Part II. Putting Customers First

Introduction

One of the two organizing themes of the IPM Symposium/Workshop was "Putting Customers First" in the conception, design, implementation, and assessment of IPM programs. For a program to be successful in each of the above mentioned phases, it must address customer goals; be consistent with customer values, preferences, and resources; assist customers in overcoming constraints or barriers to adoption; and undergo systematic assessment to evaluate program performance.

The IPM customer base is diverse. It includes public and private landscape managers, producers of food and fiber, consumers, agribusinesses, and environmental groups, to name a few. The interests of these groups are complex, at times overlapping, at times in conflict. The challenge of "Putting Customers First" is to identify and, where necessary, reconcile the myriad interests.

Given this broad and diverse customer base, the first afternoon of the IPM Symposium/Workshop was devoted to hearing a variety of views. The objective of these presentations, some more and some less formal, was to paint a picture of the breadth and depth of customer concerns with IPM programs. USDA Deputy Secretary Richard Rominger opened the conference with a brief presentation in which he discussed the USDA IPM Initiative in the broader context of a U.S. agriculture increasingly reliant on world markets and depending critically for its competitive edge on the public's commitment to agricultural research. Rominger spoke of needed investments in research on alternative pest-management options, new crops, soil health, water quality, wildlife, and other areas. He noted that Congress is increasingly urban and suburban. The implications, Rominger argued, are that agriculture and agricultural research must appeal to a broader constituency to receive support. So, while meeting the primary needs of farmers, agricultural research and IPM must also address the broader needs of society.

Following Deputy Secretary Rominger were Ken Evans of the Arizona Farm Bureau, Polly Hoppin from the World Wildlife Fund, Lynn Olsen of the National Potato Council, David Benner of the Research Committee of the State Horticulture Association of Pennsylvania, and Don Jameson of the National Alliance of Independent Crop Consultants. Each of the speakers presented their organization's priorities for IPM research and extension programs. The speakers had significant areas of agreement: the importance of pest-management approaches that enhance both farm-level profitability and environmental stewardship; the need for producers to have access to a broader array of pest-management options; the importance of applied on-farm research; and the imperative of including producers and other stakeholders in setting research and extension priorities.

A wide range of estimates, however, were offered of where U.S. agriculture was in terms of meeting the administration's 75-percent IPM adoption goal. Many factors help explain the divergent assessments, including crop and regional differences, to be sure, but also different visions held of IPM by members of its broad customer base. This divergence underscores the challenge IPM practioners face in working with a diverse client base to forge a consensus on goals and priorities for IPM research and extension. Strategies and tools for dealing with this challenge are discussed throughout the rest of the Symposium/Workshop.

The USDA IPM Initiative

Richard Rominger
Deputy Secretary, USDA

I do not think there is any issue that I deal with in this job that hits closer to home or better represents what I consider to be my life's work than integrated pest management. The soil of our Yolo County, California, family farm does not run through my fingers every day. It does not need to. I am not with my sons as they make regular decisions on bio-pesticides or apply *Bacillus thuringiensis* (B.t.) to certain crops. And I do not need to be. The kinship I have with the effort to farm in a way that protects the environment is a lifelong, deeply ingrained bond, and I appreciate your invitation to join in this very timely, and personal, discussion.

IPM Viewed Through a Microscope

The English writer G.K. Chesterton once said, "The telescope makes the world smaller, it is only the microscope that makes it large." We cannot afford to look at IPM through a telescope. That vision is simply too narrow, too unrealistic, and too out-of-touch with the complex factors that will determine its future. Today I want to put IPM under a microscope. I want to examine it under a lens and view it in terms of the bigger context in which it does, and must, exist.

That context includes the vision this Administration shares for IPM and agricultural research, the problems that all aspects of agricultural research face as we enter the late 1990s, and what we must do to counter those problems.

Administration's Vision for Agricultural Research

Export Picture

Central to any agricultural outlook today is the international trade environment. A description of agricultural exports at this point might seem like an abrupt U-turn; but the exports vehicle is actually traveling the same route as our IPM and research programs. Last week, at the Agricultural Outlook Forum, Secretary Glickman announced that the value of U.S. agricultural exports should hit $60 billion this year, which keeps us on track to achieve our long-term projections of $66 billion for exports by the first year of the 21st century. Those exports mean real economic benefits, incomes, and jobs. That is one part of the story. The other part is how reliant American agriculture is on exports and how much more reliant we will become.

In 1994, exports represented about 23 percent of agricultural producers' gross cash receipts from the marketplace. That figure may hit 31 percent by the turn of the century. Now, contrast that with the economy as a whole. Overall, exports accounted for only 11 percent of the nation's gross domestic product in 1994. That figure is projected to hit 13 percent by the year 2000.

The bottom line is that *American agriculture is right now twice as reliant on international markets as the economy as a whole and will be 2.5 times as reliant by the turn of the century*. The expectation is that long-term domestic demand will grow more slowly than long-term productivity. Add to this the fact that, as the rest of the world becomes more prosperous and as population grows, foreign demand will remain strong, particularly in Asia and Latin America. It is clear that agriculture's future and its prosperity depend on a growing export market.

Investment in Infrastructure

These trends and projections complement what is going on within agriculture itself. As the turmoil over the Farm Bill demonstrates, agriculture continues to move away from restrictive government and toward programs that are increasingly market-oriented. Secretary Glickman said last week at the Outlook Forum that "what government does *outside* the traditional commodity programs will become increasingly important." The Secretary strongly supported, as he has over and over again,

investment in infrastructure, research, conservation, and rural development. *Investment* is the key. It is vital if farmers are to have the solid foundation they need to prosper and compete in the world.

U.S. agriculture is the most competitive in the world. But we will remain competitive only if the Federal Government retains its vital roles; ensuring research for new crops and keeping our soil sound, our water safe, and our wildlife protected. The Secretary's strong pro-research stance echoes the President's commitment. It echoes our consistent theme that *everyone* who works to equip farmers with the necessary production tools is working toward meeting global food demand, and research is among the most important of those tools.

Last spring, at the National Rural Conference in Ames, Iowa, President Clinton said, "We need more agricultural research, not less. We should not back up on research, we should intensify research . . . . Even as we give responsibilities back to the states and local government and the private sector, the national government has a responsibility and an obligation to support adequate research."

The result of the President's commitment is that the Senate-passed Farm Bill included the research title proposed by the Administration last year. The Administration's support is also evident in our goal to help producers implement IPM methods on 75 percent of total crop acreage by the year 2000, our additional Farm Bill proposals, and our budget requests.

Problems Facing Agricultural Research

There is something about the budget side of the picture that reminds me of that great story about the scientist, unjustly accused and convicted of a major crime, who found himself incarcerated with a long-term sentence in a jail in the middle of the desert. His cellmate turned out to be another scientist. Determined to escape, the first man tried to convince his coprofessional to make the attempt with him, but the man refused. After much planning and with undetected help of other inmates, our scientist made his escape. But the heat of the desert, the lack of food and water, and his inability to locate another human being anywhere drove him almost mad, and he was forced to turn around and return to the jail. He reported his terrible experience to the other scientist, who surprised him by saying, "Yes, I know; I tried it and failed too, for the same reasons." The first scientist responded bitterly, "For heaven's sake, man, when you knew I was going to make a break for it, why didn't you tell me what it was like out there?" To which his cellmate replied, with a shrug of the shoulders, "Who publishes negative results?"

Like you, we are very disappointed about the negative results from our FY 1996 budget request. Congress fell far short of giving us most of the increase we wanted in the President's budget for the IPM Initiative. The final appropriations bill gave us $20.5 million. That is a slight ($2-million) increase over last year. With that $2 million, we were able to establish a new initiative to meet farmers' critical pest-management needs. But it does not even approach the $36.5 million that we requested to help producers implement IPM.

These funds are in addition to the approximately $110 million for ongoing research in our base program of IPM and biocontrol work. I know that this funding shortfall for the IPM Initiative will affect several goals, such as providing universities more grants for research and giving ARS funds to conduct "area-wide" IPM projects. But I also know that this reflects budget reality today. This is the bigger budget picture that we see when we look through the microscope, whether we like it or not. Our concern is that the Congress must consider the long-term needs of agriculture, and not just the short-term budget battle. We hope, when the House takes up the Farm Bill this week, that it will build on the progress the Senate has made, particularly in the area of research.

Secretary Glickman has often said that the budget must not be balanced on agriculture's back. But the budget is not an abstract affair. Part of the issue is: *who*is doing the balancing? Writing this Farm Bill is a Congress that is increasingly urban and suburban and generally lacking in a rural or farm background.

In 1994, for the first time, the top five positions in the House were held by members from suburban

districts. If we take into account the members who have announced retirements in 1996, the next Congress is likely to have the smallest number of senators and representatives from rural districts in the nation's history. The implications here are greater than reduced voting power among those who can channel funds to agriculture and research. It also means that the traditional, solid political base for agricultural research is being replaced by a more diversified group that often benefits from agricultural research indirectly. This constituency includes domestic and foreign producers as well as consumers, people in the marketing system, and others related in some way to the food and agriculture industries.

How Shall We Respond?

All of this is one way of saying that those of us involved in agricultural research must move from the defense and see this, *make this*, a time of opportunity. Public agricultural research was, at one time, the model for all public research and can be again, with some practicality and accountability to back it up.

Others Need to Know

First, we must recognize that we have a tough sell out there. We might get frustrated that our proven, life-enhancing research, education, and extension must run a gauntlet of skepticism and scrutiny. But that is a fact of life in this environment, and we must deal with it. Scientists talk about the environment or "ecology" for public support of public science. They talk about the "social contract" between themselves and the public and how it is changing. I am determined, just as Secretary Glickman and Under Secretary Karl Stauber are, to give what it takes to counteract today's "ecology" of skepticism. That means more of what I call "results-thinking." It also means greater accountability for the funds allocated to us and, perhaps, just a little more PR (public relations). We all know how much our agricultural scientists throughout the land-grant system and USDA achieve. But others need to know.

They need to know about the efficiency of the federal-state-local partnership for agricultural research, extension, and education. They need to look at Federal funds as the glue of the partnership. Every Federal dollar appropriated for agricultural research, extension, and teaching leverages four to five state, local, and private dollars. The annual rate of return on the overall investment in research and extension is between 30 and 50 percent, depending on location and commodity. How many other investments can match that? As a bonus, this is a partnership that assures that critical national issues get local attention and not just a "one size fits all" solution.

Others need to understand the impact of the federal–state science and education partnership on issues that concern society. Consumers, for example, want more than an abundant food supply. They want to reduce real or perceived health risks of chemicals in food, and they want assurance that production is environmentally friendly. IPM is a perfect example of the cutting-edge work being done to meet these demands and to balance production and the environment. I wonder how many understand that IPM is dollar-wise and environmentally friendly and that, because of it, pesticide use is down?

- I wonder how many have heard of IPM's great contributions in Texas, a savings of 20,000 jobs and a $1.5 billion annual savings in pesticide applications.

- How many know what is going on in Utah, where growers saved more than $8 million over the past five years, as more than 70 percent switched to IPM.

- Do they know that USDA and ARS researchers have released three corn lines with super resistance to the European corn borer, the world's most devastating corn pest?

- Or do they know that Midwest farmers are heeding the advice of extension specialists to improve their use of insecticides and as a result are reducing their production costs by some $2.00 to $4.00 an acre?

- I wonder how many are aware of the microprocessor developed by Purdue plant pathologists that saves spraying costs and reduces

fungicide applications or the weather monitor developed by Missouri researchers that helps farmers cut pesticide use.

Accountability

But I am a practical fellow. In the current competition for funding, listing all we have done and are doing is important but not enough. The budget these days is not only about numbers. It is also about being accountable for funds allocated; meeting farmers' real needs in the field; and showing concrete, specific results. The Government Performance and Results Act requires all federally operated and funded programs to show measurable outcomes from Federal dollars. I urge all of you in agricultural research and science, especially with the applied nature of your work, to embrace this accountability. This is an opportunity to lead the Federal research community once again.

We must remember, though, that we are accountable to more than just the requirements of law. At a basic level, we are accountable to the farmers of this country. Our efforts are effective if they help *them* to meet the economic and environmental challenges they face in the field every day. It is important that we keep that basic accountability to farmers foremost in our minds and direct our IPM efforts toward meeting their most important needs.

Government's Response

At USDA, we are also looking at the big picture. Since 1946, we have cast USDA's research goals as "plant" science; or "animal" science; or "soil, water, and air" sciences. Now, it is imperative that we improve the linkages between the different disciplines. Researchers cannot operate in a vacuum. And that is where USDA comes in. The Secretary and I may not work in a lab, but we are pretty effective with pen and paper. What we have done in the past three years is to set the stage for a "systems" approach to the biological, physical, and social sciences. We have linked research to extension and education under the Cooperative State Research, Education, and Extension Service. We feel this is the most accurate blueprint for the work to be done: to meet the needs of our customers with world-class research and statistics and to extend that knowledge to end users.

We also requested, and got in the Senate-passed farm bill, what is called a Fund for Rural America. I do not think there is any greater evidence of the weight this Administration puts on rural economic development than the fact that this Fund was one of the major factors in achieving passage of the Senate bill. The purpose of the Fund is to supplement dollars going to agricultural-research and rural-development programs. This money will help diversify the agricultural sector and boost economic opportunity in rural America.

President Clinton is adamant on the point that this Farm Bill *must* provide essential research funding that brings farmers the latest farming techniques and keeps American agriculture ahead of the competition. The Senate bill authorizes the Secretary to transfer $300 million into the Fund over three years, two-thirds earmarked to rural development and one-third to research grants. We feel that these funds represent an important investment and are desperately needed. But they still fall short, and we urge the House to improve on the Fund as it works on the Farm Bill this week.

The Fund for Rural America is just the latest small success in this Administration's ongoing support for agricultural research. I want to thank you again for this chance to put IPM under the microscope. IPM has a great track record. We know its significance to consumers, trade, and society. We are dealing with some big challenges, and IPM must function, practically and effectively, in a bigger context. This is a time of opportunity, not defense. Once we achieve this kind of thinking, then we will have done for IPM what it does for all of us.

What American Farmers Need from USDA and Their Land-Grant Universities to Implement IPM on 75 Percent of U.S. Crop Acres

Ken Evans
Arizona Farm Bureau

The sound of the chopper's blade pierced the predawn fog over the yet to be planted cotton field in the desert Southwest. The unique thing about this helicopter was not that it was flying in zero visibility, nor that it was applying an ultra-low-volume preplant herbicide, nor even that it could stay in flight for more than two hours without refilling or refueling.

The really unique thing was that it was being flown by a computer, from the seat of a Suburban, parked at the edge of the field with DGPS/GIS and remote-control technology that was perfected in the Gulf War.

By spraying only 13 acres out of an 80-acre field that had a weed problem identified and located on a digital map the prior year, chemical usage and costs were reduced dramatically. Imagine being able to identify the location and specifics of a pest problem in a field and then being able to return exactly to that same spot a week, a month, a year, or ten years later. A small peek through the window of the future, perhaps, but to those of us in production agriculture, it provides a glimpse of the promise that tomorrow's technology truly holds for American farmers.

I appreciate the opportunity to appear before you today, representing the 4.5 million member American Farm Bureau. Our national president, Dean Kleckner, is leading a trade fact-finding mission to Vietnam and Indonesia. But I am sure that what I am about to say, and what my friend President Kleckner would say, are very similar.

It is a pleasure to address the many who work so hard on behalf of America's farm and ranch families. No matter how big American agriculture becomes, it is, and always will be, the men and women of rural America who till the soil and produce the products needed by people around the world.

Today, I have been asked to address what American farmers need from the USDA and our land-grant universities to implement integrated pest management on 75 percent of our crop acreage. If that is truly what you want to hear, this would have to be a very short talk. You see, I am here to tell you that American agriculture is well past the IPM concept. Actually, IPM is technically old hat.

Farmers understand that we do not have to eradicate every pest we see. It does not make ecologic or economic sense, and we could not do it even if we wanted to. There are too many examples of resistant pests coming back stronger than ever after fields have been treated.

Take my alfalfa fields. Aphids and weevils used to give me fits. We would spray the field and knock down the pests, but in the process, predators would disappear, too, even when we used pest-specific chemicals. The pesticide did not harm the beneficials directly, but they starved to death. This action resulted in a recurrent need to spray because when the next wave of aphids and weevils hit, no predators were around, and my hay yields would get knocked for a loop.

So, now I rely on cultural practices, such as release of beneficial insects and better timing of cutting, as well as farm planning to ensure compatible crop rotations and adjoining crop synergy. I apply chemicals only as a final resort to return a balance to my fields and to defend my economic future.

This leads me to point out that, when I must use the most effective chemical, it had better be there for me. We are losing too many good, safe, crop-protection chemicals to the Delaney Clause and to increasingly sensitive measuring devices. Many of our necessary minor-use chemicals will be taken from us as manufacturers realize they cannot recapture exorbitant reregistration costs. We need effective, efficient chemicals as a last resort to save

our crops and to help mother nature remain balanced. We have learned to place them where and when they will do the most good. I repeat, actually and factually, IPM is technically old hat.

America's farmers and ranchers are well on the way to addressing the next paradigm, which is very much like the boy scout supermarksman who, when asked to explain his astounding shouting prowess, declared "ah shucks, ain't nothing, ya just shoot first and draw the target later." Some government officials learn that trick early and practice it often. When I asked some of my cohorts what it would take to get them to implement IPM on 75 percent of their acreage, they wanted to know why they should ignore good management on the remaining one-fourth of their land.

In that light, the future objective of pest management lies in being able to produce more yield with fewer chemical and energy resources.

Major improvements are dependent on five factors:

1. the ability to define and record the exact locations of pests;
2. the ability to return to exactly that same location at a later time for followup observation or control;
3. the ability to apply precise amounts of designer chemicals to that exact spot, not to that section or quarter section, but to the exact acre that needs to be sprayed;
4. the ability to manage pests, not just kill them;
5. the ability to understand that pest management is only one component of whole-farm management, or holistic farming as it is referred to today.

I want to use my time today to share with you some of the thoughts and goals of working farmers across America. We are stewards; there is no two ways about it. I take care of my land because it takes care of me. That may sound cutesy, but it is true. Financially, physically, and mentally, my farm sustains me and much more.

Modern farmers recognize that our efforts affect more than our immediate acreage. In my management scheme, I look beyond my fence row, beyond the horizon. What I do on my acreage affects my business, touches my neighbors, and ripples throughout the country and the world. My job as a farmer is to work with nature, not against it.

Just a few of the tools we use to accomplish that stewardship include:

- prescription, species-specific chemicals
- variable-rate application equipment
- remote computer-controlled application systems
- satellite remote imagery
- global positioning and geographic information systems
- real-time, site-specific, and regional reporting of pest infestations

The future of U.S. agriculture in a global economy depends on our ability to increase our effective throughput: not to produce more per acre, but to produce more from each unit of resource expended. Farmers use these tools to weave together the many resource elements that affect us to develop a sound and sensible whole-farm management scheme.

What are some of these elements? They include water quality and availability, soil type, microclimate identification, topography, crop adaptability, preservation of wildlife habitat, pest alternate host symbiosis, plant population diversity, and crop synergy.

There is another important element often forgotten by those who do not farm but who wish to control what farmers do. That element is the human need for food and fiber. We must produce food and fiber, flowers and fish, forestry products, and (more and more these days) industrial feedstocks.

America's farms, through the work of America's farmers, must provide enough food, fiber, and industrial feedstock not just for Americans but for a hungry and growing world. After analyzing these and other elements, such as environmental and wildlife impacts, we seek to implement our goal of building an energy-efficient, low-maintenance, high-yielding, multifaceted, interdependent production system that we call a farm.

By using the knowledge, provided in large part by you and your fellow researchers, farmers like myself

seek to develop a sustaining, sustainable farming operation. In the West, we have been traditionally on the cutting edge. What surfaces and is ultimately adopted by us usually works its way into mainstream America in a decade or two. Improved agricultural management practices have moved far swifter. As an example, I would submit that our concept of conservation is different than what some here in the East think.

Conservation is not a plan. It is not a project, or a chore list, or a checklist against which someone can measure compliance. Conservation is a philosophy, deeply held and carefully practiced, by today's responsible farmer. As farmers, we must look at the whole, not the parts.

Integrated pest management still addresses the parts. When management, cultural practices, and other farm tools are integrated to manage pest problems, we call it IPM. That is a start in the right direction, but only a start. Modern farmers have moved past that stage.

IPM is one component of holistic farming that farmers who will prosper in the 21st century are adopting and implementing today. The world has witnessed a tremendous growth in agricultural production, in large part by imitating U.S. farmers. Technological advances just keep coming.

- Computerized tractors know precisely where they are, anywhere on Earth, in precise longitude and latitude.

- Tractors know and show not only how much fuel per hour they burn but how much fuel per acre and gallons per bushel of corn produced they consume.

From genetically altered hybrid seed that produces crops that repel pests to designer, species-specific protection chemicals, U.S. farmers are rapidly adopting the latest innovations.

Farmers have learned to incorporate these innovations into a total-farm-management program, or holistic farming, not solely into pest control. Agricultural chemicals, for example, serve a very useful, very definite purpose. However, many farmers agree with me that chemicals should be one of our last lines of defense, not our first.

We have come to realize that there is not, and should not be, a chemical solution to every farm problem. The attitudes of farmers about agricultural chemicals and pest control are maturing and changing along with society's: not every bug or every strange plant is a pest. We have changed our goals. We recognize we do not have to increase our yield per acre year after year after year. We have learned to maximize returns and quality while reducing inputs and costs.

From you, we need real-farm, real-life help and guidance, not "Epcot Center" type science. You know what I mean: not the sterile lab, government grant, sci-fi advances that look good on "the next step" but do not pan out in my neck of Arizona. But no matter how modern, how far-reaching the innovations, it is still the farmer's love for the land that most influences our stewardship. I am not sure that university people understand this fully. I also do not know what people here in the Beltway understand. But farmers do appreciate the need for basic research.

In fact, during the Farm Bill debate, the Farm Bureau steadfastly supported two points: not loan supports, not deficiency payments, but market development and agricultural research. Keep in mind, we need help not only to be productive 100 years from now, but also to survive tomorrow. Help us face the economic pressures. Help us face the social pressures.

We hope you recognize that this 75-percent goal is not what agriculture needs. We want to take care of 100 percent of what we can. We want to enhance the environment. We want to feed and clothe the world. And we want to make a profit so that this can be a continuing process. I want to leave my land in better shape than when I started, and I want to endow my kids with my love for the land. I am not unique. I am not in the vanguard. America's farmers and ranchers are proud to lead the world not only in productivity but also in resource conservation.

I thank you for this opportunity to discuss one American farmer's philosophy for tomorrow and today.

Reducing Pesticide Reliance and Risk Through Adoption of IPM: An Environmental and Agricultural Win-Win

Polly Hoppin
World Wildlife Fund

I appreciate the opportunity to be here and speak with you today. I am here to represent the environmental viewpoint, although I know in this audience there are many others, as we heard from Ken Evans, who agree that environmental and public-health goals are high priorities for IPM. The commitment of the USDA staff working on the Integrated Pest Management Initiative [Barry Jacobsen and Mike Fitzner and (at ERS) Carol Kramer, Sarah Lynch, and Cathy Greene, just to name a few] to environmental concerns (not just rhetorically but as it will translate into program evaluation) is impressive.

I am going to focus my talk today on the importance of debating and then coming to agreement about societal goals and about establishing mechanisms for measuring progress toward them. I, and others from consumer and environmental organizations, think it is time for many in the IPM community to stop trying to be all things to all people. They should clearly describe the relationship between IPM and environmental and public-health objectives (which polls show Joe Q. Public cares very much about) and make ambitious plans to assist large numbers of farmers in moving away from heavy reliance on pesticides by reestablishing healthy ecosystems on their farms.

First, a word about policy goals.

The 1995–1996 Congressional session was dominated by a historic debate and struggle to agree on and adopt a way to balance the Federal budget. The debate has focused on three key decisions:

1. How to set the goal for changes in fiscal policy leading to a balanced budget.
2. The appropriate changes in programs and policies needed to achieve the consensus goal.
3. How to keep score.

By late fall last year, the White House and Republicans in Congress had finally agreed that the goal should be a balanced budget in seven years and that the budget agreement and its detailed components must collectively reach this goal. While disagreements over tax cuts and spending priorities have yet to be resolved, just agreeing on this goal and how progress toward it would be measured and monitored was a major step and was the focus of weeks of intense negotiations between the White House and Republican leaders in Congress.

Anyone trying to manage a budget, whether for a government agency, a local organization, or a family, knows that goals matter, as do accurate and honest numbers, in keeping track of your checkbook, credit card debt and obligations, mortgages, retirement funds, and (lest we forget where we are) Federal income taxes, flat or otherwise.

Clear and measurable goals and an honest, credible way to monitor progress are clearly also vital in the environmental-policy arena. The Clean Air Act set goals for pollution levels and the number of days they could be exceeded. Various international agreements and protocols have set clear-cut goals and established timetables for achieving them, with more on the horizon.

Other encouraging examples can be drawn from industrial pollution prevention. Companies participating in EPA's voluntary “33/50" program have agreed to reduce their emissions of 18 toxic chemicals over specified time periods. Many companies have far exceeded their original commitments.

Like most environmental and consumer groups concerned about pesticides, the World Wildlife Fund (WWF) applauded the Administration for making a commitment in June 1993 to promote pesticide reduction and sustainable agriculture. WWF took USDA's followup pledge to aim for adoption of IPM on 75 percent of crop acreage by the year 2000

as an indication of the seriousness of the commitment. In the past two years we have worked with grower groups, government specialists, and other environmental organizations in an effort to help determine what this goal really means and to help foster agreement on constructive steps the USDA, EPA, and FDA can and should take toward achieving this goal. While we have a long way to go, WWF is encouraged by what we see as growing momentum toward IPM around the country, fueled in no small part by innovative farmers who are, in many respects, far ahead of policymakers and scientists in making IPM happen on their farms.

As WWF assessed USDA's and EPA's plans for working toward this goal, we and agricultural and environmental groups raised questions such as:

- What will be the baseline, and how will we track progress towards the goal of 75 percent of crop acreage in IPM?
- What crops and regions are farthest from and closest to achieving this goal, and what are the implications for R&D resources and for policy?
- Will environmental goals, which are at the heart of the original definition of IPM, be central elements of the IPM that USDA is promoting or will they simply be beneficial side effects that likely, but not necessarily, come with IPM adoption?
- More specifically, how will IPM adoption affect pesticide use and risks?

The case I want to make today is that it is in the best interest of the IPM community to more clearly delineate the environmental contributions of various kinds of IPM systems, to go public and indeed market these contributions, and to help target public and private sector resources toward IPM systems that minimize environmental impacts. Environmental and consumer organizations will be supportive of IPM to the extent that it results in improvement in environmental quality and public health.

How can you convince the public that IPM is addressing their concerns? You can define IPM more clearly, distinguishing between systems that still rely heavily on chemical pesticides and those that maximize the opportunities for adequate pest management existing in a well-balanced biological system. You can make a public commitment to moving as many producers in the direction of biointensive IPM systems as possible. You can propose ways of measuring individual and aggregate progress toward the kinds of IPM that rely less on hazardous pesticide products. And you can publicize data used in measuring progress.

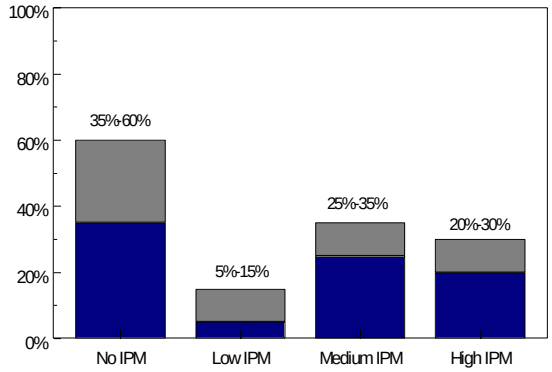
What has been done so far to measure IPM adoption and to distinguish between chemically intensive and biointensive IPM?

In response to the many questions raised about President Clinton's IPM adoption goal, the USDA's Economic Research Service completed an innovative study on a very short timetable. The report used a simple method to estimate the number of acres of several major crops under no IPM and under "low," "medium," and "high" levels of IPM. Figure 1 presents our synthesis of USDA's findings.

In its 1994 study, USDA estimated IPM adoption for field crops, fruits and nuts, and vegetables. Its estimates were constrained by the data it had available from the Cropping Practices Surveys carried out from 1990 to 1993. All these surveys include detailed pesticide-use data, but varying amounts of information (from almost none to considerable) on other pest-management practices. USDA based IPM adoption principally on whether a field was scouted and sprayed in accordance with specified thresholds. Higher levels of adoption required the use of additional practices considered

Figure 1

USDA Estimate of IPM Adoption: A Synthesis Across Crops and Types of Pests



* Shaded areas define ranges in values reported for different crops and classes of pests.

by USDA as “indicative of an IPM approach.” Clearly, USDA's analysis was not comprehensive, nor did it claim to be.

What does the USDA study tell us about the starting point toward the 75-percent IPM goal? The Department did not add up its estimates of IPM adoption across categories of pests. But if it had, the numbers would have come out that roughly half of the acreage was under one of the three levels of IPM:

- About 5 to 15 percent was under low-level IPM, just scouting and applications in accordance with thresholds.
- About 25 to 35 percent was under medium-level IPM, which requires scouting and adherence to thresholds plus one or two additional practices from a list of those considered by USDA as “indicative of an IPM approach.”
- About 20 to 30 percent was under a high level of IPM, scouting plus thresholds plus three or more practices “indicative of an IPM approach.”

There are a number of weaknesses with this method, readily acknowledged by USDA, that stem largely from lack of data.

First, and most important to the environmental and consumer communities, the data do not distinguish between practices that are related to treatment with chemical pesticides, and those that are preventive (that is, based on altering the biological and ecological interactions between crops, pests, and beneficial organisms). Practices that constitute treatment with, or contribute to the efficiency of, pesticides are considered as “indicative of an IPM approach” by USDA's criteria, as are practices that draw upon and are most compatible with biological relationships on the farm.

In the interests of time, I will not go through this in detail, but let me give you an example. Five of seven weed-management practices included on USDA’s list of “indicative of an IPM approach” are in fact required if herbicides are to be used. They are:

- post-emergent-only applications
- alternating herbicide active ingredients
- banding
- spot treatments/field mapping
- reduced rates of application when weeds are small

Only two of the seven, crop rotation and mechanical cultivation, could help distinguish systems that remain heavily dependent on pesticides from those that are biointensive. A longer version of my remarks details the practices for the other major classes of pests and other cropping systems considered “indicative of an IPM approach.” All include more practices essential to effective pesticide use than those integral to biointensive IPM.

WWF has developed a method for measuring pesticide reduction and adoption of IPM that, we think, substantially improves on USDA's initial study. It is on this method and the conclusions we have drawn about the prevalence of IPM in the United States that I would like to spend the rest of my time today.

WWF's experience with measurable goals used to drive pesticide reduction in other countries made us especially interested in the 1994 USDA report. As we discussed the basis of the Department's estimates with experts in the field and a wide range of stakeholders, we became convinced that more work was needed to come up with a measurement method truer to the ecological foundation of IPM. We were encouraged by the openness of USDA analysts in considering different approaches and started a set of activities and analyses in early 1995, with the help of consultant Chuck Benbrook.

Our method evolved with each interaction we had with pest-management specialists in formal meetings we convened or in casual conversations. For instance, Dr. Charles Mellinger, Technical Director of Glades Crop Care, a major independent crop consulting firm in Jupiter, Florida, explained that their fresh-market-tomato IPM program has at least 60 distinct “practices” or components, not all of which are needed every year, but which are relied upon sequentially as a function of what scouts observe in the field. Dr. Mellinger urged us to develop a method that takes into account the dynamic aspects of IPM, dynamic because of changing weather, pest pressure, markets, the emergence of resistance or secondary pests, or changes in technology.

I know Charlie is here, and feel confident in saying to him in response to his challenge: we are not there yet, but we are moving in the right direction. In designing our measurement method, WWF sought a system that can be adapted to changing conditions and that can be stretched to accommodate the widely different pest-management challenges found across the country.

Like the USDA continuum, WWF's IPM continuum has four zones. The criteria for IPM adoption change as you move along the continuum, getting more complex and more biologically oriented and prevention-focused.

At the core of our method for measuring adoption of IPM is a variable we call the "IPM System Ratio." The IPM ratio is composed of two variables: "dose-adjusted acre-treatments" (DAAT) and "preventive practice points" (PPP). The value for IPM System Ratio is calculated at the field/farm level, and equals PPP divided by DAAT. As farmers move along the IPM continuum toward biointensive IPM and reduce their reliance on pesticides, they typically adopt additional prevention-based practices and IPM System Ratio values rise.

The DAAT variable is a way of taking into account the large differences in application rates between older and newer low-dose products, as well as the typical, rather than the full label or average, application rate of a given product. It is a spatial measure that adds up the number of active-ingredient applications made with a specified rate of application. An example of our empirical findings in the case of use and reliance on atrazine, a major problem pesticide, follows in figure 2.

The IPM preventive-practices variable is the sum of biologically and ecologically based practices that either reduce pest pressure, increase the number and role of beneficial organisms, or enhance a crop's ability to overcome a degree of pest pressure.

The differences in approaches between USDA's study and our method include:

- In our method, the ratio of chemical treatments relative to preventive practices, which categorizes farmers in the different zones, is tailored to particular crop agroecosystems.

Figure 2

Atrazine Dose-Adjusted Acre Treatments

* Atrazine product labels call for 1.6 to 2.0 pounds a.i. per corn acre treated.

* Average rate of application in 1994 was 1.07 pounds a.i. per acre treated.

* Proxy-dose used in calculating dose-adjusted acre-treatments equals 1.23 pounds (1.15 times the average rate of 1.07; or 77% of the minimum recommended rate).

* 42,832,000 corn acres were treated at any rate of application in 1994

* 37,030,000 dose-adjusted acre treatments at 1.23 lbs/acre in 1994.

* Practices that reduce dose-adjusted acre treatments on a given field --

*Banding
*Spot-spraying
*Reduced Rates by Targeting Weeds When Small

- In contrast, USDA counts the number of practices, irrespective of treatment intensity.
- USDA's method does not consider reliance on and use of pesticides nor levels of pest pressure.

WWF's first detailed empirical application of this method was carried out by our consultant Chuck Benbrook and assessed integrated weed-management systems on corn and soybean farms in 1994. Earlier this month, Chuck presented the method and preliminary results at a workshop at the Weed Science Association (WSA) annual meeting in Norfolk, Virginia. He received positive feedback from many researchers, some of whom offered to work with us in applying the method in their State. To those here today, let me add we would welcome a chance to collaborate with IPM research teams, commodity groups, consultants, regional coops and marketing companies, and others working to develop ways to measure IPM adoption and to quantify the public-health, economic, and environmental-quality benefits of IPM.

According to USDA's criteria, 57 percent of soybean acreage was managed under medium or high IPM (based on the 1993 Cropping Practices Survey database). WWF has studied the 1994 Cropping Practices Survey. According to our criteria, about 36 percent was managed under

medium and high levels of IPM, and only 6 percent of that was under biointensive integrated weed management. In both soybeans and corn, our method results in far fewer acres in the high zone than does the USDA method.

What do we do with these data once we have them? That depends on who is using them. Together, soybean growers, crop consultants, and Extension personnel could assess whether it is technically feasible for the growers in the low zone to move to the medium zone (e.g., whether or not differences in levels of IPM adoption stem from a pest outbreak specific to a particular region, weather, or other factors beyond a grower's control). They could set goals for percentages of soybean growers moving into higher zones and develop programs to achieve those goals. Growers of food products could consider developing a label describing practices of growers in the high zone, aiming for a premium price.

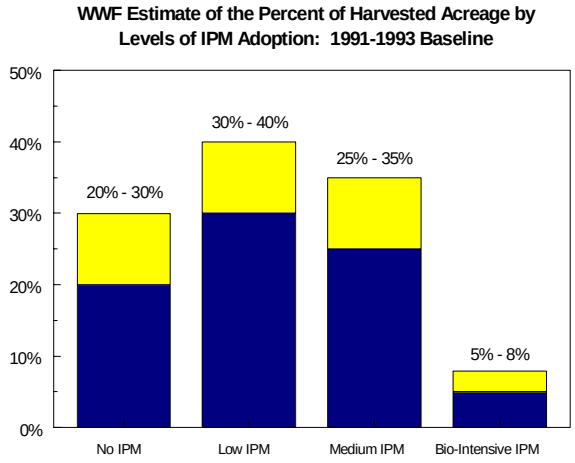
Our next step with these data was to further explore growers' reliance on pesticides in the different zones. As I noted earlier, reducing the use of pesticides is a top priority for environmental and consumer groups, and we think the ability to point to reduced reliance and risk is an important asset for practitioners and policymakers promoting IPM. We propose seven indicators of pesticide reliance, also detailed in the longer version of my presentation.

Based on our preliminary work, we have made a rough estimate of baseline IPM adoption in 1992–1994 (fig. 3). The figure includes ranges reflecting the fact we have not completed our analysis. But based on the differences between our method and USDA's method, we feel confident the calculated values will fall within the ranges presented here.

So what do these data suggest about the President's 75-percent goal?

Based on USDA's de facto decision-rule, that any acre scouted and sprayed in accordance with a threshold counts as at least low level IPM, at least 50 percent of the nation's cultivated acreage is under IPM. In fact, with USDA's definition, many more acres may be in IPM because USDA did not count

Figure 3



acreage under organic or other biologically based production systems that do not involve the spraying of pesticides, nor acreage where there is very little pest pressure (because producers did not necessarily spray in accordance with a threshold), nor acreage for which there are no applicable thresholds. In contrast, with our definition, anywhere from 30 to 43 percent is already in the medium and high zones of IPM. The biggest difference between USDA's and WWF's estimates is in the high zone: WWF estimates 5 to 8 percent and USDA estimates 20 to 30 percent.

The President chose wisely in setting a goal of 75-percent IPM adoption. But to say that we are almost there is to say that we are not moving much beyond the *status quo* of pest management that relies heavily, though efficiently, on pesticides. We suggest that it is ambitious but doable to aim for 75 percent of crop acreage in the high or medium zones of IPM for all major categories of pests requiring routine pesticide use. It will clearly take longer than three more years to achieve this goal, and progress will remain incremental as growers move along the IPM continuum.

Clearly, there is much work to be done to move from our current estimate of IPM adoption (a little more than a third of acreage in the medium and high zones) to reach 75 percent of acreage in these zones, the President's goal as WWF interprets it. We think the nation will require at least 10 years to achieve this goal. We also believe that not only can it be done, it must be done to reverse troubling trends in

public-health risks and environmental contamination.

We base our confidence in large part on the rapidly growing enthusiasm for farmer-led participatory research, which gets scientists out into the field to do systems-based research in the best lab of all for solving pest-management problems: the real world. We also are encouraged by the number and effectiveness of reduced-risk biopesticides gaining registration by EPA as well as by the positive results many growers are achieving through the release of beneficial organisms. Over time, as farmers move closer to biointensive IPM and as biodiversity is restored both above and below the ground, new products and approaches will become more useful, helping to keep pest populations under control in those years when biological processes do not fully meet the challenge.

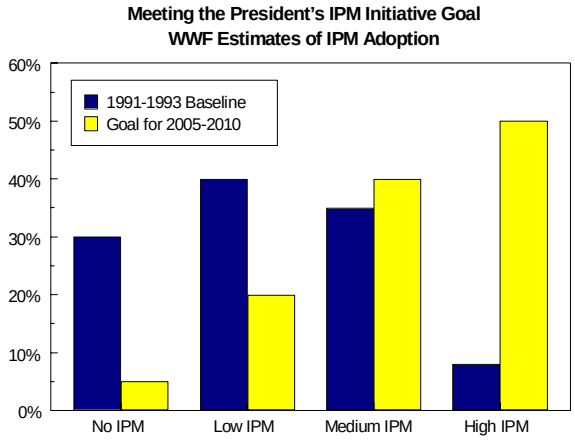
Adding risk to the equation is a final step (both key and difficult) in linking IPM adoption to reduced public-health and environmental risks. Four major categories of pesticide toxicity must be assessed: acute mammalian toxicity, chronic mammalian toxicity, ecotoxicity, and impacts on cropping system sustainability and beneficial organisms. Risk-indicator index values can be used to estimate the environmental and/or health consequences of pesticide use measured by pounds applied and/or dose-adjusted acre treatments, by crop or region, by pest-management system, and over time. Because adoption of biointensive IPM requires enhancing biodiversity and beneficial populations, farmers have to make a special commitment to reducing the use of broadly toxic, ecologically disruptive pesticides. The positive consequences of change in the selection of active ingredients will be captured more fully when measures of pesticide reliance and use are adjusted in accordance with toxicity indexes.

To conclude, across the United States and elsewhere in the world, the train is out of the station in terms of public concern (at least three more major reports and books on risks from synthetic chemicals will be published between now and June) and in terms of growers and processors marketing their produce as "green," "clean," and "better." It is time to agree on ambitious, meas-urable goals and to get on with attaining them, a process that will be far more successful if all communities supporting progress along the IPM continuum can work together to convince an always skeptical Congress that IPM is the way to go. Figure 4 presents both our IPM-adoption base-line estimate in 1991–93, and our goals for 2010.

We are certain American farmers are eager to move in this direction and that the nation's pest-management professionals are ready to help accelerate progress along the IPM continuum. We hope USDA, EPA, and agribusiness will work cooperatively to find more effective ways to use the current level of public and private resources invested in pest management and pesticide-safety research and regulation. As a nation, we may be better off by spending less time studying and arguing over pesticide risks, and more on overcoming the many, real, technical, informational, and economic barriers to progress toward bio-intensive IPM.

Cooperative approaches will accomplish far more than the past decade's still-unresolved debate over reforms to the Delaney Clause, enlivened periodically by the pesticide-of-the-month syndrome. The increasingly contentious nature of pesticide and pest-management policy issues in the United States has poorly served both farmers and the general public. It has divided those who need to work together to craft and support changes in policy and in research and education funding priorities. Such changes are essential to assure that attainment of the President's IPM goal is both realistic and worth doing.

Figure 4



IPM Needs of Potato Producers

Lynn Olsen
National Potato Council

The potato is America's favorite vegetable and is grown in all 50 states on a commercial basis. We grow potatoes in all types of geographic areas: sandy soils, clay soils, peat soils, and many others. Cold, hot, wet, dry, and all kinds of weather conditions make potato growing a challenge. What is IPM? At a meeting in Washington State three weeks ago it was suggested that IPM is environmental stewardship. The potato industry is and has been practicing IPM long before it became a buzzword. Why? Because we had to for economic reasons and out of pride in our farms and industry. The definition of IPM keeps changing, and I am not sure that is all bad, but it does make it harder to understand.

Some of the things that we do to decrease pesticide use and risk in our industry are only common sense. We use small grains, sweet and field corn, alfalfa, green manure crops, and others in our potato rotations for nematode, insect, and weed control. We sample soils for fertility needs, soil PH, and nematode counts. We sample petioles and soil during the growing season so we can apply nutrients when and if they are needed.

Scouting by crop consultants, fertilizer and chemical field men, and processor representatives are part of our everyday life these days. We as growers also scout our fields. We spend many hours checking our fields for insects, moisture, and other potato problems by ourselves and, some-times, with other industry people.

The way we irrigate and the amount of water we use and the way it is applied are changing all the time. For the better, I might add. Water quality is becoming better every year.

Moldboard plowing has been reduced dramatically in favor of deep ripping. This leaves most of the previous crop residue on top of the ground, which helps retain moisture and helps stop erosion. Pitting or damming is a practice that has been around many years and is widely used with sprinkler irrigation.

Furrow irrigation has been helped by the use of PAM, which is a polymer that is used to dramatically reduce soil erosion and increase moisture and nutrient retention. The use of straw mulch in furrow irrigation has had a big impact on water quality.

Circle irrigation is changing all the time. We can apply water where and when we want it with new and better technology. We have high-pressure and low-pressure systems; impact, spray, and rotor sprinklers; and drops and drags for better water coverage in different soil types and growing conditions.

"Site specific" is fast becoming part of our farming vocabulary. The use of global satellite positioning (GSP) is increasing. We take soil samples every 1.5 to 4 acres in each field. This is letting us put nutrients and pesticides where we need them. GSP is being used more all the time. Yield monitors and irrigation systems are also being tied into GSP for more information. Aerial applicators are also using GSP for spraying fields.

Computers? You bet! In everything we do. Wisconsin's growers and university people have developed a $400,000 system they call Wisdom. Many of you saw Wisdom displayed two years ago in Las Vegas. They are continually updating it. This type of management program for our potato crops and other crops commonly grown in our rotations helps bring more IPM into practical use faster. This past July, several potato-research people from different states were given hands-on instruction on how to use Wisdom. This instruction was made available by a grant from the EPA to the National Potato Council through their Environmental Stewardship program. Information like this is being used and changed to work in different growing areas.

Potato varieties, whether they are genetically engineered or brought about by Extension breeding programs for specific uses, are being used as they become available. Some of these varieties are resistant to pests. Some need less fertilizer and water, and others do not bruise as easily. Some are for specific processing uses, such as french fries. Some are bred for looks and shelf life because of consumer demands.

Many of these things I have mentioned have happened because of research at the State and Federal levels, but also because they were environmentally sound and economically feasible.

The government does not have to give us incentives to reduce fertilizer and pesticide use. Common sense; improved safety for our families, workers, and consumers; protection of our environment; and economic survival are all the incentives we need. I keep talking about economics, but if it is not economically feasible, we are out of business, and we do not eat, and neither does the rest of the world.

Selective pesticides, as opposed to those with broad-spectrum activity; timing of applications because of harmful pest thresholds instead of spraying by the calendar; and using short residual or nonpersistent pesticides are things we use when possible. The late-blight epidemic has caused us to use more crop-protection fungicides than normal because of the violent nature of the beast. Late blight has become an epidemic. We hope we can at least slow it down until research can find some solutions.

Another consideration is the development of pesticide resistance. Alternating classes of chemicals, site-specific applications, resistant varieties, and the use of B.t. are ways we try to slow down resistance.

The use of ADMIRE that became available in 1995 reduced the use of other active ingredients by 100,000 lbs. in one state alone last year. Also, the use of tank-mixed materials was reduced from five to a maximum of two in this state. Potato growers hope that the good use of fertilizer and chemicals will prevent more regulations.

The National Potato Council now has a research database for use from the Extension Service and land-grant universities. The research database is organized both by State and discipline. Disciplines are: disease, economics, engineering, entomology, irrigation, plant pathology, soils/fertility, storage, varietal development, and weed science. The states covered are Colorado, Delaware, Idaho, Maine, Michigan, Nebraska, North Carolina, Oregon, Pennsylvania, Washington, and Wisconsin. We also cover the Red River Valley. We started with 1990, went through 1994, and are in the process of collecting 1995 information. As I said earlier, potatoes are grown in all 50 states, so we know our database is not complete, but it is a start. We decided to start with 1990 instead of earlier because of the time involved in providing and compiling the research information. The credit for compiling this database goes to Dean Zuleger and Tim Johnson of the Wisconsin Potato and Vegetable Growers Association. Dean and Tim spent at least 160 hours between them planning and implementing the database. The state potato offices spent untold hours collecting and providing the information to Dean and Tim. A diskette was provided to each state that participated in this project. To use the information, you must have the program Quattro Pro for Windows or Microsoft Excel. This past week we received a copy of all federally funded potato research in the U.S. for 1995. We will have to disaggregate these research projects by discipline and State, but a lot of thanks goes to USDA for providing this information to us.

What can the USDA do for the United States potato growers? First, we wondered why a national research database was not already available for use by researchers and the potato industry? You would think it would only take a telephone call to obtain this information. It took a lot more. Thanks to Undersecretary Karl Stauber and Mike Fitzner, we received this information.

Although most researchers will not agree with us, we know there is duplication of research to a certain extent. We feel 20 percent duplication is on the low side, but this much we have found. We know this by conversations with growers from another state. Not only is this a waste of grower money, it is also a waste of Federal and State monies. It is also a waste of research time. Potato researchers need to

communicate with each other more than they are. Grower-identified and -driven priorities are the inputs needed to increase our use of IPM.

Let growers set the priorities that affect local areas in each state because these growing areas have different problems and needs. Two years ago at the request of EPA, we identified 23 geographic potato-growing areas in the 11 fall potato growing states. I reemphasize, local areas know what is needed; Extension and land grant universities can facilitate the process of finding out those needs.

Growers are private and independent individuals, and it is sometimes very hard to get their input. But we will help because this is something we, as a grower group, and various people and agencies within the USDA and EPA have been working to change. Three years ago when we were trying to get NTN registered, we had a meeting with EPA and USDA, and our feeling was that these two agencies did not communicate with each other very often. Larry Ellworth at USDA has been working with EPA personnel to address issues that affect the public and growers, and we appreciate this. I am sure there is more interaction than this between the USDA and EPA, but if there is not, we are in real trouble. Communication is the key to success. Growers must get more involved in conferences like this. How many growers of any commodity are here today? That is more than the seven or eight that were in Las Vegas at the Second IPM workshop. Although there is a lot more grower involvement in this workshop, it still is not enough. But, it is headed in the right direction. A lot of good information will be presented by the people involved in this conference, but let us make sure that the information they share with us gets to the growers. It has to be in grower hands to be used.

A grower must see locally the accomplishments of any program. Actually, he must see the results on his own farm.

State, regional, and area IPM teams have been set up. To growers, this looks like typical government overkill. I am sure it is not, but let us take a look at what has happened by this time next year and reevaluate these teams' programs and progress. This is probably already part of the strategic plan but I thought is was worth mentioning from the growers' point of view.

Producers need more information about well designed crop-rotation programs. Good rotation plans for specific crops could slow pest resistance to crop-protection chemicals. Economically viable rotation plans could also improve soil tilth. This, in turn, would reduce wind and water erosion.

The National Agricultural Statistics Service (NASS) needs more funding so that the National Potato Council and USDA researchers and EPA can identify fertilizer and pesticide use and pests. The NASS now surveys the 11 fall growing states. Fertilizer and crop-protection chemicals and 10 target pests are included in this survey.

We need information on spring and summer states and a breakdown by geographic areas. Some geographic areas are very small, like the Skagit Valley in Northwestern Washington. Others are very large like the Red River Valley in Minnesota and North Dakota or the Columbia Basin in Oregon and Washington.

Statistics also need to show why there is an increase in crop-protection chemicals some years and reductions in others. Late blight is a problem that mandates the use of more pesticides in some states one year but not the next. This information needs to be in the statistics, and we need to document why these variations occur. Weather seems to be the number one reason for the increase or decrease from one year to the next. Also, the new strains of late blight need to be identified in the statistics so we know why pesticide use increased or decreased. Growers need to feel more comfortable about why and by whom these statistics are used. So, more information is better, but it is also more time consuming and expensive for everyone.

Under the Federal Crop Insurance Corporation, growers who practice IPM should have lower rates than those who do not. The Extension Service needs more funds to evaluate IPM trials and demonstrations on farms. Research programs need to have long term funding (5 to 10 years) instead of having to develop and submit grant applications yearly. USDA needs to understand grower practices

before putting more rules and regulations into place that impact production and use of IPM practices. Growers must be at the center in development of IPM programs, and their advice sought continually. It is not that we are smarter than anyone else, but we need to be part of the IPM program. We need new and better ways to forecast the weather so we know when to apply pesticides. USDA needs to let the public know that IPM is being used.

The USDA could work closer with the EPA on plant-back restrictions on new "safer" chemicals that restrict their use by growers.

I am sure I have sounded very negative about the USDA but I can tell you that the pluses far outnumber the minuses. Without the help from the different groups and personnel within USDA, growers would still be using outdated practices. USDA has brought U.S. potato growers to the point where IPM is used every day. We certainly appreciate all the help we have received.

In the USDA IPM Initiative Strategic Plan, "stakeholders" are identified as growers, consultants, land-grant-university faculty (Extension and research), appropriate State and Federal agencies, nongovernmental environmental, consumer public-interest groups, and others. In the "others" group, there is one that should be listed and not as "other," and that is financial institutions (or as growers say, "our banker"). They have as much influence over growers as anyone else. Potato growers' costs are anywhere from $1,000 to $2,600 per acre, depending on the area and problems encountered. Most growers have to pledge all their assets to obtain a loan. Bankers are going to make sure they get their money, one way or the other. That could mean forcing the grower to apply pesticides that are not needed.

The National Potato Council realized several years ago that we needed to interact with the environmental community. We still are not doing as much as we should be, but we are making growers aware of some concerns environmental groups have. Polly Hoppin, who spoke earlier, was on a panel at our annual meeting last year. Because of people like Polly, attitudes about environmental groups are changing in the grower community.

We also know that Congress sometimes rams things down your throats, and that makes IPM harder to implement, but sometimes growers can help get changes made by Congress if you let us know.

Communications! Farmers are probably the poorest at letting people know what we are doing, but we are getting better at it.

We feel we are practicing IPM very close to the 75-percent level mandated. Some states, and especially those areas that specialize in seed production, are at much higher percentages. IPM is different in every area, which makes it much harder to explain to the growers and public.

Are we satisfied where we are? Absolutely not! We have to keep striving to do better.

As I mentioned before, the National Potato Council is a charter member of EPA's Environmental Stewardship Program. At our next annual meeting, we will be presenting the first annual National Potato Council Pesticide Environmental Stewardship Award to one grower from each of the seven regions we have selected. There are four major components to be considered:

- reduction in pesticide risk
- extensive use of IPM tactics
- use of biological control or alternative pest-control methods
- groundwater, surface water, and habitat protection

There are several areas within each of these four components. These awards will give recognition to growers who are practicing environmental stewardship.

Remember, we believe environmental stewardship is IPM, and IPM is environmental stewardship.

IPM Needs of Apple Producers

David Benner
Pennsylvania Apple Grower

IPM was first introduced to the Pennsylvania apple industry 30 years ago. The possibility of reducing pesticides is what got the growers interested. Positive results from early research led to increased interest by growers. Increased interest led to increased research. Increased research progressed to more positive results. Today, the eastern apple industry routinely acknowledges IPM as the best approach to growing high-quality apple crops. Our industry has been using IPM commercially for the past 15 years, and efforts are continuing to be made in many directions to increase the intensity of applying additional IPM.

I have served on the research committee for the State Horticulture Association of Pennsylvania for 14 years. When I first joined the committee, we had less than $10,000 to direct toward research. The IPM ball was beginning to roll back then and needed to be accelerated. Efforts to increase the budget went into gear, and two weeks ago the committee invested $74,000 in apple research projects for 1996. I am proud to report to you that the increased funds came directly from three specific sources: Pennsylvania growers, apple processors, and packers. And, just to further exemplify how committed we are to advancing our industry, these funds are all voluntary commitments, and I repeat the word voluntary.

Another example of the intensity level of apple growers in the East is "regionalization." It is no secret that Federal and State budgets have decreased funding in the past six years for tree fruit research. Grower representatives and college of agriculture research and extension people from Pennsylvania, Maryland, West Virginia, and Virginia have been meeting for two years in an effort to maximize their respective research and extension dollars. Within the past 90 days, New Jersey has accepted the invitation to share in these regionalized efforts.

It is most important that you understand how concerned an apple grower is about the environment. An apple tree is planted at a location in a field. It is the grower's responsibility to manage the environment of that location to assure production and profitability for the expected life and productivity of that tree for up to 30 years. To put this into relative perspective, let me remind you that, excluding sleep time, the human body rarely remains in the same spot for more than an hour and a half. During this 30-year tree life, 25 commercial crops might be produced. Not only does the environment of the tree need to be managed for 30 years, but the environment of each separate crop must be managed according to the factors affecting that crop.

IPM is accepted by apple growers because it is grower friendly. It offers crop-management tools, techniques, and practices that guarantee growers a more stable orchard environment, the ability to maintain or increase the quality of each crop, the ability (when everything works together) to allow for less use of pesticides, and the chance to show a profit after each crop.

I am sad to report that there are some things going on in 1996 that affect IPM that are not grower friendly.

First, the Delaney Clause has become outdated by technology and must be revised or replaced. To imply that the "presence" of a pesticide residue translates directly into "danger" is absolutely false. We must help our legislators understand that we need the Delaney Clause modernized because, in its present draft, it is holding IPM back and restricting it from progressing. Remember, as participants of IPM programs, we can only control the speed of adoption, we cannot determine the final results. We do not know what the final result will be; extended scientific research will be the only ultimate factor to determine the future of IPM.

Second, random removal of products presently available to growers, especially before new products are labeled as replacements is not grower friendly. We need to help EPA understand that any and every tool in our IPM toolbox is valuable. To take an old

or worn one away without replacing it with a new and better one retards IPM progress immensely.

- When a product is removed, more stress is put on the remaining products to do the job, en-couraging situations in which a pest may develop resistance. When this happens, we do not have a problem anymore, we have a disaster. I was informed within the past week that EPA plans to announce a proposal to ban the use of two post-bloom miticides by 1997: Kelthane and Omite. This action will reduce the growers' choices from four to two and means that the responsibility of control, instead of being spread over four choices, must then be assumed by the remaining two, Vydate and Carzol. Mites have been documented to develop resistance to pesti-cides in two years; I hope someone has a plan.

- Contrary to what some may believe, the honest fact is simply that more products available to a grower for the control of any pest can ultimately lead to a lesser amount of pesticide being used.

- When a product that controls multiple pests is removed, it must be guaranteed that qualified substitutes and/or replacements be available for all the pests, not just the major one or two.

- Uniformity of label restrictions can be a problem. Captan is the only apple fungicide to which no resistance has ever been recorded. It is very important to our industry. However, growers remain confused as to why a four-day reentry interval must be observed for entering the orchard while only a one-day interval exists from the time of application to harvest and consumption of the fruit. In other words, two days after you eat the apple it is still illegal to walk into the orchard.

Third, assume for a moment that knowledge and IPM tools are presently available that could eliminate a grower's crop disaster. Why does not the grower know it? Whose responsibility is it that he learn it? How are IPM changes and updates communicated to growers? These questions all have the same answer: the Extension Service. You have already heard me report that Pennsylvania increased its research funding nearly ninefold in 14 years. It is only logical to assume that the Extension Service is going to require additional resources to communicate these results. New chemistry involving the use and effects of pesticides, new techniques that eliminate the need for pesticides, and new technologies that require updated use of pesticides are examples of the vast responsibility of communication our present Extension Service bears. We must together develop and maintain resources that enable Extension to serve us adequately. Failure to communicate can only lead to retarding the speed at which IPM can move.

Finally, my last area of concern involves a subject we would all like to forget. However, we must not, because we surely do not ever want such an event to occur again to any crop. I refer to the 1988 crisis the apple industry endured involving Alar. Valid scientific research results must be the sole source of energy by which we move forward with IPM. One-sided research and the failure to communicate and educate ourselves in the arena of IPM are not acceptable factors in IPM development.

The Eastern apple industry is proud of its relationship with IPM. We encourage everyone to act professionally and respond positively to the challenges of taking IPM to the next level. We acknowledge the constant potential volatility of IPM but continue to accept the responsibility of stewardship of its implementation.

Implementing the National IPM Goal: What Crop Consultants Need

Don Jameson
National Alliance of Independent Crop Consultants

Ladies and Gentlemen, on the behalf of the National Alliance of Independent Crop Consultants (NAICC), I want to express our appreciation for the opportunity to address this meeting as well as participate in the poster session.

Our topic is: Implementing the National IPM. Goal: What Crop Consultants Need. First, may I define a consultant as we represent them. We are men and women participating in the practice of applied agricultural production. We use knowledge of agronomy and entomology, among other disciplines. We use knowledge of the crop, along with information out of the field about the crop's status, to help farmer clients make rational "best management decisions." We both walk and scout fields, as well as use advanced and sophisticated equipment for sensing conditions in the field. We give judgment not just on products and rates of chemicals but also on risk reduction. Consultants use memory and experience as well as models and computers to analyze results that aid in decision choices.

Our members are compensated by fees paid by their grower clients rather than indirectly through the sale of crop-production inputs.

A recent Doanes Agricultural Service Company survey indicates a growing profession, with consultants having a direct influence on one in six farm crop acres in the United States. Personally, I have been associated with the broad concepts of integrated pest management for most of my life, having grown up on a diversified Kansas farm where it was common practice for my father to alternate between soybeans and field corn. This was a simple applied strategy to avoid problems with corn rootworm and corn stalk-borer. However, I have recently become considerably more active in my reading and thinking on the current considerations flowing into this gigantic concept that has been labeled IPM. It is a concept as wide as the Mississippi and intricately as curious as the cultural complexities of the Orient.

It is no wonder that those of us deeply involved tend to approach it in the broader sense as integrated crop management.

My goal now for a few minutes is to make a presentation of four main points of need we in the NAICC believe that Department of Agriculture can provide or continue to provide (I use the word "continue" because your support has existed already in many ways).

As an illustration of our needs, allow me to first tell a story of several players in the mint industry. These are the people that flavored your toothpaste this morning. I hope to illustrate the four points I will yet speak to. This is a success story.

Mint is a multidisciplinary challenge. It has unique nutrient and water demands. It is vulnerable to several stem and leaf diseases. One of these stem-fungus diseases (verticillium) can be enhanced by one of the two major nematodes that can infect the roots. The leaf-foliage pests are mites, grasshoppers, aphids, cutworms, and loopers. These show up above ground. Oh, there is one more of the order: *Lepidoptera*, a root borer who can do a mega root canal, rendering the plant dead on arrival come spring. The adult root borers fly and mate in July and August.

Do you see the makings for an integrated pest-management system here?

My newly hired pest-management specialist is learning, but he cannot explain it all. He never had a nematology course. My other staff entomologist understands those pests with wings and six legs. But, the part on diseases and nematodes, well that is another department where he had no course preparation.

Nineteen years ago, Jim Todd on our staff was

digging and problem solving: he found an alien. It turns out to be the beginnings for explaining how we had "winter injury" during mild Pasadena winters. He gets credit for the first discovery of mint root borer (MRB) in Washington State. Oregon already was at work.

Recognition of the problem moves to the Mint Research Commission, and cooperative funding goes to Dr. Pike of Washington State University Research and Extension Service.

With the aid of a chemical company, several tactics for control are worked out: tillage, cultural practices, and a postharvest chemical-pesticide treatment.

Some people begin to see another pest. There are reports of failings in natural mite control heretofore not observed. Dare we say one chemical had shifted the equilibrium in the population dynamics of another? Besides a chemical pesticide, what other options could be used?

Then a company developed a biocontrol beneficial parasitic nematode. It is a new idea; the industry is cautious; the control cost is $90/acre (three times the conventional treatment). Meanwhile, the USDA Agricultural Research Service (ARS) scientists at Yakima think of pheromones and of using timed summer sprays on the adults. Dr. Harry Davis camps out many nights in Sonny's mint field. He studies their nocturnal flight and mating habits, and he pretty well nails it down. Colleagues crack the pheromone code and can synthesize it. They license the pheromone to a private manufacturer. Mint-root-borer field-sampling techniques and thresholds are developed by Dr. Pike and other research and Extension scientists at Oregon State University and the University of Idaho. Our firm, Agrimanagement, offers a commercial detection and control management service to farmers. Samplers are hired.

Dr. Davis calls us for lists of fields known to be hot with infestation. We furnish these, and he camps out more nights and tests his pheromone product. Meanwhile, the biocontrol company is gaining creditability and is able to enlarge the market. The price falls to $50 per acre with favorable anecdotal reports coming in. I persuade Larry to try it on two fields, we do a postseason sample, and this bio--control looks exciting.

Then in 1993, ARS furnishes pheromones to the private consultant to try out. Trap catches are counted and charted. Data are correlated to Weather Service data. A summer control spray is applied to several fields. Growers Don, Larry, Mike, and Sonny try it in July on the strength of their consultants' argument and persuasion. It stretches the budget about $25/acre.

The September root-sampling results come in. Some fields show a bull's-eye direct hit. Others show less definitive results. Sonny says it was money down a rat hole. More research is needed. Who needs to do that?

Because of funding constraints, the university project on MRB has been terminated. The private consulting company continues with its own resources and grower-invested trials. Sonny tries it one more time. Some say the technique is flawed. But we believe we see it working and usable. It scores for Sonny this time. Great, a postharvest chemical will not be needed!

Now we have another tool. The strategy of pheromone trapping is adopted by an observing chemical/fertilizer dealer. September samplings for larva expand before treatments are *carte blanche* applied. Also, biocontrol parasitic nematodes have come down to $39 per acre for the officially recommended dose.

Now we have a multifaceted system for mint root borer control in place. Other parts (bio- and chemical control) are under development, but there are still mites, foliage disease, and the nematodes. One chemical-company- and university-tested nematode product would work and has met residue standards. It has been on the long IR-4 waiting list, memory says, for four years. Some are hoping for release during the fall of 1996; check with us next year.

The representatives of various commodity groups speaking here before me furnished a fine prelude to my remarks. Indeed, many of our needs for IPM are

the same because these people are our direct employers. As my story illustrated:

First, we need trained and educated people to fill our ranks. These need to be people trained in multi-disciplinary education with skills in diagnosis and problem solving. We need Government acceptance and support for the concept of moving toward a multidisciplinary curriculum at the undergraduate and graduate levels.

At our workshop on Wednesday the panel will expand the vision of how this can work, especially to the promotion of IPM goals. We believe academic, government, and private practitioners can cooperate to develop this concept. Regional programs could lead to a doctor of plant health degree or to what is called a professional degree.

Second, we need publicly funded agricultural science research. This has been the very bedstone used to build today's IPM systems. Government needs to acknowledge this vital role and even to promote to the public the value of allocating dollars to agricultural research.

In developing research goals, researchers and policymakers can benefit from a close relationship between the grower and crop advisors and consultants. We consultants do need to be participants in helping identify the type of research or policies needed. By our involvement, we can be used to deliver information to the producer and to return observations and experience to the researchers and policymakers.

On the topic of research needs, good points have already been made by the commodity representatives and by Chuck Peters. In a phrase, we do need the infrastructure, the policies, and stimulation of private and public entities to bring systems of control and biocontrol products for primary or "rescue" use into the market.

As former primary pests are contained by IPM strategies or via transgenics, new secondaries may emerge. Other issues of resistance management will deserve continual attention and research.

This takes me to a different question that is important to the end users of IPM tactics: The economic gain or advantage for a farmer-user must be planned for, achieved, and promoted. But if there can be gain, there can also be loss incurred by the use of soft, biocontrol systems if nature does not cooperate. This risk has always been shouldered by the producer. Fresh thinking and discussion is needed on the issue of the economic risk and liability that may arise when using an IPM tactic or system that fails in comparison to a conventional approach.

Third, crop consultants need the recognition of our established NAICC certification program. By meeting its stringent education, experience, and continuing-education requirements, advisors and consultants can be distinguished as a Certified Professional Crop Consultant. NAICC has worked with EPA and the USDA in the development of this program to make sure it satisfies expected standards.

Such credentials should assure policymakers, farmers, and the general public that those purveyors of methods and information, who farmers freely choose to advise them, are competent.

Fourth, consultants need supporting policies to promote and stabilize them as private firms delivering IPM services. Funding and policy for IPM programs need to be designed in such a way that they do not strongly subsidize competition from the public sector where private services are in place or can be available to assume the job. Policy should permit funding allocations to be directed or shared by private entities when they are able to codirect and execute research projects.`

Independent or private crop consultants should seek to participate in the initial design and thinking of IPM planning committees. However, it is important that funding be available to support consultant travel and time in such activities. We acknowledge that you do appreciate the difference between a public salaried employee and the private business farmer or crop advisor who leaves his place of business to participate in a conference or committee meeting directed to issues of public policy.

Privatization of agricultural-technology and information transfer and adaptation is evidence of the overall long-term success and validity of Federal and university agricultural research and Extension systems.

Crop consultants have a unique personal relationship with their individual clients that makes them able to transfer information that is accurate as well as specifically adapted to the demands of each farmer. This relationship is important for State and Federal environmental compliance as well. Growers do consistently express confidence and satisfaction with their consultants. This confidence allows us to be highly effective in transferring technical advice and regulatory information.

Simply said, consultants must get good results or they will not be hired back. In other words, our work is under ongoing assessment.