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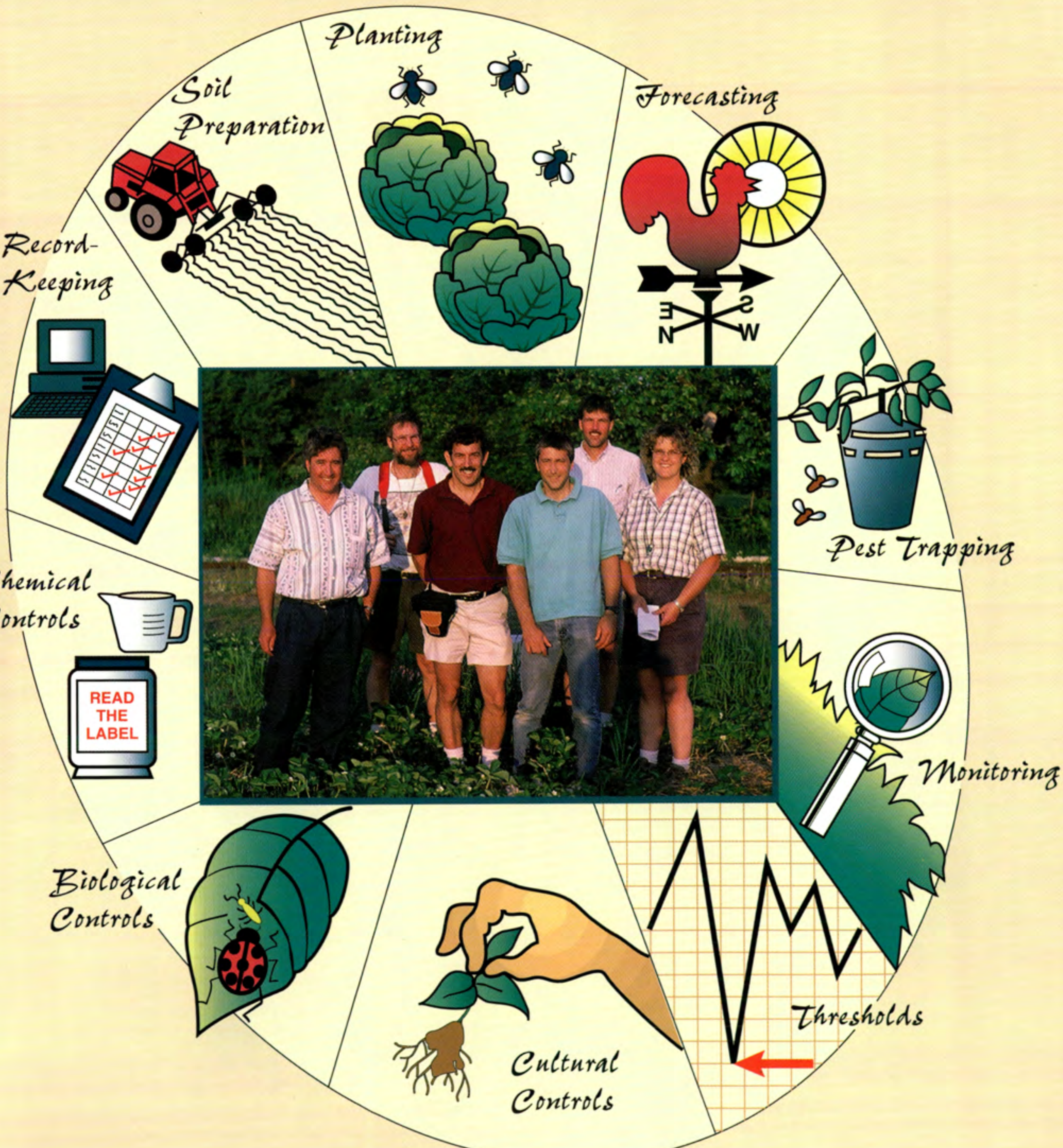
New York State

Integrated Pest Management Program

1998 Annual Report



IPM: It takes teamwork

STATE OF NEW YORK
DEPARTMENT OF AGRICULTURE AND MARKETS

George E. Pataki
Governor

Donald R. Davidsen, D.V.M.
Commissioner

The 1998 Annual Report of the New York State Integrated Pest Management Program marks the twelfth consecutive year of public support of the statewide effort. The IPM program provides agricultural producers with pertinent information obtained from research, demonstration and implementation projects addressing priority pest problems identified in the Long-Range Plan and by the IPM Working Groups and the Statewide IPM Grower Advisory Committee. Agricultural producers are encouraged to raise crops and animals using a combination of alternative control strategies that reduce or replace the application of pesticides. The assistance provided to New York producers through the New York State College of Agriculture and Life Sciences at Cornell (CALS) has become of even greater significance with the enactment of the Food Quality Protection Act, which will undoubtedly influence the future availability of a number of agricultural pesticides. The ability of CALS to research and develop needed biological alternatives and new strategies will continue to be enhanced through the funds provided by the New York State Legislature.

The 1998 report provides an in-depth review of several crop teams and highlights the accomplishments achieved in the four major commodity areas of emphasis in the past year: Fruit, Livestock and Field Crops, Ornamentals and Vegetables. Approximately 60 different projects received program support in the past year, with work occurring in all but six counties across the state. The increasing voluntary adoption of IPM practices by growers testifies to the continued cost effectiveness of IPM.

Under Article 11, the express purpose of the State's Integrated Pest Management Program is to integrate crop management, cultural practices, field scouting, economics, and chemical and biological controls. The 1998 report demonstrates how this directive has been implemented to encourage and promote research, support and delivery systems to serve the producers of the state.

It is with great satisfaction that I present the 1998 Annual Report.

Sincerely,

Donald R. Davidsen, D.V.M.
Commissioner

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Acknowledgments

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Cover photo: Members of the Cornell strawberry IPM team. (See story on pp. 16-17.) L to R: Wayne Wilcox, professor, Department of Plant Pathology, Geneva; Greg English-Loeb, assistant professor, Department of Entomology, Geneva; Marvin Pritts, professor, Department of Fruit and Vegetable Science, Ithaca; Joe Kovach, fruit IPM coordinator, Geneva; Kevin Maloney, technician, Department of Horticultural Sciences, Geneva; and Regina Rieckenberg, former extension educator, Oswego County.

Photos on p. 15 by C. Koplinka-Loehr (top, middle) and D. Gilrein (bottom).

Photos on p. 23 by C. Koplinka-Loehr (top, bottom left) and R. Way (bottom right). Top: Christine Casey and John Barrone discuss IPM for poinsettias; bottom left: Leslie Allee buries a corn rootworm trap; bottom right: Brian Daugherty (left) and Max Spittler use vacuums to remove tarnished plant bugs from strawberry plants.

Table of Contents

Director's Message—4

Updates and Recaps—6

Growers Face New Constraints—6
Nurturing Private-Sector Responsibility for Weather Data—6
Does IPM Pay?—7
Measuring Progress in the Adoption of IPM—8
Interest Grows in Communicating the Good News of IPM—9
Strawberry Customers Surveyed—9
Excellence-in-IPM Awards Highlight Achievements of Seven New Yorkers—11
New Resources Available—14

Teamwork Examples—15

The Strawberry IPM Team—16
The Nursery IPM Team—18
The Livestock and Field Crops IPM Team—20

Commodity Highlights—23

Fruit—24
Livestock and Field Crops—27
Ornamentals—30
Vegetables—33

IPM Grants Program—39

Funded Project Lists—40

State-Funded Projects, by Commodity—40
State-Funded Projects, by Project Type—42
Federally Funded Projects—45

Committee and Staff Lists—46

IPM Operating Committee—46
IPM Commodity Working Groups—46
Statewide IPM Grower Advisory Committee—48
IPM Program Staff—inside back cover

Director's Message

Teamwork is the primary reason why the New York State Integrated Pest Management Program completed its twelfth year of activity on a note of success and accomplishment. Significant progress was made because the agricultural producers of our state continue to value the work of the IPM Program. They showed it by their participation as full members of the team of people who make IPM happen in New York.

The year was certainly a challenge in terms of pest management. Potato leafhoppers, late blight on tomatoes, small insects called thrips, which carry viruses to greenhouse crops, and leafrollers, which continue to damage apple crops, all had banner years. Fortunately there were IPM efforts underway that helped growers manage some of these pests effectively. Damage from others was at least mitigated by steps taken toward developing new IPM methods. For one, the leafroller, significant results will only come through a long-term effort exploring new options.

Working with the Statewide IPM Grower Advisory Committee has helped us gain a clear understanding of the priorities that agricultural producers have for the IPM Program. This 25-member committee serves as a sounding board, enabling producers to react to the way the program is progressing. It also plays a significant role in shaping the future of the Program. The committee carefully reviews the need for educational outreach and for the development of new IPM methods and recommends certain actions. It recognizes that level state funding for the past five years is beginning to create some unique constraints for all portions of the Program.

Through a strict accountability process, we have been able to determine that the bottom line for 1997 was that IPM efforts continued to

- provide economic solutions to many pest problems facing agriculture in New York

- result in improved environmental stewardship on the part of New York agriculture, mostly through reduced loading of the environment

- increase the availability of alternative measures for managing pests so that producers are not caught in a squeeze due to pest or regulatory pressures

- obtain and disseminate information that reduces society's concerns over risks to health and the environment

- demonstrate that New York agriculture can be more sustainable and be in concert with concerns related to health and the environment

- document producers' progress in adopting IPM methods

While these impacts are significant in and of themselves, the activities that make the impacts possible are also worthy of mention. Activities are numerous and include 59 development and outreach projects that either uncovered new information or demonstrated new methods to agricultural producers. Among these activities are the production of newsletters for both participating and nonparticipating agricultural producers, training of Certified Crop Advisors, the publication of resource material such as fact sheets, manuals, and videotapes, and the writing of more than a hundred articles in newsletters and magazines on the why's and how-to's of IPM.

Even though we cannot see the answers to all of New York's pest problems, we can clearly see some future constraints on agricultural production in the state. The impact of the Food Quality Protection Act of 1996 is just beginning to be felt at the farm gate. While the Act affects only one of the array of IPM options (the chemical pesticide option), it does threaten to seriously disrupt an integrated approach to managing pests.

In the past I have often written about the word "integrated," indicating that there are no "silver bullets" insofar as pests are concerned. The potential loss of a portion of the pest management options agricultural producers have available to them makes it more imperative than ever that New York should continue to have an IPM program. Even as the debate about pesticide restrictions and cancellations heats up, IPM offers a different approach than that taken in many circles. Rather than seeking another pesticide to replace the one in danger, the IPM Program seeks to find alternative ways to manage a pest, ways that may depend on combining a pesticide with other tools.

All one need do is examine many of the results of projects that were funded by the IPM Program this year to see proof once again that agriculture's reliance upon pesticides can be reduced without adversely impacting the quality or yield of New York crops.

I believe the IPM Program clearly sees the trends, the needs, and the opportunities to bring the management of pests into more biological balance than ever before. We are fortunate to have the teamwork that is necessary to help us achieve this goal.

James P. Tette

Photo: K. Colton

Updates and Recaps

Growers Face New Constraints

Food Quality Protection Act changes growers' options, but the IPM Program can help

The Challenge. For a moment picture yourself as a carpenter who has just seen someone take away a number of his tools, yet he is expected to complete the job he agreed to do without having the tools replaced. This is the situation the agricultural producers of New York may face in the coming years due in part to the Food Quality Protection Act. While parties on all sides of the pesticide use issue agreed to passage of this legislation, the outcome may severely constrain agricultural producers. Add to that the fact that federal funds to address the outcome of the FQPA have been earmarked primarily for the cost of regulations associated with the Act, and you might be able to gain an appreciation for what lies ahead.

There is no question that the implementation of the FQPA will mean a significant departure from business as usual for most of the state's agricultural producers. Pesticide availability for most New York crops will be threatened.

A Source of Help. One place producers can turn to for help is the New York State IPM Program. For a dozen years the Program has been adding to the IPM toolbox. It has uncovered alternatives to synthetic pesticides and then fitted them into agricultural systems while maintaining system profitability. It has conducted demonstrations for farmers and growers, to help them gain confidence in these new methods. Finally, the Program has informed the public about how farmers in the state are responding to societal concern over pesticides. This long history of IPM work will serve growers well in this time when conventional options are diminishing.

Nurturing Private-Sector Responsibility for Weather Data

The Northeast Weather Association gains financial independence

The Northeast Weather Association (NEWA), a nonprofit membership organization originally funded by the New York State IPM Program, had 67 new members in the 1997 growing season, representing a 56 percent increase in membership over 1996. NEWA continued to disseminate weather data, pest forecasts, and weather forecasts to its members, who include growers, food processors, private consultants, fieldmen, and extension personnel. Before NEWA was formed, state IPM dollars were the sole source of support for IPM weather efforts. Since the formation of NEWA, the IPM contributions supporting weather-related projects have decreased, being supplanted by NEWA contributions.

During the 1997 growing season NEWA was able to maintain an electronic weather network in which individual weather instruments are linked by four computers that act as "bulletin boards." The electronic bulletin board sites (BBS) are located in Geneva, Canandaigua, Fredonia, and Middle-

Weather station in NY vineyard

town. The BBS gathered weather data daily from 57 data loggers. The data were summarized and run through various pest forecast models for potatoes, onions, apples, grapes, sweet corn, and tomatoes. Degree-day accumulations and weekly sweet corn pheromone trap catch reports were made available to members. Information was transmitted either through a daily FAX or by members downloading it to their computers. The network was operational 100 percent of the days from April 1 to October 31.

NEWA contracted with Weather Track, a private meteorological firm, for customized agricultural forecasts updated once daily. These forecasts provided a synopsis, zone forecasts, extended forecasts, confidence level of forecast, and a chart for various forecast parameters for three days. NEWA also contracted with American Weather Concepts to supply forecast graphics.

Does IPM Pay?

Practicing IPM can mean both environmental and monetary savings

The question that agricultural producers ask most frequently about IPM is "Are these IPM methods cost effective?"

In 1997 this question was addressed by the manager of the Central New York Crop Management Association, an organization that has its roots in the New York IPM Program. An analysis of the value of scouting for potato leafhopper and corn rootworm showed that five farms realized savings between $1,255 and $7,074 just by having their fields scouted (table 1). Scouting usually results in monetary savings because it provides definitive information about pest levels that can then be used in making decisions about pesticides. Growers who do not scout their fields often rely instead on treatments that are applied preventively.

Similar evaluations, such as one just conducted on the release of a biological control agent for the alfalfa weevil, show an extremely favorable (1 to 90) cost benefit ratio. The weevil, once a damaging

Table 1. *Financial Benefits of IPM Scouting*

Farm	Savings	Alfalfa Acres	Field Corn Acres
1	$ 7,074	350	211
2	$ 3,123	147	104
3	$ 2,643	166	17
4	$ 5,214	200	104
5	$ 1,255	37	70 (snap beans)

Source: *CNY Crops News,* Issue 97-4, Oct. 1997 (Central New York Crop Management Association newsletter) pest in New York, is now managed in an integrated fashion that includes biological control, weather-derived forecasts of weevil development, field monitoring, and proper cutting (harvesting) of the alfalfa. There is a chemical management option as well, but it is seldom needed.

Interest is also increasing in a related question: "How well does IPM pay in environmental terms?" Unfortunately there are no easy ways to measure the impact of IPM on water or soil quality. However, we now have environmental impact baselines, calculated by the "environmental impact quotient" (EIQ) method developed in 1992. We know that these values, and data on the numbers of pesticide spray applications, show less environmental loading by pesticides than ever before for several cropping systems.

Measuring Progress in the Adoption of IPM

Survey of sweet-corn growers provides data

The "continuum of IPM" refers to the incorporation of IPM methods, starting with a chemically based, calendar spray program and moving to one that is information-based and relies on biologically intensive methods. Growers of any cropping system can measure their progress in the adoption of IPM by calculating their position along this continuum.

In 1997, progress in the adoption of IPM was measured through a survey of fresh-market sweet corn growers, conducted as a collaborative effort with the NYS Agricultural Statistical Services. Two hundred six growers were asked 14 questions about their IPM practices. These questions were related to the "elements" of IPM as defined by growers, processors, retail food distributors, and Cornell University (figure 1, p. 10).

As can be seen in table 2, more than one-tenth of the 206 growers have adopted 80 percent or more of all IPM elements. This group has progressed far along the IPM continuum. One-hundred and seventeen additional growers have adopted 50-80 percent of the IPM elements, showing a high degree of adoption but with some room for improvement. The remaining 30 percent may not have been able to more fully adopt IPM practices because their operations are not near sites where IPM methods have been demonstrated.

Data from the survey helped the IPM Program by revealing that future educational outreach efforts need to emphasize weed mapping, nutrient testing before sidedressing additional fertilizer, and accurate record keeping.

Table 2. *A Measure of Fresh-Market Sweet-Corn Growers Using IPM Methods*

% IPM Elements Adopted	# Growers Using IPM Elements
≥90%	9
80%	17
70%	26
60%	52
50%	39
40%	34
30%	10
≤20%	19
	[Total growers = 206]

Interest Grows in Communicating the Good News of IPM

IPM labels tell consumers about grower stewardship

Explaining the environmental stewardship of agricultural producers to consumers at the point of purchase is a worthy enterprise. Wegmans Food Markets began such an enterprise two years ago, when it chose to use IPM labels and to develop materials that explain IPM to its customers.

In 1997 two grower organizations and a food processor—the New York State Berry Growers Association, the Eden Valley Growers, and Curtice Burns—requested use of the IPM logo as a step in their initiation of IPM labeling. The requesting parties then met with Cornell research and extension IPM experts to choose sets of elements that define IPM for specific commodities. "Elements of IPM" are now in place for 10 vegetable and 4 fruit crops in New York. The elements for fresh-market sweet corn are shown in figure 1, p. 10.

More than 4,000 acres of vegetables and fruit were grown for IPM labeling in 1997. The producers growing these crops kept detailed records of their use of IPM. Their progress in adopting IPM elements was documented by independent third parties who reported to the organizations that licensed the IPM logo.

The use of the IPM logo insures the integrity of every participant in the IPM labeling process.

Strawberry Customers Surveyed

Farm stand buyers care about pesticides, IPM

Professor Dan McDonald, Cornell Department of Communication, shared some fascinating facts about consumer attitudes when he spoke at the NYS Berry Growers Association meeting in February 1998. McDonald reported on data that he and his department chair Carroll Glynn gathered and analyzed. The data came from two 1997 surveys, a statewide, random sampling of the general public and a sampling of customers at berry stands around the state.

Survey subjects were asked questions about pesticides, the environment, and IPM. When berry stand customers were asked why they choose particular farm stands, traditional reasons like taste were dominant, but environmental concerns were also influential. Here are some of the attitudes gleaned from the surveys:

- About 75 percent of consumers are concerned about the health and environmental impacts of pesticides.
- 61 percent of those surveyed disagree with a statement ranking the appearance of berries above the way they are grown. Only 19 percent agree that aesthetics are more important.
- Consumers respond favorably to the idea of IPM, whether they understand it or not. Nearly all would choose IPM-grown berries over conventionally grown berries if both were available for the same price.
- 61 percent are willing to pay *more* for "berries grown in ways that minimize pesticide use."
- A majority of those surveyed about priorities for pesticide research ranked "effects on groundwater" number one.

Figure 1. *Elements of IPM for Fresh-Market Sweet Corn*

MAJOR PESTS

Insects	Diseases	Weeds
European corn borer (ECB) corn earworm (CEW) fall armyworm (FAW) corn flea beetle corn leaf aphid western corn rootworm seed corn maggot cutworms common armyworm sap beetles	common rust smut northern corn leaf blight Stewart's wilt anthracnose maize dwarf mosaic seed rots	broadleaves annual grasses perennials

SITE PREPARATION

1) Review weed maps of fields to choose appropriate weed control strategies.
2) Crop Rotation: plant only in fields where sweet or field corn has not been grown in the previous year to avoid corn rootworm, anthracnose, smut, and northern corn leaf blight.
3) Soil-test at least every three years; fertilize according to recommendation.

PLANTING

1) Use pest-resistant varieties when possible for controlling common rust, smut, Stewart's wilt, northern corn leaf blight, and maize dwarf mosaic.
2) Seed treatment: use fungicide-treated seed for control of root and seed rots.
3) Avoid use of granular, in-furrow insecticides in fields not at risk for seed corn maggot (risk factors include early plantings in cold soil and recently incorporated cover crops or other decomposing organic matter).
4) (Optional) Use banded herbicide applications and cultivation to reduce herbicides.

POSTEMERGENT NUTRIENT MANAGEMENT

1) Use pre-sidedress nitrogen test to decide if additional sidedress nitrogen is needed.

PEST MONITORING AND FORECASTING

1) Monitor flights of ECB (E and Z race), CEW, and FAW on your farm using recommended pheromone traps and lures.
2) Scout as recommended for ECB, FAW, CEW, flea beetles, and common rust.
3) Make a written weed map of the field to use for evaluating the preemergent herbicide program and making postemergent treatment decisions.

PEST MANAGEMENT

1) Calibrate sprayer(s) annually.
2) Use recommended action thresholds to make decisions about applying pesticides for insects and diseases of importance.
3a) Choose effective pesticides that have the lowest environmental impact based on overall environmental impact quotient (EIQ).
3b) Choose effective pesticides that preserve natural enemies based on natural enemy component of EIQ.
4) Keep records of pest densities, pesticide applications, cultural pest management practices, and biological control techniques used.
5) Cultivate for weed control.

POSTHARVEST

1) Update weed maps to use when planning for next year.
2) Mow or disk fields after harvest to reduce pest populations.
3) Establish cover crops for weed control and to scavenge leachable nitrates.

Excellence-in-IPM Awards Highlight Achievements of Seven New Yorkers

Growers, consultants, and scientists are honored

Excellence-in-IPM Awards were presented this year by the IPM Program to seven people with outstanding records of achievement. "The purpose of the awards," explains Director Jim Tette, "is to honor people for developing new IPM methods or for sharing IPM with others." The award winners were honored at industry meetings early in 1998.

The Winners Are ...

Elizabeth Graeper Thomas, owner of Liz Thomas Orchard Consulting, of Trumansburg, and a member of the board of directors of NEWA (the Northeast Weather Association). She has been a crop consultant since 1982, helping commercial apple growers in Wayne County to understand and apply IPM principles to their orchards. For example, she has encouraged growers to manage apple scab by relying on rainfall data rather than calendar-based sprays. "We've fine-tuned the process," says Thomas. "I care about how much pesticide is out there." Thomas also advocates the use of predatory mites and has seen growers change their tolerance for damage and become more willing to try biological control. She is keen on having IPM save growers money and thinks that everyone should work harder to ensure that new, "softer" pesticides are economically viable.

David Gadoury, senior research associate in plant pathology at the experiment station in Geneva, works on the biology and ecology of plant diseases. His work has been incorporated into disease management programs in New York, the northeast region, and other parts of the world.

Gadoury and the late Roger Pearson determined how the powdery mildew fungus survives winter to cause infection in the spring. They then revised the grape disease management program, reducing the number of annual fungicide applications by as much as 50 percent, while improving disease control. As a direct result of these changes, New York grape growers save nearly $1 million a year and produce higher quality fruit.

Gadoury has also developed a heat-maturity model for predicting the onset of apple scab and is studying the development of the grape diseases downy mildew and black rot. The new information he is developing about these diseases is helping growers to select appropriate treatments for their fruit crops and to time the treatments correctly.

L to R: Liz Thomas, Jim Tette, and Dave Gadoury enjoy a conversation at IPM award ceremony. Photo: R. Way.

Tim and Colleen Stanton practice IPM on a family farm in Feura Bush that they have owned for 11 years. They devote nearly 400 acres to production of hay and other field crops, small fruits, vegetables, and greenhouse plants.

Tim, who is in charge of most of the daily farm operations, uses rotation, pest-resistant plant varieties, pest traps, conservation tillage, and a host of other IPM methods. He is willing to try new ideas and in recent years has helped to develop the use of rye mulch for pumpkins, tested powdery mildew-resistant pumpkins, and participated in pumpkin variety trials. He has also conducted sweet-corn trials on reducing bird damage and has evaluated biological controls for insect pests.

Colleen and her sister operate a seasonal farm stand, "Our Family's Harvest," in New Scotland. This retail store sells produce from the Stanton farm, and Colleen speaks regularly with customers about how the food is grown. "I don't know how anybody *couldn't* get into IPM these days," says Colleen. "If you're not using IPM, you're probably throwing money away." Colleen regularly monitors for insect pests with sticky cards in the Stantons' two greenhouses.

Rich Wildman, president of Agricultural Consulting Services, Inc., is a pioneer in the field of IPM. His business, begun in 1983, was one of the earliest private crop-consulting firms in the state. Today, Wildman's full-time staff offers production advice on some 70,000 acres of vegetables and field crops in New York, Pennsylvania, and Massachusetts. This advice has helped growers make substantial reductions in pesticide use.

Wildman originated the concept of a "whole farm" approach, which embraces nutrient management planning and soil resources in addition to pest management. He has also developed software that helps growers with record keeping. Wildman says one of his greatest contributions has been "bringing IPM into a format that's readily and intensively adopted by growers."

He has worked to improve scouting techniques on several vegetables, and willingly shares his knowledge with extension faculty and staff at Cornell. He serves on the IPM Commodity Working Group for vegetables, where he evaluates IPM research and implementation proposals. Wildman is also on the executive boards of the National Alliance of Independent Crop Consultants and the Professional Agricultural Consultants of New York State, two organizations that have fostered the development of IPM.

Rich Wildman (left) and Tim Stanton at IPM Award ceremony. Photo: R. Way.

Frank Wiles, executive director of the New York State Berry Growers Association (NYSBGA), is a visionary with a 30-year history of fostering IPM. Wiles views all berry growers as IPM practitioners and is convinced that his award should be shared by them all.

Wiles has a 31-year career in Cooperative Extension, where he began as a 4-H agent and later became a county director. During the early years of the NYS IPM Program, Wiles worked closely with fruit IPM coordinator Joe Kovach, encouraging growers to practice IPM and establishing scouting protocols for berry pests. Wiles also led IPM demonstrations in sweet corn, tomatoes, and potatoes. Under his guidance, growers in the Southern Tier saw IPM firsthand and gained confidence in it.

Over the past seven years Wiles has witnessed a 50 percent drop in pesticide use in New York strawberries. This can be attributed to scouting, biological controls, use of disease-resistant varieties, and other practices he has encouraged.

Wiles has recently helped to develop specific descriptions of IPM for strawberries, blueberries, and raspberries. These "elements of IPM" are being imitated around the country. He also provided leadership in the NYSBGA application for membership in the EPA's Partners in Environmental Stewardship Program. This membership has resulted in a grant to increase the visibility of the berry growers' marketing efforts.

Curt Petzoldt, assistant director of the NYS IPM Program and vegetable IPM coordinator, is rarely content with the status quo. Since 1985 he has been actively engaged in fostering IPM methods and concepts in the New York state vegetable industry.

For almost five years Petzoldt has provided the leadership for an applied research project that draws on the expertise of at least five science disciplines. The project compares four vegetable growing systems (conventional, IPM present, IPM future, and organic) to assess which practices can be incorporated into present and future cropping systems.

Two years ago Petzoldt and IPM extension educator Timothy Weigle founded the Northeast Weather Association—a nonprofit membership organization that provides growers with timely weather data and pest forecasts.

Petzoldt has led Cornell's response to recent private-sector requests for an IPM label with a scientific basis. Interest in IPM labeling of food has grown, and Petzoldt is now participating in out-of-state meetings on national IPM labeling.

Frank Wiles (left) and Curt Petzoldt at IPM Award ceremony. Photo: R. Way.

New IPM Resources

Web site, printed matter increase access to IPM information

In this age of exponential growth in the world of electronic media, the IPM Program is keeping pace with a helpful and attractive World Wide Web site to be found at the following URL:

http://www.nysaes.cornell.edu/ipmnet/ny/

The site includes IPM practices for vegetable crops, newsletters, fact sheets with color photos, graphs, statistics, and more. It is designed and maintained by IPM staff member Karen English-Loeb.

There are many advantages to electronic media, but the need for printed matter continues as well. Some of the IPM-related resources produced in 1997 at Cornell are summarized here.

Integrated Pest Management for Bedding Plants: A Scouting and Pest Management Guide

This manual provides information on scouting for pests and diagnosing nutrient deficiencies. Case studies, scouting forms, and a bibliography are also included. Edited by Christine Casey and Carrie Koplinka-Loehr.

Weeds of the Northeast

This comprehensive book, authored by Richard H. Uva, Joseph C. Neal (formerly of Cornell), and Joseph M. Ditomaso, is a great aid to proper weed identification. Published by Cornell University Press, its 416 pages include 746 color photos and 118 drawings.

Fact Sheets

- *American Plum Borer*
  This fact sheet on an insect pest of apples is authored by David Kain and Art Agnello.

- *Powdery Mildew of Cucurbits*
  This fact sheet on a common disease of vegetables is authored by Margaret Tuttle McGrath.

- *New Cultivation Tools for Mechanical Weed Control in Vegetables*
  This fact sheet describes and illustrates newly developed implements for cultivation, an IPM alternative to herbicides. It is authored by Jed Colquhoun and Robin Bellinder.

Same Trees, Fewer Pests

This article on pest-resistant trees was written by Carrie Koplinka-Loehr for the February 1997 issue of the magazine *American Nurseryman.*

Thrips? Think Pink

This article on sticky trap colors for thrips, a greenhouse pest, was written by Christine Casey and published in the October 1997 issue of the magazine *GM Pro.*

Teamwork Examples

The Strawberry IPM Team

The Team

Successful teams are composed of members with diverse skills. The IPM strawberry team in New York is made up of the key players listed below as well as others too numerous to list. Six of them can be seen in the cover photo.

Dick DeGraff, grower from Oswego County. Dick serves on the Statewide IPM Grower Advisory Committee, helping the IPM Program with his producer perspectives. He was a cooperator this year for an IPM demonstration project on blueberries and strawberries. DeGraff and other cooperators donate their time, equipment, and cropland in order that data can be gathered and analyzed and findings made accessible to other growers.

Greg English-Loeb, assistant professor of entomology, Geneva. One of English-Loeb's research projects has been examining the impact of the clipper weevil on strawberry yield.

Joe Kovach, fruit IPM coordinator. Kovach provides leadership for educational outreach efforts in fruit crops, coordinating interdisciplinary projects that reduce the environmental impact of fruit production systems. He has recently worked with honey bees as a means to transport a beneficial fungus to fruit flowers to prevent the disease of gray mold. He also manages a long-term strawberry systems comparison study.

Kevin Maloney, technician, horticultural sciences, Geneva. He lends expertise on the breeding of strawberries for qualities such as pest resistance and on horticultural concerns.

Marvin Pritts, professor in the Department of Fruit and Vegetable Science, Ithaca. Pritts contributes horticultural advice and data on weed management and on pest resistance or tolerance. He worked with English-Loeb on the "clipper" project.

Regina Rieckenberg, former extension educator, Oswego County. Rieckenberg taught strawberry growers in Cayuga, Oswego, and Onondaga Counties how to do IPM scouting, and she demonstrated IPM practices in their fields.

Wayne Wilcox, plant pathology professor, Geneva. Wilcox provides extension leadership for fruit crop diseases and conducts research on soilborne pathogens that attack roots of berry crops.

Frank Wiles, grower from Tioga County and executive director of the New York Berry Growers Association. Wiles has been a cooperator on IPM-funded projects and is one of this year's Excellence-in-IPM Award recipients (see pp. 11-13). The Berry Growers Association provided partial funding for the multidimensional strawberry systems comparison initiated by Kovach.

Teamwork Outcomes

Each player contributes something crucial to a team effort, as shown in the following example, a summary of recent work on managing the "clipper" (the strawberry bud weevil).

1

Joe Kovach found through his research that clipper damage had little effect on strawberry yield and that clipper effect was greater on the edges of fields than in the interior.

2

Greg English-Loeb took Joe's data and did more detailed research into strawberry plant response to the clipper. He learned that the plants seemed to have a mechanism for compensating for clipper damage.

3

Regina Rieckenberg validated the research findings of border effects and of the lack of injury from clipper damage at and beyond the standard threshold levels by testing these concepts in growers' fields, including those managed by Dick DeGraff.

4

Marvin Pritts wanted to know whether all strawberry varieties could compensate for clipper injury like those tested by Joe, Greg, and Regina, so he and Greg tested these ideas on 12 varieties and found that 11 of the 12 compensated to varying degrees.

5

The result is more detailed recommendations on clipper management for New York growers. These recommendations benefit both the growers and the consumers because fewer pesticide treatments for clipper injury are needed than was formerly thought. This means less monetary outlay for the growers and less pesticide in the environment.

Jenny Ogrodnick looks for clipped buds in a strawberry field. Photo: R. Way.

The Nursery IPM Team

Teamwork Results

IPM work in ornamentals spans the far reaches of New York state and includes turfgrass, greenhouses, and nurseries. Teamwork in the nursery setting is a burgeoning part of recent IPM efforts and has resulted in impacts such as these in 1997:

- six major nursery growers in Erie County reduced their pesticide use, learned the importance of spray water quality, and improved their skills in the areas of pest identification, record keeping, and identification of beneficial insects
- reflective mulch was found to be an effective means of reducing numbers of a common insect pest in field-grown cut flowers in Putnam County
- *Branching Out,* an IPM-related newsletter, provided timely insect and disease information for tree and shrub pest managers to 672 subscribers

The Team

Included here are many of the Cornell employees who have contributed in various ways to nursery IPM in New York. Also referred to, though not by name, are the growers who have allocated portions of their nurseries for IPM demonstrations. Without their cooperation and enthusiasm, IPM methods could not traverse the distance between small-scale experiments and implementable techniques.

Christine Casey worked in Ithaca as an IPM extension educator until August, 1997, when she left the job to pursue further education. Christine lent her expertise in biological control to nurseries in western New York in 1996 and 1997 and led a demonstration of reflective mulch for thrips management in field-grown cut flowers in Dutchess County in 1997. **Linda Yannone,** a graduate student in the Department of Floriculture and Ornamental Horticulture, assisted with the thrips project.

Scott Clark is an extension educator in Suffolk County. He has responsibility for ornamentals, especially for nurseries. He laid the groundwork for nursery IPM in the state, doing the first outreach to nursery growers some 10 years ago. Since that time he has continued to introduce IPM scouting and other IPM methods to nursery growers on Long Island.

Andrew Corbin, IPM extension educator since 1996, works in ornamentals both on Long Island and in the lower Hudson Valley. This year he and Gilrein co-led a project using Oriental beetle pheromone traps in a Long Island nursery.

Karen Dean, extension educator in Erie County, is the project leader for the nursery IPM project there. She teaches the growers participating in this project to do their own scouting, which has led to reductions in pesticide use. In 1997 Karen organized two summer meetings at which larger groups of nursery growers received timely pest management information.

Rod Ferrentino is the ornamentals IPM coordinator, based in Ithaca. Rod contributes to the nursery IPM team his expertise in public speaking and education and in overall coordination and analysis of IPM-funded projects.

Daniel Gilrein, entomologist for Cornell Cooperative Extension, Suffolk County, has been working for several years on educating nursery growers about IPM. In 1997 he worked alongside Corbin on the testing of Oriental beetle pheromone traps in container-grown nursery crops on Long Island.

George Good, faculty member in the Department of Floriculture and Ornamental Horticulture, brings to the team expertise in cold hardiness of woody plants and cultural and mechanical methods of protecting such plants in the winter.

Growers who have allowed IPM demonstrations to occur in their nurseries have contributed their time and risked loss to their crops for the sake of education and the advancement of IPM methods.

George Hudler, faculty member in the Department of Plant Pathology, contributes knowledge on diseases and insect pests of trees and shrubs. He edits *Branching Out,* a newsletter that serves as the only formal yearly record of insect and disease occurrence and severity on trees and shrubs in New York state.

Andy Senesac is a weed specialist and an extension educator in Suffolk County. He educates nursery growers about such IPM methods as weed mapping (finding where the weed problems are) and ground cover management.

Michael Villani, a faculty member in the Department of Entomology, Geneva, lent his expertise in Oriental beetles to the pheromone trapping project executed by Corbin and Gilrein.

The Value of Teamwork

"The IPM participants have become a group of growers I will continue to work with because of their support and enthusiasm for IPM and Cornell Cooperative Extension. Though a transition has been made from IPM-subsidized scouting to private scouting, I believe that there will continue to be an IPM link between these growers and Cooperative Extension."
—Karen Dean

"While there is often concern that one can get lost in the crowd when engaged in research collaboration, my past and present projects with [others] has only helped my overall program and, I hope, has also helped theirs."
—Michael Villani

Karen Dean monitors nursery stock in the winter. Photo: C. Casey.

The Livestock/Field Crops IPM Team

TAg: Teamwork in Action

"Tactical Agriculture Teams," called TAg for short, is an educational model in which groups of growers and Cooperative Extension educators meet regularly in the growers' fields to discuss day-to-day IPM and integrated crop management issues and solutions. TAg is teamwork in action.

The concept of TAg was born in 1990, the brainchild of IPM Specialists Phil Sutton and Jim VanKirk and of Livestock and Field Crops IPM Coordinator Keith Waldron. In the following interview, Sutton ("S") and Waldron ("W") reflect on eight seasons of TAg Teams in New York.

Why did you start doing TAg Teams?

W: We wanted to teach IPM principles and techniques directly to farmers in the field. We knew that they would learn, apply, and remember IPM information better that way than if they heard about it secondhand. And because farmers value the advice of other farmers, we hoped that TAg participants would become "ambassadors" for IPM to their neighbors. This is what has ended up happening.

The team approach has been especially effective for those of us working with dairy and field crops growers in New York because of the large number of growers we need to reach. We have 10,000 clients out there.

Were growers eager to participate in TAg from the outset?

S: It was difficult at first. They didn't want to take the time to attend the meetings. Once they saw how it worked, there was no problem at all getting them to take part. Each year we've increased the numbers. In 1997 there were 75 participants from eight counties. The prior year's total was 60.

W: One thing that has made the growers want to participate, I think, is that we have always asked them to help create the curriculum. We ask them, "What do you need? What topics should be covered?"

Is the TAg concept transferable to other commodities?

W: Yes. This is a user-friendly approach for any commodity. One of our fellow IPM extension educators, John Mishanec, is using the TAg concept with vegetable growers in eastern New York, and there are examples of it elsewhere in the U.S. and in other countries. I just heard a speaker from Indonesia refer to a similar model of education in her country.

How has TAg helped New York growers?

S: Well, there's the obvious increase in knowledge and improvement in pest and crop management efficacy. We can tell right away who the TAg people are at large grower meetings. They're knowledgeable and have a good base from which to ask questions. And there are other, less tangible benefits. One farmer and county legislator has said that he believes TAg has reunited neighborhoods. He feels it fills a gap that used to be filled by local Grange or Farm Bureau meetings. I've seen, too, that TAg participants have formed new friendships. Perhaps this neighborly communication is, in some instances, the most important byproduct of our forum.

W: While TAg meetings are geared to farmers and their needs, other agricultural professionals—including lenders—attend meetings on occasion. This creates opportunities for exchange of ideas and for lenders and consultants to better understand the pest and crop concerns farmers face. It can also increase IPM outreach opportunities. One TAg "alumna" who is an agricultural lender now suggests TAg involvement to her clients.

Keith Waldron inspects field corn.

Phil Sutton (third from right) leads TAg Team discussion.

Behind the Scenes

The people listed here and on the next page are some of those at Cornell who generate the information used in the Livestock and Field Crops IPM Program, including the information used in TAg and other outreach efforts. This synopsis refers to a portion of their current work.

Gary Bergstrom, plant pathology professor, Ithaca. Bergstrom specializes in management of field crop diseases. In 1996 and 1997 he teamed up with Waldron and Elson Shields to study the use of insect-resistant corn hybrids for the management of an insect pest and a related stalk rot disease.

Jerome Cherney, soil, crops and atmospheric science professor, Ithaca. Cherney investigates agronomy of forage crops, particularly factors that affect forage quality.

He provides input, expertise, and support on integrating alfalfa, grass, and other forage IPM into crop production management.

Cornell Cooperation Extension Educators. TAg Teams were taught by Carl Albers, Carl Bannon, Lisa Fields, Nate Herendeen, Paul Westfall, and Judy Wright in 1997. Extension educators David Bradstreet, Terry Lavigne, Teresa Rusinek, and Bruce Tillapaugh also contributed to the overall Livestock/Field Crops educational outreach effort.

Bill Cox, soil, crops and atmospheric science professor. Cox studies the agronomy of grains, particularly factors that affect economic efficiency of crop production. He provides input, expertise, and support on integrating field corn, wheat, and soybean IPM into crop production management.

Rob Gallagher, senior research associate, soil, crop, and atmospheric science. He works on cultivation and weed management methods for field corn.

Russell Hahn, soil, crop, and atmospheric science professor. Hahn is Cornell's weed management specialist for field and forage crops. He is currently researching, among other topics, weed management alternatives in narrow-row silage corn.

Julie Hansen and **Jill Miller-Garvin,** research associate and post-doctoral research associate, respectively, plant breeding, and **Nate Herendeen,** area extension educator. All three collaborated with Don Viands, Waldron, and Sutton on field studies with alfalfa varieties that are resistant to damage from the potato leafhopper.

Jane Mt. Pleasant, soil, crop, and atmospheric science, associate professor. She is evaluating the ability of rye to suppress weeds and various types of cultivation for weed control. Mt. Pleasant is currently assisted in her work by **Robert Burt and Nancy Gift,** research support specialist and extension associate, respectively.

Donald Rutz, entomology professor and director of the Pesticide Management Education Program. He directs the veterinary entomology team and works with **Phillip Kaufman,** research associate, **Stefan Long,** research support aide, and Waldron on biological control of house flies on livestock and poultry farms.

Elson Shields, associate professor, entomology. He collaborates with Bergstrom and Waldron on insect-resistant corn hybrids. He also directs a project with **Tony Testa,** research support specialist, entomology, on biological control of soil insects.

Don Viands, associate director for academic programs in the College of Agriculture and Life Sciences. Viands lent his expertise to Waldron, Hansen, Miller-Garvin, Herendeen, and Sutton in their collaborative effort to evaluate insect-resistant alfalfa varieties.

Commodity Highlights

Managing Mites in Long Island Vineyards

Release of biological control agent provides new understanding of biological control of spider mites

Spider mites, especially the European red mite, can greatly reduce grape yields by feeding on grape leaves. Last year two Long Island vineyards were "inoculated" with tiny biological control organisms (the predator mite species *T. pyri*) in an attempt to manage the spider mite problem. This method is cheaper, more reliable, and more sustainable than chemical management. Furthermore, pesticide use is highly regulated on Long Island and spider mites develop resistance to pesticides very quickly.

Because it was thought that *T. pyri* cannot be found in Long Island, apple clusters harboring predator mites were shipped there from Geneva, New York, and were literally tied onto grape vines in 1996. The importation method was an immediate success. The *T. pyri* set to work controlling the European red mite (ERM) problem in their new homes.

The question of the hour in the 1997 growing season was: how is *T. pyri* faring over the long haul? Is it surviving the winter and reproducing? Is it compatible with pesticides used in vineyards to manage plant diseases? Monitoring, measuring, and comparing in four vineyards—including two additional ones in which *T. pyri* was introduced for the first time in 1997—resulted in these findings:

1) Biological control of ERM is being achieved. There were no ERM in any of the samples from *T. pyri*-release plots in 1996. In contrast, ERM densities rose as high as 50 per leaf in one non-release plot.

2) Numbers of *T. pyri* steadily declined over the July to September sampling period in the plots inoculated with the predator mites in 1996 and either declined or remained constant over the same period in the 1997 release sites. This suggests that pesticides do have an adverse effect on them.

3) One unexpected, positive turn of events was the discovery of *T. pyri* in some of the plots in which none were released. Because of their low dispersal tendency, it is very unlikely that they moved there from the release plots. A more likely explanation is that *T. pyri* is, after all, native to Long Island. This can only help in the goal of obtaining biological control of ERM throughout the region.

Photo: T. Weigle

Minimizing Sprays for Grape Diseases

Need for chemical management decreases as new information about pest biology is uncovered

A project examining reduced spray schedules and the substitution of a foliar fertilizer for conventional pesticides brought to light new information about the grape diseases black rot and powdery mildew this year.

Black Rot. Plant pathologist Wayne Wilcox, of Geneva, found that grapes are most susceptible to black rot during a relatively brief period from the start of bloom until shortly after fruit are set (mid-to-late June through early July in upstate New York). They lose all susceptibility within a few weeks after that. Accordingly, he found that if three protective sprays were administered from bloom through mid-July, all later sprays were superfluous. While results from one year are an insufficient basis for a firm conclusion, the results do provide the basis for hope that sprays for black rot can be reduced by two or three applications per season.

Powdery Mildew. As was the case with black rot, Wilcox found that the most critical sprays for protecting grape berries against powdery mildew were those applied from bloom through fruit set. Although later fungicide sprays can still be beneficial (particularly for the grape foliage), they appear to be much less critical and might be replaced with alternative control practices.

Substituting Fertilizer. Monopotassium phosphate, a fertilizer that is applied to plant leaves, was applied to vineyard test plots in midsummer as a substitute for standard fungicide sprays. When integrated into a program using conventional fungicides in the critical fruit-set period beforehand, the fertilizer applications were as effective as standard spray materials thereafter.

Should implementation of these new practices become a reality following more data gathering, unnecessary sprays will be eliminated from the environment and growers' costs for materials, equipment, and labor will be lowered.

A Summary of 1997 Fruit Projects

In addition to the projects highlighted above, the IPM Program funded work in 1997 on the following:

- comparing different strawberry production systems
- testing 12 strawberry varieties for their ability to compensate for strawberry bud weevil ("clipper") damage
- management of bird damage and the efficacy of alternative protectants for diseases in blueberries and strawberries
- biological control of tarnished plant bug in strawberries
- management strategies for mirid bugs on apples
- a pesticide timing model for treatment of flyspeck on Hudson Valley apples
- determining whether apple scab is resistant to fungicides
- weather-based models for predicting the onset of apple diseases in Upper Hudson and Champlain Valleys
- evaluation of a novel pesticide application method in high-density apple plantings
- strategies for the management of fungal-induced russet of pear and apple
- interactions among ground cover, irrigation, and weeds in vineyards
- evaluating a weather-based model for forecasting grape downy mildew
- demonstrating a postemergence vineyard weed management strategy

Several of these projects are long-term in nature and will not produce definitive results in the immediate future.

Livestock and Field Crops

Managing Potato Leafhopper in Alfalfa

IPM tactics put to good use in year of heavy infestation

The 1997 growing season in New York was a remarkable year to be scouting alfalfa fields—remarkable because it was the worst potato leafhopper year in the northeast in many decades. Potato leafhopper (PLH) is the most damaging insect pest of alfalfa in New York and elsewhere in the northeast.

The best management practices for PLH have until recently been crop monitoring or scouting, early harvest when possible, and the use of insecticides when populations reach the economic threshold. Now growers have a new option to consider: PLH-resistant alfalfa varieties.

Evaluating Resistant Varieties. In 1997 several seed companies released commercial PLH-resistant or tolerant alfalfa varieties. They couldn't have timed it better. Cornell scientists Julie Hansen, Jill Miller-Garvin, Keith Waldron, and Don Viands compared 8 of these new varieties to 12 susceptible varieties in field trials at Ithaca and Clarendon. Sampling in the Ithaca fields (done by sweep-net catches) showed PLH presence above the economic threshold for 8 out of 12 sweeping dates between late June and mid-September.

The resistant varieties generally came out ahead of the susceptible ones by a significant margin on all counts under heavy insect pressure: higher yields, better feed value, higher net value per acre, and lower PLH damage. In spots where the insect pressure was only moderate, differences in yield were not noted. While these seeding-year results are encouraging, the "rest of the story" lies in how well the plants survive our New York winters and perform in subsequent years.

Training Pays Off. Growers who have gone through "TAg" training were at a distinct advantage when confronting the PLH infestation in 1997. (For more on TAg see pp. 20-21.) A survey of New York alfalfa growers completed at the end of the growing season showed that TAg participants were much more likely than other growers to use sweep nets to determine PLH population levels and to hire scouts. They also remained vigilant for the PLH longer into the season, thus averting substantial losses sustained by some who ignored the problem after the second harvest.

Jill Miller-Garvin (left) and Julie Hansen inspect an alfalfa field for signs of PLH damage. Photo: C. Koplinka-Loehr.

Resistant variety of alfalfa. Photo: D. Garvin.

Biological Control of House Flies

Effectiveness and temperature sensitivity of two beneficial wasp species compared on dairy farms

Dairy farmers have limited chemical options for house fly control in their barns and calf hutches due to increasing resistance on the part of the flies and to increasing regulation of pesticides. Previous IPM projects have shown that biological control is an effective means of managing house flies and stable flies in dairy barns and poultry houses.

In 1996 and 1997 the efficacy of two biological control agents, two tiny wasp species that consume immature flies ("pupae"), has been evaluated. This year's project focused on the wasps' abilities to find hidden flies, their rates of parasitism, and any temperature effects on these characteristics.

Results on searching ability indicate that both of the wasps *(M. raptor* and *M. raptorellus)* killed more of the fly pupae that were planted on the surface of straw bedding than those that were buried 2 cm beneath the straw. Neither wasp species found the buried pupae within a 24-hour period. Parasitism rates were equivalent for the two species.

M. raptorellus is considered the more promising of the two biological control agents because of its ability to lay six to eight eggs in each fly pupa and thus build its population more quickly than can *M. raptor,* which lays only one egg per pupa.

Temperature considerations may prove to be an equalizing factor in a choice between the two, however. *M. raptorellus* produced multiple progeny only when temperatures exceeded 18°C (normal temperatures between June 15 and Sept. 1). Rates of fly consumption were significantly greater for both wasp species on unusually warm days (above 24°C) than at lower temperatures.

As yet untried are controlled comparisons of sustained mass releases of the two species on dairy farms. This is the next logical step before a recommendation can be made to farmers regarding the two agents.

Bt and the "Beasts"

Bt-enhanced field corn fends off an insect and disease pest complex, but is the price right?

The second year of a project comparing Bt *(Bacillus thuringiensis)* and non-Bt corn hybrids confirmed what was learned last year. This naturally occurring insecticide, when added to the genetic material of corn, provides protection for that corn from the insect European corn borer and the disease anthracnose stalk rot. Detectable

European corn borer feeding injury was near zero for both of the Bt hybrids planted this year. Anthracnose stalk rot injury was also minimal.

Silage yields were somewhat higher for both of the Bt hybrids than for their non-Bt counterparts, but the highest yield came from a well-adapted non-Bt commercial hybrid. Yield differences were due to factors other than Bt this year. European corn borer populations were so low in 1997 that there was little risk of injury and little call for the built-in protection provided by the Bt.

Counterbalancing the two years of data are two important reasons to either limit or postpone adoption of this form of biological control: cost and the development of resistance. Economic benefit from planting Bt hybrids is not a sure thing. Why? Because the European corn borer is a variable pest. It does not show up every year. Or it shows up in such small numbers—as in 1997—that it isn't a pest worth attending to. The Bt hybrids, on the other hand, invariably cost more than their non-Bt counterparts.

The build-up of resistance is a common concern in the arena of pest management. Often new materials are introduced in a system and are used for a time to ward off pests and then are rendered impotent by the pests' adapting to them. Bt is not immune to this problem.

The data suggest that growers considering the use of Bt hybrids should first compare them to other well-adapted commercial hybrids. If they decide to plant Bt hybrids, they should be aware of recommendations about maintaining portions of their corn fields as non-Bt "refuges," places where corn borers will not come in contact with Bt and will not develop resistance to it.

A Summary of 1997 Livestock and Field Crops Projects

In addition to the projects highlighted above, the IPM Program funded work in 1997 on the following:

- ability of a rye cover crop to suppress the weed yellow nutsedge
- combining reduced herbicides with cultivation for weed management in field corn
- biological control of soil-dwelling insect pests in field corn and alfalfa
- row cultivation as a means of reducing herbicides and conserving soil in field corn
- reduced herbicide rates for narrow-row silage corn

Several of these projects are long-term in nature and will not produce definitive results in the immediate future.

Ornamentals

Grubs in Turfgrass: To Treat or Not to Treat

New grub "decision rule" ready for implementation; could reduce the need for insecticides by 50-80 percent

Professional turf managers in New York want to use IPM. No longer comfortable with the convention of preventive pesticide sprays, they have asked for new guidelines. They seek help in determining whether grubs are a sufficient threat to the health of their turf to warrant action. Their questions led Cornell entomologists Mike Villani and Jan Nyrop to work on a "decision rule" for grubs. The rule, formulated in 1995 specifically for the grub species European chafer and for home lawn settings, is based on a combination of a risk assessment of each site and 20 plug samples taken throughout the lawn to determine grub densities. The risk rating was formulated after gathering data on lawn characteristics such as slope, age, amount of shade, and grass variety. Table 3 shows how risk is assessed and which kinds of lawns will require sampling for grubs and possible treatment.

In 1997, after four years of background work, Villani and Nyrop are confident that the decision rule is reliable and can reduce the need for insecticides by 50 to 80 percent.

Table 3. *Risk rating system for European chafer larvae on residential lawns*

NOTE: Lawns with risk categories less than or equal to 4 NEED NOT be sampled or treated.

% of Lawn in Shade	% of Lawn that Is Kentucky Blue Grass	Risk Category	Need to Sample?
>60%	<30%	1	no
>60%	30-60%	2	no
30-60%	<30%	3	no
30-60%	30-60%	4	no
>60%	>60%	5	yes
30-60%	>60%	6	yes
<30%	<30%	7	yes
<30%	30-60%	8	yes
<30%	>60%	9	yes

How Wet Should It Get?

Information about the moisture needs of nematodes will help in their effective use as biological control agents

Nematodes—microscopic roundworms that live in soil—have gained prominence as a biological control method in the past ten years. They infect many different insects and are potentially useful in any agricultural production system. But acceptance of this method by growers has been hindered by inconsistent results. Sometimes nematode sprays have resulted in astounding mortality rates of soil-dwelling pests; sometimes they have not.

Jennifer Grant and Michael Villani, of the Cornell entomology department in Geneva, undertook an IPM project in 1997 that has heightened our understanding of nematode ecology. "In order for nematodes to be effective pest hunters, they're going to have to have their needs met," explains Grant, a doctoral student. "We know that they need both high humidity and a layer of water in which to move through the soil, but just how much moisture is optimum? That's what we wanted to find out with this project."

Grant and Villani used both laboratory and field settings to test two nematode species whose Latin names will be abbreviated here as "HB" and "SG." The two species were stored at three different temperatures prior to testing them in soil because temperature is known to affect their activity quotient.

HB and SG were exposed to four levels of soil moisture ranging from very dry (6 percent) to very moist (15 percent). Waxmoth larvae were put in soil cups as food for the nematodes. Both species infected 80-100 percent of the waxmoths when moisture content was sufficient (in all but the driest soil). Their activity declined over time as the soils dried out but increased following re-wetting of the soils. HB that were in high moisture-content soils and that had been stored at the coolest temperature hunted and infected their waxmoth prey for the longest period. HB also seemed to tolerate both extremes of moisture (too little and too much) better than SG.

The field test showed similar results to the laboratory test, but the nematodes did not hunt and infect their prey for as long as was expected. While initial rates of insect mortality were between 80 and 90 percent in all but the driest soil, the rates dropped below 35 percent after eight days.

A beginning has been made, but more must be learned about the effects on nematodes of moisture and other soil characteristics. Mechanisms by which nematodes infect their prey must also be better understood. All of this will lead to much more certainty about their effectiveness at specific field sites.

Reducing Reliance on Pesticides in Turfgrass

Lowering the seeding rates can reduce the amount of pesticides and fertilizers needed for new turfgrass stands

Turfgrass is a highly managed commodity, especially in high income-generating settings like golf courses. Turfgrass managers may be reluctant to use IPM recommendations during the establishment of new golf greens, when pesticide and nutrient inputs are often substantial. Cornell turf specialist Frank Rossi explains that "They fear that IPM will compromise the aesthetics or functionality of the turf."

In the face of tremendous economic pressure to produce new grass quickly, turfgrass managers often increase grass seed rates above normal levels. Reducing seed rates sounds intuitively wrong in such circumstances, but the preliminary work of Rossi and of Eric Nelson, also of Cornell, indicates that it's the best move. Their data show that moderate seed rates actually lead to healthier stands than those achieved by excessive seeding. Crowding the seedlings apparently makes them more susceptible to diseases. This, in turn, means that supplemental fertilizer and fungicides will be required in high-seed areas to maintain the grass.

Visual cover ratings by Rossi and Nelson showed that the higher seed rate plots exhibited more rapid growth initially. But by six weeks after planting—about 40 percent of the way through the establishment phase for turfgrass—visual cover ratings were equalized among the plots. There was no benefit from the increased seed rates.

Absent any aesthetic arguments for or against various seed rates, the decision on how much seed to use should take into account the following advantages of low seed rates: 1) disease incidence tends to be less; 2) maintenance costs are lower due to lessened reliance on pesticides and fertilizers; and 3) ability to produce tillers (daughter plants that grow from the base of grass plants) is enhanced, leading to better traffic tolerance. More research is needed to verify these results, but these first-year results should alert turfgrass managers to some new ways to handle the pressures of the turf establishment phase.

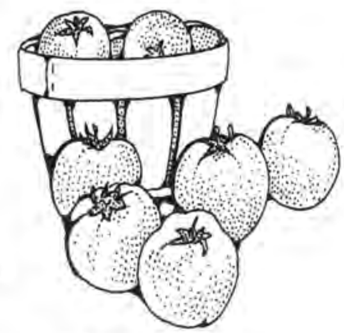
A Summary of 1997 Ornamentals Projects

In addition to the projects highlighted above, the IPM Program funded work in 1997 on the following:

- implementation and demonstration of nursery IPM in Erie County
- Oriental beetle pheromone trap monitoring in nursery crops
- use of reflective mulch to reduce thrips populations in field-grown cut flowers
- demonstrating IPM for poinsettias and bedding plants in Orange County
- evaluating separate traps for male and female Japanese beetles
- investigating the impact of conventional pesticides on composts used as biological control for turfgrass diseases

Several of these projects are long-term in nature and will not produce definitive results in the immediate future.

Vegetables



Practical IPM for Tomato Diseases

Staking, mulching, and a weather-based forecasting system reduce reliance on pesticides

Fresh-market tomatoes are an important part of the livelihood of growers such as the 50-plus roadside marketers on Long Island. Recent disease problems in Long Island tomato fields spurred Margaret Tuttle McGrath, plant pathologist at the Cornell laboratory in Riverhead, and Dale Moyer, Cooperative Extension educator in Suffolk County, to evaluate the latest in applicable IPM techniques.

Several common diseases of tomato in New York State are caused by organisms that can survive in the soil, including early blight, Rhizoctonia fruit rot, and anthracnose. While long-term rotation is a proven IPM method for managing soilborne diseases, it is often impractical.

The approach taken by McGrath and Moyer was 1) to compare a weather-based forecasting system that has become the standard for disease control in processed tomatoes in the Midwest ("TOM-CAST") to the standard weekly spray program, and 2) to evaluate staking and plastic mulch as disease management tools.

TOM-CAST proved to be a great means of reducing pesticide use. The seven sprays called for by TOM-CAST in the 1997 season provided sufficient control of powdery mildew and early blight to get a tomato yield as good as that produced with the standard weekly spray program, in which twelve sprays were applied. Saving five sprays means cutting pesticide inputs by 12.5 pounds per acre. This obvious environmental benefit also saves $141.50 per acre for each grower.

Staking tomatoes to keep them off the ground and using raised beds with black plastic mulch were also found to be beneficial additions to a disease control regimen. These practices reduce the opportunities for disease-causing organisms in the soil to get to the fruit. Tomatoes grown using both of these methods produced significantly more marketable fruit than those grown on bare ground. Any concern about the cost of these methods was allayed by a look at the net gain. While the stakes, plastic, and attendant labor costs came to $800-1,000 per acre, the value of the yield gain attributable to them was $3,911 per acre.

Releasing Beneficial Insects in Sweet Corn

Answers are sought to how long beneficial wasps will last and how far they will travel

Cornell entomologist Mike Hoffmann added some new brushstrokes to the biological control picture in sweet corn this year. Hoffmann continued an ongoing investigation into the ability of *Trichogramma ostriniae*, a small wasp that parasitizes eggs, to control the insect pest European corn borer (ECB). What was different about this year's work was that instead of using "inundative" releases of the wasps Hoffmann tried one, early-season "inoculative" release.

Inundative releases are those in which massive numbers of wasps (such as 120,000 per acre) are released in a field each week in the hopes that they will take the insect pests by storm. With inoculative releases, only a few wasps are released, and the release is carefully timed. The hope with this approach is that the wasps will reproduce and spread out on their own in search of the insect pests.

This year's releases took place on four farms in central New York. The farms were particularly compatible sites for biological control because of their reduced insecticide inputs. At each farm about 200,000 *T. ostriniae* females were put in six half-pint cartons fitted with screening for protection from predators. The cartons were attached to individual corn plants. Emergence of the wasps was verified by retrieval of the cartons several days later. This method is simpler and less expensive than the inundative method, making it more likely to be one that growers can and will adopt.

How well did it work? The *T. ostriniae,* known to be relatively short-lived creatures, continued to feed on ECB egg masses up to 80 days after their release, showing successful establishment and reproduction in the fields. The tiny wasps also showed their ability to "cover the territory." They were observed traveling over distances of at least 300 feet within and between corn fields, and it is believed they will travel further where conditions make it worth their while.

While additional trials are needed to fine tune best times and densities for releases, it is clear that this method of biological control shows promise as part of an IPM strategy for the ECB. As Hoffmann points out, this method has potential uses that extend "beyond New York and also into crops other than sweet corn."

Eliminating Herbicides in Cabbage

Adequate weed control can be achieved by combining cultivation and interseeded cover crops

Good news on the IPM front came this year from a project on weed control in transplanted cabbage. Herbicide applications were eliminated. Weeds were managed instead by a combination of cultivation and the planting of a cover crop between the cabbage rows. Robin Bellinder, a fruit and vegetable science faculty member, found that as long as moisture conditions are adequate and the cabbage is given enough nitrogen, yields in the fields using these IPM methods are equivalent to those in fields treated with herbicides.

Variations on the theme included two cultivations versus three, plus either hairy vetch or spring oats as the cover crop; two cultivations versus three, with no cover crop; and one application of nitrogen fertilizer versus two. These treatments were compared to hand weeding, herbicide applications with no cultivation or cover crop interseeding, and no weed control at all (a check plot). Here is a summary of what was learned:

- the second nitrogen application increased cabbage yields for all treatments by an average of six tons per acre
- three cultivations, either with or without interseeded cover crops, provided control equivalent to herbicides

- two cultivations were insufficient as a weed management strategy, whether or not they were combined with a cover crop
- cabbage interseeded with oats suffered the greatest yield reductions, about 30% less than yields in the herbicide-treated plots

Bellinder is hopeful that this picture could look even brighter: "With further study focused on proper timing, I think we may see that two cultivations will be enough, meaning both cost and herbicide reductions."

Overcoming Onion Maggot Resistance

The biopesticide Bt: an option for onion maggot flies?

The onion maggot is one of the most important onion pests for New York growers. It can cause 100 percent losses in untreated onion fields. But growers need more options for their control than they currently have. Through years of exposure, onion maggots have built up significant resistance to insecticides. Furthermore, the most successful treatments for onion maggot only target the first-generation immature life stages. Insecticides are used for adult flies of the second and third generations, but the flies are elusive targets. Fewer than 20 percent of them are in the field at any one time.

With these problems in mind, Jan van der Heide, Cooperative Extension educator in Oswego County—in close cooperation with Charles Eckenrode, of the entomology department in Geneva—initiated an IPM project on the use of Bt, a biopesticide, as an alternative treatment for adult onion maggot flies. Bt *(Bacillus thuringiensis* pv. *Israelensis)* has the advantage of being highly specific in its effects. It has been shown to have little effect on insects that are natural enemies of insect pests in onion and other vegetable crops.

Onion grower Dan Dunsmoor, of Southwest Oswego, provided space in his fields for small wire cages, placed over portions of onion rows. Plants in four of the cages were sprayed with sugar water laced with Bt; four other cages received plain sugar water. Adult flies from a laboratory colony were placed in all eight cages.

When onion maggot damage to the caged plants was assessed after 17 days, the differences were dramatic: 41-82 percent of the plants were damaged by the onion maggot flies in the four "no-Bt" cages versus 11-28 percent in the "Bt cages."

"The damage level is not low enough to make the Bt bait solution a stand-alone method of control," explains van der Heide. "But I see it as a good fit within an integrated pest management strategy." The next step is to determine whether the Bt will still cause substantial fly mortality at a lower, more affordable dose.

Marylou Hessney puts Bt-laced solution in onion maggot cage. Photo: J. van der Heide.

Managing Onion Diseases

"Know your enemy" is the key to increasing success with onion disease management

Onions are plagued by a number of diseases in New York. One of these diseases, Botrytis leaf blight, has been dealt with aggressively. The "Blight Alert" system, developed several years ago under the leadership of Cornell plant pathologist James Lorbeer, gives growers warning when weather conditions favor the development of this disease. The idea is that they can withhold chemical treatment until such conditions exist. Monetary savings averaged $133 per acre for the 10 growers who used Blight Alert in 1996, even though blight disease levels were high that year. The savings were due to 66 percent reductions in pesticide applications.

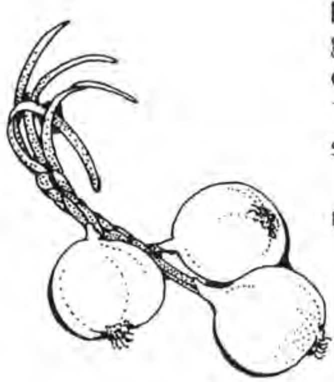
While Blight Alert is an excellent program, it does not address other serious diseases such as black mold or bacterial soft rots. Black mold, for example, can render onion bulbs unmarketable for use in the production of onion seed crops. Growers are often reluctant to forego a fungicide application when the Blight Alert program suggests it, for fear they are leaving their crop vulnerable to these diseases.

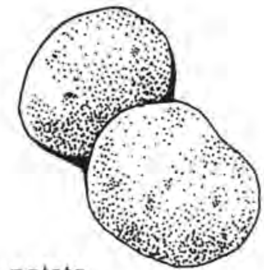
In 1997 IPM Extension Educator John Mishanec and Orange County Extension Educators Maire Ullrich and Teresa Rusinek tackled black mold and bacterial soft rot. They looked at storage methods, onion varieties, and weather conditions as possible contributors to disease outbreaks. They also compared disease incidence and onion quality in Blight Alert fields to those in conventionally managed fields. Conclusions from this first year of what will be an ongoing investigation include

- "expertly maintained" storage facilities (careful attention paid to temperature and humidity) have lower infection rates than do less closely maintained ones
- certain onion varieties have higher incidences of both black mold and bacterial soft rot than do other varieties
- weather is the dominating factor for bacterial soft rot incidence in the field
- harvest quality in Blight Alert fields was equivalent to that of conventionally treated fields

For the past two years Professor Lorbeer has also been working on the disease of black mold. He used seed samples from the 11 onion fields with which Mishanec, Ullrich, and Rusinek were working, testing both home-grown and commercial seed for the presence of black mold. He has found that the black mold fungus may be perpetuated annually on certain farms in Orange County. In most cases, both home-grown and commercial seed tested from those farms have been infested with the disease. Onions harvested from the 11 Orange County fields will be tested later in 1998 for black mold so that more can be learned about the dynamics of both seedborne and airborne infection.

Further study of these diseases should result in grower guidelines that supplement and strengthen the existing Blight Alert program.





Detecting Late Blight Disease of Potatoes

New test paves the way to more rapid diagnoses

"Late blight" gained notoriety in the mid 1800s as the cause of the Irish potato famine. Today this disease is still a force to be reckoned with by both potato and tomato growers worldwide. Part of the problem is the difficulty of detecting it. Extension educator Carol MacNeil points out that "The BLIGHT ALERT warning system that we recommend to growers certainly gives them an awareness of weather conditions that are conducive to late blight, so they can be watching for symptoms. But the next step—testing sick plants to discern whether they're infected with the late blight fungus—needs to be done more quickly than it's now being done. Precious time can be lost while we wait for the results of incubation." The standard incubation test can only diagnose late blight once fungal spores have developed. Furthermore, the test can be foiled by the presence of other microorganisms that can mask the late blight fungus.

Enter a new technology called polymerase chain reaction (PCR). Cornell Extension Associate Diane Karasevicz explains how PCR works: "Small amounts of DNA that are specific to certain target organisms, such as the fungus that causes late blight, are amplified to detectable levels. If the late blight pathogen is present in the sample tissue, we can tell it by the type of DNA that is amplified." The advantages of PCR are that it can be done very quickly, it can detect the late blight fungus in the absence of spores, and it can sort out the late blight fungus from other microorganisms that may be present.

Previous to the 1997 growing season PCR had proven itself in the laboratory setting, but more field testing was needed. In 1997 Karasevicz evaluated 56 potato and tomato samples using PCR. For 16 of the 56 samples, PCR failed to diagnose late blight even though a cross-check using the standard test showed its presence. Technical problems responsible for these inaccuracies have been addressed, and further research will assess the validity of the test.

Accurate diagnoses of the disease can assist growers in using healthier seed for planting, determining whether crops will need treatment, and evaluating the health of harvested potatoes and tomatoes. Rapid diagnoses will enable growers to stop the spread of the disease before entire crops are lost. Fine-tuning of the PCR test may make such diagnoses a 21st-century reality.

A Summary of 1997 Vegetable Projects

In addition to the projects highlighted above, the IPM Program funded work in 1997 on the following:

- breeding cabbage and broccoli that are resistant to blackrot and Alternaria disease
- comparing current grower practices with IPM recommendations for disease and insect management in pumpkins, melons, and zucchini
- composts and other biological control measures to reduce late-season collapse of melon
- testing "reduced-risk" fungicides, biopesticides, and mulches for control of powdery mildew and fruit rot in pumpkins
- using compost extracts as a biological control for root diseases in hydroponically grown greens
- flaming, cultivation, and delayed seeding as weed control methods for vegetables
- disease-suppressive effects of composts in vegetable systems: are they residual and to what mechanism are they attributable?
- effect of barley windbreak density on onion maggot damage
- effectiveness of biopesticide for disease control in red onions
- use of Sudan grass as rotational crop in onion fields
- understanding daily activity patterns and pesticide resistance of the onion thrips
- demonstrating weather-based monitoring and the Blight-Alert program to onion growers
- demonstrating IPM methods in muck onion production
- pheromone trapping systems for European corn borer in sweet corn, potato, peppers, and snap beans
- disseminating pest-related information for fresh-market sweet corn via the pheromone trap network
- classical biological control of the European corn borer in sweet corn
- greenhouse and field testing of biopesticides *(Bt and Beauvaria bassiana)* for control of the European corn borer in sweet corn
- developing an IPM protocol for fresh-market and processing tomatoes
- disseminating information on late blight in potatoes and tomatoes

Several of these projects are long-term in nature and will not produce definitive results in the immediate future.

The IPM Grants Program

How Funding Decisions Are Made

The New York State IPM Program provides funds every year for projects that will demonstrate IPM concepts to agricultural producers on their farms. The Program also funds projects that need one or two years of field testing to validate new IPM knowledge and technology. Each fall the Program issues a request for proposals (RFP) for both demonstration and research projects. The RFP contains a list of crop and pest priorities developed by the four IPM Commodity Working Groups and outlined in the *New York State Integrated Pest Management Program Strategic Long-Range Plan.* Proposals are due in late January.

After the Commodity Working Groups evaluate and rank the grant proposals, the IPM Executive Committee makes final funding decisions.

Project leaders are notified of the funding decisions in March, and work on the funded proposals usually begins immediately. The funding cycle is completed when the project leaders file reports on project outcomes with the IPM Program office in December. Table 4 lists the numbers of funded projects for each year of funding so far. Titles of the 1997 funded projects are listed on pages 40-45.

1997 Fund Allocation

The New York State governor and legislature provided $837,000 for the IPM Program in 1997. State funding has remained at this level since 1993. Table 5 shows the allocation of these funds in 1997.

The Cornell research and extension community was able to successfully compete for funds in the amount of $494,889 from federal IPM programs in 1997, making possible the completion of additional projects of significance to the future of IPM.

Table 4. *Projects Funded through IPM Grants*

Year	*Demonstration*	*Research*	*Total*
1986	13	22	35
1987	17	36	53
1988	25	41	66
1989	29	43	72
1990	31	49	80
1991	24	33	57
1992	25	28	53
1993	17	28	45
1994	18	27	45
1995	24	25	49
1996	21	23	44
1997	21	38	59

Table 5. *1997 Allocation of State Funds for IPM*

On-farm Demonstrations	$418,938
Research and Development	$282,687
Grape Entomologist	$ 50,000
Public Awareness	$ 44,850
Electronic Technology Support	$ 24,046
Weather-related Support	$ 16,479
Total:	$837,000

State-Funded Projects

Titles and Project Leaders, by Commodity

Fruit

Apple

Management Strategies for Optimizing Summer Fungicides Applied to Apples in New York's Upper Hudson and Champlain Regions—K. Iungerman

Development of an Action Threshold and Management Strategies for Mirid Bugs on Apples—A. Agnello, D. Kain, J. Kovach, W. H. Reissig

DMI Fungicides on Apples: Survival of the Apple Scab Pathogen in Sprayed Leaves, Late-Season Scab, and Sustainability of DMI Use in IPM Programs—D. Gadoury, R. Seem, W. Wilcox

Development of IPM Strategies for the Control of Fungal-Induced Russet of Pear and Apple—T. Burr, M. Heidenreich

Development of a Fixed Spraying Structure for High-Density Apple Plantings—A. Agnello, W. H. Reissig, J. Kovach

Refining and Validating a Fungicide Timing Model for Controlling Flyspeck on Apples in the Hudson Valley—D. Rosenberger

Grapes

Demonstration of a Postemergence Weed Management Strategy and Reexamination of Grape Berry Moth Management Practices in the Lake Erie Region—T. Weigle, R. Dunst, G. English-Loeb, B. Shaffer

Biological Control of Spider Mites in Long Island Vineyards—J. Nyrop, G. English-Loeb, W. Wilcox, A. Wise

Substituting Water for Herbicides: Interactions of Cover Crop Extent and Irrigation in New York Vineyards—R. Pool, A. Lakso, R. Dunst

Forecasts of Grape Downy Mildew for New York and Pennsylvania Regional IPM Programs—D. Gadoury, R. Seem, W. Wilcox

Minimizing Spray Programs for Control of Grape Disease Based on Phenological Stages of Susceptibility—W. Wilcox

Small Fruit

A Strawberry Multidimensional IPM Systems Comparison Demonstration—J. Kovach

Implementation of New IPM Technologies in Blueberries and Strawberries—R. Rieckenberg

Assessing and Augmenting Biological Control of the Tarnished Plant Bug in New York Strawberries—M. Hoffmann, K. Tilmon

Cultivar Tolerance to Strawberry Clipper Damage—M. Pritts

Livestock and Field Crops

Field Crops

Integrated Crop and Pest Management TAg Teams for New York—P. Sutton

Combining Reduced Herbicide Rates and Cultivation for Effective Weed Control in Corn—J. Mt. Pleasant

Potential Management of the European Corn Borer/Anthracnose Stalk Rot Pest Complex with Transgenic (Insect-Resistant) Corn Hybrids for Silage Production—G. Bergstrom, J. K. Waldron, E. Shields

Optimizing Row Cultivation for High-Residue Cropping Systems—R. Gallagher

Reducing Damage from Potato Leafhoppers on Seedling Alfalfa Stands in New York through Variety Selection: A Comparison of Resistant vs. Susceptible Varieties—J. Hansen, J. Miller-Garvin, J. K. Waldron, D. Viands
Ability of a Rye Cover Crop to Suppress Yellow Nutsedge—J. Mt. Pleasant
Classical Biological Control of Soil Insects in Field Corn and Alfalfa—E. Shields, T. Testa
Reduced Herbicide Rates for Narrow-Row Silage Corn—R. Hahn

Livestock and Poultry
Evaluation of Temperature on Searching Ability and Parasitism Rates of *Muscidifurax raptorellus* and *Muscidifurax raptor* in Dairy Barns and Calf Hutches—D. Rutz, S. Long, J. K. Waldron

Ornamentals

Greenhouse
IPM Implementation and Demonstration Program for Poinsettias and Bedding Plants in Orange County—S. MacAvery, T. Rusinek, C. Casey, A. Corbin, B. Carlos

Nursery
IPM Implementation and Demonstration at Commercial Nurseries in Erie County—K. Dean, C. Casey
Suffolk County Oriental Beetle Pheromone Trap Monitoring Program—A. Corbin, D. Gilrein
Use of Reflective Mulch to Reduce Thrips and Aphid Populations in Field-Grown Cut Flowers—C. Casey, L. Yannone

Turfgrass
Novel Use of Japanese Beetle Pheromone and Floral Lures to Reduce Grub Populations in Turfgrass—M. Villani, W. Roelofs
Continuation of Validation and Implementation of a Control Decision Rule for Scarab Grubs in Turfgrass—M. Villani, J. Nyrop
Moisture Effects on Entomogenous Nematodes—J. Grant, M. Villani
Impacts of Conventional Turfgrass Pesticides on the Efficacy of Composted Amendments Used for the Biological Control of Turfgrass Diseases—E. Nelson, C. Craft
Evaluation of Turfgrass Establishment Systems for Pesticide Reduction—F. Rossi, E. Nelson

Vegetables

Crucifers
Crucifer Vegetables with Resistance to Blackrot and Alternaria Leaf Spot—E. Earle
Combining Cultivation and Interseeded Cover Crops for Weed Control in Transplanted Cabbage—R. Bellinder

Cucurbits
Demonstration/Evaluation of IPM Protocols for Cucurbits—A. Seaman
Management of Powdery Mildew and Phytophthora Fruit Rot, Two Important Cucurbit Diseases—M. McGrath, N. Shishkoff, J. Sieczka
Biological Control Measures to Reduce the Late-Season Collapse of Melon—T. Zitter
Breeding and Evaluation of Squash and Pumpkin with Multiple Disease Resistance—R. Robinson
Impact of Composts on Disease Incidence in Vegetable Systems—A. Rangarajan

Mixed Vegetables

Integrated Management of Potato and Tomato Late Blight in New York State—A. Seaman

Evaluating the Use of PCR (Polymerase Chain Reaction) to Detect *Phytophthora infestans* in Field-infected Potato and Tomato Tissue—D. Karasevicz

Pheromone Trapping Systems: Refinement of Protocols for Monitoring European Corn Borer and Fall Armyworm in Sweet Corn; and Development of an Effective Pheromone Trapping System for European Corn Borer in Potato and Snap Beans—J. Knodel

Stale Seedbed Practice for Vegetable Production—B. Caldwell

Strategies for the Biological Control of Root Diseases in Hydroponically Grown Vegetables—E. Nelson

Onion

Encouraging Adoption of IPM in Muck Onion Production Through the Use of Demonstrations—L. Stivers

Use of Sudangrass for Improved Yield and Quality of Onions Produced on Muck Soils in New York—J. Mishanec

Use of *Trichoderma* for Control of Soilborne Pathogens in Onions—J. van der Heide

Effect of Barley Windbreak Placement on Onion Maggot Damage—J. van der Heide

Using Bait Solutions Containing Bt for Onion Maggot Control—J. van der Heide

Onion Disease Investigation in Orange County—J. Mishanec, M. Ullrich, T. Rusinek

Demonstration of the Northeast Weather Association and Blight Alert to Onion Growers in New York State—M. Ullrich, J. Mishanec, C. MacNeil, T. Rusinek

Onion Thrips in Onions: Dispersal, Flight Habits, and Resistance—M. Hoffmann, C. Eckenrode, J. Gangloff

Nature and Source of Inoculum of *Aspergillus niger* causing the Aspergillus Black Mold Disease of Onions in New York—J. Lorbeer

Sweet Corn

WNY Sweet Corn Pheromone Trap Network—A. Seaman

Early-Season Establishment of *Trichogramma ostriniae* for Season-Long Suppression of European Corn Borer in Sweet Corn—M. Hoffmann

Microbial Control of Lepidoptera Attacking Sweet Corn—A. Shelton, M. Hoffmann, J. Vandenberg

Tomatoes

Development and Demonstration of an IPM Protocol for Fresh-Market and Processing Tomatoes—A. Seaman

Investigation of TOM-CAST, Staking, and Mulch for Managing Tomato Diseases—M. McGrath, D. Moyer

Titles and Project Leaders, by Project Type

Application Technology

Development of a Fixed Spraying Structure for High-Density Apple Plantings—A. Agnello, W. H. Reissig, J. Kovach

Biological Control

Biological Control of Spider Mites in Long Island Vineyards—J. Nyrop, G. English-Loeb, W. Wilcox, A. Wise

Moisture Effects on Entomogenous Nematodes—J. Grant, M. Villani

Assessing and Augmenting Biological Control of the Tarnished Plant Bug in New York Strawberries—M. Hoffmann, K. Tilmon

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Microbial Control of Lepidoptera Attacking Sweet Corn—A. Shelton, M. Hoffmann, J. Vandenberg

Chemical Methods

DMI Fungicides on Apples: Survival of the Apple Scab Pathogen in Sprayed Leaves, Late-Season Scab, and Sustainability of DMI Use in IPM Programs—D. Gadoury, R. Seem, W. Wilcox

Minimizing Spray Programs for Control of Grape Disease Based on Phenological Stages of Susceptibility—W. Wilcox

Impacts of Conventional Turfgrass Pesticides on the Efficacy of Composted Amendments Used for the Biological Control of Turfgrass Diseases—E. Nelson, C. Craft
Reduced Herbicide Rates for Narrow-Row Silage Corn—R. Hahn

Cultural Methods

Substituting Water for Herbicides: Interactions of Cover Crop Extent and Irrigation in New York Vineyards—R. Pool, A. Lakso, R. Dunst
Optimizing Row Cultivation for High-Residue Cropping Systems —R. Gallagher
Ability of a Rye Cover Crop to Suppress Yellow Nutsedge—J. Mt. Pleasant
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Combining Cultivation and Interseeded Cover Crops for Weed Control in Transplanted Cabbage—R. Bellinder
Stale Seedbed Practice for Vegetable Production—B. Caldwell

Education/Demonstration

Management Strategies for Optimizing Summer Fungicides Applied to Apples in New York's Upper Hudson and Champlain Regions—K. Iungerman
Demonstration of a Postemergence Weed Management Strategy and Reexamination of Grape Berry Moth Management Practices in the Lake Erie Region—T. Weigle, R. Dunst, G. English-Loeb, B. Shaffer
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Use of Reflective Mulch to Reduce Thrips and Aphid Populations in Field-Grown Cut Flowers—C. Casey, L. Yannone

Forecasting/Monitoring

Refining and Validating a Fungicide Timing Model for Controlling Flyspeck on Apples in the Hudson Valley—D. Rosenberger
Investigation of TOM-CAST, Staking, and Mulch for Managing Tomato Diseases—M. McGrath, D. Moyer
Forecasts of Grape Downy Mildew for New York and Pennsylvania Regional IPM Programs—D. Gadoury, R. Seem, W. Wilcox
Evaluating the Use of PCR (Polymerase Chain Reaction) to Detect *Phytophthora infestans* in Field-infected Potato and Tomato Tissue—D. Karasevicz

Host Plant Resistance

Cultivar Tolerance to Strawberry Clipper Damage—M. Pritts
Potential Management of the European Corn Borer/Anthracnose Stalk Rot Pest Complex with Transgenic (Insect-Resistant) Corn Hybrids for Silage Production—G. Bergstrom, J. K. Waldron, E. Shields
Reducing Damage from Potato Leafhoppers on Seedling Alfalfa Stands in New York through Variety Selection: A Comparison of Resistant vs. Susceptible Varieties—J. Hansen, J. Miller-Garvin, J. K. Waldron, D. Viands
Crucifer Vegetables with Resistance to Blackrot and Alternaria Leaf Spot—E. Earle
Breeding and Evaluation of Squash and Pumpkin with Multiple Disease Resistance—R. Robinson

Multidimensional

A Strawberry Multidimensional IPM Systems Comparison Demonstration—J. Kovach

Pest Biology

Development of IPM Strategies for the Control of Fungal-Induced Russet of Pear and Apple—T. Burr, M. Heidenreich
Onion Thrips in Onions: Dispersal, Flight Habits, and Resistance—M. Hoffmann, C. Eckenrode, J. Gangloff
Nature and Source of Inoculum of *Aspergillus niger* causing the Aspergillus Black Mold Disease of Onions in New York—J. Lorbeer

Pest Thresholds

Development of an Action Threshold and Management Strategies for Mirid Bugs on Apples—A. Agnello, D. Kain, J. Kovach, W. H. Reissig

Continuation of Validation and Implementation of a Control Decision Rule for Scarab Grubs in Turfgrass—M. Villani, J. Nyrop

Pheromones

Pheromone Trapping Systems: Refinement of Protocols for Monitoring European Corn Borer in Sweet Corn; and Development of an Effective Pheromone Trapping System for European Corn Borer in Potato, Peppers and Snap Beans—J. Knodel

Novel Use of Japanese Beetle Pheromone and Floral Lures to Reduce Grub Populations in Turfgrass—M. Villani, W. Roelofs

Federally Funded Projects

Northeast IPM Grants Program

Linking Northeast Pest and Crop Models to Electronic Bulletin Boards
Project Leader: C. Petzoldt ; Funding: $13,379

Determining the Impact of an IPM Educational Effort to Field Crop Producers
Project Leader: J. K. Waldron; Funding: $12,885

Development of a Model IPM Recommendation Document
Project Leaders: C. Petzoldt, M. Hoffmann, S. Reiners;Funding: $25,000

Integrating Crop Rotation and Plant Resistance in Onion Pest Management
Project Leaders: M. Mutschler, L. Ellerbrock, J. Lorbeer, C. Eckenrode; Funding $65,124

Integrating Disease and Mite Management in Apples and Grapes
Project Leaders: G. English-Loeb, J. Nyrop, W. Wilcox, W. H. Reissig, A. Agnello; Funding: $86,885

A Reduced Pesticide IPM Strategy for Control of the Parasite Honey Bee Mite, *Varroa Jacobsoni*
Project Leaders: N. Calderone, L. Willett; Funding: $100,000

Technology Transfer of Biologically Based Controls: Fungal Diseases of Greenhouse Tomatoes
Project Leaders: J. Lamboy, H. Dillard; Funding: $91,616

Northeast Pepper IPM Project: A Four-State Project
New York is one of four states that are participating in this grant.
Funding: $100,000

IPM Operating Committee

he IPM Operating Committee provides the primary policies and directives that guide the New York State IPM Program. Membership is made up of the chairpersons of the four IPM Commodity Working Groups, the IPM Program director, directors of research at Geneva and Ithaca, a director of Cornell Cooperative Extension, the director of the Plant Industry Program of the New York State Department of Agriculture and Markets, and the director of the Cornell Pesticide Management Education Program.

James Tette, Director, New York State IPM Program, Cornell University—Chairperson
Ronnie Coffman, Assoc. Dean for Research, College of Agriculture and Life Sciences; and Director, Agricultural Experiment Station at Ithaca
Russell Hahn, Assoc. Professor, Soil, Crop and Atmospheric Sciences, Cornell University
Michael Hoffmann, Assoc. Professor, Department of Entomology, Cornell University
James Hunter, Director, New York State Agricultural Experiment Station (NYSAES), Cornell University
Robert Mungari, Director, Division of Plant Industry, New York State Department of Agriculture and Markets
Eric B. Nelson, Assoc. Professor, Department of Plant Pathology, Cornell University
W. Harvey Reissig, Professor, Department of Entomology, NYSAES, Cornell University
Donald Rutz, Director, Pesticide Management Education Program, Cornell University
R. David Smith, Assoc. Director, Cornell Cooperative Extension, College of Agriculture and Life Sciences, Cornell University
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IPM Commodity Working Groups

The IPM commodity working groups help the IPM Program organize its long-range plans, identify priorities for and evaluate proposals made to its grants program, and encourage teamwork among the scientific disciplines at Cornell.

Fruit

W. Harvey Reissig, Entomology, Geneva—Chairperson
Arthur Agnello, Entomology, Geneva
Deborah Breth, CCE, IPM Extension Educator
Thomas Burr, Plant Pathology, Geneva
Greg English-Loeb, Entomology, Geneva
Joseph Kovach, IPM Program Unit
George Lamont, Fruit Grower, Orleans County
Clancy Maynard, Pest Management Consultant, Crist Bros. Orchards, Orange County
Marvin Pritts, Fruit and Vegetable Science
Terence Robinson, Horticultural Sciences
David Rosenberger, Plant Pathology, Geneva
Timothy Weigle, CCE, IPM Extension Educator
Wayne Wilcox, Plant Pathology, Geneva

Livestock and Field Crops

Russell Hahn, Soil, Crop and Atmos. Sciences, Chairperson
Gary Bergstrom, Plant Pathology, Ithaca
William Cox, Soil, Crop and Atmos. Sciences
Janice Degni, CCE, Lewis County
Lawrence Eckhardt, Capital Area Ag. Consulting, Rensselaer County
Kevin Ganoe, CCE, Herkimer County
Mark Green, Cash Crop Farmer, Monroe County
Donald Rutz, Entomology, Ithaca
Elson Shields, Entomology, Ithaca
Margaret Smith, Plant Breeding and Biometry
Philip Sutton, CCE, IPM Extension Educator
J. Keith Waldron, IPM Program Unit

Ornamentals

Eric B. Nelson, Plant Pathology, Ithaca—Chairperson
Nina Bassuk, Floriculture and Orn. Horticulture
Andrew Corbin, CCE, IPM Extension Educator
Gerard ("Rod") Ferrentino, IPM Program Unit
Daniel Gilrein, Long Island Hort. Research Lab.
George Good, Floriculture and Orn. Horticulture
George Hudler, Plant Pathology, Ithaca
Frank Rossi, Floriculture and Orn. Horticulture
Michael Villani, Entomology, Geneva

Vegetables

Michael Hoffmann, Entomology, Ithaca—Chairperson
George Abawi, Plant Pathology, Geneva
Robin Bellinder, Weed Science
Leroy Ellerbrock, Fruit and Vegetable Science
Margaret ("Molly") Kyle, Plant Breeding and Biometry
Dale Moyer, CCE, Suffolk County
Laura Pedersen, CCE, Ontario County
Curtis Petzoldt, IPM Program Unit
Stephen Reiners, Horticultural Sciences
Anthony Shelton, Entomology, Geneva
Steven Slack, Plant Pathology, Ithaca
Ward Tingey, Entomology, Ithaca
Maire Ullrich, CCE, Orange County
David Votypka, Potato Grower, Steuben County
Russell Wallace, Fruit and Vegetable Science
Richard Wildman, Ag. Consulting Services, Inc., Monroe County

IPM Program office. Photo: C. Koplinka-Loehr.

Statewide IPM Grower Advisory Committee

Committee origin and function

The Statewide IPM Grower Advisory Committee is a group of New York agricultural producers who meet annually to advise the IPM Program on its plans and activities. The Committee was established in 1992 by the governor of New York to ensure that grower input is an important factor at both the policy-making and the operating levels of the IPM Program. Members are invited not only to react to ideas but to help set the agendas for upcoming meetings. Their opinions and concerns are incorporated into the decisions and policies of the IPM Program. Members are also asked to inform their respective industry groups about IPM Program developments and to share with their local state legislators perspectives on the value of the Program.

Producers who served on the committee in 1997

Warren Abbott, field crops, fruit, and vegetable grower
Dawn Betts, grape grower
Walter Blackler, apple grower
John Cecchini, dairy farmer
Scott Collins, dairy farmer
Randy DeBacco, golf course superintendent
Richard DeGraff, vegetable grower
David Deuel, dairy farmer
Rod Dressel, apple grower
Bill Erickson, grape grower
Robert Feindt, golf course superintendent
Tom Giles, vegetable grower
Amy Hepworth, apple grower
Carol MacNeil, Cornell Cooperative Extension
Gerry Miller*, greenhouse grower
Richard Moses, vegetable grower
Robert Noble, dairy farmer
Darrel Oakes, apple grower
Randall Paddock, IPM consultant to apple growers
Rick Pedersen, vegetable grower
Brian Reeves*, fruit and vegetable grower
Charles Scheer, nursery grower
Marion ("Mickey") Shuback, onion and turf grower
Cal Snow, dairy farmer

*Co-chairpersons

Photo: C. Koplinka-Loehr

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