ambush and Pounce on the cherry label. The use is being dropped at the end of 1994, and it's one of those chemicals that we cannot survive without. Cherries are being taken off the label for economic reasons, but we have to have it for cherry fruit fly. It's the only material we can use close to harvest for cherry fruit fly control, particularly for fresh market types of cherries or cherries going to baby food processors. Consequently, we are in the process of running that one back through IR-4 to get it re-registered. And it's been a little bit of a problem for us because the intent not to re-register for cherries came after our national IR-4 priority setting meeting last September. So we just found out about this; and because priorities have already been set, the funding is not necessarily available to get this done in 1994, which we really need to do. Therefore, the cherry industry may have to come up with

some funds to get this done because we can't afford to lose these pesticides. If we do lose them this year, if we don't re-register them, it'll be a new registration for next year. That is much more complicated and much more expensive.

How does IR-4 set priorities? They are generally set at the annual IR-4 national meeting. The focus, of course, is always on the highest priority needs expressed by the review committees. We go over hundreds of chemicals and set priorities on which ones need to be registered or re-registered first. Needless to say, it's important for your industry to be represented at these national priority setting conferences.

Once a request is selected as a priority, regional coordinators and federal liaison representatives contract a state and/or federal agricultural scientist to carry out the testing that's necessary for re-registration. Pesticide residue samples are taken under approved protocols established by IR-4 and packaged for delivery to an analytical laboratory.

A petition package is prepared by IR-4 and then sent to EPA for review. Then EPA establishes a tolerance for a residue. A tolerance is granted, of course, only after extensive study to ensure that the product will be safe for the consumer. Finally, EPA publishes their approval in the Federal Register. It's more complicated than this, but basically that's the order of what happens. It's extremely important that someone from each of your respective industries keep track of what's going on and what the needed materials are and make sure you are represented. IR-4 is always willing to help, but you have to keep them informed.

What are the impacts of reduced pesticide use and/or elimination of our needed materials? A couple of years ago a study was funded by the American Farm Bureau Research Foundation entitled, "Economic Impacts of Reduced Pesticide Use on Fruits and Vegetables." Some of our people here in Michigan were involved in that study, which estimated agricultural yields if pesticide use were reduced by 50 percent to zero. According to this study, if pesticide use were reduced by 50 percent on Michigan apples, we would have 100 percent loss because you cannot grow apples in this humid climate without pesticides. In the state of Washington, which is an arid climate, if pesticides were reduced by 50 percent, there would be an estimated 30 percent loss. That's because fungal organisms are not nearly so serious in the central valleys of Washington. But with no pesticides, there would probably be a 100 percent loss because they do have a number of insect problems. In Maine, there would be an estimated 70 percent loss of the potato crop if the use of pesticides were cut in half. With California grapes, an estimated 68 percent loss would be expected if pesticide usage were cut in half, and a 99 percent loss could be anticipated if they weren't used at all. Florida would lose most of their tomatoes with a 50 percent cut in pesticide use. Humid climates suffer the most from disease infestation, and Michigan agriculture would suffer accordingly.

For vegetables in general, across the country a 50 percent reduction in pesticide use would result in an estimated average yield loss of 20 percent for processing vegetables and 42 percent for fresh vegetables and for fruits. A 50 percent reduction in pesticide use would result in extremely serious losses of both fresh and processed fruits. For example, in the cherry industry there's a zero tolerance for cherry fruit fly; and if pesticide use were reduced by 50 percent, or almost any amount, that insect could not be controlled, and the cherries would have to be thrown out.

So without a basic fungicide and insecticide program, our cherry industry would likely very quickly move some place else, most likely to Eastern Europe. I know my friends in Hungary would be ecstatic about that because they already have a fairly large cherry industry, and they would dearly love to be able to ship their cherries in here. Serbia also is pretty big in cherries, and I think they might even put their guns away and start growing cherries if we

couldn't grow them because they do have the capability.

The Farm Bureau study quotes the opening statement of a National Science Foundation (1993) study which acknowledges the contribution of pesticides by stating, "Their application has improved crop yields and has increased quality for fresh fruits and vegetables in the diet, thereby contributing to improvements in public health." Severely reduced pesticide use in the United States would also suggest a reduction in our ability to compete in international fruit and vegetable markets. We would all like to export more of our agricultural products, so let's not lose chemicals to the point where our industry goes some place else and we import our own products back into this country.We certainly cannot compete in export markets if we don't have the quality produce to send.

In summary, fruits and vegetables are minor crops and a significant consideration in the loss of minor use pesticides is due to economics because companies cannot afford to re-register them for such small uses. The IR-4 program can help with minor use pesticide registration and re-registration. Therefore, it behooves our industry in Michigan to utilize this avenue to keep the critical materials that we must have in order to stay competitive. So get familiar with the IR-4 program and be sure to utilize it whenever it's necessary.

Reference

NAS. 1993. Pesticides in the Diets of Infants and Children. Board on Agriculture and Board on Environmental Studies and Toxicology, National Research Council, National Academy Press, Washington, DC, 386 pp.

The MDNR's Perspective on the Future Trends for Pesticide Use in Michigan

We can accomplish our goals through voluntary and management programs in partnership with the agricultural community, and that's certainly the direction that would be the most effective. We do have regulatory requirements and mandates, and we can meet those most effectively through the partnership approach.

The Michigan Department of Natural Resources (DNR) has not, historically, been involved in agricultural issues. In 1972, when the Clean Water Act was passed and Michigan became one of the first states to administer it, we focused primarily on point source discharges, industrial releases, municipalities, these sorts of problems. In fact, I think we did quite a substantial job, along with our partners in EPA, in controlling point source discharges. In the 1987 amendments to the Clean Water Act, nonpoint source pollutants were addressed directly for the first time. Section 319 of that Act established a new program to control nonpoint sources (NPS) of pollution, and various states across the nation began to pay more attention to these issues. Agricultural chemicals are a primary example of a nonpoint source pollutant, and they came under direct consideration in those efforts.

Since that time, we've been working very closely with the agricultural community, establishing a very strong working relationship to address these concerns. We recognize that we're not going to accomplish our goals and our mandates to protect our surface and ground waters without establishing relationships and programs with our agricultural community.

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The key as we move forward is that we do it through a management approach, working with the farmers and minimizing the need for regulatory enforcement programs, which require a lot of energy, staff, and money, sometimes without getting the results we need. I think we're at a crossroads. We can accomplish our goals through voluntary and management programs in partnership with the agricultural community, and that's certainly the direction that would be the most effective. We do have regulatory requirements and mandates, and we can meet those most effectively through the partnership approach. Our partners within the federal government, EPA, and the U.S. Department of Agriculture, have the same message, "Let's manage these chemicals and minimize the need for regulation but recognize that the regulation will be there if necessary."

This conference on the future trends for pesticides use is timely and important, and it's important that the participants play an active role in guiding the future direction on pesticides. Their use must be decreased. The choice is whether we manage this reduction ourselves in a voluntary manner or whether it will be forced on us.

The DNR is involved in a number of activities related to the use of pesticides. These include our efforts to address nonpoint source pollution under Section 319 of the current Clean Water Act and also in deliberations for the reauthorization of the Clean Water Act, specifically, the direction the Act will take relative to nonpoint source controls and watershed management. We are involved in

implementing Special Practice 53, the Integrated Crop Management Practices Program, and the Coastal Zone Management Act (CZMA). We also work with FIFRA to develop state management plans for pesticides.

Relative to the Clean Water Act, the staff of the DNR have been administering Section 319 since its inception in 1987. Two of the key activities are to oversee a federal grant program, which provides financial assistance to implement best management practices and planning of nonpoint source controls, and to develop a compilation of best management practices for nonpoint source controls used by the public. The development of the Best Management Practice (BMP) manual for agricultural practices is well along and will be available later this year. It has a section on integrated management practices for the use of pesticides. This evaluates past uses, current pests, and the impact of the chemicals. Then it suggests an economically viable management system that will address the needs for both pest management and water pollution control. BMPs for pesticides include integrated crop management, chemical containment facilities, and filter strips. The manual is rather technical and is aimed at technical and professional staff. We're also developing practice manuals for farmers and the public. These assistance materials will be available following the manual itself.

Relative to Section 319 grants, we've awarded several statewide for projects on impacts of agricultural chemicals on ground and surface water. We have awarded one to the Michigan State University Institute of Water Research to establish at the effects of agricultural practices on the Donnell Lake ecosystem in Cass County. In the Paw Paw area, the VanBuren County Soil and Water Conservation District is implementing a 319 project to reduce nitrates in pesticide contamination of groundwater. We also have funded an MSU Extension grant to modify the Farm-A-Syst program, a voluntary program to prevent pollution, focusing on the farmstead. It is designed to aid farmers and rural residents in identifying pollution risks, and it provides information to prepare action plans to reduce high risks.

The Clean Water Act is up for reauthorization this year. There are several major issues, but two of the most important are nonpoint sources of pollution and wetlands. Relative to nonpoint sources, there is a lot of discussion relative to the timing of mandatory vs. voluntary controls. There is general agreement that states should have the opportunity to accomplish necessary reductions through voluntary controls before mandatory controls are required. The area of discussion revolves around when states would need to establish regulatory authority to impose management practices in threatened or impaired waters. Should that authority be in place as part of the initial program approval, to encourage voluntary compliance, or should it not be required unless and until voluntary programs are shown not to be successful? The states maintain that it will be difficult to establish state regulatory authority to impose across the board management practices unless it is clear that water quality goals cannot be met through voluntary approaches.

EPA is seeking to require states to establish enforcement authority to impose NPS controls within 30 months of enactment, but not to require states to use that regulatory authority unless voluntary measures fail. Some of the bills to date provide for two five-year periods to accomplish water quality goals. That is, states would have two five-year periods in which to accomplish voluntary controls before the enforceable measures will be imposed. The states are questioning the need to establish regulatory authority to impose enforceable NPS requirements within 30 months of enactment if such authority will not be used for ten years. What happens over the next several months will depend upon the sense of commitment that is felt from the agricultural community to achieve necessary reductions without federal and state mandates.

Another area in which the DNR is directly involved is the Coastal Zone Management Act (CZMA) which requires certain controls for coastal lands. The Great Lakes are considered to be coastal waters, and almost the entire state of Michigan is covered by the provisions of the CZMA. Section 6217 of the CZMA requires states to have approved coastal zone management programs; accordingly, they must develop and submit to EPA a coastal nonpoint pollution control program; and each program must provide for the implementation, at a minimum, of management measures in conformity with EPA guidance. The Act established a 30 month period in which states must have these programs approved by EPA following the promulgation of their guidelines. EPA promulgated a CZMA guidance document in January, 1993, which establishes a number of practices for agricultural communities, including pesticide management. The 30 month clock is ticking and states with coastal waters such as Michigan have until June, 1995, to have programs in place that will ensure implementation of management measures in conformity with the EPA guidance document.

The good news is that the guidance is reasonable. The pesticide practices that have been identified in the CZMA guidance document are very similar to those which the state experts are developing in conjunction with the agricultural community under the Section 319 program. They call for reasonable analysis and implementation of practices. The bad news is that the CZMA guidance document would generally require a "one size fits all" approach, making individual tailoring of management practices to areas of impact difficult.

In the DNR's discussions with EPA, our major point has been that the requirements and deadlines for nonpoint source management in CZMA and the new Clean Water Act should be consistent. Moving forward on these two programs on different time frames is very difficult. While EPA is sympathetic to our dilemma, they are not proposing any adjustment of the CZMA deadlines at this point; so CZMA continues to be moving on a faster track than the proposed Clean Water Act reauthorization deadlines.

We can resolve these issues by moving with reasonable programs in a way that will address specific agricultural practices and assure the types of protections that the CZMA guidance calls for; and that will be the direction we'll be working on with you in the next several months to meet these deadlines to implement these types of practices in Michigan.

There are also some other areas where the department is involved, for example, the pesticide management plans under FIFRA. In October, 1991, EPA released a pesticides and groundwater strategy. This described a new approach to preventing pesticide contamination of the nation's groundwater by using its regulatory authority under FIFRA. This approach would enable the development of state management plans (SMPs), which emphasize prevention, and a state-federal partnership that would allow for tailoring pesticide management practices to local conditions. The key issue in this policy is if EPA determines that a given pesticide will leach into groundwaters, then it can be registered and remain registered only if it is used under an approved pesticide specific SMP. So it's very important that we be thinking about the development of SMPs for these types of chemicals. The Michigan Department of Agriculture in cooperation with the Office of Water Resources and Land and Water Management Division of the Michigan Department of Natural Resources has developed a generic SMP that contains the framework to be used for the specific SMPs.

In September of 1993, EPA, USDA, and FDA issued their joint policy at the federal level to reduce the risks of pesticides through comprehensive legislative reforms. Commodity specific reduction goals are part of what is being looked at. One of the issues, of course, is where to draw the baseline for these reduction goals. It's important that we're involved in that discussion.

The message is that with all of these programs, farmers working with state and federal regulatory agencies collectively have a chance to manage the change in pesticide management. We have opportunities and pitfalls. The key is to keep thinking, working, and talking about how we're going to take advantage of those opportunities to move ahead.

In summary, the Department of Natural Resources is involved in pesticide management and will be in the future. Working closely with our partners at MDA, MSU, and the agricultural community, and with our sister federal agencies, we collectively have the opportunity to guide the future of pesticide management and control. This conference is an example of the joint efforts that we need to pursue if we're going to be successful. The DNR is committed to the goal of proper management of agricultural chemicals, to assure both a healthy agricultural economy and to protect our vital water resources. Our goal is to continue to move in that direction.

Reference

USEPA. 1993. Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters. Office of Water, Report No. 840-B-92-002, US Environmental Protection Agency, Washington, DC.

MDA's Perspective on the Future Trends for Pesticide Use in Michigan

There does not seem to be consensus among the regulatory agencies as to what approach should be taken to prevent nonpoint source pollution of the Great Lakes.

Future trends for pesticide use in Michigan are a national as well as a state concern. Such issues as the Delaney Clause Paradox, adequate IR-4 funding, pesticide use reduction, and pesticide labeling modification are not just confined to Michigan. The key requirement is to fashion a policy so that it will be meaningful to Michigan. Consideration of pesticide use also must address water quality. Besides the Coastal zone Management Act (CZMA) and the Clean Water Act (CWA), we must also consider the Great Lakes Toxics Reduction Initiatives (GLTxRI), Great Lake Initiative 2 (GLI 2), virtual elimination of persistent chemicals, pesticide label changes, and the World Wildlife Fund's and EPA's reduced use initiatives, MDA's cooperative agreement with EPA, and the newly enacted Michigan Groundwater and Freshwater Protection Act.

Michigan's Environmental and Relative Risk Report (1992) should also be considered when developing future pesticide use policies. The major considerations under discussion include reducing risk and reducing reliance on pesticides. Pesticides are among the 24 issues identified in the relative risk report. This project, funded by EPA, brought together regulatory agencies, citizen groups, and the scientific community in an attempt to identify residual environmental risks, the risk remaining with current regulatory control in place. The risks were ranked as high-high, medium-high, and medium. The group agreed that of the 24 issues, there were no low risks. The priorities were ranked as follows:

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HIGH-HIGH

1) Absence of Land Use Planning
2) Degradation of Urban Environments
3) Energy Production and Consumption
4) Global Climate Change
5) Lack of Environmental Awareness
6) Stratospheric Ozone Depletion

HIGH

1) Alteration of Surface Water and Groundwater Hydrology
2) Atmospheric Transport and Deposition of Air Toxics
3) Biodiversity and Habitat Modification
4) Indoor Pollutants
5) Nonpoint Source Discharges to Surface and Groundwater
6) Trace Metals in the Ecosystem

Regarding biodiversity and habitat modification, pesticides play a significant role. The same is true for indoor air pollutants and nonpoint source discharges. The remaining considerations include contaminated sites, contaminated surface water sediments, generation and disposal of hazardous wastes, radioactive wastes, industrial solid waste, photochemical smog, point source discharges, accidental releases and responses, acid deposition, criteria and related air pollutants, and electromagnetic field effects. That is a short summary of the environmental risks as identified in the relative risk project. Pesticides are

interwoven in those issues, but they were not specifically identified in and of themselves as the number one environmental issue. Rather, pesticides are an integral component in many of the issues.

Under the Coastal Zone Management Act, Michigan is one of 29 states with approved coastal zone plans. The plans are optional and Michigan could opt out of the Coastal Zone Management Act if the state so desired, but that would be poor public policy in the long term. Agriculture needs to participate in the Coastal Zone Management Act and be actively involved in determining what constitutes a management measure. Section 6217 of the Act requires specifying the best technology based measures that state and local governments should implement to reduce pollutants entering coastal waterways. However, implementation requires answers to a number of relevant questions such as what is the zone? What's the boundary? Is it 1,000 feet from the high water mark? Is it statewide? One size fits all management measures are difficult to support scientifically and even harder to implement. Clearly, the same management measures for a high density livestock operation on the shore of Lake Huron might not be necessary in Gratiot County. The same would also hold true for pesticide application technologies. Certain application constraints may be needed along certain water bodies but not in other geographic areas.

The CZMA addresses five areas. Agriculture is at the top followed by forestry, urban runoff, hydromodification, and marinas. This program is not intended to supplant existing programs, but rather to update and expand them. The perception is that the existing programs are inadequate; otherwise why would there be Great Lakes fish advisories? Why would we find certain triazine herbicides in Lake Michigan?

According to one definition, "Management measures are economically achievable measures for the control of the addition of pollutants from existing and new categories in classes of nonpoint sources of pollution which reflect the greatest degree of pollutant reduction achievable through the application of best available nonpoint pollution control practices, technologies, processes, siting, criteria, operation methods, and other alternatives."

What economically achievable means is somewhat unclear. An analysis by EPA indicated that if the animal grazing measures were implemented under the Coastal Zone Management Act, about a third of the dairy farmers would increase their negative deficit. This is a problem although perhaps not viewed as one by EPA. Therefore, the definition of economically achievable is a key consideration. What's the best available control technology? Is it the use of the global position satellite technology that permits locking into a satellite system to correlate application rates and commodity yields? Is it technology that bases its application on computer identification of a specific weed? What is best available control technology?

Also, EPA has indicated that farm specific pesticide management plans may be necessary to document the changes in behavior and thought processes necessary to implement the management measures. This is consistent with some of the objectives of the Clinton Administration's pesticide policy to reduce risk. It identifies as goals: 1) that integrated pest management (IPM) be used on 75 percent of the acreage by the year 2000, and 2) sunsetting or banning certain pesticides of concern. This raises the potential of prescription pesticide treatment.

A management measure is a description of the range or methods and measures of practices, including structural and non-structural controls, operation maintenance procedures, and some type of description of the categories of the activities. This would also include identification of the individual pollutants. Quantitative estimates of pollution reduction fit very nicely into this concept. However, description is needed of the factors which should be taken into account when the measures are adapted to specific sites or locations including monitoring. If a management measure is implemented, some response or improvement should be seen. That

briefly summarizes some of the challenges of the Coastal Zone Management Act.

Because of the progress in moving the implementation of the CZMA forward, many individuals are saying that the management measures being developed should be included in the reauthorization of the Clean Water Act so that a level playing field is created. As an industry, it would be difficult to argue against that rationale. One could argue that there should be standardized management measures that are economically achievable and feasible. Individuals generally developing legislation don't have a high enough level of understanding of current technology so it is critical to involve those who do in the process to ensure that a reasonable, practical solution is identified and implemented.

Now, let's briefly review the Great Lakes Toxics Reduction Initiative (GLTxRI). EPA developed a draft concept paper to address the reduction of loadings of toxic pollutants to the Great Lakes ecosystems. All parties agree that it is essential to protect and restore the ecosystem of the Great Lakes. This is only achievable through coordinated actions among multiple environmental programs. Part of the challenge identified by EPA is how to address problems through regulatory agencies. Historically, the fragmented approach has been ineffective. Will farming activities be regulated under the Coastal Zone Management Act or the Clean Water Act? Under FIFRA? Under some of the USDA initiatives such as the SP 53 Integrated Crop Management Program? Under the direction of the local fire marshal? Under SARA Title III. A fragmented approach is not feasible. Some type of agreement is needed as to how to address the nonpoint pollution or runoff issue. Under GLTxRI, EPA refers to preventing, controlling or eliminating the release of toxic pollutants associated with activities related to agriculture. This particular initiative focused on the biocumulative chemicals of concern. Most pesticides that are identified as bioaccumulative chemicals of concern such as DDT, dieldrin, heptachlor, and aldrin have been suspended or canceled. Therefore, this is no longer a use issue, and the best way to address the concern is to provide a program where these suspended/canceled pesticides can be picked up and disposed of properly. However, EPA thought some compounds currently in use should be identified and targeted to analyze how the system would work. EPA has since reconsidered the GLTxRI in favor of a virtual elimination strategy. This means, by and large, zero discharge of a specific compound. As of yet, there does not seem to be consensus among the regulatory agencies as to what approach should be taken to prevent nonpoint source pollution of the Great Lakes. The regulatory agencies are looking at this issue seriously. The programs being developed and implemented include pollution prevention, risk reduction, and environmental equity. EPA refers to them as P^2, R^2, and E^2; and each includes a source reduction component based on the assumption that a reduction at the source will cause less exposure, less pollution, and ultimately less environmental damage.

What has been the response of product manufacturers? With atrazine, for example, application rates have dropped from up to 10 pounds per acre to two and a half pounds per acre maximum in a calendar year. The recommended rate is two pounds per acre on soils that are not highly erodible, and 1.6 pounds of active ingredient on highly erodible soils, a significant change. There are also setback requirements: 50 feet from wells for mixing and loading, 66 feet from where runoff enters streams, 200 feet from lakes and reservoirs. All of the changes are based on the need to improve the water quality of rivers and lakes and will result in reduced use of the pesticide.

For pesticide use reduction to be effective it is essential to establish a baseline from which to measure future reductions. Are reductions going to be based on the current ten pounds per acre rate or the new label rates? Are the rates of reduction going to be calculated from before IPM was implemented or after? Is the use of those "nasty dozen pesticides," whatever they might be, going to be reduced,

and increase the use of the reduced risk pesticides? Those policy questions have yet to be answered.

These same policy issues have been proposed by the World Wildlife Fund, an environmentally-based organization, in their initiative targeted to reducing the use, risk, and reliance on pesticides in the Great Lakes region. Their objective is to base the program on the concept of pollution prevention by reducing the amount either released or applied. This initiative creates a great opportunity to forge new partnerships in addressing this complex issue. The World Wildlife Fund held a stakeholders' meeting in January in order to identify common goals, develop realistic implementation mechanisms, and obtain farmer acceptance by basing the initiative on farmer to farmer education. If the World Wildlife Fund can get the right people to agree on what reduced pesticide use, risk, and reliance means, a common ground or consensus is more likely to be achieved.

Another way to look at reduced pesticide risk, use, and reliance is in the context of worker protection. The revised federal legislation requires pesticide manufacturers to make label changes that include information on application restrictions, restricted entry intervals, posted and oral warnings, and personal protective equipment. Additionally, employers are now required to train pesticide workers/handlers and provide decontamination sites, personal protective equipment, and emergency response. This law will affect over 3.9 million workers.

EPA is mandating that the state develop a management plan for those pesticides that have the potential to leach into groundwater. EPA has identified a tentative list of eight compounds, all of which are used in Michigan, that may need a state specific management plan because of their potential to end up in groundwater. EPA has the authority to either allow or disallow a use in any state while the Michigan Department of Agriculture has the authority to suspend or cancel a pesticide statewide.

An integral component of pesticide specific state management plans will be the reduction in use of the specific compound. In other words, a compound may have to be applied as a band instead of broadcast. Maybe application rates or irrigation scheduling will also have to be reduced. Wellhead protection procedures may also be required for mixing and loading those compounds. With such considerations, there's certainly some impetus to reduce use other than the public policy decision to "do the right thing."

Last, on a state level, the new Michigan Groundwater and Freshwater Protection Act was signed last November. The bill passed both houses with overwhelming support. It passed the Senate 34-2 and was unanimous out of the House. This type of broad-based bipartisan support doesn't happen very often. The original Michigan three bill package included Senate Bill 74, which is now Public Act 247. That was the outreach aspect of the initiative, which included technical assistance and the voluntary compliance aspect of the program known as the groundwater stewardship program. Senate Bill 74 also attempts to coordinate existing and new program elements. MDA and MDNR have developed a generic plan that will define coordination amongst the agencies.

Senate Bill 675, which is now Public Act 248, amended the Michigan Pesticide Control Act and defines how farmers and regulatory agencies must respond to contamination. In the absence of any detection there's a proactive, voluntary program. As Director Bill Schuette said, if they're given the appropriate information, "farmers will do the right thing." They certainly don't want to contaminate their own wells or their neighbors'. If MDA can furnish information through USDA, SCS, ASCS, MSU, and a number of other participants, the right thing should occur.

If a detection of a pesticide in groundwater occurs above certain trigger levels, a response will occur. For a single well, a one-on-one activity plan is required. If there are multiple contaminations above 20 percent of the maximum contaminant concentration level as

established under the Federal Safe Drinking Water Act, MDA will determine the need to initiate the rule-writing process to limit the use of that product in that aquifer region.

The third bill was Senate Bill 688, which attempts to deal with the nitrate issue. The primary question still remains as to how to determine the source of the nitrate. If, for example, atrazine is found in groundwater, it is safe to say human activity had some role in its being there. The presence of nitrates in groundwater poses a more complicated identification problem than pesticides. Is the nitrate "naturally occurring" and simply the background level? Does it originate from animal manure? Is it from septic tanks? Is it in urban runoff? What are the sources? What's the magnitude or contribution of the various sources? Will Michigan be one of the first states to develop fertilizer use rules in response to the groundwater nitrate problem? At this time that doesn't appear to be the direction the initiative is proceeding. While agreement has been reached that there is nitrate contamination of groundwater, there is no consensus on how best to address the issue. So far, discussions of methods for preventing nitrate contamination of groundwater have included soil testing, tissue testing, realistic yields, and irrigation scheduling.

In summary, pesticide use can be reduced and still allow the farmer to be economically viable. The Michigan Energy Conservation Program (MECP) proved that. If more individuals would calibrate sprayers and measure fields, pesticide use would be reduced. Another factor is integrated crop management. Farmers are starting to move away from integrated pest management to integrated crop management, more of a systems approach to farming. This requires that relevant pesticide selection criteria be reviewed. For example, which pesticides should be selected or rejected? Should they be a high toxicity, short residual pesticide? Can a high toxicity, short residual pesticide be safely used if the tractor cabin is equipped with a charcoal air filtering system? Or should highly toxic pesticides no longer be used because of worker safety concerns? No-till farming practices have been adopted in many areas of Michigan to prevent erosion and at the same time keep the pesticides in place. This has improved the protection of surface water quality. But then what should regulatory agencies do about the new computer model predictions concerning the negative impacts to groundwater from the introduction of contaminants through increased macropores as a result of no till farming? What's the impact of no-till farming then on groundwater? Should farmers use pesticides that are: the least soluble? Most soluble? Least persistent? Most persistent? These issues are related to the expectations that must be communicated to the farm community. A process is needed to reach agreement among the regulatory agencies, environmental groups, and farmers as to how the decision making criteria will be established.

As was mentioned earlier, a baseline is needed from which to reduce pesticide use. Commodity specific reduction goals make sense, but how about the commodity farming operations that have already reduced pesticide applications through the effective use of IPM programs? Other operations have already reduced their inputs significantly by banding instead of broadcast applications of pesticides. If a pesticide use such as growth regulators is suddenly reduced 50 percent in the apple industry, what happens to their market? Will the farmer go to a biannual bearing apple tree which produces fruit only fit for the juice market? Use reduction goals are nice political targets, but are they realistic?

MDA's position, as Director Schuette stated, is that any reduction initiative needs to be risk-based. On farms the message has to be conveyed that reducing pesticides will result in a tangible benefit, reduced risk. Finally, regulatory consistency is needed. Every effort should be made to ensure that when "someone gets the Good Housekeeping seal of approval" they are indeed in compliance with the rules and regulations for MDPH, MDNR, MDA, and the various offices at EPA.

Reference

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Summary Report on the July 27-28, 1993 Agricultural Chemical Source Reduction Workshop

We can better manage pesticides to reduce the health and environmental risks while maintaining the economic viability of agriculture.

Mr. Steve Miller
Office of Water Resources
Michigan Department of Natural Resources
Lansing, Michigan

The Agricultural Chemical Source Reduction Workshop, cosponsored by Michigan State University, the Michigan Department of Natural Resources, and the Michigan Department of Agriculture, focused on agricultural chemicals, both fertilizers and pesticides. The workshop brought together about 60 knowledgeable people on July 27-28, 1993, to consider methods that could be implemented to reduce the use of pesticides in agriculture. The consensus of the participants was that we can better manage pesticides to reduce the health and environmental risks while maintaining the economic viability of agriculture. A copy of the final report is presented as Appendix 2 of this proceedings.

Several major themes came out of that workshop. One was that it's possible to reduce pesticide use without adversely impacting the pesticide users. Use reduction can serve as a valuable focal point for research and extension, and it should be based on the concept of risk reduction. Risk reduction depends on what we're trying to protect, whether we're looking at the risk in terms of worker protection, agricultural yield, human health, surface or groundwater quality protection.

The workshop participants expressed a consensus that we do not want to support an overall reduction of pesticide use of 50 percent for all crops at this time. However, they agreed that probably a qualitative source reduction goal for pesticide use would be valuable and that agricultural producers can adopt such a goal while maintaining economic viability. MDA and MDNR want to look at source reduction in the process of developing state specific management plans under FIFRA. Continuing discussion is needed of commodity specific reduction goals that are reasonable.

A small but growing number of Michigan Association for Sustainable Agriculture (MASA) and Organic Farmers have reduced pesticide use while maintaining economic viability, and they are leading the way. Specific examples include:

1) A Midland County farm with 850 acres in sugar beets, corn, soybeans, and dry beans has reduced the use of insecticides and fungicides 100 percent and herbicides between 30 and 40 percent.

2) A St. Joseph County farm with 100 acres of seed corn, soybeans, snap beans, oats, and alfalfa has reduced the use of herbicides between 25 and 30 percent on seed corn and 50 percent insecticides and fungicides.

3) An Ingham County organic farm with 335 acres of corn, soybeans, small grains, and alfalfa has not used any pesticides for the past eight years.

4) A Barry County farm with 600 acres in corn, soybeans, and alfalfa has reduced herbicides 50 percent in test fields using band spraying while increasing yields 5

bushel/acre compared with fields where herbicides were broadcast.

The MDNR wants to build on source reduction efforts that have been achieved. We recognize that pesticides are essential for modern agriculture, but agricultural producers must reduce their use as much as possible. The public is demanding it through the marketplace. We have this window of opportunity to make the transition to lower input, sustainable agriculture rather than waiting for regulations to be put in place. A small, but growing number of farmers are leading the way in Michigan. Now we need to get all farmers the information, technical tools, and support they need to reduce pesticide use as much as is feasible.

Food Safety and the American Consumer

For the first time, we have a good scientific study raising an element of doubt about the safety of pesticides in the food supply.

To consider Food Safety and the American Consumer I will describe the Gerber pesticide elimination system, economic consideration of pesticide restriction, and compare finished product tolerances to raw produce tolerances. I will cover the rationale for our system, how we approach this problem, and give you an example of research we are doing to eliminate pesticide residues.

The pesticide issue is about food safety concerns. There are two significant areas of food safety, the microbiological and the chemical or in this case pesticides. I juxtapose these for a reason. Microbiological food safety concerns are by far the most important. We have all heard in the news about problems associated with bacteria in hamburger, cheeses, and chicken or other poultry. Microbiological problems have the highest potential for immediate health effects. That is why the government and the food industry emphasize it and allocate so many resources to controlling microbiological problems. An opinion survey by the Food Marketing Institute (FMI) demonstrated that the public increasingly perceived chemical contamination (pesticides) as an important food safety concern as well. After the FMI study the National Academy of Sciences (NAS) released their 1993 report entitled, "Pesticides in the Diets of Infants and Children." For the first time, we have a good scientific study raising an element of doubt about the safety of pesticides in the food supply. The doubt arises because we simply don't have adequate information to make good evaluations about the risks low level pesticide residues may pose for children.

Dr. Nicholas Hether
Gerber Products Company
Fremont, Michigan

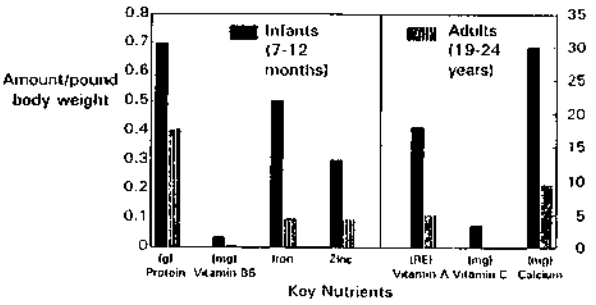

Figure 1. Nutritional Requirement Differences for Infants and Adults. (Based on 1989 Recommended Dietary Allowances.)

At Gerber, we began the thought process almost a decade ago that has culminated in our present program. It is based on our knowledge that babies are different. Babies are not little adults. Babies require more key nutrients (Figure 1) than adults. Babies consume more per pound than do adults (Figure 2). These factors are logical because babies are growing rapidly. Babies, consequently, have a greater potential for exposure to pesticides in the food supply than do adults. This is what we have had to consider as we created our system.

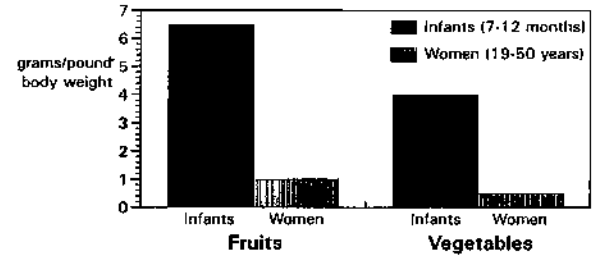

Figure 2. Food Consumption Differences for Infants and Adults.

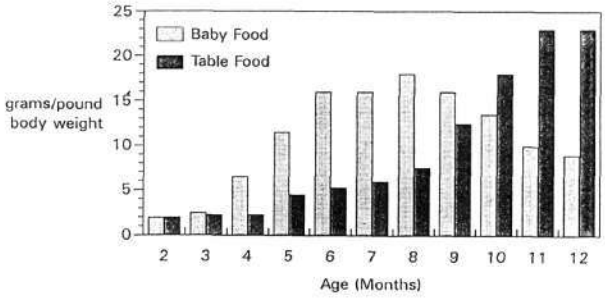

Figure 3. Food Consumption Profile for Infants. (Sources: 1989 Gerber Infant Nutrition Survey; 1986 CSFII.)

Figure 3 compares baby food consumption to adult food (table food) in the first year of life. Although table food consumption increases through the first year, baby food is a high proportion of the diet. Gerber baby food is approximately 70 percent of the baby food consumed, and in some food categories over 80 percent. Babies get a large share of their diet from one source, Gerber; and much of that food comes from Michigan. As a result, if there is anything in the food supply that would affect the health and well being of babies, we certainly have to be aware of it. At Gerber we have a great responsibility and we take it very seriously.

You are all aware of the tolerance system for regulating pesticides. It is important to remember the tolerance system was designed to regulate pesticide use on the farm, and it applies to the raw agricultural commodity (RAC). It has nothing to do with finished product, processed food, or cooked food. That is why we went through something of a revolution of thinking over the last decade. Our change in thinking started in the early 1980s with the ethylene dibromide residue problem in grain based products. We recognized that the tolerance did not tell us what we wanted to know about finished products. For us the only thing that matters is whether pesticide residues are present in our baby food. Because the tolerance system was irrelevant to our needs, we had to completely re-engineer what we were doing. We have adopted a focus on the finished

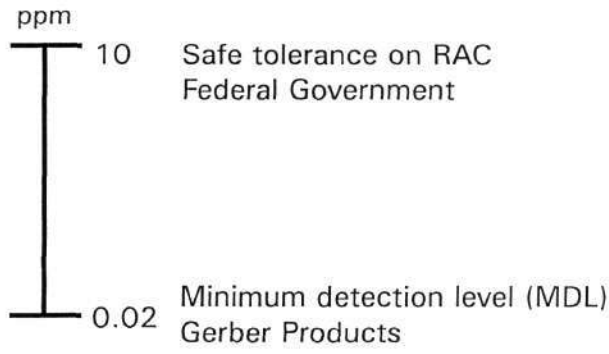

Figure 4. Comparison of Federal Pesticide Standards and Gerber Goal.

product. Our goal is to have no detectable residue in our finished products.

Figure 4 is a generalized example of a pesticide with a tolerance of 10 parts per million (ppm) and a minimum detection limit (MDL) of 0.02 ppm. Gerber's goal for finished products is the MDL, which in this case is about 500 times lower than the raw produce tolerance. It is important to note here that our goal is the MDL and not zero. The present testing technology cannot measure zero residue. It is impossible to measure zero, which is why no one can claim a product to be pesticide free. For each crop, pesticide, product combination we want no detectable pesticide in the finished product. When you consider that we have about 200 different food products, that we buy produce from 30 states, and that we buy some ingredients outside the United States, it is a major logistical challenge to reach our goal. We also had to create a system that would allow us to do this economically and reliably.

Figure 5 compares the tolerance at 10 ppm of a real pesticide to the allowable daily intake (ADI) for a baby. The ADI is the amount of pesticide per unit of body mass that can be eaten every day of life with no likely adverse health effect. Tolerances are established by EPA and have safety factors based on the ADI incorporated in them. Tolerances are based on ADI's for adults. If you consider that a baby has a small body mass and eats more than adults per pound of body mass, there can potentially be

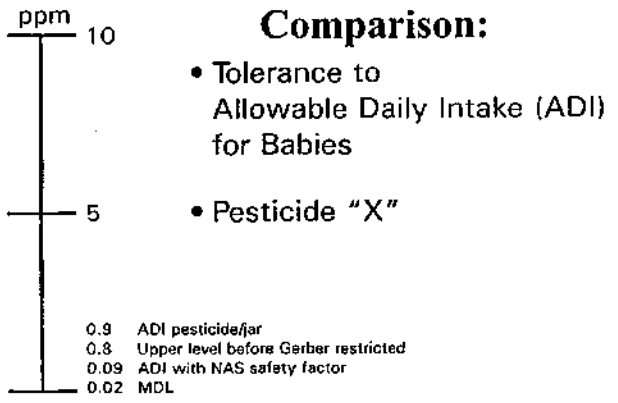

Figure 5. Comparison of the Tolerance at 10 ppm of a Real Pesticide to the Allowable Daily Intake for a Baby.

a difference between the tolerance, which is regarded as a safe level for adults, and what might be considered safe for a baby. In Figure 5 I have calculated the ADI for a baby at the 10th percentile of development (still normal development but a small mass baby) eating a food at the 90th percentile of consumption for that body mass (high consumption rate but still normal). ADI is 0.9 ppm, which is approximately 10 times less than the tolerance level. When we did pilot plant experiments with this pesticide/crop combination, we found that it was possible to get 0.8 ppm in the finished product. This was simply unacceptable to us. The 1993 NAS report recommended an additional 10 fold safety factor be used for risk estimates of pesticide residues in foods consumed by infants and children. With that extra safety factor the ADI for a baby becomes 0.09 ppm or about 100 times less than the established tolerance level. The important point is that it is possible for a pesticide residue to be present at a level considerably less than tolerance but still be considered above a reasonable health risk for a baby. That is why we have adopted the system that we have.

We call it a Total Systems Approach. The goal is to have no pesticide residue detectable in our finished product. It is a simple system in concept and has four key points (Table 1). First, we have a requirement to know what pesticides are used in, on, or around our crops and ingredients; their spray histories in other

Table 1. Total Systems Approach.

- Know what pesticides are used
- Know what happens in our process
- Take specific actions to eliminate residue
- Apply knowledge for continuous improvement

words. Second, we know what happens to the pesticide in our process. We track the pesticide from the field to the finished product, taking samples for testing at multiple points in the process. The basic question we ask in our research is, "Is pesticide present in the jar at the end?" If the answer is "yes" for any particular pesticide then we take specific actions to eliminate those residues and prevent them from occurring again. That is the third point of our system. Fourth, we apply the knowledge we gain in a system of continuous improvement.

Returning to crop history, some lessons can be learned from the Alar fiasco. At that time no one had a good, clear idea about what was used, where, or when. As a result of all the different estimates going to the press, there was suspended belief in the government, in the growers' associations, and in the chemical companies. We have made the crop history a fundamental part of our system. In testimony before Congress last fall, EPA Administrator Carol M. Browner commented that the crop history would likely be an important tool in the Clinton Administration's food safety proposals (Table 2). At Gerber we have been doing this since 1963. It is simply a good business practice. We have recently put in a new computer system which conforms to many of the California requirements so we have in place a good way of analyzing our information. If the state of Michigan or the grower groups want to help farmers, then I would recommend that they cooperate to organize a state-wide crop history system. That, in my view, will be of immeasurable benefit in the future.

The Gerber system is based on the principles of HACCP (Table 3), which is an acronym that stands for Hazard Analysis Critical

Table 2. Crop History is Key.

The Lessons of ALAR

Browner's Testimony

- "accurate pesticide use information...make more realistic exposure estimates"
- "expand current record keeping requirements to include all pesticides"

Gerber System

- A requirement since 1963
- CDMS computer system - new 1992
- Conforms to California system

Control Point. It originated in a food company in the 1960s as a way to prevent food born illness in the space program. The basic idea is to prevent problems from occurring. It is done by careful review of a food production system to identify points at which hazards can get into the system and then prevent them. The same concept can be applied to the control and elimination of pesticide residues in food. Such an approach was described in an article published in *Food Technology* (March, 1992) entitled, "Managing The Pesticide Challenge: A Food Processor's Model."

Table 3. The Gerber System is Based on the HACCP Principle.

Hazard Analysis Critical Control Plan (HACCP)

- Anticipate problems
- Prevent residue occurence

Figure 6 outlines the points of opportunity for controlling and eliminating pesticide residues in baby food. Some crops can absorb residual soil pesticides, and we test soils for crops that are susceptible. The pesticides are those banned 20 to 30 years ago. We use disease resistant varieties. We adjust the planting of different crops for our baby food to avoid pests. During the growing season, much

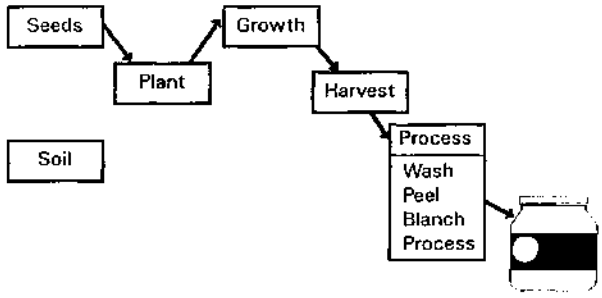

Figure 6. Outline of Control Points. Adapted from "Managing the Pesticide Challenge: A Food Processor's Model," *Food Technology*, March, 1992.

of our production is under IPM guidance. Todd DeKryger and Jim Breinling, from Gerber, have helped organize the West Michigan Crop Management Association. We contributed a little seed money to help it start because we believe IPM programs are important for the future. We watch the timing of the last application of pesticide before harvest, the pre-harvest interval (PHI).

Table 4. Pesticide Use Reduction a Major Goal.

IPM Is The Future

- "primary mechanism...to...reduce pesticide risk at the farm level
- 75% of crop acreage in IPM by 2000

Gerber IPM Program

- Ag Research since 1946
- Plant breeding - carrots, peaches, others
- Crop management association
- Biological controls

Pesticide use reduction is a major goal of the Clinton Administration; and IPM is an important tool to get to the goal, although their understanding of IPM has not been described (Table 4). At Gerber we have had an agricultural research program since 1946. IPM has been a major feature since the early 1980s and two Gerber programs were used as models at an early stage. Our carrot work in Texas is a good example of our research. We also sponsor plant breeding and have developed

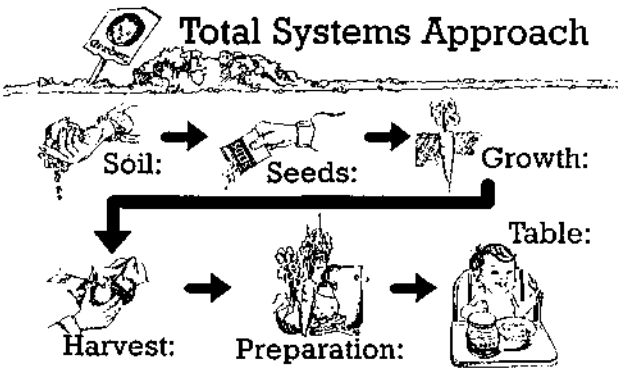

Figure 7. The Total Systems Approach.

disease resistant varieties. Along with the biological controls they will be important in a successful IPM approach. It is clear that United States agriculture will need to move to approaches with less intense reliance on agricultural chemicals.

Figure 7 is an example of the graphics from some of the consumer education material we created to describe the HACCP concept in an understandable way. Our consumer information is intended only to respond to customer's questions. We keep in close touch with our customers. All Gerber packages list a telephone number, call 1-800-FOR-Gerber. We have a consumer response line open 24 hours a day staffed by multilingual people. They are all mothers or grandmothers who have practical experience with children. We get on the order of 50,000 phone calls a month. The vast majority of the calls are about product information. We do have constant feedback from our customers. There is a constant, low level background of calls about food safety. Most calls inquiring about pesticides come from young mothers, most of whom do not have obvious technical background or necessarily high levels of education. The questions often are about Alar. To them, Alar now has become synonymous with pesticides. We use the customer response brochures to answer their questions. We do not use pesticide or food

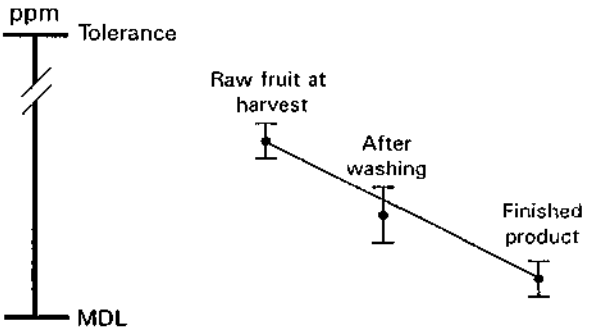

Figure 8. Generalized Example of Pesticides Used on Crops Which Leave a Residue on the Finished Product.

safety matters to sell food. That's important to us. We don't believe that you should use food safety to sell food.

An important part of our effort is to inform other third parties who have credibility with the caregivers of the children about our pesticide and food safety work. These include such organizations as the American Academy of Family Physicians, the American Dietetic Association, many of the Agricultural Extension branch offices, congressional aides, and others who can also answer questions people may have about food safety. From our communication efforts I learned that there is a remarkable lack of elementary public knowledge about the agricultural system. You as individual farmers, your grower organizations, the universities, and the state agriculture agencies can make a large impact by organizing basic education efforts to describe your concerns and work on these matters. There is fundamental ignorance about the agricultural system in this country and you can change that.

Figure 8 is a generalized example of the experimental work we do to determine if a pesticide has a propensity to survive a cooking process and leave a residue in the finished product. Because we have spray histories, we know which pesticides are used. We track pesticide residues through the process. The residue level on the raw produce is typically 5 to 20 percent of tolerance, if you can find it at all.

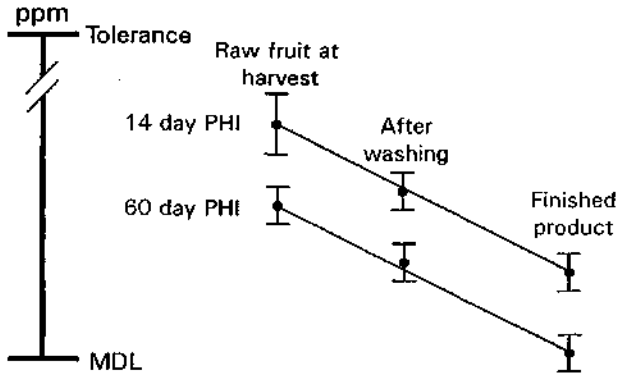

Figure 9. Generalized Example of Pesticide Residue on a Finished Product as a Function of Pre-Harvest Interval.

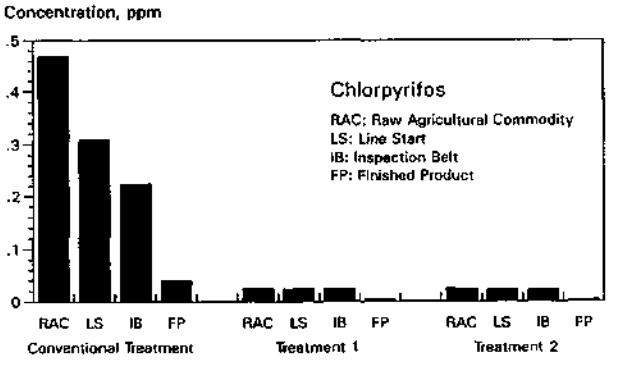

Figure 10. North State Apple HACCP, 1992.

We take multiple samples at multiple steps in the process, although only three are shown in the example. In this case, the residue level was at the MDL so this pesticide would be appropriate for use on Gerber crops. We do this kind of experiment over two or more years at two different geographic locations to make sure the data are reliable. Usually we do this work in coordination with university researchers because it is extremely important to us to have good science behind our information. Once we know a particular pesticide does not give residues in the finished product, we set up a finished product monitoring program and use our crop histories to guide subsequent testing. This helps us focus resources on the areas most in need of attention.

If a pesticide does leave residues in the finished product (Figure 9), then we take action to determine if there is a way to preserve its use for the farmers and still meet our goal. In this example the pesticide did leave a residue above the MDL in finished product when it was used with the 14 day PHI specified on the label. We did a series of experiments (only two are shown) growing the crop with PHI increased at two week intervals. With a 60 day PHI the residue went to the MDL in the finished product. As a result of this work we put an added restriction on the use of this chemical on our crops. However, if with the added restriction it were no longer a useful tool for a grower, then we would ban it. It is not adequate for us only to take a pesticide use away. We have a responsibility to help find alternative mechanisms for dealing with the pests. We have that responsibility because most of our growers are under contract; over half have been selling to us for more than 10 years. In some cases we have relationships going back up to three generations. Such relationships cannot be treated lightly. Our agricultural research group acts as liaison with universities, our farmers and the Gerber corporate research to find alternatives. We don't tell farmers what to use. We only examine what they are using; and then for those few things that leave a residue we either restrict or, if necessary, do not allow its use on crops we buy.

In North Carolina we are in the second year of a three year study to determine if we can eliminate pesticide residues on apples by the use of biological pest controls in an IPM program (Figure 10). Six to eight different pesticides are in this study, but only one is shown in the example. In the conventional treatment residue in the finished product is on the order of about 0.04 ppm. In the alternative treatments, designed in part to control the tufted apple bud moth, chlorpyriphos was used early in the season with biological controls closer to harvest. In the experimental treatments pesticide levels were very low on the raw fruit, and the finished product was at the MDL. This example demonstrates of the kind of research that we are doing to find alternative ways to deal with these

pests other than conventional chemical treatments.

Some regulatory or legislative activity is likely in the next year or two as a result of the 1993 NAS study. Crop histories are likely to be an important feature. There is probably going to be some uniformity in the way raw materials and processed foods are treated under the regulations. IPM is apt to be a critical feature of any future activities to control pesticides. At Gerber we believe the kind of IPM research that we are doing, coupled with detailed crop histories, will be key features in managing pesticide issues in the future as well as to meet the expectations of our customers.

Reference

NAS. 1993. Pesticides in the Diets of Infants and Children. Board on Agriculture and Board on Environmental Studies and Toxicology, National Research Council, National Academy Press, Washington, DC, 386 pp.

Future Directions for Pesticide Use; A Perspective from the National Agricultural Chemicals Association

Reduction in pesticide use in American agriculture has been in progress for many years without the need for new government programs, policies, edicts, or mandates.

The National Agricultural Chemicals Association (NACA) is the not-for-profit trade association that represents the manufacturers and formulators of pesticide products for agricultural crop protection in the United States. Today I would like to address a number of challenges for the crop protection industry.

Pesticide Use Reduction

Last June, Carol M. Browner, EPA Administrator, Michael Espy, Secretary of Agriculture, and Dr. David Kessler, FDA Commissioner, jointly announced a policy to reduce pesticide use in the United States. The announcement caught many by surprise, leaving them unprepared to respond quickly. I believe the Clinton Administration anticipated a strong public reaction to the release of the National Academy of Sciences (1993) study entitled, "Pesticides in the Diets of Infants and Children," a reaction which, incidently, never developed.

This appears to be a real coup for environmental activists. In the months of discussion, debate, and flying rumors since then, it has become apparent that prudent consultation within the respective agencies in advance of the announcement might have given it quite a different form or could have canceled it altogether. Scientists and managers within those agencies now shrug their shoulders, explaining that we are saddled with an irreversible political pronouncement on which no one voted. EPA and USDA held an invitation-only workshop a few weeks ago to obtain public input on the direction the policy should take on whether reduced risk was more or less important that reduced use. By the end of the day-and-a-half session it was clear that their minds had been made up for them without benefit of the input. Reduced use is definitely the goal; reduced risk would be nice if it happened.

In retrospect I would like to say to Ms. Browner and her colleagues, welcome to the party. Reduction in pesticide use in American agriculture has been in progress for many years without the need for new government programs, policies, edicts, or mandates. It has been made possible by the research efforts, technological advances, and persistence of the agrichemical industry responding to the needs of its customers and to healthy free market competition. As often as not, the government regulatory framework acts as an impediment rather than a facilitator in this process. New classes of herbicide and insecticide chemistry have dropped the effective treatment range for many major pest problems to grams per acre of pesticides that are very low in toxicity to human beings. Furthermore, the cost of pesticides does not allow the American farmer to be extravagant in their use. Leaders in the agricultural chemical industry often note that no matter how carefully they set the lowest practical use rate for a product in determining label directions, the ingenuity of American farmers comes up with ways to reduce it still further while maintaining efficacy in order to cut crop production costs.

While Scandinavian models of mandated pesticide use reduction are often touted as

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examples for the United States to follow, it is important to note that those countries started with much higher use rates, due in part to the nature of government subsidy programs and the intensity of agricultural production. For the most part there is not a lot of padding built into pesticide rate recommendations and actual use in the United States. Mandated reductions could cut deeply into our crop protection muscle. Technical progress in Scandinavia in the late 1980s was also made here.

Reducing pesticide use simply for the sake of reduction is a bad idea. It cannot be equated directly to reduced use because it leaves out of the equation, economic, pest, and even many environmental and health risks. If reduced risk cannot be demonstrated first and foremost, forcing use reduction is likely to be counterproductive. Predicted economic losses to growers can be substantial, as has been shown in studies sponsored by NACA and the American Farm Bureau Federation. Loss of efficacy of alternatives can lead to increased pesticide use in attempts to control difficult problems. A less diversified arsenal of weapons leaves us vulnerable to shifts in pest problems and populations, and with restricted choices for crop production. Even minor effects on food prices can have dramatically adverse effects on the most vulnerable segments of the American populace, those living in conditions of poverty.

I have heard here today and a number of times before that the public is demanding a reduction in pesticide use. I would challenge that as an unproved assumption. Some very strident voices repeat it loudly and often, but I don't believe the marketing experience of organic foods bears that out on a widespread basis. If the public is demanding it, they will pay more for organic foods; but how many are doing it when they are given a choice?

Resolve the Delaney Dilemma

The threat is imminent of massive revocations of tolerances for pesticides affected by the Delaney clause, as required by the Les v. Reilly court decision. This raises the specter of chaos in food production and litigation tying up pesticide registrations and EPA resources. A year ago EPA solicited public comments on a petition from the National Food Processors Association, which proposed administrative rather than legislative solutions to concerns raised by Court's strict Delaney interpretation. So far the Agency has chosen not to act in a decisive, coordinated manner on the petition and the comments that it generated. This may be a rallying point in any confrontation on tolerance revocations.

Redefining processed commodities, developing new carcinogenicity classification schemes, utilizing pass-through provisions--none of these correct the bad science of the Delaney clause. While agreement is widespread that the Delaney clause should be replaced, tinkering with it, however, is politically unpalatable to many on both sides of the debate because whatever replaces it could be worse. We have an uneasy truce with the Delaney clause. Perhaps it is a case of better the devil you know than the devil you don't know.

What Is Needed to Provide Adequate Crop Protection for Minor Crops?

Maintain the tools we have. We must cut the economic cost to registrants of maintaining these pesticide uses, which are often only marginally profitable, without sacrificing margins of safety. Re-registration has been a rocky road. Five years ago Congress mandated an untried program with ambitious deadlines. We couldn't be certain at that time that it was the best approach. We--industry, EPA, IR-4, and commodity groups--have learned a lot and have had to adjust along the way. Industry is exploring ways with EPA to more efficiently and more intelligently plow through the mountain of data to make important decisions and retain essential uses.

EPA's Special Review and Re-registration Division is placing a much-needed emphasis on the *value added* to re-registration decisions of data it requires through additional studies or repeating studies. Some studies have

little or no effect on risk/benefit analyses for a particular pesticide and should receive commensurate attention in the regulatory process. We would hope this attitude carries over quickly to the Registration Division. EPA is showing increasing sensitivity to minor crop concerns in granting data waivers and making decisions. While these are positive signs, they have been slow in coming, and there have been a lot of registration casualties along the way. The process still needs to be standardized, made more predictable, more sane. Getting and keeping needed minor crop pesticide use registrations should not require the flexing of political muscle to forge scientifically rational decisions and compromises. It should not have to rely on the Section 18 Specific Exemption Process of FIFRA.

Get new products into the marketplace. The best solution to reduced use, reduced risk, and minor crop pest control needs is straightforward streamlining of the pesticide registration system to reduce the unnecessary costs and long delays in getting new products to market, without regard for special criteria favoring one or another product and so-called fast track treatment. The pesticide market in the United States is mature. A new product must take market share from something already out there. Therefore, it has to be an improvement. The growers who make crop protection decisions are sensitized to environmental and health issues. Let market competition play its very important key role in determining which products thrive and which merely survive in the market place.

Implementation of an Endangered Species Protection Plan for pesticide use has dragged on for many years, and we are still not certain of the exact form it will take. It has the potential to be particularly disruptive and frustrating for minor crop production because of the possible prohibition on the use of registered products over large areas where endangered species may be present. Prudence must play a bigger part in decisions whether or not to allow pesticide use when the existence of the endangered species is only suspected or merely possible. With increased emphasis and attention to endangered plant species, developers of new herbicide products are beginning to feel the effects of unreasonable demands and expectations on the part of EPA. Because it is "wrong" to test herbicides on the actual endangered plant, and given the possible variations in selectivity, one can only conclude that any herbicide may affect any endangered plant species. This leads to some very onerous data requirements and unreasonable restrictions on experimental use permits. NACA has initiated a dialogue with EPA officials to attempt to resolve such concerns.

Positive factors in pesticide use and regulation.

NACA will shortly purchase and distribute 1 million worker handbooks and 300,000 handler handbooks for training agricultural employees according to requirements of the Worker Protection Standard. We expect that state lead agencies and possibly the Extension Service will play key roles in the distribution. These manuals must go to workers and handlers as the take-home message from training sessions. They must not end up as example copies for the likes of us or squirreled away in offices or warehouses. We plan to solicit the assistance of farmworker advocates to verify the distribution of these manuals to the right people. Even so, these numbers do not fulfill the entire need for training materials. We hold up this challenge and example to other organizations with a stake in agriculture to come forward and fill the gap. Individual manufacturers, commodity organizations, and others should step forward and participate also. While implementation of this regulation has not been smooth and trouble-free, it is necessary to make real improvements in worker safety and public perception.

NACA is participating in an effort with companion organizations around the world to develop an International Manufacturing Code for pesticides. The ultimate goal is to bring manufacturing facilities and processes in developing countries up to the rigorous safety and environmental standards of those in highly

industrialized nations. There is a long way to go on this project.

Pesticide applicator training in developing countries. Pilot projects of the Safe Use Initiative have been in place in Guatemala, Kenya, and Thailand for a couple of years now. This program, sponsored by the international group of national associations of agricultural chemical manufacturers (GIFAP)[1], is drawing high praise and favorable reaction from the United States, the host countries, and neighboring countries. We hope to see it expanded through combined funding efforts.

Through the cyclical efforts and sensationalist journalism of environmental activist groups and other paranoia profiteers, pesticide exports are back in the limelight. The best safeguard is a vigilant system of inspection and testing of imported produce for illegal residues, not the misguided economic strangulation of United States leadership in crop protection technology. Through the efforts of NACA, analytical methods for pesticides exported from the United States but not registered here have been provided to the Food and Drug Administration to strengthen that program. I might add that improvements in the economic strength of United States crop production through adequate crop protection choices, particularly for minor crops, would mean less imported produce to worry about.

NACA has fostered projects for cooperative development of data to improve risk assessment. The Spray Drift Task Force is a prime example of this. We are currently exploring the possibility of a similar project on worker exposure data.

Conclusion

One of the best ways we can improve pesticide regulation is to get state and federal regulators out on the farm, and into the food packing and processing plants to let them see first hand where their food really comes from. Environmental activists and legislators should also be a part of this hands-on educational effort. There is a great misconception among too many of the arm-chair generals, who would control the availability of crop protection choices, that they have a monopoly on wisdom, that farmers can't or won't or don't know how to make wise decisions in the use of pesticides. They need to learn differently on a first-hand basis.

Reference

NAS. 1993. Pesticides in the Diets of Infants and Children. Board on Agriculture and Board on Environmental Studies and Toxicology, National Research Council, National Academy Press, Washington, DC, 386 pp.

1. GIFAP is the French acronym for the International Group of National Associations of Manufacturers of Agrochemical Products.

The Federal Legislative Perspective on Minor Crop Pesticide Use

My advice to people in the agricultural community is GET INVOLVED. This is not a time for sitting on the sidelines. This is a time for change.

By the minor use pesticide issue, what is meant is the loss of crop protection tools, not for safety reasons but for economic reasons. Basically, the cost of generating data to satisfy the U.S. Environmental Protection Agency's (USEPA) requirements for either registering or re-registering crop protection tools for a particular use outweighs the return that the agricultural chemical manufacturer expects from the sale of that product. For example, if it costs $100,000 to develop data to support a particular minor use pesticide and sales for that use are $75,000, clearly there is an economic disincentive for the manufacturer to develop the required data. This problem applies to both obtaining registrations for new uses and maintaining existing registrations. Over the past five years, this issue has become particularly acute.

Until 1970 agricultural chemicals were regulated by the U.S. Department of Agriculture (USDA) under the Federal Insecticide, Fungicide and Rodenticide Act of 1946 (FIFRA). The law was intended to protect farmers from using ineffective pesticides and those that were potentially dangerous to the users. In 1962, *Silent Spring* was published. A perception started to develop that USDA was not doing a credible job in regulating pesticides. In 1970 the USEPA was formed. Then President Nixon decided to transfer jurisdiction over pesticide regulation from USDA to USEPA.

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Consequently, in 1972 there was a wholesale revision of FIFRA. Essentially, the regulatory focus changed from assuring the efficacy of pesticides to requiring manufacturers to provide sufficient data to demonstrate that the use of a pesticide in accordance with its label would not cause an unreasonable adverse effect to human health or the environment.

In amending FIFRA, Congress had a problem to address, namely, what approach should be taken with respect to pesticides that were previously registered by USDA. It could do one of two things. First, it could cancel all the pesticide registrations for which adequate data did not exist and restore them only after sufficient data had been developed. The impact on the agricultural community from such an approach is obvious. Second, it could "grandfather in" USDA registered products and require pesticide manufacturers to update their data bases within a short period of time, essentially over a five-year period. This seemed reasonable and it was the approach selected.

However, USEPA had much to do in its formative years and had only a limited number of personnel to handle all its responsibilities. By 1988, some 16 years after passage of the FIFRA amendments, most chemicals still had not gone through the re-registration process. In fact, of the more than 600 active ingredients contained in the more than 50,000 pesticide products, USEPA issued only approximately 182 interim re-registration standards. It was on a schedule to issue approximately 25 new re-registration standards each year. The U.S. Government Accounting Office (GAO) reviewed the USEPA re-registration effort and determined that it would not complete the re-registration process, under its then current schedule, until the year

2024. Accordingly, Congress decided that this was unacceptable and enacted the 1988 FIFRA amendments. They were aimed at accelerating the re-registration process so that it would be completed by 1997, some 27 years before USEPA had been scheduled to complete it.

The schedule set by the 1988 amendments to FIFRA 1988 is tight. Congress intended to take the delay out of the process. Anyone familiar with the 1988 amendments is aware that there is not much flexibility built into the process. It is this need to develop data for a whole host of pesticides within a relatively short time frame that has been a major source of tension and creates the dilemma which we now confront. FIFRA's compression of the time required for submission of data has forced chemical manufacturers to make difficult economic decisions not only on the allocation of their capital resources, but also their personnel. Often, as a result of the decision making process, pesticides for minor uses became the first casualties.

For pesticide manufacturers, these are business decisions that most chemical manufacturers agonize over. Farmers are in business to raise crops, feed their children, and put a roof over their heads. Chemical manufacturers have similar problems. They have families to feed and mortgages to pay. Their economic response is understandable. The economic consequence is a result of the regulatory system that society is perceived to want. This perceived demand for extensive information is driving the system and creating tensions which ultimately are impacting the agricultural community.

Some legislative solutions to the minor use pesticide issue have been spearheaded by the Minor Crop Farmer Alliance. House Agricultural Committee Chairman Kika de la Garza (Texas), and Senators Daniel K. Inouye (Hawaii) and Richard G. Lugar (Indiana) are among the chief sponsors of legislation to provide incentives to preserve the availability of many safe pesticides used on minor use crops as well as to stimulate an interest in registering new or existing pesticides for minor uses.

House Bill HR 967 has approximately 128 co-sponsors, including several Michigan representatives. The Senate Bill, S 985, has approximately 43 co-sponsors. However, to date, neither of Michigan's Senators, Carl Levin nor Donald W. Riegle, Jr., has agreed to be co-sponsors. We are hopeful that will change.

As it was drafted, the Minor Crop Pesticides Act would essentially, first, define minor uses to include those non-economic uses on commercial agricultural crops or sites, on animals, or for public health; and, second, would extend exclusive data protection for 10 years when such data relate solely to minor use pesticide. For instance, when a manufacturer registers a pesticide for the first time, USEPA is required to maintain the data in confidence. Competitors can rely on those data only after a certain time period, i.e., after 10 years have elapsed, or if the original data submitter voluntarily allows them access. The legislation would provide additional protection for data relating to minor use pesticide information.

Third, the legislation would extend the time for submission of residue chemistry data for minor use pesticides for two years after the final deadline for the major pesticide uses. Basically, this would establish two categories of pesticide information, one for major uses and the other for the minor uses. The pesticide manufacturers have indicated that it would be beneficial if they would be allowed to complete the re-registration process by developing the data necessary to support their major uses first and subsequently supply the data necessary for supporting the remaining minor uses.

Fourth, the legislation would expedite minor use pesticide registration decisions in three instances: (1) if there are three or more minor pesticide uses per major use, (2) if the use would replace one that has been canceled within five years of the application, or (3) the use would avoid the re-issuance of an emergency exemption. If the USEPA is going to cancel a particular chemical or if the USEPA (which has been under much criticism lately for continually issuing emergency exemptions for pesticide uses) has pending registration applications for uses

addressing emergency circumstances, registration applications for those uses would receive a priority. Fifth, the legislation would also authorize the conditional registration of minor pesticide uses that were previously canceled or proposed for cancellation or deletion after December 24, 1988. We call this the "Lazarus" provision. Essentially this would return to the market for a period of time certain chemicals that were previously canceled.

Sixth, the legislation would also provide a temporary extension of unsupported minor pesticide uses to the final deadline for submission of data for uses being supported. This is a transition period provision. In other words, what is needed in the farm community is early notice that a particular chemical is being eliminated. Manufacturers have a reason not to provide that notice. When pesticide manufacturers decide not to defend a particular pesticide use, sometimes they wait until they submit their voluntary cancellation request to the agency prior to notifying the user community. There needs to be a better communication system, a warning at the earliest possible time that identifies when a particular use is going to be lost.

Seventh, the legislation would also establish USEPA and USDA pesticide minor use programs. It is important that those two agencies cooperate. As strange as it sounds, in Washington, D.C. the USDA and USEPA may not always talk to one another. As a matter of fact, often they talk at one another, if they talk at all; and that has to change. This is not good for society, nor is it good for farmers or for chemical manufacturers. Both federal entities have an opportunity to do great good or great harm. We would suggest that they focus on doing the greater good, and one way they're going to do that is by coordinating efforts in the pesticide area.

Eighth, the legislation would also provide a matching fund for data development with industry and the USDA. If minor use data are required, under a matching program a grower organization, for example, could put up half the money and the USDA the other half, which would then be repaid by the growers over a longer period of time, e.g., 10 or 20 years. The Minor Crop Farmer Alliance also wants an increase in funding for the IR-4 program and to have additional funds devoted to the IPM programs. These are very important.

A question might be, "Why not just have increased data exemptions for a number of these minor uses so that USEPA would not have to review or require so much data?" However, minor uses are usually associated with fruits and vegetables, and those uses are in the public's mind. For example, if a residue problem comes up, you normally don't hear about it in reference to Christmas trees. You hear about it developing on apples, potatoes, and other foods that people typically consume. The publicity is particularly intense if the residue involves exposure to children. The media respond to perceptions about public sensitivities, and we have a responsibility to take those perceptions into account.

Members of the Minor Crop Farmer Alliance are also being impacted by pending food safety legislation. Currently, the minor use problem cannot be addressed until food safety legislation is adopted. This is proving to be most difficult with the pending food safety bills. On the one hand, the Kennedy-Waxman bill is supported by environmental groups. On the other hand, the Lehman-Bliley bill is supported by food and chemical companies. Kennedy-Waxman supporters claim that the Lehman-Bliley bill is not viable even for discussion purposes. Similarly, the food industry and the chemical manufacturers say the Kennedy-Waxman bill is equally not viable. Both groups are stalemated. The Minor Crop Farmer Alliance wants this political impasse broken so that our minor use problem can be addressed. This hasn't happened yet. Hopefully, when the Clinton Administration comes out with its proposals, it will be able to break the political logjam. The good news is that in some early pronouncements about the Administration's legislation, a section will deal with minor use pesticides. Consequently, there is at least some hope that this issue can be resolved.

Again, it would be helpful if you would discuss this with members of the Michigan congressional delegation with whom you have a relationship, particularly on the Senate side. Request that those members co-sponsor the minor use pesticide legislation or, if they're already co-sponsors, request that they insist that the bill be acted upon during this session so that it can be signed into law by the President.

As I leave you, I would offer you some of "Ruckert's philosophy." My advice to people in the agricultural community is GET INVOLVED. This is not a time for sitting on the sidelines. This is a time for change. The President popularized this theme during his campaign and the current Administration intends to follow up on that theme. There will be change! The question is, what form will that change take? There is a need for those of you in the agricultural community to work with and educate different groups. You have the opportunity to either sit in a coffee shop and grouse with one another about how terrible the world is and how bad the environmental groups are, or you can decide to develop outreach programs, to seek out some of these groups, to listen to them, and to try to discuss our problems with them. It does not always work, but there has to be an outreach effort. The officials in Washington at the USEPA, FDA, and the USDA do not know your business as well as you know it. Often, even though they know very little about your business, they will be making decisions which will affect your future. So you have a responsibility to educate them. You have to recognize your strengths. Look at your assets and marshall them. Identify short and long term goals, and work to build a consensus. Recognize that agriculture has changed, at least the political dimension involving agriculture. Back at the turn of the century, what agriculture wanted it got. That is no longer the case. Look at demographics. Most of members of Congress come from essentially non-agricultural communities. We need to educate them about agriculture, our goals and our problems. We need to build coalitions, particularly with non-farmers. And remember, perceptions count, particularly in Washington, D.C. Consequently, how an issue is presented can become almost as important as the substance of the issue. Therefore, time and attention must be devoted to developing appropriate strategies to address the industry's issues.

Reference

Carson, R. 1962. Silent Spring. Houghton Mifflin Company, 1 Beacon St., Boston, MA 02108.

The Grower's Perspective on Minor Crop Pesticide Use

The role of the grower and their organizations lies in three main areas: involvement, education, and intervention.

INTRODUCTION

You are probably asking yourself, why was a trade association executive invited to talk about the grower's perspective on minor crop pesticide usage, especially one from Florida. Let me answer this question before I get into the substance of my presentation this afternoon.

First of all, in my previous life before Florida Fruit & Vegetable Association (FFVA), I was employed as the technical director for a major fresh vegetable producer in South Florida. In that role, I was responsible for pest management, production research, and recommendations for approximately twenty different crops on over 15,000 acres of production. As that role became more and more regulatory over the seven years I was there, Florida Fruit & Vegetable Association's Board of Directors recognized the shift in regulatory impact on its grower membership and created the Environmental and Pest Management Division in 1985. The vision of the Board of Directors at that time is borne out when you realize that they created the division based on the needs of the membership even though it represented a major, unfunded commitment to the Association. Since that beginning, FFVA's Environmental and Pest Management Division has grown to 3 full time professional staff, an administrative support person, and commensurate clerical support. This has occurred over the past eight years at a current cost to the membership of almost $500,000 per year. One hundred percent of the voting membership of FFVA are ***grower*** shippers in the state of Florida and I still work for growers. FFVA is a totally volunteer organization. It is not part of a federal or state mandated association.

Secondly, are pesticides important in current Florida production scenarios and are they under close regulatory scrutiny? The answer to both of these questions is a resounding yes. Florida's climatic conditions, which allow essentially year-round production, also provide year-round conditions that favor the development of economically damaging pest levels. Over the past fifteen years, which comprises my frame of reference, the tools we have for pest control have diminished in number and efficacy and replacement tools are not becoming available at an adequate rate to assure continued economically viable production. Couple this with the fact that all crop production in Florida would be viewed as minor when compared with the total national picture. The maximum acreage of individual crops in Florida does not equal the acreage of corn in individual counties in Iowa and Illinois. The citrus industry with 791,000 acres represents the largest of our minor crops, with tomato, watermelon, and sweet corn following at 50-60,000 acres each, and planted acreage for other commodities falls quickly after these. However, they represent significant economic returns to the economy of Florida. Fresh fruits and vegetables provide a farmgate economy of $3 billion annually.

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DISCUSSION

The role of the grower and their organizations lies in three main areas: involvement, education, and intervention. Effectiveness in each of these areas largely depends on the willingness of the individual grower to participate in the interest of their industry. Each of these areas carry its own problems and possibilities.

Involvement

In Florida, and also nationally, the political realities of regulatory decisions are moving to the forefront in all arenas. In this climate, representation is critically important. Growers must become involved at the local, state, and regional level as well as nationally. We are faced in Florida by regulatory efforts at all of these levels; over half of the 67 counties have home rule charters approved by the state legislature, which provide for local environmental protection agencies. We have local and regional planning councils that impact land use decisions, regional water management districts that permit surface water management, wetland utilization, and consumptive water use. At the state level five individual state agencies (Florida Department of Agriculture and Consumer Services, Florida Department of Environmental Protection, Florida Game and Fresh Water Fish Commission, Florida Department of Community Affairs, and the Florida Department of Health and Rehabilitative Services) have regulatory impacts on farming. The Governor and Cabinet sit collegially as the environmental adjudicatory council to provide oversight of state environmental and land use agency decisions. Each of these agencies have a different perspective of our industry and the potential regulatory mechanisms necessary to deal with the impacts in the areas of responsibility they serve.

At the national level we are all familiar with the regulatory impact of EPA's Office of Pesticide Programs; but we tend to overlook the EPA offices that direct the water program, air program, toxic substances, other than pesticides, and solid waste program, all of which potentially impact the way we farm. For the most part, as an industry, we have also overlooked the regulatory programs contained within the various divisions of USDA, the Army Corps of Engineers, FDA, and the Department of Interior.

In light of the complexities presented by the myriad of regulatory entities, no one person or organization can stay abreast of all of the potential regulatory needs at the grower level. Therefore, it is imperative that growers organize at the local level and form coalitions with like minded groups at the state and federal levels. FFVA participates in several state level, issue oriented coalitions and was a founding member of both the Minor Crop Farmers Alliance (MCFA) and the Crop Protection Coalition (CPC) at the national level. The MCFA now numbers more than 130 organizations working to develop legislative solutions to the minor crop pesticides dilemma. The CPC was formed to provide a forum for organizing users to address the potential loss of individual crop protection tools. The current activity of the CPC is to deal with the projected loss of methyl bromide as a result of the Clean Air Act. Coalitions provide the political base to ensure that all sides of an issue are heard prior to finalization by any regulatory action.

Education

The second component of a successful effort is education. This is important not only as the grower or his/her organization become educated about the regulatory efforts of the various outside agencies, but also to attempt to educate the regulatory agencies and the general public about each industry. One important fact to keep in mind at all times is, ***"You are the only person who knows why you do what you do and all of the factors that lead to a particular crop production decision."*** Regulatory agency decisions are often made based on analysis of a single cause and effect decision making process without consideration of

the complex matrix of factors that you consider on a daily basis as you make these decisions. It is imperative that we move out of our shell and talk to the regulatory community.

It is equally important for members of the regulatory community to bring their agendas to the regulated community to share the underlying information that leads to the perceived regulatory need. One very effective way to deal with this two way communication and education process is through agricultural field tours for the regulatory community. FFVA has held tours annually for the past seven years. We invite the Office of Pesticides Programs at EPA and the various state and regional regulatory agencies in Florida for an intensive five day tour of minor crop production, including handling, packing and aligned industries. The group dynamics of this tour are extremely interesting and have been consistent over the seven years we have held this activity. We try to split the regulatory group equally between the federal and state level, and also try to have an industry representative (grower or trade association representative) for each four to five regulatory participants. On Monday everyone remains aligned along institutional affiliations, EPA with EPA, state regulatory with state regulatory, and industry with industry. By Friday, it's one big happy family. Part of the reason is that we remain on a bus together between 12 and 15 hours per day for the week, and by moving from one planned stop to another, personal communications remove the barriers created by the perceived polarization due to the jobs each of us are charged with. Disembodied voices on the other end of a confrontational telephone conversation or written correspondence become real people; often with shared concerns and areas of interest. The other positive benefit from our perspective is the exposure of the regulatory community to the reality of horticultural production in Florida. The consistent comment we receive is, "I had no idea of the technical sophistication and complexity of commercial vegetable production; the only model I had was my backyard garden."

Intervention

The availability of crop protection tools is also an important component of FFVA's role on behalf of the minor crop growers in Florida. We accomplish this through three specific mechanisms.

1. Identification of Critical Needs.

   Production practices vary from region to region and crop to crop. It is necessary that a central clearinghouse of critical needs, both fulfilled and unfulfilled, is maintained at the state level, as it is at the federal level via the IR-4 program. Growers are the only persons with the direct day-to-day knowledge of what works, under which cropping conditions, to define these critical needs. Not only is this valuable to the regulatory community, but it also serves to direct support industries to those needs that represent potential markets.

2. Intervention in Labeling.

   The grower community or its organizations can play an important role in the registration process. As a product moves through the regulatory process, the various milestones can be followed through direct contact with the registrant, EPA, or other grower groups. As the major decision points are reached, EPA often solicits direct grower input, either formally through a Federal Register announcement or informally via letter or telephone. For those users of concern a timely response from the growers carries more weight than that of a trade association or the registrant. In Florida we have come to rely on the 24(c) Special Local Need process under FIFRA to address different use patterns required as a result of our needs.

   FFVA has carried this to another level with the incorporation of a not-for-profit subsidiary, Third Party Registrations, Inc. (TPR). This subsidiary was set up

specifically to pursue critical registrations on behalf of FFVA's producer members where either non-performance or crop phytotoxicity liability preclude the primary registrant from voluntarily obtaining use registration. As an example, TPR, Inc. is currently in the process of registering a herbicide for use on organic soils to grow lettuce, escarole, and endive. This product not only has potential non-performance and crop liability concerns, the basic registrant also has concern over potential carry-over damage for crops planted after the treated crop is harvested. In fact, they turned the lettuce growers down flat when they were approached about labelling the use in 1989. TPR, Inc. investigated the research needs for registration, developed a budget and timetable for approval by the lettuce growers to proceed with registration efforts. The total cost of this project, $520,000, was borne by the growers who would benefit from the use. The acreage supporting this project is a little over 8,000 acres. Why were the growers willing to commit the $65 per acre cost for this product? Hand weeding in lettuce the previous three years had averaged $350 to $650 per acre and caused a 10-13% decrease in yield per acre. The registrant was looking at gross annual sales in Florida of less than $60,000. In cases like these, Third Party Registrations, Inc. is an attractive, and often, the only option to obtain pesticides for crop uses. For most minor uses though, third party registrations are an impractical and prohibitively expensive process.

3. Intervention Through Specific Exemption.

FFVA has secured petitions by the Florida Department of Agriculture and Consumer Services for 17 crop/chemical combinations under the Section 18, Specific Exemption process of FIFRA. This mechanism of last resort allows exemption from registration for use on a time limited, use limited basis in response to urgent, non-routine pest outbreak situations. Grower organizations serve as the direct line of communication to ensure that this process is used appropriately and consistently. Again, this is a mechanism of last resort, but it is critically important when it is needed. At the state level, a coordinating council for these activities can be of tremendous benefit.

Beyond direct intervention on specific pesticide issues, the grower community needs to participate in the ongoing FIFRA legislative reform debate at the national level. Currently FIFRA is a product registration law with minimal direct impact beyond the regulatory level. The debate over proposed legislation will center on several issues beyond registration of pesticides. Growers will need to become familiar with the proposed package, weigh the various options, and make their needs known.

CONCLUSIONS

The unescapable conclusion for everyone here is the same, whether you are a grower, a grower representative involved with allied industries, part of the academic support community, or part of the state or federal regulatory community. ***YOU HAVE TO BECOME INVOLVED.***

As a *grower*: You need to become involved at the local level to educate your neighbors about what you do, why you do it, and why pesticides are important to your production practices, and the fact that you don't indiscriminately apply them. At the state level, you have to be willing to identify your critical needs to assure that they are not lost in the regulatory shuffle. At the federal level, you need to become involved with the coalitions supporting your industry. You have to help educate the federal regulators and legislators. At the personal level, you need to be willing to keep an open mind. Just because you have done it that way for 30 years or more, does not mean it is right. You have to be willing to look at it

and determine if it is environmentally sound and where changes can be made, then make them.

For those in *allied industries and academia*: You need to listen to the grower community. They know what their needs are, and you should be willing to work cooperatively with them to solve the production challenges.

For the *regulatory community*: Crop production and protection form a complex, dynamic system which requires input from many sources. You need to listen and learn from the regulated community.

As a *commodity group*: We all have a role in ensuring the continued viability of American agricultural production. We have to work together.

Weed Management

Trying to determine which pesticides were "at risk" on minor use crops was a massive undertaking.

The application of pesticides for weed management is discussed more fully in the Minor Use Pesticide Report which will be available from Michigan State University Extension in mid-July, 1994. Much of that information is summarized in an executive summary that lists the various commodities, their dollar value (farm gate) to the state, and the number of acres on which the crop is produced (see Appendix 1). This information is also presented in Table 1. These commodity producers range from apple growers to a few mint and seed corn growers. Trying to determine which pesticides were "at risk" on minor use crops was a massive undertaking. What is meant by "at risk?" The primary reason a pesticide is defined to be at risk is that there are no alternatives to replace it. Alternatives may be other pesticides or methods of controlling specific weeds or insects or pathogens.

Other reasons why a pesticide might have been termed to be at risk would be because of a lack of re-registration, a potential for carcinogenicity, a potential for groundwater contamination or concern for worker protection. Finally, we looked at the dollar value of that commodity and the net loss in value to the state's economy if a specific pesticide were lost. In summary, three factors were considered to analyze potential pesticides at risk in Michigan in minor use crops. One was the potential to lose that pesticide. Second was whether or not there were alternatives to control the pest, and third was the farm gate value lost to the state.

It is not always possible to predict which pesticides are going to be lost. For example, the IR-4 priorities were established and then, a short time later, IR-4 was notified that the registrants (manufacturers) of Ambush and Pounce (permethrin) were considering no longer supporting registration of this pesticide for cherries. So we are doing our best with the information that we have to predict which pesticides are at risk.

The Minor Use Pesticide Report also identifies a long list of pesticides that were assessed to be at risk (Table 2). While this executive summary does not provide information for any specific commodity, the full report lists the pesticides for each one. For example, Table 3 presents Benlate (benzimidazales) as an example of the collection of pesticides for that fungicide group. A potential reason for losing Benlate might be the application of the Delaney Clause in which it might be classified as a potential carcinogen. We listed two commodities that Benlate is used on in Michigan: snap beans and cabbage. The targeted pests are also listed and whether or not there are alternatives, both pesticides and other methods. The impact on the industry if re-registration were lost is listed as well as identifying the current research not only at MSU but also elsewhere nationwide and if additional research is needed. Very few alternative research areas are being pursued for pests on certain commodities.

In summary, we first listed all pesticides considered to be "at risk." Then a specific pesticide was indicated for each commodity and alternatives were listed if they were available.

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Table 1. Dollar amounts and acres of production of minor use crops in Michigan.

Commodity	Dollar Amount	Acres
Alfalfa	$327,000,000	1,200,000
Apples	$246,000,000	58,100
Asparagus	$14,126,000	24,000
Birdsfoot Trefoil	$2,100,000	100,000
Seed Production	$750,000	5,000
Blueberry	$50,000,000	15,900
Brambles	$1,000,000	520
Broccoli	$880,000	300
Cabbage	$5,500,000	2,500
Canola	$1,850,000	10,000
Carrots	$17,443,000	7,000
Cauliflower	$2,215,000	1,200
Celery	$12,515,000	3,100
Christmas Trees and Greenery	$90,000,000	130,000
Cucumbers	$21,888,000	23,000
Dry Beans	$120,000,000	350,000
Floriculture (Poinsettias, Folliage Plants, Cut Flowers)	$137,000,000	620
Garden Greens		500
Grape	$64,000,000	11,900
Landscape Ornamentals	$220,000,000	
Lettuce	$4,060,000	1,000
Lupine	unknown	1,000
Melons	$2,625,000	1,500
Mint	$1,750,000	3,000
Oats	$5-6,000,000	150,000
Onions	$17,860,000	7,500
Peach/Nectarine	$17,000,000	8,480
Pears	$4,000,000	1,300
Peas		1,400
Peppers	$9,000,000	3,500
Potatoes	$90,000,000	48,000
Prune	$6,000,000	2,600
Pumpkins	$2,300,000	2,300
Radishes	$8,020,000	6,300
Seed Corn*	$24,750,000	$45,000
Snap Beans	$12,898,000	29,000
Soft White Winter Wheat	$84,280,000	570,000
Squash	$10,200,000	3,500
Stored Grain	not available	---
Strawberry	$8,000,000	2,400
Sugar Beets	$90,000,000	171,000
Sweet Cherry	$58,000,000	9,000
Sweet Corn	$17,970,000	20,700
Tart Cherry	$93,000,000	38,200
Tomatoes	$20,053,000	9,700
Turf**	$1,000,000,000	2,900,000
TOTAL	$3,049,167,000	5,980,020

*Southwest Michigan only **Maintenance Expenditures - Turf

Table 2. Pesticides at risk.

Common Name	Trade Name	Common Name	Trade Name
1,3 Dichloropropene	Telone II	Fenbutatin Oxide	Vendex
2,4-D	Weedone	Fonofos	Dyfonate
2,4-DB	Butyrac	Formic Acid	Formic Acid
2,4-DP	Weedone	Iprodione	Chipco
Acephate	Orthene	Lindane	Lindane
Azinphos-Methyl	Guthion	Linuron	Lorox
Benzimidazoles	Benlate	MCPA	Rhonox
Captan	Captan	MCPB	Thistrol
Carbaryl	Sevin	MCPP	Mecomec
Carbofuran	Furadan	Mancozeb	Manzate 200
Carboxin	Vitavax	Mercury Fungicides	Calo-Chlor
Chlorothalonil	Bravo	Metalaxyl	Subdue
Chlorpyrifos	Lorsban	Metham-Sodium	Vapam
Cypermethrin	Ammo	Methomyl	Lannate
Cyromazine	Trigard	Methyl Bromide	Brom-O-Gas
Desmedipham	Betamix	Oxamyl	Vydate
Dicofol	Kelthane	Oxyfluorfen	Goal
Dimethoate	Cygon	PCNB	Terraclor
Diuron	Karmex	Pendimethalin	Prowl, Stomp
EBDC's	Polyram	Phenamiphos	Nemacur
Endosulfan	Thiodan	Phenmedipham	Betamix
Ethoprop	Mocap	Phenoxyl	Weedar
Phosmet	Imidan	Streptomycin	Agri-Strep
Plant Growth Reg	NAA	Thiophanate Methyl	Topsin M
Propiconazole	Tilt	Thiram	Thiram
Prometryn	Caparol	Triadimefon	Bayleton
Propargite	Omite	Vinclozolin	Ornalin
Sterol Inhibitors	Nova		

We then attempted to rank this lengthy list of pesticides on specific commodities according to the priorities established as the most important issues in the state. The rankings were based on the potential dollar loss to the state, the potential lack of alternatives, and the potential to lose that pesticide. In other words, we tried to predict the potential for loss. Is Benlate really threatened? Is Benlate's use on snap beans threatened? Could it potentially be lost to Michigan agriculture? We're not sure. We are concerned about the potential for enactment of the Delaney Clause with respect to potential carcinogenicity, and that is why the specific researcher or staff person ranked it at risk with few alternatives.

Table 4 lists the top ten minor use pesticides classified at risk. This list was derived over a year's time through three phases of reiteration of the Minor Use Pesticide Report.

With regard to the different pest management groups, I would like to begin with weed management and provide a bit more detail on herbicides and the potential for loss in minor

Table 3. Example of the Collection of Pesticides for the Fungicide Group.

Pesticide	Trade Name	Reason for Potential Loss	Crop	Value
Benomyl	Benlate	High C (Carcinogen) O (Delaney Clause)	Snap beans Cabbage	$12,898,000 $ 5,500,000

Pests controlled: White mold, Alternaria.
Alternatives: Thiophanate-methyl, iprodione are alternatives for snap beans. EBDC fungicides and chlorothalonil are alternatives for cabbage.
Impact of Alternatives to Industry: As long as alternatives remain available, probably little impact would occur.
Current Research at MSU - Department/Researcher: Dr. M.K. Hausbeck, Department of Botany and Plant Pathology, conducts annual field trials for fungicide efficacy on these diseases.
Current Research Nationwide: Researchers in nearby states conduct fungicide efficacy programs.
Additional Research Needed: Continued efficacy trials on alternatives.
Contact Person: Dr. M.K. Hausbeck, (517) 355-4534.

Table 4. Top ten minor use pesticides.

Pesticide and Crop	Potential $ Loss Rating	Potential for Pesticide Loss	Availability of Alternatives	Total
Captan/Apples	3	3	3	9
Oxyflurofen/Onions	3	3	3	9
Linuron/Carrots	3	3	3	9
Prometryn/Celery	3	3	3	9
Lorsban/Onions	3	3	3	9
Captan/Blueberries	2	3	3	8
Benlate, Topsin M/All Beans	3	2	3	8
EBDC's/Asparagus	3	2*	3	8
Benlate/Apples	3	2	3	8
Diuron/Asparagus	3	3	2	8
	3	3	2	8

Dollars Lost:
high (3) = > 50% of Crop Value
medium (2) = > 25% of Crop Value
low (1) = < 24% of Crop Value

Risk of Loss:
high (3)
medium (2)
low (1) Subjective Rating

Available Alternatives:
high (3) = No alternatives
medium (2) = 1-2 alternatives
low (1) = 3 or more alternatives

Table 5. Herbicides at risk.

Pesticide and Crop	Potential $ Loss Rating	Potential for Pesticide Loss	Availability of Alternatives	Total
Linuron/Carrots	3	3	3	9
Prometryn/Celery	3	3	3	9
Oxyfluorfen/Onions	3	3	3	9
Pendimethalin/Onion	3	2	3	8
Diuron/Asparagus	3	3	2	8

Dollars Lost:
high (3) = > 50% of Crop Value
medium (2) = > 25% of Crop Value
low (1) = < 24% of Crop Value

Risk of Loss:
high (3)
medium (2)
low (1) Subjective Rating

Availabile Alternatives:
high (3) = No alternatives
medium (2) = 1-2 alternatives
low (1) = 3 or more alternatives

use crops. Weed management was considered as to which herbicides currently used in minor use crop production would be at risk or have no alternatives. The risk of losing the pesticide could be due to the re-registration requirement on a specific minor use crop. Often this involves very short notice because it is not in the manufacturer's best interest to inform a grower in advance that the pesticide may not be re-registered because of a lack of net return to the company or because of the risk to a person's health or to the environment.

Table 5 summarizes the herbicides identified as being at risk in the Minor Use Pesticide Report. For sugar beet producers, Betamix (desmedipham and phenmedipham) is a single herbicide which, if for any reason it were not re-registered for use in Michigan, would be quite catastrophic to the growers because the hand weeding costs would increase astromomically. Prowl (pendimethalin) has a number of minor crop applications. Some of the crops Prowl is used on are more critical than others. Lorox (Linuron) is used on numerous minor use crops such as carrots and potatoes; however, its use on carrots may be more critical because of a lack of alternative weed control options. Caparol (prometryn) is used only on celery, and it's a critical herbicide for celery production in Michigan. Goal (oxyfluorfen) is used on various minor crops, including fruit, and is very important to onion producers. Karmex (diuron) is used on a variety of cropping systems as is Weedone (2,4-D).

Next the Minor Use Pesticide committee attempted to categorize by commodity and herbicide those pesticides at greatest risk. An example illustrates some of the reiterations that the committee went through in trying to think through this. This example compares 2,4-D application to many crops in Michigan versus Caparol which is used only on celery. We're familiar with 2,4-D use in turf and we're familiar with using 2,4-D to control weeds in Christmas tree plantations, small grains, corn, and forages. In many of these cropping systems we have alternative ways to control weeds without 2,4-D. For example, on wheat we can use higher seeding rates or alternative herbicides. However, if 2,4-D is not re-registered, the one crop that might be most impacted in Michigan is asparagus because there are few alternatives for broadleaf weed control.

Let's now look at celery production and the use of Caparol in Michigan. Celery is produced on approximately 3,000 acres, and Caparol (promotrene) is used to control weeds pre-emergent. Without this herbicide, it would be catastrophic to celery growers on muck soils, and we might not be able to produce celery in Michigan. So how does one rank the loss of 2,4-D versus the loss of Caparol? How do we

assess severe impact on one commodity group versus a minor impact across a broad range of commodity groups? The information in Table 5 is an attempt to rank the potential loss of selected pesticides on specific crop commodities. The number three denotes, respectively, the highest potential dollar loss to the state, the greatest potential to lose a pesticide, and the lack of any available alternatives. These three columns are then summed to create the final column. The highest total attained would be a nine and this would be attained if the dollar loss was > 50 percent crop value, the risk of loss was high, and there were no alternatives. Therefore, three of the herbicides, linuron, prometryn, and oxyfluorfen, are ranked somewhat higher because no alternatives are available.

In summary, the committee felt that onion growers, if they did not have Goal, carrot growers if they did not have Lorox, and celery growers if they did not have Caparol, would probably have great difficulty trying to grow these three crops in Michigan.

Disease Management: Present Situations and Future Trends

Some processors have voluntarily placed more stringent restrictions on the use of pesticides than those required by law as a precaution against sudden changes in public opinion or regulations.

Current farming techniques require fungicides to produce high quality, inexpensive food and fiber products. Fungicides help to bolster other plant disease management techniques such as plant resistance, cultural control, and biological control. A wide array of fungicides and bactericides is required to help manage the many pathogens that attack crops. The need for fungicides and bactericides to maintain the public food supply is somewhat at odds with increased public concern about possible adverse, "non-target" effects of fungicides on people, on wildlife, and on the environment in general. The goal of this summary is to describe the critical issues regarding availability and prudent use of fungicides and bactericides for the control of plant pathogens. Many of the issues concerning fungicides also apply to herbicides, insecticides, and growth regulators.

As an agricultural agent, I am frequently asked to explain the benefits and risks of agricultural chemicals to the consumer. We have seen that the public press has a tremendous impact on public opinion. In general, the most significant health and safety issue concerning the United States food supply is microbial contamination. However, the major issue of public concern regarding the United States food supply is pesticides. Growers and the agrichemical industry are rightly concerned that the regulatory decisions on the availability and use of pesticides be based on science rather than opinion.

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A fungicide or any other agricultural chemical may be withdrawn from the marketplace for a variety of reasons. The decision by a company to discontinue the production of an agricultural chemical may be simply be due to economical considerations. This is particularly true for minor (specialty) crops such as fruit and vegetables where the acreage and thus the potential for profit by an agrichemical company is small compared with major crops such as corn or soybeans. We should note that so-called minor or specialty crops are extremely important to Michigan where they accounted for 66 percent of the state cash receipts for all crops, according to Michigan Agricultural Statistics for 1992. Growers, agricultural chemical companies, the United States Department of Agriculture, and university specialists have joined forces to support the national IR-4 (inter-regional) program. The IR-4 program assists in the registration or re-registration of agricultural pesticides for minor crops where the profit margin is small.

An indirect cause for some agricultural chemicals to be withdrawn from use is pest resistance combined with a lack of pesticide alternatives. A prime example is benomyl, a fungicide that was almost miraculous in its control of diseases such as apple scab, Cercospora leafspot of sugarbeets, white mold of celery and many others. Pest resistance has rendered this fungicide nearly useless for many pathogens because growers had few alternative fungicides for rotation. Rotation of fungicides slows the development of resistance by plant

pathogens, thus allowing the use of specific fungicides for more seasons.

Many agricultural chemicals have been or may shortly be withdrawn from the marketplace because the hazard to human beings or the environment is deemed to be too great. Some chemicals are considered to be possible or probable carcinogens or considered to present toxicity hazards to workers or the environment. On a national level, fungicides are thought to be responsible for 60 percent of the estimated dietary risk from pesticides even though fungicides account for 7 percent of pesticide sales. Some processors have voluntarily placed more stringent restrictions on the use of pesticides than those required by law as a precaution against sudden changes in public opinion or regulations.

To focus on the hazards associated with the use of fungicides, we can be concerned with: 1) the residue on the plant product, 2) possible danger to agricultural workers, or 3) residue in the environment. If pesticide residue on the plant product is the major issue, of paramount concern is its persistence and the preharvest interval. The preharvest interval is the time between the last application date and the date of harvest.

The opportunities for reductions in fungicide usage differ for various crops and regions. The need for fungicides is greater in the eastern United States where the humid conditions favor plant diseases. I will draw upon tree fruit for specific examples, but the concepts are true for other plant systems. In the eastern United States apples are treated with an average of seven to eight fungicide sprays in a season. Cherries have an average of four fungicide sprays per season and for peaches the average is five. There is evidence that Michigan growers have in some cases reduced the number of fungicide sprays. For example, in 1980 the number of fungicide applications on Michigan apples was on the order of 15 sprays for the whole season. In 1986 the value was nine sprays, and for 1988 the average was eight sprays. These data have to be interpreted carefully because the reduction in the number of sprays over this time period was, in part, due to the adoption of new fungicides with systemic and longer residual activity.

In Michigan and most apple production areas, two major fungal diseases of apples and pears are sooty blotch and flyspeck. Sooty blotch and flyspeck are diseases in which the fruit develops an unattractive black skin. Fruit with sooty blotch or flyspeck symptoms cannot be sold as fresh fruit and are greatly devalued. Control of sooty blotch, flyspeck, and storage rots present a challenge for the management of pesticide residues. Infection of apple fruit by these pathogens and fungicide applications to control them usually take place from shortly after petal fall to harvest. The most effective fungicides for control of sooty blotch and flyspeck are ethylene bis dithiocarbamates (EDBCs), benomyl and thiophanate-methyl. As one would expect, fungicides applied shortly before harvest are most likely to appear on the harvested product.

The choice of management options for apples depends on the price for the final product. Apples can be sold for the fresh market, for processing (apple pies, applesauce, and the like) and for juice. Fresh market apples, average return to the grower of $0.25 to $0.40 per pound, are worth at least five times the same weight of apples sold for juice. Apples destined for fresh market sales must be nearly or totally free of blemishes from diseases, which requires a thorough disease management program under midwest weather conditions. The management options that are affordable for processing apples are much different than for an apple crop aimed at the fresh market. So, to determine the opportunities for reduction of pesticide usage, it is necessary to focus in depth on each production system.

In some situations we can substitute alternatives to pesticides, but in many cases the structure of the market for a commodity is the barrier. For example, for the Michigan apple market we deal primarily with five varieties: Red Delicious, Jonathan, Macintosh, Ida Reds and Northern Spy. These varieties are moderately to highly susceptible to scab, fire

blight, and powdery mildew, three common diseases in the eastern United States. Plant breeders have developed apple varieties resistant to several of these diseases. For example, apple varieties have been released with resistance to scab, rust, mildew, and fireblight. However, these new varieties are not acceptable to consumers because the quality of the new varieties is inferior compared to the standard varieties. To make matters worse, there is evidence that a new race of apple scab in Europe is able to attack some of the new "resistant" varieties. It is an on-going struggle to find alternatives to pest control chemicals.

Across the whole agricultural industry, the fungicides that are considered most at risk for withdrawal from registration are EDBCs (mancozeb), chlorothalonil, benomyl, thiophanate-methyl, and captan. The EDBCs, chlorothalonil, and captan are particularly prized because of their wide spectrum of activity and relatively low potential for pathogen resistance. Chlorothalonil, benomyl and/or thiophanate-methyl are crucial for the landscape ornamental, floriculture and Christmas tree industries; and chlorothalonil is very important to the turf industry. Captan is also considered to be very valuable for for the fruit and vegetable industries, and it is at risk for withdrawal from registration. Other compounds are highly important for individual crops, such as carboxin for loose smut on wheat crops. Less at risk for withdrawal from registration, the sterol biosynthesis inhibitor-type fungicides such as tridimefon, myclobutanil, propiconazole, and fenarimol have been very valuable to many plant producers. Also valuable are the systemic fungicides iprodione and vinclozolin. In many cases, there are few or no chemical substitutes for the fungicide at risk for withdrawal from registration. Sulfur and copper compounds are some of the oldest and least expensive fungicides still in use, but they are less desirable because of their phytotoxicity and long term effects on the underlying soil.

In the future we can expect to see a further reduction in the number of fungicides that are available to the grower. Plants will be developed with increased resistance to disease plus improved quality. Greater attention to cultural and biological control methods will help to reduce but generally not eliminate the need for fungicides. In the short run, the greatest potential for reduction of fungicide hazard to the consumer will be accomplished by better residue management close to harvest and by the development of processing techniques after harvest to remove residues.

Insecticide use on Minor Crops: Current Situation and Future Trends

Insecticide availability and use is rapidly being reduced primarily because of: 1) concerns about effects on the environment and human health, 2) high costs of registration and re-registration, and 3) insecticide resistant insect pests.

Insecticides have a long history of use for crop and animal protection and prevention of human diseases. Use of Paris green for control of Colorado potato beetle in 1867 was probably the first wide-scale use of insecticides for crop protection. Paris green, lead arsenate, and other insecticides were commonly used before 1940. Insecticide use dramatically increased with the introduction of DDT in the 1940s. Other chlorinated insecticides, organophosphates, and carbamates rapidly followed in the 1950s and pyrethroids appeared in the 1970s.

Insecticides dominate insect management systems because they are highly effective, inexpensive, easy to use, and reliable. However, insecticide availability and use is rapidly being reduced primarily because of: 1) concerns about effects on the environment and human health, 2) high costs of registration and re-registration, and 3) insecticide resistant insect pests. There are currently over 500 species of insects and mites worldwide that are resistant to insecticides or miticides (Figure 1). One of the earliest reports of insecticide resistance in Michigan was the discovery of insecticide-resistant onion maggots in 1956 by Dr. Gordon Guyer, now Director of the Michigan Department of Agriculture.

New pest management systems are based on integrated pest management (IPM) concepts

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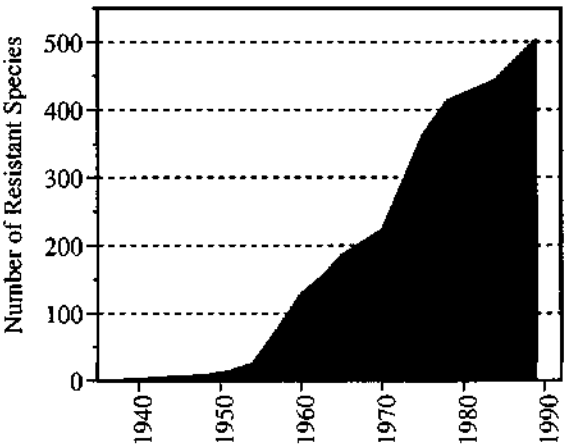

Figure 1. Number of Insect and Mite Species Resistant to Pesticides.

based on the use of multiple management tactics with attention to economic and environmental effects. This philosophy dates back to the mid 1970s. Michigan State University was one of the centers of development of IPM in the 1970s and 1980s and is still highly recognized nationally and internationally in this area.

Development and implementation of IPM is difficult because: 1) research is much more complex than pesticide research, requiring study of multiple biological and ecological factors, integration between disciplines, etc.; 2) use of IPM is also more complex, requiring more education and more intensive management than simple pesticide systems; and 3) demand for 100 percent perfect produce limits tactics that can be used.

Michigan potato growers are an excellent example of meeting the challenge of losing

Table 1. Control costs and yield losses due to Colorado potato beetle in Michigan potatoes from 1991 to 1993.

Year	Control Cost ($/A)	Yield Loss (%)	Acres	Total Loss (million $)	% of Gross
1991	124.55	12.2	47,000	15.17	19.9
1992	103.42	3.6	46,500	7.53	10.0
1993	119.62	6.0	48,500	10.53	13.4

pesticides. In 1991 the cost of control and crop losses due to insecticide-resistant Colorado potato beetles were estimated at $15.2 million (Table 1). They are now using a diverse array of tactics including crop rotation, propane flamers, trap crops, cover crops, crop monitoring, biological insecticides, and standard insecticides. In spite of even more resistance problems than in 1991, control costs plus losses in 1993 were significantly less, approximately $10.1 million. This management system is much more complicated than that used five to ten years ago and is still very costly. In addition, further increases in effectiveness and reduced costs will be required for long term competitiveness of the industry.

Effective management systems with reduced pesticide use can be developed, based on current knowledge and future research. All of us, including research, extension, government, producers, agribusiness, and commodity organizations, will need to work together to make it happen.

The Consumer's Perspective on Pesticide Use

Consumer attitudes can greatly affect government and business decisions regarding the use of agricultural pesticides. Understanding consumer attitudes can help government and businesses respond appropriately.

Consumer attitudes can greatly affect government and business decisions regarding the use of agricultural pesticides. Yet the public is often uninformed, misinformed, or distrustful of scientific judgements about the risks and benefits of pesticide use. Although public opinion is essential to democracy and free enterprise, scientific opinion is essential to the development of useful technologies. How can responsible government and business decisions result when public and scientific opinions clash? One step in the direction of more harmonious social decision-making is better understanding how consumers perceive the risks and benefits of pesticide use on foods. Such understanding will promote anticipation of public concerns and assist government and business in appropriately responding to them.

This paper presents some results of a survey of Michigan consumers' attitudes about the risks and benefits of agricultural pesticides. The survey was conducted in 1992 with over a thousand randomly selected Michigan households (van Ravenswaay et al., 1992). The survey results presented include what Michigan consumers think about the benefits of protecting crops from pests, whether chemical pesticides need to be used, the health risks to consumers from pesticide residues in food, and whether it is worth paying extra for foods certified to meet or exceed government safety standards for pesticide residues. The paper also examines the implications of these survey results for agricultural pest management in Michigan.

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Consumer Perceptions of the Benefits of Pesticide Use

When my colleagues and I began conducting focus groups with consumers, we found that when we asked about the health risks from pesticide residues in food, some consumers would say, "Well, you know, it's not that I see so much health risk; it's just that the farmers don't need to use those pesticides." This surprising finding led us to wonder why some consumers seemed to see no benefits from pesticides. Was it because consumers thought crops do not need to be protected from pests or because they thought there were other ways to control pests than to use pesticides?

As Table 1 shows, most Michigan consumers seem to agree that if plants and animals used for food were not protected from pests, food supplies, food quality, and food prices would be adversely affected. About 80 percent of our sample of Michigan consumers agreed with the statement that food supplies would decrease if plants and animals were not protected in any way from insects, diseases, or other pests. Over 75 percent agreed that food would not look as good if not protected from pests. Just under 70 percent agreed that the price of food would increase if crops were not protected. But about 20 percent disagreed that food supplies, quality, and prices would be adversely affected if crops were not protected from pests.

These results indicate that most Michigan consumers perceive benefits from protecting crops from pests, but not all Michigan consumers do. There is a diversity of consumer

Table 1. Amount of Agreement with Statements about the Effect of Pest Damage

Statement:

"If plants and animals were not protected in any way from insects, diseases, or other pests...."

Statement	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	Don't know/ refused
	Percent of Respondents				
...the supply of food available to me would decrease.	36.5%	44.3%	12.6%	5.4%	1.3%
...the food available to me would not look as good as it does now.	36.5%	39.7%	15.8%	8.1%	1.0%
...the price of food available to me would increase.	39.8%	29.3%	18.6%	10.5%	1.8%

N=1,003: Figures may not add to 100% due to rounding

opinion about the benefits of protecting crops from pest damage. Often, we talk about consumer attitudes as if every consumer had the same opinion. But with this kind of diversity, it is obviously unrealistic to expect that everyone will understand and support a single level of pest damage control in agriculture.

Although most Michigan consumers perceive some good reasons for protecting crops from pests, they do not necessarily perceive some good reasons for using pesticides. Table 2 shows that most Michigan consumers do not believe that pesticides are the only effective means for protecting crops from pests. Over 75 percent of our sample of Michigan consumers did not agree that pesticides are the only effective way to protect crops. This result suggests that most Michigan consumers do not see large benefits from using pesticides to protect crops. This result presents a major challenge to Michigan farmers in developing alternative pest control methods. If most of the Michigan public thinks farmers already have many effective alternatives to pesticides, there is likely to be little support for the research needed to produce these alternatives unless an effort is made to educate the public about the realities of pest damage control.

Even if most Michigan consumers think there are equally effective alternatives to pesticides, they still might support the use of pesticides to control pest damage if they believe pesticides are less costly. Table 2 shows that 56 percent of Michigan consumers agree that it is more expensive to use equally effective alternatives to pesticides, but a sizeable minority of Michigan consumers (34 percent) do not think the alternatives are more expensive.

This latter result indicates that more than half of Michigan consumers perceive at least some benefits from pesticide use in agriculture and that the main source of these perceived benefits is lower food costs, not differences in food quality. However, the question is still open as to whether these Michigan consumers think the benefits of using pesticides outweigh the

Table 2. Amount of Agreement with Statements About the Need for Pesticides to Protect Crops from Pest Damage.

Statement:

"There are many equally effective ways other than using pesticides to protect plants and animals from insects, diseases or other pests."

Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	Don't know/ refused
		Percent of Respondents		
32.7%	43.9%	12.3%	5.0%	6.2%

Statement:

"It is more expensive to use other ways of protecting plants and animals from pests than it is to use pesticide."

Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	Don't know/ refused
		Percent of Respondents		
20.8%	36.0%	19.6%	14.4%	9.2%

N=1,003: Figures may not add to 100% due to rounding

the risks. If they do, it is likely that they would support the continued use of pesticides. However, it is important to remember that the results also indicate that about a third of Michigan consumers see no benefits and are, thus, unlikely to support continued pesticide use in our State's agriculture.

Consumer Perceptions of the Risks from Pesticide Residues in Food

It is possible that some Michigan consumers regard agricultural pesticides as beneficial but not worth the risk. In this section we will look at what risks Michigan consumers perceive from pesticide residues in food over a lifetime. Then, in the next section we will look at whether they would be willing to pay more for food with reduced pesticide residues.

It is difficult to ask people about the perceived lifetime risks from pesticides. Risk is hard to define because there is little consensus about what it is in the scientific community, let alone among the general public. But even with a fairly clear definition of lifetime risk, it is difficult to measure risk perception because households differ in terms of their exposure and susceptibility to pesticides. For example, some people eat a lot of fresh fruits and vegetables and have healthy lifestyles and others do not. Some people are worried about allergies, some people about cancer. Some families contain young children and others do not. People also differ in what they do to reduce or avoid pesticide residues in food. As Table 3 shows, 62 percent said they rinse with water, and a sizeable minority said they wash with soap and

Table 3. Response to Question About Actions Taken to Avoid Pesticide Residues

Question:

"Is there anything you usually do to reduce or avoid pesticide residues in your food?" (open-ended)

Action	Percent of Respondents
Rinse with water	62.1%
Wash with soap and water	16.7%
Grow my own fresh produce	10.1%
Cook food well	5.3%
Read labels	5.0%
Buy organic products	2.4%
Buy domestic produce only	2.0%
Other	8.1%
Nothing	13.1%
No answer/refused	0.5%

N=1,003: Column does not sum to 100% because respondents could give more than one answer.

water or grow their own food. So designing a question that yields accurate estimates of peoples' perceptions of the lifetime risks from pesticide residues is very difficult and took quite an effort.

Because of the difficulty of designing a good question on risk perception, let me briefly explain the design we developed. The question we asked people was, "Suppose someone from a household like yours did nothing to reduce or avoid pesticide residues in food. What do you think the chances are that someone from that household will have a health problem some day because of pesticide residues in food?" This is very specific wording. The phrase "from a household like yours" is included so that a respondent is encouraged to think about risks only to people with diets, health habits, and lifestyles similar to his or her own rather than risks across the general population. The phrase "who did nothing to reduce or avoid pesticide residues in food" is included so that a respondent is encouraged to think about risk in the absence of an action that he or she may currently take to reduce residues. These phrases are more likely to reveal the risk perceptions that are relevant to an individual's own lifestyle circumstances but in a exposure setting that is consistent across households.

First, we asked respondents to give qualitative answers to this question. For example, respondents could state that there was no chance of that person having a health problem someday because of pesticide residues in food or that the health problem was very unlikely, somewhat unlikely, very likely, or certain to occur. We also gave respondents the opportunity to express how sure they felt about

Table 4. Response to Question about the Health Risk from Pesticide Residues

Question:

"Suppose there were a million people from households like yours who did nothing to reduce or avoid pesticide residues in food. What do you think the chances are that a person from one of these households would have a health problem someday because of pesticide residues in food?"

Chance of Health Problem	Percent of Respondents
No chance	2.4%
1 in a million	4.1%
1 in 100,000	14.1%
1 in 10,000	23.0%
1 in 1,000	22.8%
1 in 100	10.8%
1 in 10	8.4%
Certain to happen	8.2%
Don't know/no answer	6.3%

N = 1,003: Figures may not add to 100% due to rounding

their answer. Then we told respondents that we wanted to get a better idea of what they meant by their qualitative responses and asked them the same question, but with a request for a quantitative estimate of the chance of a health problem. The format of the question is shown in Table 4.

The results in Table 4 show a large diversity of opinion among Michigan consumers, but the majority perceive relatively small lifetime risks from pesticide residues in food. Two thirds perceive lifetime risks of having *any* type of health problem because of pesticide residues as being less than a National Academy of Science estimate of lifetime risk (5.8 in 1000) of having cancer from pesticide residues (NAS, 1987). Twenty percent perceive *lifetime* health risks to be lower than the Environmental Protection Agency's worst-case estimate of *annual* cancer risks from pesticide residues (i.e., 2.4 in 100,000). Over 25 percent perceive extremely large lifetime risks from pesticide residues on the order of 1 in a 100 or more.

To find out what type of health problem Michigan consumers associated with pesticide residues, we asked an open-ended question. This means we did not give respondents answer categories to choose among. We said "Suppose someone from a household like yours had a health problem some day that resulted from the current level of pesticide residues in food. In your opinion what would the health problem likely be?" The results were very surprising. As Table 5 shows, only 55 percent of respondents said cancer. A range of other health problems such as gastrointestinal, allergies, and respiratory problems were mentioned, albeit by small percentages of

Table 5. Response to Question about Health Problems Associated with Pesticide Residues

Question:

"Suppose someone from a household like yours had a health problem someday that resulted from the current levels of pesticide residues in food. In your opinion, what would the health problem most likely be?" (open-ended)

Type of Health Problem	Percent of Respondents
Cancer	55.1 %
Gastrointestinal	6.8 %
Allergies	6.1 %
Respiratory	4.8 %
Other	11.9 %
Nothing	1.9 %
Don't Know/Refused	13.5 %

N=1,003: Column does not sum to 100% because respondents could give more than one answer.

respondents. This result indicates that we make a serious error in communicating only about cancer risk of pesticides to the public. There are a wide range of health concerns associated with pesticides, some of which involve immediate and acute health effects.

Risk Versus Benefit

So far we have found that most Michigan consumers perceive small benefits and small risks from agricultural pesticides, but with sizeable minorities holding rather different views. The question now is whether Michigan consumers perceive the benefits that they get from pesticides outweigh their risks. We do this for fresh apples, a food most Michigan consumers purchase. If perceived benefits outweigh risks, Michigan consumers would not be willing to pay more for apples with reduced pesticide residues.

About 90 percent of respondents said they buy fresh apples, and those who did were presented with apples that were either the same as those they regularly bought or that were the same but had one of the following two labels: 1) no pesticide residues above federal standards and 2) produced without pesticides. About half of the respondents received the first label and half received the second. All respondents were told that the labeled apples were tested and certified by the federal government, so we refer to the labeled apples as certified apples in the discussion below. Most respondents reported that they believed the labels would give them a significant level of risk reduction, but the amount was about the same for each label.

After being told the price per pound of the regular and certified apples, respondents were asked how many regular and certified apples they would buy on a typical food-shopping occasion in the fall. Different respondents were given different price combinations. Some received the same or very similar prices for the regular and certified

Table 6. Response to Question on Purchase of Apples Certified to Meet Two Different Types of Pesticide Residue Standards

Question:

"Now suppose you could also buy apples of your usual variety that have been tested and certified by the federal government to have no pesticide residues above federal standards [split sample received "to have been produced without pesticides"]. Fresh fruits other than apples are not certified. The certified apples are $__ per pound compared to $__ per pound for the regular apples (blanks filled in with one of forty price combinations). Would you buy certified apples, regular apples, some of both, or none at all?"

Type of Apple	Sample receiving "certified to have no pesticide residues above federal standards" (N=496)	Sample receiving "certified to have been produced without pesticides" (N=465)
	Percent of Respondents	
Regular Apples Only	22.6%	22.1%
Certified Apples Only	58.9%	58.9%
Some of Both	12.1%	11.8%
None at All	4.8%	5.8%
Don't Know/Refused	1.6%	1.3%

(Sample of 1,003 split between two different certification standards)

apples. Other received large price premiums for the certified over the regular apples. For example, we gave some respondents $0.79 per pound for regular and $0.89 per pound for certified apples. Here the price differential was $0.10. But some respondents got certified prices that were $0.20, $0.30, $0.40, and $0.50 higher than the price of regular apples.

Table 6 shows the percentage of respondents saying they would buy only regular apples, only certified apples, some of both, or none at all for all price combinations. The comparison of the two labels without considering prices is valid because the percentage of respondents getting each price combination was the same for each label. In each case, over half of the respondents reported that they would buy certified apples instead of regular apples. The percentages buying certified would be different if we had used different prices, so the percentages are useful only for evaluating the proportion of respondents purchasing certified apples for the set of prices we considered. However, a more general result is that we found virtually the same results for each label. The value of knowing that residues meet federal standards appears to be about the same as the value of knowing that the apples were produced without pesticides. This is consistent with the finding that each label was perceived to reduce risks from pesticide residues about the same amount.

Tables 7 and 8 show that the size of the price difference between regular and certified apples has a large negative effect on the percentage of respondents saying they would buy

certified. Table 7 shows the effect of price differences on purchases of apples certified to have no pesticide residues above federal standards. Table 8 shows the effect of price differences on purchases of apples certified as produced without pesticides. The result is about the same in both tables. When the price difference was $0.20 or less, about seventy percent of respondents chose certified over regular apples. When the price difference was $0.30 or more, only half choose certified.

These results tell us that most Michigan consumers do not believe the benefits they get from pesticide use in apples outweigh the risks. But the difference is not so great that consumers are willing to pay a lot more to avoid residues in apples. However, most consumers value knowing that residues meet federal standards almost as much as knowing that no pesticides were used. This result suggests that most, but not all, consumers may support some use of pesticides so long as there are guarantees that federal standards are being met.

Finally, although we did not look at consumer acceptance of pest damage on apples in the Michigan survey, we have examined it in a survey we conducted nationally (van Ravenswaay and Hoehn, 1991). In that study we found that consumers accept very small levels of pest damage on certified apples but not on regular apples. Worm holes and similar damage were unacceptable in either case. But a blemish not exceeding about 3% of the surface area of the apple was acceptable in the case of certified apples. Consumers apparently put a high value on controlling pest damage. However, as the Michigan survey shows, they probably would not tolerate much pest damage on certified apples because most believe there are equally effective alternatives to pesticides available to farmers.

Summary

It is important to understand consumer attitudes about pesticide residues in food because they can greatly affect government and business decisions about pesticide use in agriculture. Our survey of Michigan consumers shows a great diversity. Most believe pests are a problem, but only 56 percent see benefits from using pesticides to deal with it. The rest either think there are no pest problems or that there are already equally effective and economical alternatives to pesticides.

Most Michigan consumers perceive small risks from pesticide residues, but a sizeable minority perceive very large risks. The health problems of concern is not just cancer. There are a wide variety of health problems associated with pesticide residues, many of which involve acute and immediate health effects such as allergies.

Most Michigan consumers are willing to pay a little bit more for apples to reduced health risks from pesticide residues. Most value knowing that residues meet federal standards about the same as they value knowing apples were produced without pesticides. Only a small amount of pest damage on apples would be tolerated if reduced pesticide residues were guaranteed.

The survey results tell us that Michigan consumers want and are willing to pay for some reduction in pesticide residues on their food. However, there is quite a diversity of opinion among consumers about the risks and benefits of pesticides, so it is unlikely that a single approach to pest management is likely to please everyone. Multiple approaches are needed to serve the different segments of the consumer market. This could be achieved by labeling products that have been certified and tested to meet different standards of pesticide residue. The results here suggest that meeting the current federal standards has as much market potential as producing food without pesticides.

There is also a great diversity among Michigan consumers in terms of what they think it is likely to cost to reduce pesticide residues, and that probably influences what they think is fair in terms of higher food prices. Most Michigan consumers believe there are equally effective alternatives to pesticides. Over half think these alternatives are more costly. Thus, the majority of Michigan consumers would likely support research to develop new pest

Table 7. Effect of Price Difference on Willingness to Purchase Certified versus Regular Apples:

APPLES CERTIFIED TO HAVE
NO PESTICIDE RESIDUES ABOVE FEDERAL STANDARDS

Type of Apple	Price difference between certified and regular apples: $0.20 or less	Price difference between certified and regular apples: $0.30 or more
	Percent of Respondents	
Regular Apples Only	16.8%	30.4%
Certified Apples Only	71.1%	48.5%
Some of Both	8.4%	15.2%
None at All	3.2%	4.4%
Don't Know/Refused	0.5%	1.5%

N=496

Table 8. Effect of Price Difference on Willingness to Purchase Certified versus Regular Apples:

APPLES CERTIFIED TO HAVE BEEN PRODUCED WITHOUT PESTICIDES

Type of Apple	Price difference between certified and regular apples: $0.20 or less	Price difference between certified and regular apples: $0.30 or more
	Percent of Respondents	
Regular Apples Only	16.1%	26.7%
Certified Apples Only	68.3%	50.3%
Some of Both	9.1%	14.1%
None at All	4.8%	8.4%
Don't Know/Refused	1.6%	0.5%

N=465

management strategies and investments to reduce pesticide residues even if food costs increased slightly. But some Michigan consumers believe there are no pest problems or that there are already equally effective and economical alternatives to pesticides. These consumers present Michigan farmers and agricultural researchers with their biggest challenge.

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Row Crop Interactive Working Group

The question shouldn't be whether to reduce pesticide use, but rather, to reduce pesticide contamination and their associated negative impacts through education, leadership, and cooperation of interested parties.

Each member of the group introduced themselves and where they were from or what organization they represented. A discussion began on the actual versus perceived hazards of pesticide use; that pest control is not necessarily pesticide control, and the economic viability of organic farming. After these issues were discussed, the group focused on the task of determining the top three pest management needs facing row crop growers.

PEST MANAGEMENT NEEDS

The group members gave inputs on pest management needs in the state. After some lively discussion, each member of the group cast three votes for what they considered to be the most important issues. These numbers are included in the parentheses following the numbered item. Some items were not voted on because the group decided they could be included in another category such as technical assistance or research alternatives. Accordingly, the thirteen pest management needs identified in descending order of importance are:

1) Continuing research/demonstrations into pest management alternatives. These alternatives include biological controls, and alternative pest management (cultural, changing pesticides) for weed control in navy beans, sugar beets, specialty beans, etc. (12)

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2) Education on pesticide issues (12)

3) Develop better community/grower group linkages, especially at the commodity/commodity dealer, agricultural industry, seed industry level, as well as grower linkages for technology transfer and adoption (9)

4) Profitable production (7)

5) Understanding the underlying principles of chemical interactions with the environment (5)

6) Disease resistance in dry beans for white mold. Breed for resistance, alter row width, varieties, etc. Disease resistance in small grains for scab, rust, powdery mildew (3)

7) Herbicide resistant weeds/weed seed banks (2)

8) Lack of technical assistance. While education/newsletters are available, their timeliness is crucial (2)

9) Lack of pesticides registered on minor use crops (1)

10) Decreased herbicide use in all crops (0)

11) Re-registration of 2,4-D (0)

12) Herbicide tolerant crops; increase use of environmentally "safe" herbicides (0)

13) Control of pesticides that leach (0)

The top three pest management needs facing row crop producers were 1) continued research in pest management alternatives, 2) education of the public on pesticide benefits

and risks, and 3) establish a better grower/community technology transfer program. The first issue was discussed by the group as a whole and the worksheet completed by the group. The issues of pesticide benefits and risk and technology transfer were then addressed by individual group members filling out a worksheet on the issue they were most interested in and turning the worksheets in to the moderator. Five worksheets were turned in on research alternatives, nine worksheets were received on pesticide benefits/risk, and six were returned on technology transfer. The discussion of each of these issues below is a summary of the collected worksheets and/or group discussion.

1. Continued Research into Pest Management Alternatives for Row Crops

   Growers: Communicate needs to the Michigan Agricultural Experiment Station; cooperation among different groups--university, chemical companies, etc.; responsibility to evaluate/be aware of research to implement; enroll in SP53 and other programs; participate/on-farm involvement; active research participation.

   Commodity Group: Funding; promotion; evaluate research; encourage participation of growers by demonstrating alternatives; speak out on behalf of individual growers; integrate across commodities.

   MAES: Listening to the growers; be aware of needs; identifying research needs based on clientele inputs; non-pesticide demonstrations.

   MSUE: Education (farmers, dealers, public); encourage farmers to publish (somehow) results of research; liaison between growers and researchers.

   MDA: Monitoring impact of different practices; regulatory functions; encourage adoption of/research into alternatives; funding; direct assistance (re: alternatives) to farm level.

   MDNR: Funding special projects; document improvement to environment; "watchdog;" flexibility in regulations; assess results of research; monitoring; assessing progress; establishing baselines.

   SCS: Technical assistance to grower in implementing research; promote minimum till and not continuous no-till, promote rotations.

   USEPA: Funding demonstration projects; communication; go back to roots of FIFRA.

   ASCS: Funding; full implementation of integrated farm management plan; program flexibility.

   Pesticide Manufacturers: Receptive to new areas of research and operation; education; funding research; developing pesticides that are more environmentally friendly; diversify into crop insurance.

   Food Processors: Question cosmetic standards

   Consumer/Public Interest Groups: education

2. To Educate the Public on Pesticide Benefits and Risks

   Growers: Don't be defensive, be proactive; responsible management practices; know the facts of pesticide use; communicate the facts to neighbors and community; be proponents of low rates, containment precautions, etc.

   Commodity Group: Have a spokesperson for pesticide issues and develop a mass media education program; provide materials to consumer interest groups; fund educational programs; work with key legislators; promote field days to key public people in the community; promote the safety of their commodity.

   MAES: provide technical information for educational programs; fund efforts to quantitate benefits of pesticides; fund research on pesticide alternatives; ensure environmental soundness is a key component of MAES funded research; determine where the levels of pesticide residues are for human consumption.

MSUE: Funding for education; key people identified; assess public education needs and then develop and implement education programs targeted at the non-agricultural community. These programs should be developed in cooperation with other groups to narrow the gap between perception and reality regarding pesticide risks - show where news can be inaccurate; assess grower needs and develop education programs on the facts of pesticide use; train the growers and agriculture businesses to teach others the facts on pesticide use and how to tell the facts to the community; form coalitions between the agricultural community and public consumers; increase the timliness of the information.

MDA: Funding support to MSUE for education; provide technical assistance to MSUE including the regulatory framework and endorse the programs; actively support "Right to Farm."

MDNR: Talk about the benefits and what farmers do to steward the environment; fund these programs; present the government perspective to regulations pertaining to chemical and fertilizer use on land; be an advocate for agriculture; provide reasonable and rational judgement in enforcement of pesticide legislation. Refrain from smugness and communicate rationally with interested parties the risks/benefits of pesticide use.

SCS/ASCS: Spokespersons identified for issue; support programs by providing technical assistance and advertising them; tell the story of practices adopted by farmers to ensure good soil stewardship and responsible use of pesticides.

USEPA: Consider benefits and risks; reduce red tape; change public image to instill confidence that EPA decisions protect food, consumers, and the environment; inform audiences of the time and care taken in ensuring thorough regulatory review for registration and reregistration of products; provide a national perspective to innovative research pertaining to agriculture.

Pesticide Manufacturers: Credibility on this issue is questionable; educate groups on benefits of pesticides; provide knowledge base and funding for education at the grower and non agricultural community level; emphasis on safe use of products oriented to the general public.

Food Processors: Attend programs; inform consumers of their criteria for food safety - be advocates for safe food with pesticide use.

Legislature: Summer bus tour for education; Talk to members of Congress to facilitate a major revision in the Delaney Clause to eliminate zero risk and adopt negligible risk/benefit assessments; no involvement; remove the barriers to funding research alternatives to pesticides; pass legislation to fund education programs; regulate news people so dissemination of false information is a crime.

Consumer/Public Interest Groups: Summer bus tour for education; attend programs targeted at these groups; establish the link between the scientific community/academia and the environmental groups/general public; provide a balanced perspective of a world with and without pesticides.

3. Establish Grower/Community Technology Transfer

Growers: Share information/provide assistance to other growers in the adoption of new technology; talk and listen to consumers.

Commodity Groups: Support linkage groups, set up model groups to look for markets for products produced by alternative techniques.

MAES: Target research needs of grower groups; listen to consumers.

MSUE: Support/encourage farmer to farmer transfer - innovative farming groups; think systems research and not by crop; increase timliness of information - current technology transfer is outdated.

MDA: Encourage formation of groups; certify organic growers.

MDNR: Flexibility in regulation on a demonstration basis; be more interactive with agriculture; assist MDA in assessing management practices that relate to environmental fate.

SCS/ASCS: Encourage participation and adoption of new technologies; fund alternative practices; more integrated farm management plans.

USEPA: Visit farms including alternative farms.

Pesticide Manufacturers: Find niches to serve customers.

Food Processors: Accept produce produced with alternative technologies; producers should be partners with food processors.

Legislature: Pass organic standards; visit farms.

Consumer/Public Interest Groups: Participatory learning; provide direction and open dialogue; visit farms.

OPPORTUNITIES/BARRIERS

Opportunities

1) Reduction in pesticide use by scouting - this is already implemented in many instances
2) Increase prices of chemicals/chemical cost economics
3) Do more banding; new IPM approaches
4) Implement models and predictors of economic losses
5) Start reducing chemical use on own before it is mandated
6) Creative rotations
7) Resistant seed selection/population
8) Potential to reduce use due to technology application changes, i.e., sprayers, precision pesticide placement
9) Utilization of effective adjuvants to make post emergence pesticides more effective
10) Formulate pesticides that are non-leachers
11) Plant cover crops to change pest management
12) Biotechnology for long-range changes in pest management
13) Increase adoption of IPM programs and no-use of pesticides
14) Decrease or increase row width
15) Change pesticides to those with less lb of active ingredient per acre
16) New markets that encourage reduced use
17) Use non-chemical controls (flaming, ditching, etc.)
18) Farm programs (efficiency programs)

Barriers

1) Limited arsenal of materials for certain pests now
2) Implementation of trying to switch system
3) No organic standards or no use
4) Economic incentive for manufacturers to ignore alternatives
5) No system to give voice to alternatives
6) Cosmetic standard
7) Farm programs
8) Farm size/higher management input
9) Economics
10) Unwillingness of farmers to change methods
11) Economic risk/cash flow
12) Lack of funding/experience--research and Extension
13) Net vs. gross returns
14) Consistency of pest control (may be jeopardized by reduced use)

15) Reduced use may mean more intense labor

16) Reduction of pesticide use may interfere with programs designed to reduce soil erosion

17) Herbicide carryover of newer pesticides - damage to rotation crops

18) Pest resistance may increase

19) Lack of political clout, growers on defensive

20) Farming in Michigan on clay loam soils increase pest pressure

21) Acceptance of pest thresholds (where available)

22) Weather impacts on crop growth

23) No rewards to pesticide use risk takers

24) Need for simplicity of farm programs

25) Mind set

Technologies/incentives used to implement pesticide use reduction were discussed with the following identified as most important:

1) Risk based tax

2) Change farm program

3) Better application technology/equipment

4) Development of more effective adjuvants and their introduction into the distribution system

5) Site specific farming

6) Effective farmer groups

Far greater discussion, however, was generated on the logistics of implementing a reduced pesticide use program. These included:

1) Reduce pesticide use from what baseline? We have no baseline in Michigan. Some information is available on Restricted Use Pesticides (RUP) but these change with time. Pesticide use in Michigan is not currently measured.

2) Is not the "judicious use of pesticides" the better goal? Examples would be applications of safer pesticides, non-leachers, incorporation of other techniques listed previously to apply pesticides judiciously only when needed.

3) Should not the question be reduced risk and not reduced use? Reduced use may not improve the environment.

The group summarized the discussion with the following statement:

The question shouldn't be whether to reduce pesticide use, but rather, to reduce pesticide contamination and their associated negative impacts through education, leadership, and cooperation of interested parties.

THE NEXT STEPS: WHO WILL PROVIDE LEADERSHIP?

Every group that has to do with agriculture has the responsibility. Therefore, they all need to provide leadership.

1) Commodity groups need to take the leadership to say that the mandate to reduce pesticide use is not needed.

2) A mandate is needed to establish public reaction regarding the use of pesticides.

3) Leadership is needed for the critical task of developing a baseline for pesticide use before pesticide reduction can be tracked.

4) It is agriculture's responsibility to get the message to MDNR that reduced pesticide use may not be the correct goal.

5) While MDA is the lead agency with respect to pesticide use issues under FIFRA, they also interact/cooperate with MDNR on water quality issues related to pesticide use.

Tree Fruit Interactive Working Group Report

There is a need to develop more and better IPM technology. This should entail both maintaining currently available IPM tools and increasing IPM research to develop new ones.

Mark E. Whalon, Professor, Michigan State University Department of Entomology, chaired a large working group to address pesticide use issues related to tree fruits. Dr. Whalon asked the group to focus initially on **tree fruit commodity needs related to pesticide use** issues. The following items were identified as issues:

1. Implementation of IPM must be expanded. This expansion should include involvement and development of good working relationships with regulators in order to achieve workable regulations that allow IPM implementation.
2. The number and scope of on-farm IPM demonstrations must be increased.
3. Current research and education addressing resistance management needs to be expanded.
4. There is a need to develop more and better IPM technology. This should entail both maintaining currently available IPM tools and increasing IPM research to develop new ones.
5. There is a need to increase the accuracy of the public perception of pesticides and their uses. One aspect of this may be through industry people improving their public relations by communicating more effectively reasons for pesticide use and pesticide residue findings.
6. There is a need to consider various dimensions of pesticides and their use. At a minimum, these dimensions must include quantity, risk, reliance, environmental quotient, and reduction. Source reduction strategies should be expanded. This will likely require developing incentives to 7reduce pesticide use.
7. Fruit quality issues related to pesticide use must consider standards, tolerances, and thresholds.
8. Improved application technology is needed. It must be cost-affordable and must effectively minimize drift.
9. The pesticide registration process must be streamlined. One outcome would be to increase the availability of biological pest management tools. Streamlined registration is also necessary for U.S. growers to deal effectively with phytosanitary and residue barriers as well as other issues that may arise under the North American Free Trade Agreement (NAFTA) and/or the General Agreement on Tariffs and Trade (GATT). Other interrelated factors include methyl bromide and worker safety.
10. A major area of concern is the actual and projected loss of alternative pesticides.

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11. Pesticide use issues should be considered within a context that also places strong emphasis on maintaining economic viability and fruit quality as well as maintaining the advantages of the free enterprise system in the United States.
12. Worker safety is an important factor.
13. More work is needed with disease problems and fungicides. This should include additional work on models that help determine good opportunities for pesticide reduction. It should also encompass the continuing development of resistant varieties of plants.
14. Maintaining international competitiveness is critical. The full impact of NAFTA and GATT policies on pesticide use is still not known.
15. Alternatives for methyl bromide are needed.
16. There is a need to develop more complete and specific information about the environmental effects of pesticide use, including both water quality and non-target organisms as well as the human effects of pesticide use on both farm workers and food consumers.
17. Development of more affordable weather monitoring equipment would enable growers to fine-tune their IPM practices.
18. Research and education are needed to better understand and then communicate the relationship between postharvest residues and use the of IPM practices.
19. Efforts must be made to increase consumer willingness to fund IPM.
20. More public education is needed about agriculture for consumers, government, regulators and environmental groups.

From this long list of issues the working group members agreed that the **top three priorities** were: 1) IPM, 2) Public Relations/Education, and 3) Regulatory Process.

Dr. Whalon called for consideration of **opportunities to reduce risks from pesticide use.** The following opportunities were identified:

1. Improve application equipment; speed of application = reduced application.
2. Increase research on alternatives to pesticides. Specifically the EBDC fungicides and organophosphate pesticides.
3. Develop more affordable weather monitoring equipment.
4. Implement what is already available; this includes available tools, techniques, products and practices.
5. Develop economically viable scouting programs or services and provide training for the people who staff them.
6. Examine the effects of rain and sun on residues; when is it necessary to re-spray?
7. Broaden IPM efforts to all fruit commodities.
8. Apply bio-technologies to tree fruit pest management.
9. Begin to change public perception of biotechnology.
10. Increase awareness of the dynamic nature of pest management; it is a biological system and thus always changing.
11. Seize the opportunity to work cooperatively toward common goals among commodity groups and other interested parties.
12. Improve preplanning and joint exploration of alternatives.
13. Relax standards for fruit quality regarding processing and color.
14. Explore the potential for irradiation.
15. Anticipate and become more proactive regarding regulation.
16. Increase consumer confidence.

17. Expand the use of disease resistant varieties.

Along with opportunities come barriers. Working group members identified the following **barriers to reducing risk from pesticide use:**

1. Promotion and education are very expensive.
2. It is a challenge to bring together and involve all groups involved in marketing commodities.
3. Product quality versus minimizing pesticide use becomes a Catch 22 for producers and distributors; if the product isn't marketable, all efforts to reduce pesticide use are for naught.
4. Standards have not always been consistently applied. This makes appropriate pesticide use decisions much more difficult.
5. Increased global competition is placing U.S. growers in more direct competition with their international counterparts who have fewer pesticide regulations to deal with, and this is reducing profit margins.
6. Large and critical gaps still exist in the knowledge needed to conduct effective IPM in many tree fruit crops.
7. We lack adequate information regarding economic thresholds. Some of this information should come from consumers and from pest management workers.
8. The perennial nature of tree fruit crops presents barriers of being locked into earlier decisions.
9. There are not enough trained IPM scouts.
10. For many crops, we still lack a complete IPM system approach; we have only pieces.
11. Agriculture, as a whole, lacks an effective advocacy group.
12. No central information clearinghouse exists.
13. Public advocacy for environmentally favorable agriculture does not exist. Agriculture and environmental concerns are often seen as being lower in priority than other concerns within an individual organization or industry.
14. Low prices to growers make change and innovation more risky.
15. A public persuasion system is lacking.
16. Agriculture has lost credibility with many consumers.
17. There is no effective consumer advocacy group to support moderate and gradual agricultural production changes.
18. Government regulation has produced overkill in some areas.
19. The cost of transition to IPM may be more than some producers can bear.

With no shortage of ideas from which to work, members identified these as the **next steps** that should be taken:

1. Develop an agricultural, environmental agenda.
2. Seek funding to expand IPM from commodity groups, growers, and processors while working for increased grower commitment to IPM.
3. Investigate public user fees as a funding source.
4. Develop a long-term commitment to IPM from commodity groups, university, processors, shippers and growers.
5. Achieve widespread implementation of currently available IPM tools and practices.
6. Expand funding for IPM research.
7. Improve overall coordination.
8. Reallocate existing resources to maximize effectiveness.
9. Investigate the use of AP116 funds for IPM.

10. Investigate additional sources for IPM funding.
11. Establish an IPM advisory board, including environmentalists and health activists.
12. Develop local IPM support.
13. Improve relations with environmental groups; coordinate funding efforts to meet goals shared by environmentalists and agriculturists.
14. Develop well-trained IPM scouts.
15. Request more funding from USDA for SP-53 type programs.
16. Educate ALL growers about the benefits of IPM.
17. Reexamine federal cost-share programs.
18. Increase the priority of public agricultural education.
19. Coordinate these priorities and develop an advocacy coalition.
20. Coordinate public relations efforts across agriculture.
21. Agriculture should take the lead in developing public relations efforts with a coalition across all groups--commodity groups, etc.
22. Define the agenda and coalition of agricultural industries.
23. Improve the credibility of agriculture by including DNR and environmental groups.
24. Join the national coalition for IPM efforts.

Small Fruit Interactive Group Report

Growers are being forced to change the way they use pesticides without being provided with the know how to do it. How can growers modify their practices if they haven't been shown a better method?

GROUP MEMBERS

Tom Bodtke, Duke Elsner, Kathy Fetter, Roy Klaviter, Fred Poston, Don Ramsdell, Chris Rajzer, Bill Shane, Jim Thompson, and Gary Van Ee.

Ten representatives from the small fruit industry, regulatory agencies, and Michigan State University met on February 23, 1994, to discuss pest management for small fruit needs as part of the Agricultural Summit I. Crops under small fruit included: blueberries, grapes, strawberries, and brambles. Many of the points discussed by this group were of a general nature and would apply to other agricultural areas.

IDENTIFICATION OF CRITICAL ISSUES

Eight critical issues were identified that directly or indirectly affect the use of pesticides by the small fruit industry. The list is a consolidation of 13 issues initially identified by the group.

1. Communication

Health Issues to the Public

Major point: There is a strong need to communicate the health benefits of small fruits and other foods. The public needs to be aware that the issue of microbial toxins in contaminated food needs to be considered in balance with pesticide residues.

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Additional points: The resources are available for a strong effort to comunicate health issues. The health departments can work with MSUE and others to get the information to the consumer. We have to work together. Instead of bashing inflammatory journalists, we should find a way to work with them.

Urban - Rural Interface

Main point: Expanding populations has made pesticides, nutrients, and farm-related odors a critical issue. People from urban backgrounds may have more concerns than people from a farming community. There is a need to help people with urban background understand what a farming operation requires. Also, there is a need to work with growers who have been farming for many years and feel that they shouldn't have to change.

Additional point: Part of of the issue is due to public perception that agricultural chemicals are hazardous to health. The perception is not necessarily based on understanding. Why do they believe what they do? Media.

Easy Access to Information

Main Point: Growers need to have a ready and reliable source of information on pesticides, regulations, and all aspects of farming.

Additional point: As farmers lose familiar chemicals and shift to unfamilar ones, they need to have a ready information source that tells them exactly what they can and can't do and the effects of the chemical. Many times the information is not available in time to address the problem. The issue falls back to harmonization and consolidation of regulations so that the grower need call only one agency.

Growers are skeptical about the weight of evidence for pesticides problems. Farmers are willing to change practices, but they don't want to do it for a problem that doesn't exist.

2. Lack of Weather and Pest Information

Main Point: Growers face a lack of pest, disease, and weather information on both a farm and regional level. This issue is in part a communication problem. In some situations the pertinent information may be known by a few in the region but is not communicated to the grower in a timely fashion. In other cases, insufficient research or insufficient weather information is available to guide pest management activities properly.

3. Profitability to Grower

Major point: Opportunities for pesticide reduction depend on profitability. Marketing of food is increasingly becoming a global issue. For example, Chile is becoming a blueberry competitor; Washington state is a now a major grape competitor. Growers are willing to put up with any regulation or special requirements of the processor as long as there's a profit. The current profit margin is small so growers can be regulated out of business.

Additional points: Growers are being forced to change the way they use pesticides without being provided with the know how to do it. How can growers modify their practices if they haven't been shown a better method?

4. Loss of Pesticide Registrations, Few New Registrations

Main point: Farming has become precarious for many crops, including small fruit, because the number of registered pesticides is becoming smaller as existing pesticides are not being re-registered and few new pesticides are being registered.

Additional points: United States agriculture has become very specialized. The risks involved in the reliance on a few pesticides is greater because the United States food supply is based on a few crops. Many crops (corn, wheat, etc.) are down to a few varieties.

5. Harmonization and Clarification of Regulations Among Agencies

Main point: Growers need specific directions from government and other agencies. If agencies could present a unified voice, farmers would respond. There is a need for coordination of agencies and regulations. Regulations need to be clearly and succinctly spelled out.

Additional point: The Right-to-Farm legislation is a step in the right direction. It will require work at the federal level. The group discussed the formal codification or creation of an agriculture ombudsman's office.

6. Dealing with Increasing Farm Labor Regulation and Increased Liability

Main point: Growers need additional help in complying with regulations to deal with farm labor.

Additional points: Many of these problems exist because agriculture has gotten so specialized. The smaller farmer cannot afford the man hours and/or professional assistance that is needed to keep current with farm labor regulation.

7. Deterioration/Reduction of Basic Extension Services for Traditional Agriculture

Main point: If the MSU Extension agent can't provide specialized information, where does a farmer go for answers? The questions growers face on all levels are becoming more complex, yet there is not a corresponding increase in information available from MSU Extension.

8. Developing Commodity Groups Unity

Main point: Some commodity groups have divisive components (e.g. processors versus

growers) which impares the ability of the industry to move forward on important issues.

PEST MANAGEMENT NEEDS FACING THE COMMODITY GROWERS

The group determined that the top three needs are as follows: 1) Harmonization and clarification of regulations among all agencies, 2) Communicating health issues to the public, and 3) Profitability (for the farmer). The group discussed each of the three priorities, determined strategies, and identified groups for future participation.

1. Harmonization and Clarification of Regulations Among Agencies

Strategies: The group determined that there is a strong need for communication among the major players concerned with the issues. We see a major roles in this effort for regulatory agencies, Michigan State University Extension, Michigan Agricultural Experiment Station, Soil Conservation Service/SCD, commodity/ producer/processors, chemical companies, legislature, and consumer and or public interest groups. We would expect that regulatory agencies would play a leadership role.

A possible way to start is to begin networking among all the groups listed above. The regulatory agencies are the most critical to get involved, but all need to provide input.

2. Communicating Health Issues to the Public

Strategies: We need to convince consumers with scientific evidence that the benefits of eating fruits and vegetables far outweigh any risks. The scientific community is a more credible information source than the group manufacturing the product. Despite some public skepticism, credibility is still higher in the scientific community than from the food product manufacturer with a vested interest.

Maybe it's time to look for new partners without overlooking valuable, traditional ones. Inflamatory journalists? Maybe our opportunity is to look for a way to work for them. If, in fact, they're focusing on a few researchers that carry an exaggeratedly negative message, is there no way to alter that? Maybe we should look for a way to work with the media? Educate the media? They would bristle at that suggestion; but if we offered good quality "raw" materials, they might use them.

In responding to this issue, the following groups would have major inputs: 1) Michigan Department of Agriculture (MDA), 2) Michigan Agricultural Experiment Station (MAES), 3) mass media, 4) trade associations, 5) Michigan State University Extension (MSUE), 6) commodity groups, 7) Public health departments, 8) US Environmental Protection Agency (USEPA), 9) consumer/public interest groups, and 10) food processors. Minor input would be contributed by: 1) the USDA Soil Conservation Service/Soil Conservation Districts and 2) the Michigan Department of Natural Resources.

3. Profitability to Grower

We see that the following groups have major roles in the improvement of profitability to growers: 1) individual growers, 2) commodity groups, 3) MAES, 4) MSUE, 5) USDA, 6) food processors, and 7) legislature.

Michigan State University, through MSUE and MAES, needs to help develop techniques and information transfer to lower production costs. The legislature also has an important role. State imposed regulations can throw growers out of competition with other production areas.

BARRIERS/OPPORTUNITIES IN REDUCING PESTICIDE USE

Barrier	Opportunity
Lack of weather and pest/ disease/weed information and interpretation	Networking current information
Lack of information on the fate of pesticides	More research and transference
Current lack of funding for IPM research and implementation	Attracting federal funding
Lack of long term career ICM/IPM specialist	Cooperate with commodity groups
No clear definition of the role of the public and private sectors in IPM implementation	Stimulate business opportunities
Slow/cumbersome registration and re-registration	Pressure EPA/legislature to speed process
Lack of research on alternative pest controls	Develop legislative support for research
Lack of affordable application equipment with more efficient delivery	Development support for research and development

Vegetable Interactive Working Group Report

The challenge of maintaining the quality and diversity of Michigan's vegetables with reduced pesticide use will require concerted, coordinated, and effective research and education/outreach programs.

The vegetable interactive working group (24 members) was diverse and included representatives of commercial vegetable growers, organic growers, processor organizations, agrichemical industry, grower organizations (Michigan Asparagus Research Committee, Michigan Potato Industry Commission, Potato Growers of Michigan, Michigan Farm Bureau, MASA (Michigan Association for Sustainable Agriculture), and Michigan State University research and extension.

Each person was given time to express what he or she felt were critical needs for the Michigan vegetable industry. Although each commodity has its own specific needs, discussion focused on broader issues that applied to all or most commodities. A list of 31 critical needs was generated (Table 1).

Research Needed

Research was identified as the single most important need of the Michigan vegetable industry. All agreed on a strong need to reduce pesticide use and develop alternatives, even though individual members of the group did not always agree on why this should happen. For example, a processor indicated that customers want reduced pesticide use; growers indicated the need for reduced use and finding alternatives because of consumer and processor demands but also because of the loss of pesticides due to pest resistance or regulation.

Group members particularly emphasized the need for research on alternatives to pesticides. Needs included research: on biological control, to manage pesticide resistance, to measure risks of alternatives on vegetable yield and quality, to meet regulatory needs (support for new registrations of pesticides, support to keep current uses), to minimize negative aspects of pesticide use, to lower pesticide residues with high quality and productivity, to implement currently known alternatives to pesticides, to identify long-term solutions, to develop pest forecasting systems, and to maintain water quality.

Education Needed

Education was also identified as a high priority. The needs included educating the industry on: specific pesticide labeling, the need for reduced pesticide use, the alternatives available, and the benefits of adopting alternative pest management practices. The general public needs education regarding the respective roles of pesticides and alternatives and their importance to our food supply (quality, cost, and availability). Regulators need to be educated about pest and crop production problems and to understand that reducing the pesticides available through regulation often increases their use; the remaining pesticides may be less effective and require more intensive use. Likewise, registration of new, more effective products can reduce overall use dramatically. The group

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Table 1. Identified Critical Needs in the Vegetable Industry

1. Labeling, especially EDBC (if you start with one product you have to continue with it throughout the season). Growers need to be able to mix and match products for problems like late blight on potatoes.
2. Resistance management, new strains of pests.
3. Potato beetle control. Need new materials to control Colorado potato beetle to manage resistance. Have to have a choice of products.
4. Get government agencies, especially the leadership from MDA, EPA, DNR, and the legislature, involved with vegetable crops (tours, discussions, etc.) at the farm level.
5. Need the public and regulators to understand that having more alternatives can promote less pesticide use rather than having fewer pesticides available.
6. Pest resistance management.
7. Need more biological control agents for the full complex of pests we deal with.
8. Need to reduce pesticide use. Look at more alternatives emphasizing alternative practices. Transfer information from people who have successfully used alternatives to those who need those alternatives.
9. Concern about economic risk to farmers and lack of alternatives for giving up a chemical.
10. Educational programs at all levels especially the consumer, including children, about roles of pesticides and alternative practices. Help people to understand ramification of pesticide elimination and the difficulty of maintaining food supply without them. The solution is to have safe foods and safe pesticides.
11. The agencies that regulate and license pesticides and their use needs to improve their methods. New safer pesticides are moving too slowly through the registration process.
12. Need to integrate all the information about a pest problem rather than attacking them piecemeal. Integrated crop management is needed to help identify gaps of knowledge and pest management tools.
13. Research is needed to develop more pest management alternatives. Commodity groups must be willing to support (including fund) such research.
14. More genetically-engineered products need to be developed and educational programs initiated to help the public to accept them. An informational network between commodity groups and others is needed to accomplish this.
15. Consider what it would take to produce adequate food and fiber without the use of chemicals. Look at economics and research, like MASA.
16. When chemicals are reduced, resistance as well as crop yield and quality, can become a problem.
17. Additional research on methods for minimizing negative impacts from pesticide use on groundwater, the environment, and safety concerns. Research should include economic impact considerations and evaluation of specific best management practices.

18. Address the declining infrastructure of MSU Extension and the need to provide more technical information with fewer human resources.

19. Need more minor use registration (IR-4) in spite of higher cost of "good laboratory practices."

20. Need more regulatory continuity between states and government agencies. Take a long term view.

21. Don't let our food supply continue to be a political football.

22. Commodities depend on other people to regulate their business. For example, plant breeders release varieties that are a problem from the start. In Europe there is greater control. Varieties seem to have one quality that is improved. Broader spectrum improvement is needed.

23. Educating EPA and other regulators what is happening at the farm level. Keep them up to date, e.g., the differing needs of agriculture in arid and humid areas.

24. Lowering residues regulations while the need exists to maintain quality and productivity.

25. Reduction issues fall into two categories: a) practices that already exist and work, and b) things we don't know. For the first, we need to broaden awareness and use of those practices. For the second, the biggest hindrance is dollars for research.

26. Need to be sure that the United States Census accurately identifies those in agriculture. Because only two percent of the population is in agriculture, that designation has been dropped from the Census. Congress will ignore farmers if they are not represented in the Census.

27. Look at long term solutions as well as short term crisis management.

28. Good forecasting system.

29. Commodity organization to address issues and cause action.

30. Ensure clean and available water.

31. Survey/database of crop information.

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voiced concern that MSU Extension campus and field staff were being reduced at a time when crop production was becoming much more complex (e.g. weekly sprays vs. complicated IPM systems) and educational needs were increasing.

Organization Needed

The third major category of needs identified by the group was for a strong organization to act on behalf of the Michigan vegetable industry. Some vegetable commodities have strong groups representing them while others have no organized group at all. A stronger, more active Michigan Vegetable Council would meet this need, but this would require a significant commitment of time and money from the industry.

The time was inadequate to address, in depth, each of these needs. Research on alternatives to pesticides was chosen to address in a more complete manner.

Research Funding

Individual commodities need to provide support for commodity research, but additional funding is also needed. The federal government should support research, especially where federal regulations create the need. Consumer and

environmental groups should contribute to funding. They could work with a commodity group on joint projects to reduce pesticide use. The Michigan Agricultural Experiment Station is a major supporter of research and should continue its support for research on alternatives to pesticides. All stakeholders, including growers, the Michigan Department of Agriculture, agrichemical companies, and EPA should contribute to funding.

Leadership

Leadership for research on alternatives to pesticides should come from the Michigan vegetable industry, individual commodity organizations, the Dean of MSU's College of Agriculture and Natural Resources, the Director of the Michigan Agricultural Experiment Station, the Director of the Michigan Department of Agriculture, Extension's Vegetable Agriculture and Natural Resources Committee, and vegetable processors, e.g. the Gerber Products Company. A process like the Agricultural Summit Conference should be continued to determine specific research projects. Priorities should be determined by stakeholder groups including growers, commodity representatives, MSU, and others. A coalition of stakeholders, including consumers and environmental interests, should be organized to develop and support programs.

Stakeholders and Their Responsibilities

A list was generated of the stakeholder groups and their responsibilities toward research on alternatives to pesticides.

1. Individual growers should support the vegetable council and participate in cooperative research.
2. Commodity groups should direct funding, provide leadership, help set research priorities, lobby for funding, and help educate growers and consumers.
3. The Michigan Agricultural Experiment Station should help set priorities, provide personnel, funding, and facilities.
4. MSU Extension should also help set priorities and should coordinate on-farm research and demonstration, as well as provide funding.
5. The Michigan Department of Agriculture should provide leadership and funding, assist in setting priorities, and help with the registration of new pesticides, which may be necessary to allow certain alternatives. For example, biological control can only be effective in an agricultural system if the pesticides are narrow-spectrum materials that do not adversely affect biological control organisms.
6. The Michigan Department of Natural Resources should cooperate on research on environmental aspects and help with funding.
7. The USDA Soil Conservation Service and Agricultural Stabilization and Conservation Service should cooperate in research and provide funding.
8. The EPA should provide funding for alternatives to pesticides, give input to research priorities, and consider applications to IPM in the pesticide registration process.
9. Pesticide manufacturers can help with funding on projects of mutual interest, commit to effective management of pesticide resistance rather than just maximum short-term sales, and broaden their research to include IPM applications for specific pesticides.
10. Food processors should provide leadership, funding, and technology to address residue tolerance concerns.
11. Consumer groups, environmental groups, and public interest groups should join with agriculture to develop funding and provide

leadership for programs to reduce pesticide use.

12. The Michigan Legislature should provide funding ($10 million/year), coordinate state agencies, and consider the impact of regulations on producers and consumers. They should understand that research on alternatives to pesticides is a program for the people of Michigan, consumers, environmentalists, etc., as well as for Michigan agriculture.

Barriers and Opportunities/Incentives

Barriers as well as opportunities and incentives to pesticide use reduction were also discussed (Tables 2 and 3). Maintaining high quality produce with reduced pesticide use was seen as a major barrier to reduced pesticide use. For example, many vegetable commodities have zero or near zero tolerance for insect injury or insect contamination. Often these requirements are specific federal regulations or mandated by the processor. Uncertainty about the risk of reduced quality with reduced pesticide use is a barrier. In many situations, reduced pesticide use might result in no increase in risk, but this is usually not known.

Opportunities/incentives included personal reasons, such as desire to reduce family exposure to pesticides and customer satisfaction. Organizations such as crop management associations, consumer/environmental/ agriculture groups, and local community summits would support reduced pesticide use. Research and demonstration on alternatives to pesticides were viewed as important incentives/opportunities to reduce use. Government programs like the SP 53 Integrated Crop Management Program, IPM cost-sharing, and worker protection laws that make pesticide use more difficult were important incentives to change.

The next steps in this process were outlined.

1. Determine research priorities.

Research priorities need to be identified by commodity groups, MSU, and regulatory agencies. Individual commodity groups should set their priorities. The Michigan Vegetable Council could act on behalf of commodities that don't have their own organization. This could be followed by a meeting of commodity groups, MSU research and Extension personnel, processors, and other interested parties, initiated by Dean Fred L. Poston, to determine priorities across commodities.

2. Develop funding.

Funding should be requested from the state legislature by commodity groups. This would require the coordination of requests across commodities and would include commodities besides vegetables and organizations such as the Farm Bureau.

3. Develop partnerships with stakeholders to plan, get funding, and implement.

Directors Robert G. Gast (Agricultural Experiment Station) and Gail L. Imig (MSU Extension) would initiate a partnership that included broad groups. The first step is the identification of potential partners such as the National Wildlife Fund, the League of Women Voters, Rodale Institute, the Michigan Vegetable Council, and others.

4. Develop a strong vegetable commodity organization.

The Michigan Vegetable Council should work with other commodity organizations like the Michigan Potato Industry Commission, Michigan Onion Committee, Celery Research, Inc., Michigan Asparagus Research Committee, etc., as well as broader groups such as the Michigan Horticultural Society to coordinate and strengthen action to meet the needs of the Michigan vegetable industry.

Table 2. Identified Barriers to Pesticide Reduction in the Vegetable Industry

1. Lack of alternatives.
2. Economic/yield loss.
3. Need for quality.
4. Lack of recognition that there are acceptable alternatives.
5. Lack of information about alternatives.
6. *Perception* of reduced quality/yield and increased economic risk.
7. Increased risk at some point of reduction.
8. Lack of existing IPM support programs.
9. Regulatory barrier to use of products that are safer.
10. Liability and law suits. Consultants can be hesitant to recommend lower rates or recommend not to spray.
11. Perceived risks which may or may not be real.
12. Cost of implementation (bottom line and a narrow profit margin).
13. Export standards may vary as to whether quality of residues are acceptable.
14. The lack of public acceptance of genetically engineered materials.
15. Foreign competition. Other countries may not be reducing pesticide use and taking the costs.
16. Large investment already exists in the current production system.
17. Fear of failure, pressure to succeed, peer pressure.
18. Financial/banking restraints.
19. Philosophical resistance/habit.
20. "Quality" regulations.

Table 3. Identified Opportunities/Incentives for Pesticide Reduction in the Vegetable Industry.

1.	Economics.
2.	Growers' concern about family exposure to pesticides.
3.	Available alternatives.
4.	Consumer demand.
5.	Environmental mandate.
6.	Research and demonstration on viable alternatives.
7.	Availability of genetically engineered products.
8.	Certified produce may bring higher price.
9.	Pesticide resistance problems.
10.	Crop management associations.
11.	Desire to satisfy our customers.
12.	Partnerships between consumer, environmental and agricultural groups.
13.	Funding.
14.	Government programs like SP53.
15.	Local community summits that would educate and build support.
16.	Leadership.
17.	Worker protection and pesticide laws.

5. Hire an IPM Coordinator.

An IPM Coordinator should be hired by Michigan State University to coordinate IPM programs in Michigan and develop funding sources at the state and federal level.

The challenges of maintaining the quality and diversity of Michigan vegetables with reduced pesticide use will require concerted and coordinated research and educational efforts by the Michigan vegetable industry, Michigan State University, the Agricultural Experiment Station, MSU Extension, and other groups and agencies. A strong vegetable commodity organization with links to fruit growers and other commodity organizations and open communication with Michigan State University, the Michigan legislature, and state agencies will help achieve this goal.

Landscape Industries Report

Superficially, most homeowners want to reduce pesticide use; but when they are confronted with a serious pest problem, they seem to shift in the opposite direction and demonstrate a surprisingly careless attitude about pesticide use.

Dean Fred L. Poston convened Agricultural Summit I in response to a plea from Michigan growers for help in finding ways to prevent the continued loss of effective pesticides available for use on fruit crops. Representatives of the vegetable and field crop industries joined them during the planning stage of the conference. The landscape industries were invited to join the conference when several individuals from this group expressed an interest in attending. We took advantage of this opportunity to discuss how pesticide issues impact the landscape industries, what is unique and what issues we have in common. Because of the small number of people who met during the conference to discuss the landscape industries issues, we cannot adequately represent the entire industry's concerns and needs. However, we would like to share the key issues that were re-identified.

If the needs of the landscape industries are to be seriously addressed, another conference is needed with participants divided into sections for the: 1) nursery and landscape, 2) turfgrass, 3) greenhouse, 4) Christmas tree, and 5) forestry industries.

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Pesticide issues are critical to the landscape industries, but the concerns go beyond the loss of effective materials. In many cases we interact directly with the public in highly visible areas. Problems with pesticide use are not only magnified by the large number of individuals in urban areas but by the large area of turf being treated, approximately 1.5 million acres, greater than any other minor use crop. The opportunity for pesticide misuse and accidents is also greatest in the landscape area because the average homeowner is not very knowledgeable about how to use and store pesticides or the risks of exposure to them. Industry workers are well trained with respect to pesticides. All professionals working in urban areas are required to be certified if they are applying pesticides, even temporary employees who are being supervised.

Nine pesticide issues were identified that impact the landscape industries:

1. Guidelines for certification of nursery stock adopted by the Michigan Department of Agriculture are contradictory to their own mandate to help reduce the use of pesticides in agriculture.
2. Implementation of IPM practices is difficult in nurseries and urban landscapes because of the tremendous diversity of plants (over 200 genera) and associated insect and disease pests.
3. The public rewards landscapers with their business based on the price of their services and the quality of the plants being cared for.

There is little business incentive to reduce pesticide use.

4. The number of pesticides available for use on landscape plants has steadily decreased over the last five years.
5. Regulations on the use of pesticides in urban areas are sometimes based on public perception rather than science.
6. Perceived or real pesticide contamination of production areas and managed sites.
7. Pesticide residue on turf, Christmas trees, and flowering plants, the perceived and real risks.
8. Pest resistance to pesticides in greenhouses.
9. The new EPA rules on entering greenhouses after pesticide application make greenhouse plant production more difficult and costly.

The three issues with the highest priority were discussed and ways were identified to address each problem, including the roles of MSU, MDA, DNR, and the landscape industry.

1. *The number of pesticides available for use on landscape plants has steadily decreased over the last five years.*

The primary reason that agricultural chemical companies have decided not to re-register some products or not to register new products for the landscape industries is because their projected sales are not always greater than the cost of registration and, therefore, are not profitable. Companies are also wary of labeling products for landscape markets because the diversity of plants makes phytotoxicity problems and law suits more likely. The small number of plant species grown for the turf and Christmas tree industries makes it easier for companies to label products for those uses, while the nursery, landscape, and greenhouse industries are very difficult to label products for because of the large number of species grown (well over 200 species each). The phytotoxicity problem has forced several companies to drop one or more products. Within the last year, DuPont Agricultural Products decided to drop all of their ornamental pesticide products, partially because of the losses suffered from law suits over phytotoxicity caused by benomyl.

One approach to this problem is to find ways to support the federally funded IR-4 program that assists companies in gathering the information necessary to registered products for minor use crops. The IR-4 program includes testing for phytotoxicity problems. The landscape industries with the greatest diversity of plants need to commit more funding for phytotoxicity testing so new products can be determined to be safe to use on the most important types of plants. Unfortunately, the level of support available from the IR-4 program does not cover the costs of researchers running tests to support registration. More support is needed from the landscape industries, the Agricultural Experiment Station, MDA and MSU Extension to make the IR-4 program work more effectively. Efforts to register new products should be coordinated with other states so one scientist can concentrate on a few products. Extension agents are also encouraged to become involved in IR-4 field testing. The landscape industries also need to be educated about the IR-4 program and how to support it.

Another way to adjust for the loss of pesticides is to develop more alternative management strategies. In recent years horticultural oil sprays have been developed for use against scale insects; methods have been developed to eliminate grass from nursery fields to prevent Japanese beetle infestation, and many plants resistant to certain insects and diseases have been identified. The development of alternative management strategies like these requires several years of research and field testing. Pest problems must be prioritized and

funding committed for several years to solve them. Funding must come from the landscape industries, the Agricultural Experiment Station, MSU Extension, and MDA.

2. *Guidelines for the certification of nursery stock by the Michigan Department of Agriculture contradict their own mandate to help reduce the use of pesticides in agriculture.*

The inspection of nursery stock and other plants being shipped to other states often leads to increased pesticide use so growers can meet inspection requirements. In some cases strict standards are necessary, such as if an exotic pest has become established in Michigan but has not yet been found in other states we are shipping to. However, many of the pests that result in rejection until more pesticide is applied are found throughout the country and pose no additional threat to plant health, such as aphids and Lecanium scale. These insects tend to be more of a production problem and disappear once plants are put in the landscape.

The Michigan Department of Agriculture is committed to helping growers reduce pesticide use when it is possible. Consequently, the MDA has helped to develop alternatives to pesticide treatment for ways to certify plants, such as container inspection for Japanese beetle larvae. Unfortunately, certification is a political nightmare because each receiving state must also agree on the acceptable levels of each pest. Recently, the North Central Plant Board, a group of state agency leaders that discuss certification standards, has shown an interest in relaxing the strict standards set for some pests.

Leaders of the nursery industry need to meet to discuss certification and draft a statement that supports more lenient standards for certain pests. The MDA needs to provide leadership for other north central states in setting more realistic standards for plant inspection. Research is needed, supported by the Michigan Agricultural Experiment Station, the nursery and Christmas tree industry, and MDA to develop management strategies that are alternatives to pesticide treatment.

3. *There is little business incentive for landscapers and turf managers to reduce pesticide use.*

The public rewards landscapers with their business based on the price of their services and the quality of the plants being cared for. Public awareness of pesticide issues is an area the landscape industries have in common with other minor use crops. Professional landscapers, golf course superintendents, and turf managers have increased their knowledge of pest biology substantially over the last ten years due to educational programs coordinated through MSU Extension and trade magazines and journals. This knowledge has allowed them to manage pest problems with less pesticides. However, a point is reached where further reduction in pesticide use means that a trade-off or balance must be maintained between the cost of the service, the amount of pesticides being used, and the quality of the product.

Unfortunately, the gap between the knowledge level of homeowners and the knowledge level of professional landscapers and turf managers seems to be growing larger. Homeowners still want grass that looks like a golf course fairway and perfect trees and shrubs. Public education is desperately needed to explain the current role of pesticides in maintaining landscapes and realistic ways to reduce pesticide use. Superficially, most homeowners want to reduce pesticide use; but when they are confronted with a serious pest problem, they

seem to shift in the opposite direction and demonstrate a surprisingly careless attitude about pesticide use. The greatest educational needs lie with public outreach. Because this is a large and difficult task, we need to research the best way to approach it. Which educational approaches will be most effective? Should we work through the schools or with newspapers, radio, television, and garden centers? We suggest a two-step approach to this problem. First, fund a project to determine the best way to educate people with help from the Department of Social Sciences. Funding is needed from MDA, DNR, MAES, MSUE, and the landscape industries to investigate the best educational approaches. Once the best methods are determined, more funding is needed to launch the programs.

The issues identified in Agricultural Summit I can only be addressed through effective communication and cooperation among MDA, DNR, MSUE, MAES, and industry. Accordingly, it is recommended that a steering committee be formed to follow up on the suggestions made at this Agricultural Summit. The committee should consist of representatives from the landscape industry, MSU, MDA, and DNR.

Finally, the role of an IPM coordinator is very critical to the viability of a strong commodity industry in Michigan. Therefore, the College of Agriculture and Natural Resources is strongly urged to fill the position as quickly as possible.

Future Strategies for Michigan Commodity Producers

We can no longer just look out for our own commodity group because, if there is a hole in the boat, the whole boat sinks, and the same is true for agriculture.

Agriculture is facing more and more challenges every day. The number of United States farmers totals 2 million of whom 1.2 million are part-time. The average net farm income of the 1.2 million farmers is a minus $3,800. Today's 300,000 farms produce 85 percent of the food and fiber in this country.

In the cherry industry, for example, the statistics are typical. Consequently, consolidation is taking place at a very rapid rate in both the growing and processing sectors. Not very long ago most everyone had ties in one way or another to production agriculture. Today many people are two or three generations removed. They do not understand production agriculture, and we are all at fault for not educating them. Not long ago, when farmers wanted changes, they would simply drive to Lansing or call Washington and get results. Those days are gone because production agriculture, while it is very important to the state's economy, does not represent the voting block that it once did. This means that we are going to have to do more work to educate both state and federal politicians.

Agricultural Summit I was initiated to focus on one component of production agriculture, primarily the Minor Crop Pesticide Issue. This problem is of special concern to fruit and vegetable growers because we are talking about the re-registration of many of the older compounds that we are using today as well as the registration of newer, safer compounds. Minor crops have been hit especially hard and are going to sustain the most losses unless production agriculture can change this direction.

The Agricultural Summit should focus on the Minor Crop Issue because more than 50 percent of Michigan's agriculture is considered to be in that category. Some basic facts should be noted:

1) Minor crops are those fresh fruits and vegetables in the produce section of the grocery store that are at the heart of the food safety debate.

2) Minor use crop growers are among the heaviest pesticide users as they must constantly struggle to control plant diseases, insects, and weed problems.

3) Minor use crops are directly impacted by the Delaney Clause and face more cancellations if Congress does not act to pass new legislation that takes risk assessment into account.

4) Minor crops growers must recognize and deal with insect and disease resistance. Because fewer chemicals are available, growers have fewer compounds to resolve problems in the fields, and correspondingly, less flexibility to combine pesticides to more effectively avoid the resistance problem. Consequently, resistance and the loss of pesticides through the re-registration process will seriously affect the IPM program in this state.

5) Minor crop growers also see fewer new compounds coming on to the market because of the high cost. Estimates today are that $40-50 million are needed to bring a new

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chemical compound on the market, and those numbers may be conservative. Other authorities have put the figure at between $80 and $120 million. Re-registration of an existing compound is estimated to cost $10 million.

6) IPM is the key to the future. Growers who are not utilizing IPM must be encouraged to do so. This doesn't mean hanging up a sticky ball or a pheromone trap and telling the public that you are using IPM and then continuing to spray based on a calendar.

We have one opportunity left to utilize IPM. If we don't take advantage of IPM this time around, I think our window of opportunity will close and we will face further regulations to reduce pesticide use in the future. To take full advantage of IPM will require additional resources and dollars. The President and USDA are going to have to put up some financial resources to make a difference, as most states need more resources and scouts to work with growers. Michigan needs to take full advantage of these dollars.

Several steps have to be taken now. First, it is imperative that we all work in partnership, together. The cherry industry must work closely with the apple and potato industries and as many other groups as possible to focus on such issues as: minor crops, food safety, IPM, and other regulatory initiatives that will affect growers. For the past three years, Michigan commodity groups have worked together through an *ad hoc* committee called the Michigan Minor Crop Alliance to fund the National Minor Crop Farmers Alliance.

The Minor Crop Farmer Alliance successfully addressed the Minor Crop Issue in the President's Pesticide Reform Package released last fall. The Minor Crop Farmer Alliance also brought the Minor Crop Issue to the forefront in Washington, D.C. Three years ago, very few people in the Capitol knew what minor crops were. Today, there is a much greater understanding of the importance of minor crops to this country.

Michigan commodity groups also have worked closely with the Michigan Food Processors in an attempt to expand IPM practices available to farmers. This was accomplished by working together to fund the statewide IPM Coordinator position at MSU. Out of this effort, an advisory group called the IPM Alliance was formed. The future is going to require more of a commitment and coalition approach to farm issues. We can no longer just look out for our own commodity group because, if there is a hole in the boat, the whole boat sinks and the same is true in agriculture.

Issues concerning cherries, apples, and potatoes are very similar. First, we need to pool our resources and talents for the benefit of Michigan agriculture. We also need to work closely with MSU and the Michigan Department of Agriculture as these groups hold many keys to the success of Michigan farmers.

Second, we must tell our story. We have done a good job of talking to ourselves; however, we need to talk to our customers. IPM is an example of a very positive story that should be told. We also need to talk about why we farm the way we do and about the fact that pesticides are important to the productive capability of this state and country.

Third, the animal industry was successful a few years ago in putting together an Animal Initiative in this state in an effort to create jobs. MSU received a substantial financial commitment from the State Legislature to accomplish this, and the Michigan livestock industry will clearly benefit. Once this initiative is complete, Michigan's plant groups need to come together and focus their efforts on a similar type of initiative. We need to put together an agenda for IPM, the minor crop pesticide problem, and the food safety issue. The plant groups must get together and agree on a common agenda and then go to the Legislature to persuade them to fund the initiative. We must **organize, organize, organize** and **focus, focus, focus**. A bold new approach is crucial to the success of the plant industry in this state. However, it will only work if we can all agree on a common agenda and then work closely with

MSU, MDA, and other major agricultural groups. I hope there will be interest and support for this initiative, and that we can put together a solid action plan.

Finally, we need to talk to our elected officials. We need to tell them that agriculture is facing serious challenges, challenges that, if they are not addressed with scientific facts, could cripple our industry and our country. Agriculture has been the backbone of continued prosperity for rural America as well as a safe and abundant food supply. However, we need to write and call our elected officials on a regular basis. They are hearing from many special interest groups, and now it is essential that they hear from American agriculture.

Agriculture and the Legislative Process

The people of this nation are asking questions and demanding answers regarding agriculture and its impact on the environment. A generagion ago an issue like pesticide use and groundwater quality would not have been part of the public debate. Now we know they are inextricably part of our agricultural strategy for the future.

Charles Dickens wrote "These are the best of times - these are the worst of times." This is a good description of Michigan agriculture today as we look toward the future. Michigan agriculture is having the best of times when you look at the fact that agriculture continues to be Michigan's second largest industry, generating over $37 billion in economic activity. Michigan's agriculture is the second most diverse agricultural economy in the nation, as we produce over 50 different commodities.

Michigan's close proximity to several major population centers in the United States and Canada has proven to be a natural location for efficient transportation and effective marketing. Our abundant water resources will prove critical to the nation's future agricultural production. The number of people working on our farms, agri-businesses, and food establishments represents over 15 percent of the total labor force in our state.

The current leadership in Lansing and at Michigan State University is strong. Governor John Engler comes from an agriculture background. He knows, understands, and supports agriculture. The Governor has put forth an aggressive agriculture agenda that is moving this industry forward. This agenda includes: lowering farm property taxes, funding the animal initiative, and strengthening Michigan's right to farm law. The Governorhas also initiated an exciting new approach to the prevention of groundwater contamination. The Michigan Freshwater and Groundwater Prevention Act was signed into law. It focuses on farm technical assistance, education, and providing new technologies that will help farmers remain profitable while they continue to be good stewards of the land and our vital water resources.

In addition to the Governor, Mr. Richard Posthumus, the Senate Majority Leader and many key legislative leaders are farmers who have a desire to help agriculture in Michigan succeed and continue to be vital in Michigan on into the future. Dr. Fred L. Poston, the Dean of the College of Agriculture and Natural Resources at Michigan State University, and his staff should also be recognized for providing exceptional leadership and programs to benefit Michigan agriculture's future. For all of the before-mentioned reasons and more, these are the best of times for Michigan agriculture.

We in agriculture face some tremendous challenges despite all the good things we have going for us. Unless they are managed properly, these challenges have the potential to be devastating to the economic viability of agriculture's future. The people of this nation are asking questions and demanding answers regarding agriculture and its impact on the environment. A generation ago an issue like pesticide use and groundwater quality would not have been part of the public debate. Now we know they are inextricably part of our agricultural strategy for the future. The challenge of the 1990s is to navigate among all

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of the disparate elements of agriculture, the necessity for higher yields, lowering cost of production, expanding markets, ensuring public safety, and preserving our environment, while expanding and diversifying our agricultural heritage.

Environmental regulation of agriculture is on the horizon. It is coming in the form of the Coastal Zone Management Act, the reauthorization of the Clean Water Act, best management practices, and groundwater protection. It is not a question of if but a question of when and what form the on-farm regulation will take.

The value of this conference is to further understanding of the need to be proactive in identifying solutions and strategies as environmental/agriculture policy is developed. At issue is whether you will be a leader in developing future policy and taking active steps to ensure and communicate that farmers are and will continue to be good stewards of the water and land resources or whether you are going to allow policy to be imposed on you.

Policy is currently under consideration with respect to issues such as simply reducing the sources of potential contamination, referred to as source reduction, as compared to a more sophisticated approach of identifying relative risk, using education and on-farm technical assistance to prevent pollution problems. We in agriculture need to consider these approaches to addressing the issue of groundwater quality and weigh in on which is the best approach to the problem. For example, utilization of technologies such as integrated pest management and others need to be considered.

Other challenges such as the costs of re-registration of certain specialty chemicals are becoming too high for the registrants; so that certain uses are not being re-registered, leaving the industry without tools to combat weeds, pests, fungus, and disease that negatively impact production and can make the difference between profit and loss.

We at the Michigan Department of Agriculture are committed to helping agriculture have an active role in the future policy debate. It is critical that you are organized, proactive, and have solutions identified.

The years ahead hold great promise for Michigan agriculture. The fulfillment of that promise depends on strong leadership. Michigan agriculture is at a crossroads, uniquely positioned to take advantage of our vast natural and human resources and move boldly ahead as a leader in agriculture in America and around the world. Dealing with environmental issues will be one key to the future success of agriculture. It will require your involvement in a partnership to make sure agriculture remains viable on into the future. As Michigan's second largest industry, a successful agriculture means a successful Michigan.

Where Do We Go From Here?

Farmers may be able to reduce their use of pesticides; however, they are not in the position to completely abandon them to produce high quality food and fiber, even in low-pesticide-use agriculture.

This Agricultural Summit is about learning, education, and the exchange of diverse opinions to reach as broad a consensus as possible across the state to address major issues related to informed pesticide reduction and management strategies for the future. This conference came about as a result of dialogue among leaders of the fruit and vegetable industry, the Michigan Agricultural Experiment Station (MAES) and Michigan State University Extension (MSUE) in cooperation with the Michigan Department of Natural Resources (MDNR) and the Michigan Department of Agriculture (MDA). This process is exciting because times are changing and the participating industries are getting out in front to help control and direct the change. The conference focused on pesticide reduction and several other important topics of interest including EPA's re-registration program; advances in the technology of pest control; approaches to reduce pesticide use; public perceptions; environmental and economic pesticide impacts; risk assessment methods and evaluation; research, education, and monitoring programs; health effects of pesticide use; and an overview and evaluation of state and federal pesticide regulations.

As a user of pesticides, Michigan agriculture is looking for effective alternatives such as the greater use of integrated pest management (IPM) programs. Farmers may be able to reduce their dependency on pesticides; however, they are not in the position to completely abandon them to produce high quality food and fiber, even in low-pesticide-use agriculture. Nevertheless, political and regulatory pressures will require a cooperative response. For example, in June, 1993, the USDA, USEPA, and FDA signed a joint policy agreement to officially support a policy of pesticide use reduction. Shortly thereafter, U.S. Secretary of Agriculture Michael Espy announced the USDA goal of implementing IPM procedures on 75 percent of cropland by the year 2000. What is not clear, however, is what constitutes IPM procedures on a given farm or the baseline from which pesticide reduction efforts will be measured. Moreover, farmers are concerned that after agreeing to implement IPM with current pesticides, those pesticides will later be withdrawn and IPM alone will not be adequate! Another concern, especially among the minor crop growers, is that the focus on future IPM research will be directed toward major crops which use the greatest total amount of pesticides, rather than on minor crops already facing the loss of pesticides because re-registration is economically unprofitable for the manufacturer.

Pesticide reduction is a modern dilemma for which we must seek creative solutions and educate the public to their need. First, we must ask ourselves what we can do today. An initial step should be to encourage broader application of alternative methods in all sectors of agriculture as a way to reduce the amount of pesticides used to control plant pests. Not everyone has incorporated these low pesticide alternatives; therefore, we must consider what

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types of educational programs we should develop to expand their use. We know, for example, that the majority of farmers get their information from their neighbors and other farmers; therefore, if we want to succeed in introducing alternative methods such as integrated pest management, biological controls, and sustainable agriculture, perhaps we should set up more demonstration projects. The best method to make the transition to lower pesticide use may be by convincing the growers that alternative methods are viable and they can make the transition and survive economically.

A second step is to identify what short term research goals are necessary to encourage more farmers to adopt alternative methods. What types of research should the MAES be doing and how can MSUE incorporate relevant information on more pest organisms into the various alternative methods for greater use and applicability?

A third step is to establish the long term research goals. What will it take to keep agriculture and, more specifically, the Michigan vegetable and fruit industry in business while they face the onslaught of a number of very important plant pests? How can we implement natural biocontrols along with emerging bioengineered plants in combination with a broad range of more creative and/or traditional agricultural practices?

For one thing, biological controls in place of chemicals appears to have great potential, however, this technology is in its infancy. We need to recognize that when biological controls are suggested as a pesticide free solution to agriculture's problems, we lack natural controls for more than 90 percent of today's pests. Therefore, while these natural controls offer an environmentally friendly and safer alternative to pesticides, they are presently only a promising beginning that will take years to research and develop.

In this same category of safer alternatives is the bioengineering of plants to be more pest resistant. Many of the emerging technologies could not have been anticipated even 15 years ago. For example, the natural boundaries which limited the transfer of genetic information among different species is currently being bridged through biotechnology. This opens many exciting possibilities. We need to be taking greater advantage of both natural and bioengineered means to solve agricultural problems and improve both crop production and protection.

New methods of pest management by integrating biological control with pest-resistant plant varieties and proper husbandry will, no doubt, reduce the need for pesticides but will not eliminate their use. Therefore, we must also learn more about the ecological side effects of those chemicals and how they interact in the environment. Hopefully, agriculture's dependency on agrichemicals will be reduced by the discovery of alternatives to pesticides.

What is a reasonable position on the use of pesticides now and in the foreseeable future? Alternatives to chemical pesticides such as low-pesticide-use agriculture which incorporates IPM and emphasizes resource conservation makes good sense economically and politically. It is simultaneously supportive of food safety, human health, and environmental issues. To make this work, farmers will have to change their mind set from complete eradication of pests to some level of coexistence. The objective is to use only enough pesticide to keep pests below a threshold level.

To do this, cooperation between growers and policy makers is important and has to be taken to new levels of interaction and education. This will require changes in our approach to state and federal policy makers. Many of them are less tuned to the problems of agriculture now than in the past when their parents or grandparents came from the farm. They now get their food from supermarkets and have little appreciation of how it gets there. The problem is compounded because the voting public working directly in production agriculture is less than two percent of the total population and so has less political clout than in the past. This is important because government agencies often

have to sacrifice some programs to save others. But the influence of agriculture can be extended through voters such as bankers, truckers, fast food and grocery store employees and others whose livelihoods indirectly depend on agriculture. They represent about 20 percent of the voting public. Farmers can also solicit support from the various business sectors they interact with such as their local Lion and Rotary Clubs, hairdressers, ministers, and service station attendants. Farmers need to get off the farm and express their opinions and needs at local town meetings, the Michigan Legislature, and even the U.S. Congress to put their message forth; that they need the public's help to maintain an agricultural system that not only feeds the American consumer costing only about 12 percent of their discretionary income, but also feeds the world. Not only do we all need to work together for a common survival, we need to develop more effective lines of communication among the farmers, commodity groups, and university to better understand and identify each other's needs.

What is the next step? Is this some kind of a different beginning or is it going to be like a great many other things in agriculture over the last 20 years where we came together, had a meal, listed the priorities, and then went back to our own schedules? If MSU is going to provide leadership, what are the commodity organizations going to do? You are as much a part of the leadership in this endeavor as I am. What are you going to tell the membership of your boards? Are you going to say we are bailing as fast as we can, but the boat is still sinking and we better come up with a better strategy? You can slide easy or you can press me and everyone else to the wall and demand that we take action.

I vote for action.

APPENDIX 1

Michigan Speciality Crops Minor use Pesticide Report

Executive Summary
January, 1994

MSU EXTENSION AGRICULTURE & NATURAL RESOURCES

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PREFACE

Specialty crops are an important part of Michigan's agriculture. In many cases pesticides are a resource for their production. Pesticides allow crops to be grown to meet United States consumer demand. Re-registration and pesticide use are being highly scrutinized. Public concern about pesticides is at an all time high. The public is aware that pesticides are applied to specialty crops, and consumers are concerned about pesticide residues, some of which are potential carcinogens. In addition, non-point source pollution of lakes, rivers and groundwater is an increasing concern because pesticides that leach readily can move into groundwater.

Growers are concerned that certain diseases, insects and weeds are becoming resistant to pesticides. This resistance reduces the number of effective pesticides from which growers can choose. And registrations of new pesticides have dwindled to very few per year.

Because of the high cost of chemical testing and evaluation for Environment Protection Agency (EPA) standards and the small market for specialty crop pesticides, these pesticides have been labeled "Minor Use" by the industry.

This report was developed to identify pesticides used on Michigan specialty crops. Seven of the 13 agriculture and natural resources committees of the Michigan State University College of Agriculture and Natural Resources identified important pesticides used on specialty (minor use) crops in Michigan considered at risk. A data base was compiled which includes the pesticide, its crop use and a priority ranking, indicating how critical was the need to retain the pesticide. Also identified was current research underway at Michigan State University and elsewhere nationwide.

From this data base, seven agriculture and natural resources committees compiled individual reports in Phase I of this report, each for its particular industry: field crops, floriculture, forestry, fruit, landscape, turf and vegetables. A subcommittee made up of two members from each team identified the top at-risk pesticides used on minor use crops in Michigan. Phase II of this report explains the process by which those pesticides were identified and lists pesticides the subcommittee feels are in danger of being lost for use by Michigan growers. Phase III identifies the top pesticides.

I would like to thank all those involved in preparing this document for their many hours of individual research and writing.

Respectfully,

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Introduction

Overview

This document contains reports compiled by seven minor use pesticide committees. Committee members were campus-based specialists and Extension field agents from Michigan State University Extension agriculture and natural resources committees on field crops, floriculture, forestry, fruit, landscape, turf and vegetables.

This report suggests alternatives to pesticides currently used on Michigan specialty (minor use) crops. It also outlines the impact on the industry if those pesticides should be lost. In most cases, this impact falls in three major categories:

> Increased dollar cost to produce the crop and lower return on investment to the grower.
>
> Major quality problems in the product, such as scab on apples and insects or diseases in fresh fruits or vegetables.
>
> Potential yield loses. In some cases, yields would be reduced by up to 90 percent of a normal crop.

All of the above would cause serious financial hardship to growers who utilize current production methods and minor use pesticides.

Sample Pesticide Worst Case Scenarios

Many of our specialty (minor use) crop growers rely on one pesticide for a sustainable return on investment. In these worst case scenarios, if in fact a pesticide or group of pesticides were lost whether it be an insecticide, fungicide, herbicide or growth regulator that particular crop could be deleted from the list of crops grown commercially in Michigan. Possibly niche markets would be available for producers who could overcome that particular chemical loss. However, the cost of production would be prohibitive beyond a very small volume, high investment or high cost to the consumer. This would price a particular commodity out of reach of the majority of Michigan and, possibly, United States consumers. The following three scenarios are samples of the minor use pesticide problem.

Fungicide Scenario

Crop: Processing tomatoes

Fungicides labeled: EBDC fungicides (Dithane M-45 and similar compounds) and chlorothalonil (Bravo).

Diseases Controlled: Septoria leafspot (*Septoria lycopersici*), early blight (*Alternaria solani*), late blight (*Phytophthora infestans*).

Situation: Although EBDC fungicides are labeled for control of the above diseases and are very cost effective, tomato processors forbid the use of these fungicides because of unfavorable publicity generated during the EPA special review of these compounds. Though a market basket survey and extensive residue testing by a special task force revealed that there was no reason for concern by consumers and that residues were well below those projected, processors have ruled that EBDC fungicides cannot be used on tomatoes used in processed tomato products. This means that tomato growers must rely solely on chlorothalonil (Bravo) to control these important diseases. There have been rumors that chlorothalonil labels may be in danger also. If chlorothalonil were lost, processing tomatoes simply could not be profitably grown. Diseases would not only lower yields dramatically (by up to 40 percent), but quality would be reduced to the point where the vast majority of tomatoes produced would be unacceptable to processors.

Economic impact: About 7,000 acres of processing tomatoes are planted in Michigan annually, producing about 170,000 tons of tomatoes worth about $13.5 million. Without either labeled fungicide, it is predicted that Michigan growers would suffer losses of at least 40 percent in production, making it economically impossible to grow this crop.

Other crops: Chlorothalonil and EBDCs are the two main broad-spectrum fungicides used in vegetable disease control. The loss of either material would likely be a hard economic blow to our vegetable industry.

Submitted by: Dr. Mel Lacy and Dr. Mary Hausbeck, Botany and Plant Pathology, 517-355-4577/4534.

Herbicide Scenario

Comparing alternative weed control systems without 2,4-D or prometryn, an example of a complex issue.

Crops: Small grains, alfalfa, asparagus and celery

The herbicide 2,4-D has been under special review by EPA and science task forces attempting to determine if it is a carcinogen. 2,4-D is applied in a variety of cropping systems for broadleaf weed and brush control. It is not a restricted use pesticide, so purchasers are not required to have a pesticide license. If 2,4-D were no longer available, it would affect farmers, the turf and Christmas tree industry, homeowners, and the businesses in the state that sell lawn products because many of these products contain 2,4-D.

Many other herbicides control broadleaf weeds and brushy species. Some are more persistent in the environment than 2,4-D. Some would have a greater potential to leach through the soil profile than 2,4-D. All cost more per acre than 2,4-D. All of the crops for which 2,4-D is registered would still be grown

in Michigan, but the cost of production would increase. The greatest impact would be in birdsfoot trefoil, asparagus, and the turf and lawn care industry.

For small grain production, farmers could change to a higher seeding rate. This would increase seeding costs and promote leaf disease development or farmers could apply an alternative herbicide. All are more expensive than 2,4-D, so some farmers would not treat and weeds would reduce wheat yield.

Weeds in alfalfa and birdsfoot trefoil could be managed by cutting management and fertility programs if 2,4-D were no longer available. However, birdsfoot trefoil in Michigan is grown for seed. Seed yields would be reduced by weed competition and additional seed cleaning would be required. Weeds in forestry, Christmas trees and fruit production would be removed with other herbicides. Asparagus production and yield would be reduced 20 percent because there are no pesticide alternatives. In turf, growers, golf course superintendents and homeowners would need to use fertility and cutting management and alternative herbicides to control dandelions and other broadleaf weeds. In summary, loss of 2,4-D would affect many people in Michigan, though businesses and growers would stay in production.

Contrast this scenario where 2,4-D is used on thousands of acres to the 3,100 acres of celery production on muck soils in Michigan. Prometryn (trade name Caparol) is sold for weed control in celery only. An alternative herbicide, sethoxydim (Poast), is available to control annual grasses in celery. For broadleaf weed control, however, only linuron (Lorox) is available, and this herbicide is under review and could lose its registration. Tolerance of celery to linuron is limited and linuron cannot be applied preemergence. More weeds in celery would increase humidity in the crop and increase disease problems. Increased cultivation to control weeds between the celery rows would spread disease (such as bacterial blight) throughout the crop. Loss of prometryn would reduce celery yields by 50 percent and result in most growers being unable to produce celery economically in Michigan. In summary, celery production on the 3,100 acres of muck soils in Michigan would be devastated. The impact on the state would be minimal, but the impact on the celery growers would be significant.

Submitted by: Dr. Karen Renner, Dept. of Crop and Soil Sciences, 517-353-9429.

Insecticide Scenario

Crop: Fruit trees

Alternative controls for codling moth -- an example of what happens when an insecticide is lost in a fruit system.

Codling moth is a major pest in apple and pear, and a lesser pest in peach, plum and apricot. It has also been reported in cherry. It has been a major pest since it came from Europe in the 1800s. Insecticides for apple systems were developed primarily in response to codling moth, and they have been the control of choice since arsenicals and lead compounds were developed. Under unsprayed conditions, codling moth infestations exceed 80 percent of the hanging crop.

The insecticides used in most food crop systems, but especially in fruit, are broad spectrum in their action. This has been a desirable attribute from a fruit grower and industry marketing standpoint, but not biologically. Some organophosphates (OPs) control more than 100 species of insects across fruit crops-- not only pests, but also beneficials and other non-target organisms. Some beneficials, such as mite predators, have become resistant to the OPs and other broad spectrum insecticides.

Alternatives to conventional chemical control for codling moth: Certainly some natural control mechanisms (parasitic wasps, diseases) are at work, but none provide acceptable control. Augmentative biological control has been attempted with parasitic wasps but has not provided high levels of parasitism. Sterile insect release methods have been partly successful in isolated locations, but large-scale implementation of this technique is being done for the first time in British Columbia.

Cultural controls, such as picking infested fruit and scraping and banding tree trunks, have provided some level of control in high value apples (organic orchards) but are not feasible on a large scale because of the labor involved.

Impact of mating disruption on fruit production: Mating disruption is the only workable alternative control for codling moth, but this biorational technology has its drawbacks. Mating disruption controls codling moth by interrupting the normal mating process and preventing fertile eggs from being deposited. It is different from any prior control technology in that it does not kill any organism but simply interrupts the behavior of one species of insect. This is environmentally desirable because we are controlling one target pest with a material that does not affect other organisms. From a management viewpoint, however, substituting a non-toxic control for an insecticide with broad-spectrum activity raises some concerns. Generally, one insecticide spray will control several to many species of insects (major pests such as plum curculio, oblique-banded leafroller and apple maggot) in an orchard, and there are notable insects (lesser appleworm, Oriental fruit moth, apple curculio) that do not show up in orchards until pesticides are reduced or removed. Mating disruption costs for codling moth are approximately $155/acre (1993), compared with less than $100/acre with four sprays of conventional insecticides. Without alternative control methods for these other insects, insecticides will have to be used (admittedly, fewer applications), and the cost of mating disruption to control just one pest becomes prohibitively high.

Submitted by: Dr. Jim Johnson, Dept. of Entomology, 517-353-3890.

Phase I

Overview

Michigan leads the nation in producing many of the specialty (minor use) crops included in this report. Michigan ranks first in production of blueberries, cranberry beans, black turtle beans, navy beans, tart cherries, small white beans, cucumbers for pickles and potted geraniums. According to 1992 agricultural statistics, specialty (minor use) crops in 1990 accounted for 1,182,318,000, or 66 percent of the cash receipts for all crops grown in Michigan. The following table shows the dollar amounts and/or acres of production of most of our specialty (minor use) crops in Michigan.

Table 1. Farm gate receipts and average of Michigan specialty crops from Michigan State University Status and Potential of Michigan Agricultural Reports

COMMODITY	DOLLAR AMOUNT	ACRES
Alfalfa	$327,000,000	1,200,000
Apples	$246,000,000	58,100
Asparagus	$14,126,000	24,000
Birdsfoot trefoil seed production	$2,100,000 $750,000	100,000 5,000
Blueberries	$50,000,000	15,900
Brambles	$1,000,000	520
Broccoli	$880,000	300
Cabbage	$5,500,000	2,500
Canola	$1,850,000	10,000
Carrots	$17,443,000	7,000
Cauliflower	$2,215,000	1,200
Celery	$12,515,000	3,100
Christmas trees & greenery	$90,000,000	130,000
Cucumbers	$21,888,000	23,000
Dry beans	$120,000,000	350,000
Floriculture Poinsettias Foliage plants Cut flowers	$137,000,000	26.9 million sq.ft. (608 Acres)
Garden greens		500
Grapes	$64,000,000	11,900
Landscape ornamentals	$220,000,000	
Lettuce	$4,060,000	1,000
Lupine	Unknown	1,000
Melons	$2,625,000	1,500
Mint	$1,750,000	3,000
Oats	$5,000,000	150,000
Onions	$17,860,000	7,500
Peaches/nectarines	$17,000,000	8,480

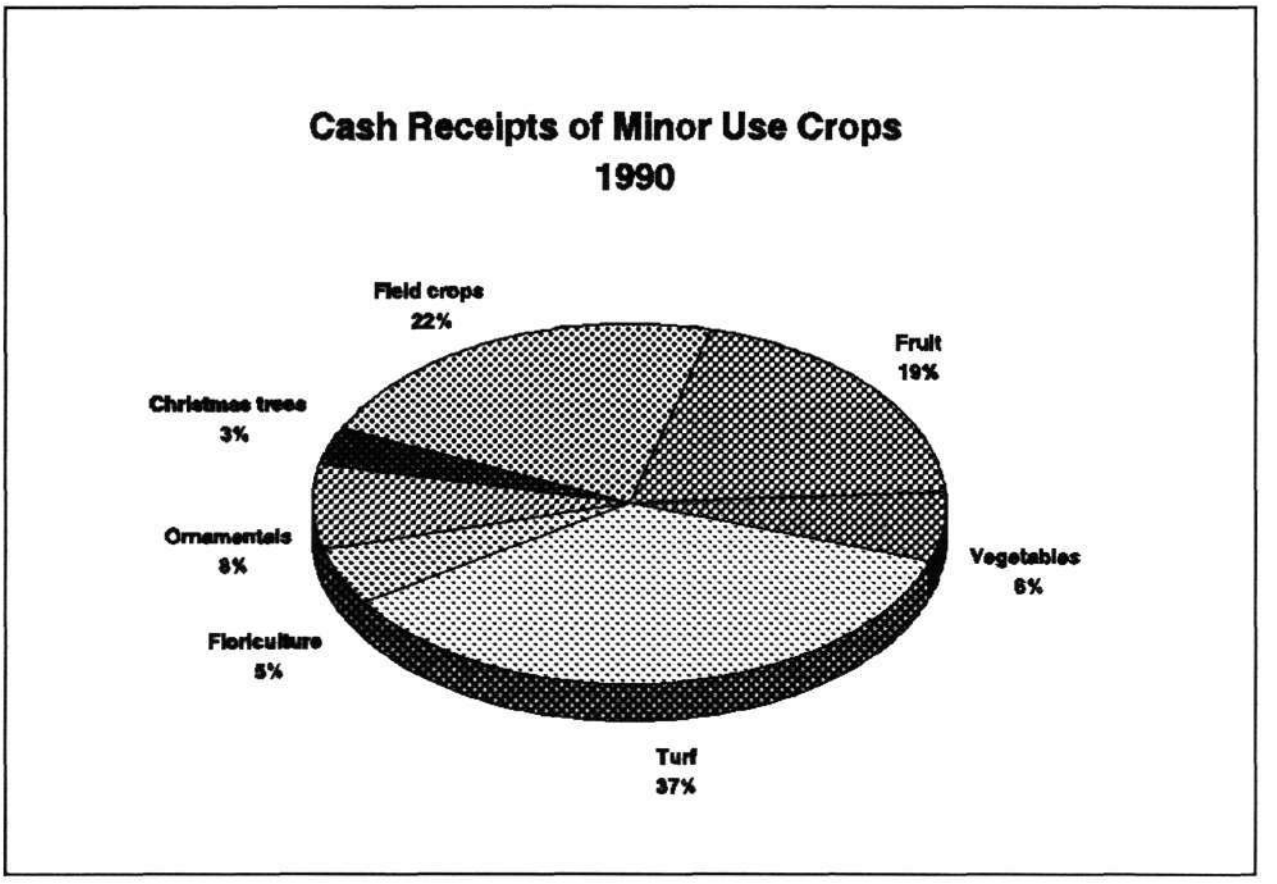
Table 1. cont. Farm gate receipts and average of Michigan specialty crops from Michigan State University Status and Potential of Michigan Agricultural Reports

COMMODITY	DOLLAR AMOUNT	ACRES
Pears	$4,000,000	1,300
Peas		1,400
Peppers	$9,000,000	3,500
Potatoes	$90,000,000	48,000
Prunes	$6,000,000	2,600
Pumpkins	$2,300,000	2,300
Radishes	$8,020,000	6,300
Seed corn		
Snap beans	$12,898,000	29,000
Soft white winter wheat	$84,280,000	570,000
Squash	$10,200,000	3,500
Stored grain		
Strawberries	$8,000,000	2,400
Sugar beets	$90,000,000	171,000
Sweet cherries	$58,000,000	9,000
Sweet corn	$17,970,000	20,700
Tart cherries	$93,000,000	38,200
Tomatoes	$20,053,000	9,700
Turf	$1,000,000,000	2,900,000
TOTAL	**$1,898,283,000**	**29,900,000**

Maintenance Expenditures - Turf

Dollar amount and acres from Status and Potential of Michigan Agricultural Report (SAPMA), Agricultural Experiment Station, Michigan State University Extension.

Figure 1. Cash receipts by percent of total on selection specialty crops.



Phase II

Narrowing the List

This report reflects information compiled by committee members during the period March 1 - June 15, 1993, on the **most critical** at-risk minor use pesticides. This information, which all the committee members agreed upon, is very time dated and sensitive in nature, not only to the producers of specialty (minor use) crops and commodity groups, but to consumers as well. Relying upon the most current information, these: **"results would change with time due to numerous inputs."**

Reasons for potential loss of pesticides include:

Re-registration of product.
The product is a carcinogen.
The product could probably be found in groundwater.
The toxicity of the product.
Worker protection.
Propaganda from undocumented research.

Strict enforcement of the Delaney clause is especially significant to minor crops grown in Michigan because many of our crops are processed and concentrated for juices and pastes.

Reports by Classification and Pesticide Name

The reports in Phase II reports include the following categories:

Pesticides listed alphabetically.
Common and trade names.
Potential for loss.
Crops on which pesticidesos used.
Dollar value of those crops.
Alternatives.
Impact of alternatives to the industry.
Research at Michigan State University.
Research nationwide.
Contact person at Michigan State University.

The following list of pesticides was put together from the data collected in Phase II of the Minor Use Pesticide Project. Both the common name and at least one trade name is listed for each.

Common Name	*Trade Name*
1,3 dichloropropene	Telone II
2,4-D	Weedone
2,4-DB	Butyrac
2,4-DP	Weedone
Acephate	Orthene
Azinphos-methyl	Guthion
Benzimidazoles	Benlate
Captan	Captan
Carbaryl	Sevin
Carbofuran	Furadan
Carboxin	Vitavax
Chlorothalonil	Bravo
Chlorpyrifos	Lorsban
Cypermethrin	Ammo
Cyromazine	Trigard
Desmedipham	Betamix
Dicofol	Kelthane
Dimethoate	Cygon
Diuron	Karmex
EBDCs	Polyram
Endosulfan	Thiodan
Ethoprop	Mocap
Fenbutatin oxide	Vendex
Fonofos	Dyfonate
Formic acid	Formic acid
Iprodione	Chipco

Common Name	*Trade Name*
Lindane	Lindane
Linuron	Lorox
MCPA	Rhonox
MCPB	Thistrol
MCPP	Mecomec
Mancozeb	Manzate 200
Mercury fungicides	Calo-Chlor
Metalaxyl	Subdue
Metham-sodium	Vapam
Methomyl	Lannate
Methyl bromide	Brom-O-Gas
Oxamyl	Vydate
Oxyfluorfen	Goal
PCNB	Terraclor
Pendimethalin	Prowl, Stomp
Phenamiphos	Nemacur
Phenmedipham	Betamix
Phenoxyl	Weedar
Phosmet	Imidan
Plant growth regulators	NAA
Propiconazole	Tilt
Prometryn	Caparol
Propargite	Omite
Sterol inhibitors	Nova
Streptomycin	Agri-Strep
Thiophanate methyl	Topsin M
Thiram	Thiram
Triadimefon	Bayleton
Vinclozolin	Ornalin

In the Phase II reports that follow, the following abbreviations were used to identify reasons for potential loss or risk and the impact on the industry.

Potential for Loss or Risk	Impact on Industry
R = Re-registration	$ = Dollar value
C = Carcinogen	Q = Major quality problems in product
G = Groundwater	Y = Potential yield loss
T = Toxicity	
W = Worker protection	
O = Other	

THIS IS AN EXAMPLE OF THE PHASE II REPORTS.

Group: Fungicide

Pesticide	Trade Name	Reason Potential Loss	Crop	Value
Benomyl	Benlate	C	Snap beans	$12,898 million
		O (Delaney clause)	Cabbage	5.5 million

Pests controlled:
White mold, Alternaria.

Alternatives:
Thiophanate methyl, iprodione are alternatives for snap beans. EBDC fungicides and chlorothalonil are alternatives for cabbage.

Impact of alternatives on industry:
As long as alternatives remain available, probably little impact would occur.

Current research at MSU - department and researcher:
Dr. M.K. Hausbeck conducts annual field trials for fungicide efficacy on these diseases.

Current research nationwide:
Researchers in nearby states conduct fungicide efficacy programs.

Additional research needed:
Continued efficacy trials on alternatives.

Contact person: Dr. M.K. Hausbeck, Botany and Plant Pathology, 517-355-4534.

Phase II

Summary

Effective implementation of pest management systems in all commodities will require a strong integrated pest management program at Michigan State University with links to commodity groups and state and federal agencies.

A data base of Phase II information will be developed for ease of access and updating of baseline information. This data base will be housed in the Extension Agriculture and Natural Resources office in 11 Agriculture Hall, East Lansing, Michigan.

When reviewing current research strategies, note that a large percentage of the alternatives to a particular pesticide are other pesticides. In most cases, the only economical alternative to a pesticide is other pesticides that may be either less toxic to humans, more environmentally friendly or in a different formulation. MSU agricultural research and Extension demonstrations will continue examining non-pesticide alternatives where applicable.

Phase III

Ranking the Top 10 Pesticides

In Phase II, more than 74 pesticides were identified as being at risk. The minor use pesticide committee then convened to determine how to rank the top 10 pesticides in the three major areas -- fungicides, insecticides and herbicides.

During a committee meeting with Dean Fred Poston and Assistant Dean Christine Stephens, it was agreed that each of the chairpersons would review the pesticides identified in Phase II and place them into a grid with three categories: potential dollar loss, potential for pesticide loss and availability of alternatives. Within each of these categories, a rating of 1 to 3 would be given.

In the first category, potential dollar loss (of farm gate receipts):

3 = dollar loss greater than $100,000.
2 = dollar loss of $10,000 to $100,000.
1 = dollar amount less than $10,000.

In the second category, potential for pesticide loss:

3 = high risk.
2 = medium risk.
1 = low risk.

In the third category, availability of alternatives:

3 = no alternatives.
2 = one or two alternatives.
1 = three or more alternatives.

Each of the minor use subcommittees used this rating system to rate each of the pesticides by crop from Phase II. The total of the scores for the three categories assisted in identifying the top minor use pesticides at risk.

Tables 8, 9, and 10 show all pesticides that received a score of 8 or higher from the fungicide, insecticide and herbicide committees, respectively. All pesticides receiving a score of 8 are listed in Table 11. Those receiving a 9, the highest possible score, are listed in table 12.

By electronic mail, fax machine and conference calls, the committee chairpersons and the coordinator reconvened and selected the top 10 at-risk minor use pesticides, which are listed in Table 13.

Table 8. Fungicides at risk.

Pesticide and Crop	Potential $ Loss Rating	Potential for Pesticide Loss	Availability of Alternatives	Total
Captan Apples	3	3	3	9
Captan Blueberries	2	3	3	8
Benlate, Topsin M All beans	3	2	3	8
EBDCs Asparagus	3	2*	3	8
Benlate Apples	3	2	3	8
Captan Celery	2	3	3	8
Thiram Celery	2	3	3	8

*Although the registration has not been lost officially, processor restrictions on usage have made these fungicides unavailable to many growers.

Dollars lost:
high (3) = > 50% of crop value
medium (2) = > 25% of crop value
low (1) < = 24% of crop value

Risk of loss:
high (3)
medium (2)
low (1) (subjective rating)

Available alternatives:
high (3) = No alternatives
medium (2) = 1-2 alternatives
low (1) = 3 or more alternatives

Table 9. Insecticides at risk.

Pesticide and Crop	Potential $ Loss Rating	Potential for Pesticide Loss	Availability of Alternatives	Total
Lorsban Onions	3	3	3	9
Avid Greenhouse	2	3	3	8
Dyfonate Onions	2	3	3	8
Formic Acid Honey	3	2	3	8
Formic Acid Pollination	3	2	3	8
Lindane Nursery	2	3	3	8
Lindane Christmas Trees	3	3	2	8
Brom-O-Gas Strawberries	2	3	3	8
Brom-O-Gas Nurseries	2	3	3	8

Dollars lost:
> 50% of crop value
medium (2) = > 25% of crop value
low (1) < = 24% of crop value

Risk of loss:
high (3)
medium (2)
low (1) (subjective rating)

Available alternatives:high (3) = high (3) = No alternatives
medium (2) = 1-2 alternatives
low (1) = 3 or more alternatives

Table 10. Herbicides at risk.

Pesticide and Crop	Potential $ Loss Rating	Potential for Pesticide Loss	Availability of Alternatives	Total
Linuron Carrots	3	3	3	9
Prometryn Celery	3	3	3	9
Oxyfluorfen Onions	3	3	3	9
Pendimethalin Onion	3	2	3	8
Diuron Asparagus	3	3	2	8

Dollars lost:
high (3) = > 50% of crop value
medium (2) = > 25% of crop value
low (1) < = 24% of crop value

Risk of loss:
high (3)
medium (2)
low (1) (subjective rating)

Available alternatives:
high (3) = No alternatives
medium (2) = 1-2 alternatives
low (1) = 3 or more alternatives

Table 11. Pesticides with scores of 8.

Pesticide and Crop	Potential $ Loss Rating	Potential for Pesticide Loss	Availability of Alternatives	Total
Captan Blueberries	2	3	3	8
Benlate, Topsin M All beans	3	2	3	8
EBDCs Asparagus	3	2*	3	8
Benlate Apples	3	2	3	8
Captan Celery	2	3	3	8
Thiram Celery	2	3	3	8
Pendimethalin Onion	3	2	3	8
Diuron Asparagus	3	3	2	8
Avid Greenhouse	2	3	3	8
Dyfonate Onions	2	3	3	8
Formic Acid Honey	3	2	3	8
Formic Acid Pollination	3	2	3	8
Lindane Nursery	2	3	3	8
Lindane Christmas Tree	3	3	2	8
Brom-O-Gas Strawberries	2	3	3	8
Brom-O-Gas Nurseries	2	3	3	8

*Although the registration has not been lost officially, processor restrictions on usage have made these fungicides unavailable to many growers.

Dollars lost:
high (3) = > 50% of crop value
medium (2) = > 25% of crop value
low (1) < = 24% of crop value

Risk of loss:
high (3)
medium (2)
low (1) (subjective rating)

Available alternatives:
high (3) = No alternatives
medium (2) = 1-2 alternatives
low (1) = 3 or more alternatives

Table 12. Pesticides with scores of 9.

Pesticide and Crop	Potential $ Loss Rating	Potential for Pesticide Loss	Availability of Alternatives	Total
Captan Apples	3	3	3	9
Oxyfluorfen Onions	3	3	3	9
Linuron Carrots	3	3	3	9
Prometryn Celery	3	3	3	9
Lorsban Onions	3	3	3	9

Dollars lost:
high (3) = > 50% of crop value
medium (2) = > 25% of crop value
low (1) <= 24% of crop value

Risk of loss:
high (3)
medium (2)
low (1) (subjective rating)

Available alternatives:
high (3) = No alternatives
medium (2) = 1-2 alternatives
low (1) = 3 or more alternatives

Table 13. Top 10 Minor Use Pesticides.

Pesticide and Crop	Potential $ Loss Rating	Potential for Pesticide Loss	Availability of Alternatives	Total
Captan Apples	3	3	3	9
Oxyfluorfen Onions	3	3	3	9
Linuron Carrots	3	3	3	9
Prometryn Celery	3	3	3	9
Lorsban Onions	3	3	3	9
Captan Blueberries	2	3	3	8
Benlate, Topsin M All beans	3	2	3	8
EBDCs Asparagus	3	2	3	8
Benlate Apples	3	2	3	8
Diuron Asparagus	3	3	2	8

Dollars lost:
high (3) = > 50% of crop value
medium (2) = > 25% of crop value
low (1) < = 24% of crop value

Risk of loss:
high (3)
medium (2)
low (1) (subjective rating)

Available alternatives:
high (3) = No alternatives
medium (2) = 1-2 alternatives
low (1) = 3 or more alternatives

This report provides an assessment of minor use pesticides on Michigan specialty crops. It also gives us an opportunity to work on alternatives and an organizational tool to set priorities. As this report is shared with individuals and commodity groups, Michigan State University needs to prepare funding mechanisms to support the alternatives to current pesticide use that will be needed for research and Extension activities related to minor use pesticides.

It is our recommendation that the Michigan Agricultural Experiment Station and MSU Extension jointly prepare a strategy for funding both short-range and long-range research to find and demonstrate practical non-chemical applications.

The minor use pesticide committee recommends that a quick response team be identified for consultation in the event that Michigan farmers lose particular key pesticides. It also recommends that this project be reviewed annually to determine the appropriateness of research and/or Extension demonstrations.

MEETING DATES

Phase I

Extension Agriculture and Natural Resources Committees: January 25, 1992.

Individual committee meetings and conference calls, February through December 1992.

ANRC Committees

Field crop	Landscape
Floriculture	Turf
Forestry	Vegetable
Fruit	

Phase II

Meeting with Dean Fred Poston: April 15, 1993, Kellogg Center, Centennial Room.

Minor use committee meetings: June 1 and June 14, 1993, Ohio State Room, Union.

June 1, 1993	**June 14, 1993**
Tom Dudek	David Roberts
Dave Smitley	Tom Dudek
Gary Thornton	Doug Lantagne
Jim Johnson	Greg Lyman
Doug Lantagne	Karen Renner
Doug Landis	Doug Landis
Greg Lyman	Jim Johnson
Karen Renner	Gary Thornton
Gustaaf deZoeten	Ed Grafius
Pete Vergot III	Pete Vergot III

Project compiled June 15 - August 25, 1993, by Pete Vergot III.

Phase III

Meeting with committee chairs Karen Renner, Jim Johnson and Tom Dudek, Chris Stephens, Fred Poston and Pete Vergot.

Report completed January 1994.

ANR COMMITTEES FOR MINOR USE

Coordinator: Pete Vergot III

Floriculture
Will Carlson (Chairperson)
Dean Krauskopf
John Biernbaum
Tom Dudek
Royal Heins
Jim Lincoln
Dave Roberts
Dave Smitley
Mary Zehner

Forestry
Doug Lantagne
Jill O'Donnell (Co-Chairperson)
Russell Kidd (Co-Chairperson)

Vegetable
Ed Grafius
Mary Hausbeck
Mel Lacy
Bernard Zandstra
Jim Lincoln (Chairperson)

MINOR USE PESTICIDE SUBCOMMITTEE

Vegetable
Mel Lacy
Jim Johnson (Team Leader)

Floriculture
Dave Smitley
Tom Dudek (Team Leader)

Turf
Dave Smitley
Greg Lyman

Field Crops
Karen Renner (Team Leader)
Doug Landis

Fruit
Gary Thornton
Ed Grafius

Landscape
Dave Smitley
Tom Dudek (Team Leader)

Forestry
Doug Lantagne
Deb McCullough
Russell Kidd

APPENDIX 2

Agricultural Chemical Source Reduction Workshop

Final Report
July 27-28, 1993

Agricultural Chemical Source Reduction Workshop

July 27-28, 1993

Final Report

Michigan Department of Natural Resources
Michigan Department of Agriculture
Michigan State University

Table of Contents

Workshop Advisory Committee

Dr. Jon F. Bartholic, institute of Water Research, Michigan State University
Dr. Frank M. D'Itri, Institute of Water Research, Michigan State University
Dr. Ian Gray, Agricultural Experiment Station, Michigan State University
Dr. Richard Harwood, Department of Crop and Soil Sciences, Michigan State University
Mr. Homer Hilner, USDA Soil Conservation Service
Dr. Robert Hollingworth, Pesticide Research Center, Michigan State University
Mr. John Kennedy, Michigan Department of Natural Resources
Dr. Ted Loudon, Department of Agricultural Engineering, Michigan State University
Mr. Steve Miller, Michigan Department of Natural Resources
Ms. Vicki Pontz, Michigan Farm Bureau
Dr. Ruth D. Shaffer, USDA Soil Conservation Service
Dr. Christine Stephens, Extension Agriculture and Marketing, Michigan State University
Mr. Ron Van Til, Michigan Department of Natural Resources
Dr. David Wade, Michigan Department of Agriculture

Section 1. Workshop Purpose, Objectives and Participants

One of the important challenges facing agriculture in the 1990's is the need to manage pesticides and fertilizers in a manner that fully integrates economic and environmental objectives. Michigan is addressing this challenge, both through implementation of existing programs and the development of the state's first Pesticide Management Plan. The plan, which is being developed under guidance from the U.S. Environmental Protection Agency, will consider a range of goals, legal authorities, and management strategies. Of central importance: the need to maintain economic viability while minimizing public health and environmental risks. Nowhere is this balance more important than in the management of agricultural chemicals.

Because of the volume of pesticides and fertilizers currently applied in Michigan, and their importance to conventional agricultural production, it is essential to consider issues of efficiency and sustainability. Do current application rates optimize crop production and economic returns? Will continued use of pesticides and fertilizers pose significant long-term risks to public health and the environment? What potential exists for reducing pesticide and fertilizer use without negatively impacting agriculture?

To address these issues, the Michigan Department of Natural Resources, the Michigan Department of Agriculture, and Michigan State University cosponsored an Agricultural Chemical Source Reduction Workshop on July 27-28, 1993. The overall purpose of the workshop was to convene a select group of experts and knowledgeable professionals to address the following question: To what extent can pesticide and fertilizer use be reduced in Michigan while maintaining economic competitiveness?

Specific workshop objectives were as follows:

- To discuss the feasibility of establishing a baseline for existing pesticide and fertilizer use against which reductions could be measured
- To identify strategies and techniques to reduce pesticide and fertilizer use while maintaining economic competitiveness
- To provide guidance to policy makers on how to reduce pesticide and fertilizer use while maintaining economic competitiveness
- To promote discussion and exchange of ideas among federal, state, local, and private stakeholders

Sixty participants from state government, universities, industry, agriculture, and environmental organizations attended the workshop (see Appendix A). During the opening evening session, introductory remarks were made by Homer Hilner, State Conservationist. Dr. David Pimentel from Cornell University then presented a keynote address on "The Environmental and Economic Impacts of Reducing U.S. Pesticide Use." This was followed by brief program summaries by representatives from the U.S. Department of Agriculture, Michigan State University, the Michigan Department of Agriculture, the Michigan Agricultural Stewardship Association, and the Ontario Ministry of Agriculture and Food. A number of posters and displays were available for viewing by workshop participants.

The second day of the workshop included a national panel of experts, who addressed the question "Can Pesticide and Fertilizer Use Be Significantly Reduced While Maintaining Economic Competitiveness?" Two state panels discussed strategies and techniques that Michigan can use to better manage pesticides and fertilizers, then workshop participants were divided into four groups to consider specific

agricultural chemical management and source reduction questions. Following reports by these groups, the workshop concluded with a plenary discussion of broad program and policy issues and the need to continue the workshop process. The following sections of this report are organized in the same sequence as workshop sessions. They include 1) Overview of Workshop Presentations, 2) Group Reports, and 3) Plenary Discussion Summary. The final section of the report identifies a strategy for continuing the workshop process to address critical pesticide and fertilizer management issues.

Section 2. Overview of Workshop Presentations

Homer Hilner, State Conservationist for the Michigan Soil Conservation Service welcomed conference participants and opened the meeting with introductory remarks. Hilner's overview remarks reflected that Michigan's productive and varied agriculture depends on the use of many agrichemicals, but that resource problems have developed from some of the chemical use. He stated that it is important to look not only at the amount of pesticide used but at the effects of such use. He stressed that Michigan agriculture should take the initiative to eliminate problems caused by pesticides to avoid further regulation. He encouraged the agricultural community to become involved in participatory self regulation, specifically through sustainable farming practices. Hilner cited a recent paper by Stephen M. Meyer from MIT which concluded that strong environmental laws have not adverse caused economic impacts. He commended the workshop organizers for their initiative toward self-regulation, and concluded by suggesting that agriculture should encourage chemical manufacturers to develop environmentally friendly products.

Dr. David Pimentel from Cornell University delivered the Plenary Speech of the workshop. Dr. Pimentel opened his presentation by stating " There is no question that we can do a better job in agricultural chemical management to the benefit of agriculture and all involved" He also pointed out "There is no question that U.S. agriculture has produced abundant, high-quality food." Pimentel presented several examples of agricultural problems that are directly related to pesticide use: The herbicide 2,4-D when applied at rates directed by the label can cause massive increases in insect pests and smuts. Pesticides cause $8 billion in damage each year. Of the one billion pounds of pesticides applied to crops in the U.S. each year, only 0.1% gets to the target pests. Since 1945, insecticide use has increased tenfold, while crop losses to insects have doubled.

Dr. Pimentel went on to review pesticide reduction programs that have been undertaken by other nations: Sweden has decreased pesticide applications by 50%, and is continuing with a second pesticide reduction program. Ontario, Canada is decreasing pesticide use to better compete with U.S. agriculture. Indonesia has decreased its pesticide use 65% on rice while increasing yields by 12%. Cabbage Looper Moths have been successfully controlled experimentally using viruses instead of insecticides.

Dr. Pimentel stressed that pesticide use reduction requires knowledge; the farmer must understand the pest, the crop, and the environment to be successful. A recent paper authored by Pimentel *et al.* estimates that a 50% reduction in U.S. pesticide use would increase consumer food prices by only 0.6% and assumes that yields remained the same. Pimentel explained that farmers are supportive of the Ontario pesticide reduction program because 1) it saves them money, 2) it helps protect farmers and their families from pesticides, and 3) it protects the environment. The program,

according to Dr. Pimentel, is substituting knowledge for chemicals. He closed his presentation by posing the question: if pesticide reduction is good for farmers and consumers, why is legislation needed? His answer was that chemical manufacturers will not support application rates less than those specified on the labels of their products, and conventional agriculture is accustomed to intensive chemical use.

Experts Panel #1: *Can pesticide and fertilizer use be significantly reduced while maintaining economic competitiveness?*

Wayne Roberts, Ontario Ministry of Agriculture and Food, reviewed the *Food Systems 2002* program which is based on programs such as integrated pest management (IPM) and sustainable agriculture under a systems approach. He stated that IPM was first discussed by Agriculture Canada and the University of Guelph as early as 1967. A strategy was set up by 1977, but not realized until 1988, and is now in place. Food Systems 2002 is a generic delivery system based on a code-a-phone system which might be more accurately be called "dial-a-prayer." This system can "control" spray applications to a 3-day period when they are most effective, based on crop, pest, and weather conditions.

Roberts addressed the question of whether IPM could be privatized. He pointed out that the economics of IPM have been demonstrated, but the environmental and social aspects are unknown. He also stated that no one organization is capable of delivering IPM because 22 crops are grown in Ontario, and each one has an individual program. Roberts suggested that IPM must be evolved beyond pest control to a holistic systems approach to agricultural management. Roberts stressed that short-term funding commitments for agricultural programs don't work, neither do fixed reduction targets. He also emphasized that growers need resource people to assist the interpretation of IPM information. Roberts closed by stating that privatization of IPM alone will be difficult, and will require continuity, commitment, and credibility.

Dr. Mike Duffy, Leopold Center for Sustainable Agriculture, Iowa State University, opened his presentation by expressing his pleasure at seeing interagency cooperation and coordination in Michigan concerning this topic, a critical element of a successful program according to him. The Leopold Center is funded by a nitrogen fertilizer tax which was set up by the 1987 Groundwater Protection Act. The Center is composed of three elements, funding for research, an administrative staff, and issue teams.

Dr. Duffy's answer to the question posed to this panel was "Yes!" The elements to be considered are: the crop, how to feed the crop, and how to manage pests. He emphasized that we do not control pests as evidenced by the corn rootworm changing to a 2-year life cycle in Iowa in response to crop rotation management of corn. He identified key agricultural practices for an agricultural chemical reduction program: mechanical control (tillage) and band applications of herbicides, soil tests to prevent wasting money on applying nutrients that are already available, and using fertilizer credits for manure and previous crops (legumes and residues). He also suggested that farmers maximize $/acre instead of bushels/acre for the most successful farm management. Duffy stated that "We're smart in the parts, but dumb in the whole," emphasizing that a holistic philosophy to agriculture is needed. He closed by pointing out that the farm operator is the critical link of reduced-chemical agriculture, the operator needs to understand the technology, crops, and pests.

Dr. David Pimentel, Cornell University, began his presentation by admitting that the estimates of poisonings and crop losses from pesticides aren't the best data, but asked the audience, "Are public health and environmental problems

absent?" He went on to point out that pesticides have benefits and costs, and emphasized that "We can do a better job of management." Dr. Pimentel has been criticized for his work, and his response to critics has been, "You do a better job, and I'll read your paper."

Dr. Pimentel stated that farming is complex; farmers must manage crops, livestock, diseases, pests, weeds, marketing, finances, and so on. To reduce pesticide use, farmers need information on better pest control. As an example, he told of a scientist in Norway who discovered that one fifth of the recommended application rate for a certain pesticide was effective for control. This finding was met with resistance, but the Norwegian government finally forced the manufacturer of that pesticide to change the label to specify a lower application rate. Dr. Pimentel concluded by reminding the audience that pesticide reductions in Europe have been enacted by political pressure outside the agricultural industry.

Dr. George Bird, U.S. Department of Agriculture, reported that the number of U.S. farms has decreased from 6 million in 1940 to 2,000,000 in 1993. Only 300,000 of these farms, however, are responsible for 85% of the food, feed and fiber production. The next step will be a decrease to 150,000 farms. Farmers will need to change to survive, and the components of the current conventional farm model are a major constraint to the adoption of Integrated Pest Management. Dr. Bird reminded the audience that agriculture is a social activity as it is human controlled production.

Dr. Bird reviewed the Stewart Smith model of U.S. agriculture which found that between 1910 and 1990 the earnings of the market sector have increased 627%, the earnings of the input sector have increased 460% and the earnings of the farm sector have decreased 8% (all figures are 1987 dollars). This industrial agribusiness model is of grave concern because it reveals the precarious position of the nation's farm families.

Dr. Bird also pointed out that farmers have become disassociated from their communities because they rely on sources that are located great distances from them for their supplies [machinery, fertilizers, feed, and pesticides]. This feature has been deleterious to communities that have relied on farm expenditures in the past.

Dr. Bird went on to define the difference between *growth* and *development*: growth is quantitative, and consists of increases in size by assimilation; it has limits. Development is qualitative, and consists of increases in benefits and the realization of potentials, and is not limited. Farm communities need development, and the 5 attributes of sustainable development are: 1) the rate of use of renewable resources don't exceed the rate of renewal; 2) the rate of use of non-renewable resources don't exceed the rate of development of new technologies and sources; 3) residuals don't exceed the assimilative capacity of the environment; 4) the appropriate quality of life must be provided and readjusted, it is not a steady state; and 5) there must be intergenerational equity. Dr. Bird then presented a 21st century diversified farm model which has the potential for 1.2 million new farms and asked the audience to ponder "Are neoclassical economics and western science compatible with sustainable development?"

Discussion Panel #2: *What strategies and techniques can Michigan use to better manage pesticides?*

Dr. Larry Olsen, MSU Pesticide Research Center, began by emphasizing a goal approach toward improved pesticide management, following IPM. The goals he discussed were: 1) prevent point source pollution (better storage & mixing of pesticides); 2) emergency preparedness (SARA title III); 3) reduce the amount applied (bands, video imaging, altering insect behavior); 4) reduce frequency of applications (scouting, timing); 5) cut use (parasites, viruses, trenches, flame throwers as alternatives); 6) human safety (noncarcinogenic

pesticides with nondetecable residues at harvest); 7) education (prevent control of nonexistent pests); 8) water quality (leaching, runoff); and 9) natural resource preservation (alternate pesticide choices).

Dr. Olsen then discussed five strategies for adopting better pesticide management programs: 1) need to set realistic production goals; 2) need a long term commitment to develop alternative management techniques; 3) need for demonstrations; 4) need to cooperate with all agencies (common databases); and 5) need for voluntary, not mandatory regulations.

Jerry Wirbel, Michigan Agricultural Stewardship Association (MASA), opened his talk with an explanation of how MASA is structured to maintain farmer control of the organization. He also spoke of how farming has changed, and the continuing need for resource people. He also told of disappointments he's had in getting money for no-till farming to improve water quality. "ASCS won't pay unless the DNR has evaluated each ditch for chemicals and determined whether no-till would help."

Wirbel reiterated that within MASA, farmers are the originators of ideas, not MASA or universities, or the government. He stressed the need for good experimental design in show-n-tell test plots, and suggested large strips of test plots that encounter differences in soils across the field.

Wirbel emphasized that farmers don't trust the advice of non-farmers because their livelihood doesn't depend on the land. He also spoke of how MASA is working with the DNR and SCS to coordinate wildlife ponds, wildlife plantings, and pheasant releases. "MASA focuses on cooperation. Farmers are willing to cut back [on chemical use] but need economic proof."

Rod King, Michigan State University Extension, explained how the role of the extension agents has changed from being a conduit between university researchers and farmers, to being involved with farmers directly, learning with them on test plots. Extension agents also have an increasing role of teaching the non-farm public about food and fiber production because reporters don't understand biological systems, and grasp sensational information.

King emphasized that "Farmers are currently managing pesticides, we must acknowledge this and do better." He suggested that we turn our attention to what techniques and strategies can be used to manage pests, not pesticides. King stressed that food production systems must maintain and enhance the natural resource base, and must be economically viable. He stated that "IPM is conceptually right, scouting is working, but, once a pest is seen, we reach for a chemical."

King encouraged the agricultural industry to improve pest management by considering what other techniques could be used, and to develop total crop management systems which include such elements as alternative pest management, crop rotation, trap crops, early cutting of alfalfa to reduce pest damage, and encouraging pest predators. King directed farmers to look at maximizing profit, not production. King closed by stating that we must continue science-based research on farming, focus on real economic gains, and develop a voluntary, not mandatory pesticide reduction program.

Joe Scrimger, Organic Farmer and Consultant, opened his presentation by explaining that "cover crops" are also part of his cropping system and they do work. He also explained that his farm production is presently centered around raising food versus raising commodities. His specialties are the soil nitrogen cycle and weed control. His customers range across Michigan, and have farms ranging from 2 acres to 2000 acres. Scrimger sees a direct need to cut pesticides and reduce fertilizers in Michigan agriculture, and asked the audience, "What are we ready for in terms of pesticide reduction?"

Scrimger suggested that we "need to reprogram the agriculture computer" because "it may have been programmed with incorrect information." He criticized MSU for initially ignoring the methods of organic agriculture. His first faculty contact was Dr. Craig Harris from the Department of Sociology. More recently he has been in communication with Drs. Edens, Hays, Bird and Harwood who have faculty appointments in the Departments of Entomology and Crop and Soil Sciences.

Scrimger went on to discuss his approach to farming. He manages biological systems for agriculture, using only products and technologies that complement the soil life cycle. Understanding life in the soil, according to Scrimger, is critical for successful low-input farming. The average agricultural soil has 2,000 pounds of beneficial organisms per acre, but 8,000 lbs/acre is required for successful organic farming. Scrimger stated that agriculture seems now ready to accept that soil insecticides affect soil fauna negatively, but we seem slower to understand that herbicides also affect soil fauna in a negative way, a result that should be considered by this group. He explained that "protoplasmic decay from the beneficial soil microorganisms short life cycle can hold soil under heavy rains and prevent erosion," so organic farming is protective of the soil matrix. Scrimger emphasized that most test plots have insufficient soil fauna for organic farming, which may explain why research on organic methods is often equivocal.

Scrimger moved on to the subject of weed control on organic farms. He cited a book co-authored by C.J. Fenzau (an Acres USA primer), in which Fenzau embraces the concept of weeds as indicators of what is right or wrong with the soil system. Scrimger joked that one conclusion which has been drawn from conventional agricultural wisdom about weeds is that they must be indicating a shortage of herbicides in the soil. From Scrimger's work, weeds indicate problems with soil conditions such as: quackgrass indicates a shortage of soluble calcium, aeration and decay; foxtail indicates soil structure problems; nutgrass indicates the soil was worked a little too wet; lambsquarters indicate a good soil, but if it is difficult to control there may have been an over application of NPK; dogbane hemp and milkweed indicate anaerobic soil lacking certain decay organisms. Scrimger stated that many farm soils have an overdose of nitrogen and potash, and are lacking in soluble calcium and phosphate, which makes for a large volume of low quality production. He emphasized that farmers need to read what the crops and the weeds are telling them about the state of their soil.

Discussion Panel #3: *What strategies and techniques can Michigan use to better manage fertilizers?*

Dr. Joe Ritchie, MSU Dept. of Crop and Soil Sciences, told the audience to remember three key terms for agriculture 1) food production/productivity, 2) revenue and 3) risk. He stated that farmers are risk-averse with respect to fertilizers; they will over-apply fertilizers to prepare for the best yields. An excess of 20-30% fertilizer application is considered insurance by farmers because it won't reduce yields, but may improve them. Dr. Ritchie identified phosphorus as the major fertilizer problem in surface waters, especially following storms, and identified the two tools farmers have for fertilizer management to be soil analyses and plant analyses. He pointed out, however, that both of these tools are qualitative, and that soil test results are not always accurate because nitrogen can change forms rapidly in the soil. Dr. Ritchie explained that interpretation of soil test results often leads to recommendations to apply an amount of nitrogen that is greater that the minimum amount required to achieve the yield goal. For example, when an agricultural advisor such as an extension specialist, fertilizer company representative or a private consultant makes a fertilizer recommendation, he/she is likely to err

on the high side to make sure the farmer has adequate nitrogen to reach his/her yield goal. If the advisor does not recommend enough fertilizer and the farmer loses some of his/her yield, the status of the advisor will be damaged. In this way, excess applications of nitrogen fertilizer are also insurance for the advisor's personal status in a farm community.

Dr. Ritchie went on to explain that management of fertilizers for minimum leaching is very different from managing fertilizers for maximum (or optimum) corn yields. Ritchie concluded by emphasizing that to become successful at managing fertilizers toward both goals, we will need to find the point of optimal corn yield and nitrate loss for each soil type:crop combination.

Joe Ervin, MSU Institute of Water Research, reminded the audience that risks are plentiful in farming, and that Cass County, the area he has been working in recently, is a complex landscape of wetlands and agriculture. He explained that nutrient management in this southwestern Michigan county revolves around the swine industry which utilizes field "farrow to finish" management. There are many areas which are not suitable for row crop agriculture, but may have been used successfully to raise hogs. The exposure of the land to high densities of animals for several months results in compaction and storm runoff carrying the manure deposited by thousands of animals. To mitigate these problems, Ervin explained, these fields need to be rotated more often to reduce these impacts, with additional attention paid to diversifying the uses of these fields. He pointed out that small wetlands currently receive much of the runoff from hog pastures, resulting in extremely heavy nutrient loadings. While these wetlands reduce nitrate concentrations, both ammonia and phosphorus build to high levels. Ervin emphasized that many wetlands may be recharging the groundwater, so there needs to be careful consideration about the use of and nutrient loading to wetlands. In addition, wetlands and streams may need to be fenced to prevent hogs from entering them.

Ervin stated that manure from confinement facilities needs to be applied as a resource, not a waste, and fields where large amounts of manure have been applied should have the soil tested to determine whether they should receive additional applications. He cautioned that expansion of animal agriculture should proceed with the utmost care in areas that are as sensitive and heavily used as Cass County; and suggested that Geographic information systems (GIS) be used to locate potential expansion areas.

Ervin emphasized that people are important in agriculture, and that "stewardship is a thread linking rural communities." He stated that the 120 farm families he has been working with are willing to change their management as long as they understand why they need to change. A global view isn't useful to these farmers, they must understand how their farming practices affects their land and their neighbor's lives before they will make changes. Ervin has observed that each farmer is different, they've had different educations, lead different lifestyles, have different resources and different expectations for their farms. These differences prevent broad policies from having the same effect on all farmers. He called on the school systems to develop more aggressive educational efforts to promote stewardship and understand the basic needs of agriculture. In addition, the agricultural community needs the expertise of universities and agencies to understand the reasons for environmental problems and the needs for change in agricultural management. Ervin closed by informing the audience that farmers do not accept blame for global problems, their practices, in their view, are important at the local scale.

Dave Dempsey, Michigan Clean Water Action, outlined three key points. First, he argued Michigan's rural groundwater contamination from nitrate is caused primarily by the

overapplication of agricultural fertilizers. He noted that the state chose 10 years ago not to reimburse owners of private wells contaminated by nitrate from the Michigan Environmental Response Act (Act 307) program because it would bankrupt the cleanup fund. He cited studies from Ottawa, Van Buren, and Cass Counties as well as a statewide scan of private wells tested by the state showing elevated nitrate levels, saying contamination was found in areas with porous soils, use of groundwater as a primary drinking water source, and intensive agriculture. If any other contaminant exceeding EPA maximum contaminant levels (MCL) was found so widely, it would be regarded as a crisis demanding immediate action, he said. Instead, the state appears to have written off whole groundwater aquifers in southwest Michigan, instead of developing a plan to prevent contamination.

Second, he observed that Michigan must take aggressive action to abate nitrate contamination caused by fertilizers. He cited proven and suspected human health effects resulting from exposures to nitrate in drinking water. Further, he said, widespread nitrate contamination across the country increases the likelihood that Congress will mandate that states control the problem. Michigan would be better served by developing a program ahead of a national mandate, he said. Such a plan, Dempsey argued, should include: 1) a statewide goal to reduce the use of agricultural fertilizers, beginning with voluntary measures but becoming mandatory if voluntary approaches aren't successful; 2) establishment of an Office of Pollution Prevention in the Michigan Department of Agriculture, one of whose tasks would be to promote aggressively best management practices (BMPs) that stress timed application of fertilizers; 3) penalties for agriculture operations not complying with BMPs after they are given an opportunity to adopt them voluntarily; 4) identification by the Department of Natural Resources of high-risk watersheds (including groundwater resources) with special monitoring of fertilizer use and runoff in those areas; 5) completion of the state's groundwater data base under DNR direction, with a special analysis of nitrates being completed first; 6) as a last resort, state regulation of operations where nitrate levels exceed the MCL consistently and over a widespread area. Such controls, would include targeted nitrate analysis of soils and wells and delayed applications of commercial fertilizer, as well as participation by operators in educational programs.

Third, Dempsey pointed out that nitrate levels have other sources as well, and urged cooperative efforts to abate them all, rather than distribution of blame for the problem. Environmentalists will join such cooperative efforts, he said.

Henry Miller, St. Joseph County Farmer, raises seed corn in Michigan. Miller recounted for the audience that he began questioning his nitrogen management after a soil test following a 100 lb/acre nitrogen application, followed by a big rain showed a nitrogen deficiency. He began reducing his nitrogen fertilizer applications, and was able to decrease them from 250 lb/acre to 110 lb/acre without decreasing his yield. Miller stated that a systems approach is necessary for proper nitrogen management because there will be residual nitrogen in plant residue and the soil after harvest. He reminded farmers that the advice from fertilizer specialists and salespeople will be biased toward the high side to insure that the crops will have enough nitrogen for a maximum yield. Miller also encouraged farmers to manage their farms for maximum profitability, not maximum yields. He also encouraged farmers to manage nitrogen to meet the crop's needs: an application schedule may be 30 lb/acre for starter, followed by 60 lb/acre in mid-June with cultivation. Miller also recommended using trap crops that will grow and use available nitrogen after the corn stops using nitrogen in July. The trap crops will keep that nitrogen in the root zone for the following season.

Section 3. Discussion Group Reports

Pesticide Discussion Group P 1

This group included fifteen participants representing the Michigan Departments of Public Health, Natural Resources, and Agriculture, MSU Extension, East Michigan Environmental Action Council, Ontario Soil and Crop Improvement Association, Agribusiness Consultants, Cornell University, BioSystems, Legislative Service Bureau and EPA Region V. They listed the following specific objectives that could be set under the overall goal to better manage pesticides: more efficient delivery of pesticides to the target organism; protection of beneficial organisms; improvement of application technology; increased use of alternatives to chemical management of pests; move toward less risky pesticides and pest control methods; better understanding and evaluation of the site of pesticide residues in and on food; reduce unwanted pest problems through better understanding of applications and their side effects; increase public acceptance of less than perfect looking produce; change the "spray first" attitude to an IPM attitude; minimize regulation intrusion in pest management; subsidize the major objective of reduction of pesticide use; avoid ad hoc decision making by the U.S. and state governments; increase farmer involvement in decision making; improve documentation and dissemination of alternative agricultural practices; use realistic risk assessment with an emphasis on environmental costs; and understanding the long term plan to deal with short term problems.

These 21 specific objectives were then combined and ranked in the following way:
1) Increase the development of and use of less risky pest control problems. 2) Increase the awareness of the cause of pest problems while treating their damage symptoms. 3) Move toward more realistic risk assessment procedures with emphasis on environmental cost including worker exposure and water quality.

Barriers to establishing a pesticide use reduction strategy in Michigan include: 1) Lack of data including the environmental impact data and baseline pesticide use information. 2) Liability issues including crop losses from use of reduced pesticide application rates. 3) Farm programs that provide incentives for high yields of major crops.

The workshop panel agreed that a statewide goal for pesticide reduction should be stated. This goal should be tailored to the community and be site specific. It will be easier for some commodities and areas of the state to achieve this goal. There was no agreement on the amount of reduction, the time table nor the unit of measure.

Pesticide Discussion Group P 2

A wide variety of opinions concerning the pesticide use reduction topic were expressed by this group. The following statements do not represent a consensus opinion, but should serve to indicate the "flavor" of the discussion. The first thing the group did was throw out the "pesticide use reduction" goal and move toward a "better pesticide management" goal. The general feeling was that "pesticide use reduction" as a single goal should not be established because source reduction could occur and not meet broader social objectives. many possible objectives under a "better pesticide management" goal were then expressed and genericized into the three primary objectives: 1) Maintain or enhance the natural resource base; 2) Achieve acceptable human and environmental health risks; and 3) Protect farm profit margins. These objectives were not prioritized, but are listed here by increasing ease of definition.

Several barriers to achieving an improvement in pesticide management were defined. The majority of these centered around the issue of being able to show the value of the management

changes to the impacted community. National farm policy was also criticized for creating a dependance on commodity crops which limits management options to producers.

On the issue of goal quantification there was fair agreement that no universal unit of measure was available which would be functional across all three primary objectives. Several options were proposed including the use of biological diversity indices, active ingredient mass normalized by toxicity, and resource specific indicators. There was also fair agreement that simply using a goal of reduced mass may lead to the use of more toxic or biologically active compounds. A minority opinion also expressed that all of the goal setting and quantification problems may simply go away if we were to get off the "pesticide treadmill" and make the switch to organic agriculture.

There was also group consensus that agricultural producers can manage pests more effectively is they had immediate access to information, incentives, and/or technical experts. Enhancements in these broad areas would, in essence, result in broader utilization of integrated pest management (IPM) principles and the reduced use of pesticides. The group agreed that pesticide use reduction was an achievable objective given the above framework.

The participants in the discussion group also stated that MDNR should be commended for providing a forum to discuss the issue. The opinion seemed to be that further discussions needed to occur and additional time allocated to this specific initiative.

Fertilizer Discussion Group F 1

The discussion group felt there was a need to re-word the goal statement regarding fertilizer input reduction. It was changed to read "Michigan should better manage nutrients to reduce health and environmental risks to improve the economic viability or agriculture." In the process of discussing specific objectives that could be set to achieve the goal, the group identified three general categories of objectives to be developed. Objectives developed should portray a proactive and positive posture regarding agricultural nutrient management. Objectives should deal with protection of public health, reduction of environmental impact, and improving economic viability of agriculture.

There was much discussion around how objectives should be worded to convey a positive approach and also result in a measurable objective. It was felt that it was not so much the nutrient input that was of concern but potential impact of nutrients. It was also pointed out that existing policies which have the effect of promoting nutrient loss to the environment should be identified and changed.

While the group did not completely develop the requested set of objectives to achieve the goal, there was general consensus that a goal for better nutrient management and some sort of a process for implementation and evaluation are steps that should be taken.

Possible goal statements suggested are:

Environmental

- Reduce the nutrient loss to the environment by ___%
- Reduce environmental impact of agricultural nutrients by ___%
- Reduce the presence of agricultural nutrients in the environment
- Identify existing policies that promote nutrient loss to the environment
- Reduce groundwater degradation
- Reduce surface water degradation

Economic

- Improve nutrient use efficiency
  tie-up [nutrients] and use next season(s)
  maximize use of "organic-N"
- Make most efficient use of crop nutrients
- Increase nutrient use efficiency by ___%

In the objective development process, we should look toward improving nutrient use efficiency and identifying management practices that could tie up nutrients in the soil and have them available for the next season and less likely to be lost to the environment.

Any statements dealing with reducing nutrient loss to the environment would be very difficult to measure.

In order to achieve any impact reduction objective, educational programs will be needed for farmers and other nutrient managers. Specific needs for educational programs identified would include education regarding the nitrogen cycle and manure-nutrient use.

Fertilizer Discussion Group F 2

As planned, the participants in this discussion group represented diverse backgrounds and, not unexpectedly, somewhat diverse opinions concerning the practicality of dramatically reducing fertilizer use in production agriculture. Nevertheless, our group did reach reasonable consensus on a set of **highest priority objectives.** These were: 1) **There must be widespread adoption of the existing Best Management Practices (BMPs) regarding fertilizers and manures.** Put another way, if the preponderance of farmers were employing all available BMPs, a marked improvement in environmental quality would result. 2) **A upper limit of tolerable environmental degradation, irrespective of economic considerations, must be established and enforced.** This decision will help ensure that the most grievous management practices or enterprises are dealt with first. Such a decision supports the agricultural stewardship ethic and reaffirms that the right to farm is not a right to pollute. 3) **Ninety percent of Michigan's arable lands should receive only the amount of nutrients needed for crop growth.**

There was less consensus concerning source reduction goals. The majority opinion held that a 30-50% reduction in fertilizer use was possible now on many farms, but that setting a statewide goal at this level would be problematic since some operations may only be capable of a 5-10% reduction in use. The minority view held that a goal exceeding 10 or 20% was impractical and ill-advised. From a consensus viewpoint, the group overwhelmingly (but not enthusiastically) endorsed a reduction goal of 10-20%. Additionally, everyone agreed that meaningful source reduction goals would need to be established on a farm-by-farm basis. There was no consensus regarding an implementation time frame. It wouldcertainly be measures in years, although a majority felt that a decade was too long.

Section 4. Plenary Discussion Summary

A range of viewpoints was expressed during the final plenary discussion of the workshop--reflecting both individual opinions and discussion group observations on the feasibility of reducing agricultural fertilizer and pesticide use.

There was consensus support for the overall goal that Michigan should better manage fertilizers and pesticides to reduce health and environmental risks while maintaining the economic viability of agriculture. Substantial differences of opinion were expressed, however, on how to accomplish this goal.

Some organic growers emphasized that the most effective way to reduce health and environmental impacts while maintaining profitability was to "get off the chemical treadmill" altogether and practice zero input agriculture. Others maintained that low input agriculture was the "preferred approach" for maintaining economic

viability while improving environmental stewardship. Still others expressed skepticism that crop yields and profits could be assured if agricultural fertilizer and pesticide applications were reduced from their current levels.

A number of workshop participants indicated that source reduction measures are beneficial, technically feasible, and achievable. However, it was emphasized that there are serious problems in attempting to quantify source reduction goals. A unilateral goal of reducing pesticide use 50 percent, for example, would be meaningless if the reduction was accomplished by substituting pesticides of lower volume but equal or greater toxicity. Similar concerns were expressed regarding the feasibility of measuring progress toward source reduction goals without adequate fertilizer and pesticide use baselines. Finally, there is the difficulty of enforcing quantified policy goals once they are formally adopted.

Dr. David Pimentel asserted that while there are technical obstacles to setting quantified source reduction goals as public policy, these goals are beneficial for moving the process of change forward. Wayne Roberts commented that Ontario's source reduction goals achieved mixed results--and may have given a false sense of success while creating unrealistic expectations for continued improvements. Future improvements, he said, will depend on adequate funding. Dr. Richard Harwood asked workshop participants to consider whether a modest fertilizer reduction goal would benefit institutions such as Michigan State University and the Michigan Department of Agriculture, particularly since there are no current requirements to implement existing best management practices for agricultural chemical use. If nothing else, emphasized Dr. Harwood, it would seriously help us to look at the inefficiencies that currently exist in agriculture.

There was broad agreement by workshop participants on two concluding points. The first involves the role of scientific research, technical assistance, and public involvement, which are considered essential to the process of establishing policies for agricultural fertilizer and pesticide management. Increased public awareness of these issues will likely result in shared decision making throughout the policy-making process. Leadership, however, should come from Michigan State University's Cooperative Extension Service. To assure that the agricultural sector has a strong voice in determining its future, it was strongly recommended that more farmers be directly involved. Secondly, workshop participants indicated that further technical discussions should be held among stakeholders before final policy recommendations are made. The workshop was viewed as a valuable first step, and additional meetings cosponsored by Michigan State University, the Michigan Department of Agriculture, and the Michigan Department of Natural Resources were suggested as a valuable forum to continue the process of examining fertilizer and pesticide management issues.

Section 5. Future Directions

Before charting the course for future policy discussions of pesticide and fertilizer management issues in Michigan, it is important to acknowledge current activities. A variety of research projects, programs, and educational initiatives are underway at Michigan State University, the Michigan Departments of Agriculture, Natural Resources, and Public Health, the U.S. Department of Agriculture, and within the private sector. These efforts need to be identified and effectively coordinated to assure that all stakeholders are better informed--and can benefit from--each other's activities.

The Pesticide Research Center and the Institute for Water Research at Michigan State University are in unique positions to expedite this process for conventional pesticide and fertilizer research. A similar role should be played by the Michigan Agricultural Stewardship Association and the Organic Growers of Michigan to assure that current field applications for low-input and organic agriculture are compiled and reported. Whenever possible, chemical manufacturers should also publish the results of their research and market surveys. Ultimately, this information will benefit both the agricultural community and policy makers.

The Agricultural Chemical Source Reduction Workshop provided an valuable discussion forum within the larger process of research and information dissemination. To continue this discussion, a second workshop is being planned for February or March of 1994. Issue questions will focus on agricultural economics, strategies for human health and environmental risk reduction, and the feasibility of setting specific pesticide and fertilizer use reduction goals. To broaden representation, the number of workshop participants will be increased to include additional agricultural, industrial, and environmental representatives.

Finally, an update will be given on the development of Michigan's Pesticide Management Plan, and workshop participants will have an opportunity to review the federal pesticide management initiative being jointly implemented by the Environmental Protection Agency, the U.S. Department of Agriculture, and the Food and Drug Administration. This initiative, with its strong emphasis on pollution prevention and source reduction, sets the larger context for development of pesticide-specific state management plans.

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Assessment of Future Trends for Pesticide Use in Michigan

February 22-23, 1994

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for the

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