FLORIDA IPM PLAN OF WORK

1. Narrative Overview. (Dr. Norman C. Leppla)

The Florida IPM program will initially address four areas of emphasis: ornamental plant nursery production, vegetable production (emphasizing tomato), cotton production, and School IPM. Sales of ornamental plants produced in Florida are approaching $2 billion per year with 36% of the producers earning more than $1 million per year. Regardless of size, the nurseries have traditionally used large quantities of pesticides applied on a schedule, rather than when needed based on scouting for pests. The Florida vegetable industry, taken in aggregate, has about the same magnitude of sales as the ornamental plant producers (www.fl-ag.com/). Pest and disease pressure in vegetables is particularly difficult to manage in Florida due to the extreme climate during the warmer months. Almost year-round production has necessitated large amounts of pesticides to control weeds, plant diseases and their vectors, and insect pests. Scouting has been minimal, except for professional crop consultants, and spraying has been according to an established schedule. Cotton is an important crop in Florida and, although the acreage is relatively low, insecticide use per acre is among the highest for field crops. In other states, insecticide use in cotton has been reduced significantly through IPM practices. Florida's School IPM Program is arguably the best in the nation and it serves as an important model for reducing the use of insecticides.

Major priorities and areas of emphasis were selected by conducting a meeting attended by some of the University of Florida, Institute of Food and Agricultural Sciences faculty who specialize in IPM research and extension: John Capinera (Entomology, Chairman), Jim Cuda (Entomology, IPM), Joan Dusky (Weed Science, Assistant Dean), Phil Koehler (Entomology, School IPM), Norm Leppla (Entomology, IPM), Russ Mizell (Entomology, IPM), Lance Osborne (Entomology, Ornamental Plants), Ken Pernezny (Plant Pathology, Vegetables), Gail Wisler (Weed Science), Dan Cantliffe (Horticulture, Chairman), David Schuster (Entomology, Vegetables), Richard Sprenkel (Entomology, Cotton), and Raghavan Charudattan (Plant Pathology, IPM). Some important faculty members were not present but will be included in subsequent meetings this year. However, the three major IPM disciplines were covered (Entomology, Plant Pathology and Weed Science), along with Horticulture and Environmental Horticulture. Natural resources were represented by several participants and the participants were from the UF Campus and several Research and Education Centers. Nevertheless, there will be some adjustment of IPM program priorities during the 5-year period of this Plan of Work.

Florida's large ornamental plant nursery industry, the second largest producer of ornamental plants in the United States, has grown rapidly and undergone significant structural changes during the 1990s in response to increasing competition and industry maturation. Floriculture is the fastest growing major segment of U.S. agriculture and the sixth largest agricultural commodity group in the United States, with farmgate cash receipts totaling $10.94 billion in 1997. Floriculture and environmental horticulture crops include bedding plants, cut flowers and greens, tropical foliage, potted flowering

plants, nursery crops, and turfgrass sod. Florida dominates the U.S. market for tropical potted foliage and cut foliage crops, with nearly 90 percent of U.S. sales. Ornamental crops are the third largest agricultural industry in Florida, following citrus and vegetables. Industry surveys (with mailed questionnaires) were conducted in 1989, 1994, and 1999 to evaluate economic trends. Over 500 responses were received from these surveys. In 1999, sales reported by surveyed firms amounted to $446 million, or approximately one quarter of total estimated industry sales. Results showed that the industry continues evolving toward consolidation of larger firms, with greater labor productivity, increasing diversity of ornamental plant products, a shift in markets from landscaper to retailer outlets, and wider distribution of products outside of Florida.

The humid subtropical environment in Florida is ideal for plant production, but also highly conducive to many pest organisms. Some pests are endemic to nursery sites and active year round in Florida. The ornamental plant production industry intensively manages pests because a low threshold for economic damage is dictated by the consumer's demand for cosmetically unblemished plants. The use of pesticides for control of pests represents not only a significant economic cost to nursery producers, but may harm non-target organisms in the agroecosystem and may pose a risk to the health and safety of nursery workers. The trend toward fewer chemical pesticides and more constraints on application procedures and employee reentry following the use of pesticides has placed tremendous pressure on the industry to develop environmentally friendly strategies for use of agricultural chemicals (www.fl-ag.com/).

The silverleaf whitefly has been the key insect pest of vegetables in south Florida since the late 1980's. Feeding by whitefly nymphs causes an irregular ripening disorder of tomato fruit but most damage is inflicted when feeding adults transmit geminivirus, particularly tomato yellow leaf curl virus (TYLCV). Infected plants produce fewer and smaller fruit. Growers rely heavily on applications of the systemic insecticide imidacloprid applied to seedlings in the greenhouse at least one week before transplanting and again at transplanting. A program to manage potential resistance to this insecticide should be implemented. Specific strategies include not applying high doses of imidacloprid to provide season-long whitefly control, applying insecticides of alternative chemistries on demand, and implementing non-pesticide alternatives (UV-reflective plastic soil mulch, trap crops and repellents).

Soil-borne pests are also potentially limiting factors of tomato production in Florida. Galling of roots by the root knot nematode reduces water and nutrient uptake, often leading to plant stunting and wilting. Nutsedges compete with the tomato plants for water, nutrients and sunlight, and also interfere with pesticide applications. Fusarium species attack the vascular system causing stunting, wilting and death of infected plants.

Cotton pest management in Florida has required significantly fewer applications of organophosphate insecticides since the boll weevil was eradicated in 1992. With the boll weevil no longer a key pest, Florida cotton farmers were able to tailor an IPM program for the principal remaining pests, including the tobacco budworm, cotton bollworm and armyworm complex. However, pyrethroid resistance in the tobacco budworm in several

areas of the panhandle caused some growers to revert to frequent tank mixes of organophosphate and carbamate insecticides in attempts to save their crops. The introduction and adoption of Bollgard cotton subsequently eliminated the tobacco budworm as a serious pest of cotton in Florida. In its place, the fall armyworm, beet armyworm, cotton bollworm, and several sucking insects (tarnished plant bug, cotton aphid and stinkbug) became pests of concern.

The School IPM program addresses Florida's 2,723 K through 12 public schools in 67 counties (districts). The enrollment census for the K to 12 schools is 2,336,793 children. Recent awareness of the potential for pesticide exposure of children in schools has stimulated the need for School IPM implementation. Integrating IPM into the school system will reduce initial and long-term exposure to children. Because children between the ages of 5 and 18 spend approximately 1/6 of their lives in schools, many parents asked that the state restrict the use of pesticides on school grounds.

The U.S. Environmental Protection Agency (EPA) encouraged schools to adopt IPM to reduce the risk of pesticide exposure to children. Children have been identified as being at a higher risk than adults because of their lower body weight and characteristic behavior. In 1995, before implementation of school IPM in Florida, pesticide use was documented at P.K. Young School in Gainesville, FL. A total of 800 grams of active ingredient (g a.i.)., of which 680 g a.i. was organophosphates or carbamates, was applied at the school. With a population of 1,100 students at the school, an average of 0.73 g a.i. of pesticide was applied per child. Extrapolating that figure to the entire public school system, results in a total amount of 1699 kg a.i. of pesticide, of which 1444 kg consisted of organophosphate or carbamate insecticides.

Transfer and implementation of IPM technology was established in 1996 with the development of the Florida School IPM Advisory committee. The committee first surveyed school districts to determine the extent of IPM implementation and whether they wanted more information about pests and pesticide management. Following the survey, a series of annual educational meetings were planned to present the principles of IPM. A School IPM Web site was initiated to provide in-depth information on IPM. Surveys have been conducted every two years thereafter to determine the extent of IPM implementation in schools.

Major collaborations for IPM research and extension include the University of Florida, IFAS departments of Entomology and Nematology, Plant Pathology, Agronomy (Weed Science), and others, along with approximately 15 Research and Education Centers located throughout the state. Also included are university departments involved in production agriculture, such as Horticulture and Environmental Horticulture. Natural resource projects will involve appropriate centers: Center for Natural Resources, Center for Aquatic and Invasive Plants, Center for Tropical Agriculture, and so forth. The School IPM program is linked to a number of centers and departments. Collaboration may also develop with the School of Forest Resources and Conservation. The Land-Grant programs are closely allied within the region via experiment station projects: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, North Carolina, South

Carolina, Tennessee, Texas, Virginia, Puerto Rico and the Virgin Islands. We also have close ties with several of the state departments of agriculture. The USDA, Agricultural Research Service and Animal and Plant Health Inspection Service support IPM within the state, along with other federal agencies such as the Departments of Interior and Defense.

Florida has a cadre of dedicated and accomplished faculty members who have developed comprehensive pest management capabilities that are being used to build IPM programs for specific crops and other contexts. At least partial IPM programs have been established for ornamental plants, vegetables (tomatoes), cotton, urban environments, citrus, peanuts, soybeans, and turf. Considerable work has also been accomplished on tobacco, wheat, sorghum, potatoes, and selected fruits. Tactics in these IPM efforts have included pest prevention and scouting, establishment of economic thresholds, improved cultural practices, least toxic pesticide use and precision application, and biological control. However, numerous obstacles currently limit the use of IPM: inexpensive pesticides, incompatibility with production agriculture, resistance to changing established practices, lack of alternatives, need for more information on pests and control options, limited of IPM coordination, understandable aversion to risking crop damage, and so forth. Additionally, Florida's climate, virtually continuous cropping, and crop diversity support a wide variety of pests and diseases that disperse constantly to cause new infestations and infections. Many of the crops are considered "minor" and have limited commodity groups, some fruits and vegetables must be blemish free, and most growing areas are rapidly becoming urbanized. Finally, the most intractable issue may be Florida's extensive coastline, and active tourism and trade, that make the state vulnerable to non-indigenous, invasive pests and diseases; as many as three or four establishing each year.

Coordinated regional efforts will be fundamental for the success of this program because many of the issues to be addressed span large areas, and the efficacy of IPM may likewise vary considerably across the region. Both formal and informal collaboration is inherent among the project participants, many of whom have worked together for most of their careers. Examples of their collaboration include joint research projects and publications, grant and project reviews, information and equipment exchanges, extension and other kinds of training activities, and symposia at scientific societies. The recent establishment of a regional pest management center at the University of Florida demonstrates collaboration across state and disciplinary lines. Many of the region's pest problems cut across state lines and are ripe for collaborative approaches that will be developed within this IPM program.

Delivery strategies will emphasize significant assistance to county faculty in obtaining and using IPM information. We will synthesize, evaluate, integrate and apply information in support of county faculty; help identify audiences and technical needs; initiate cooperative projects; and support and increase the impact and importance of the IPM program. Extension specialists and researchers will be linked with county extension faculty by developing a directory of members; identifying expertise on specific crops, pests and natural enemies; forming multi-institutional partnerships for research and teaching; coordinating resources and expertise; establishing goals, determining resource

needs, monitoring implementation, and evaluating outcomes; and conducting annual meetings. Presentations will be made at grower meetings at the local, regional and state level based on the plans of work of county extension faculty. Annual statewide meetings include the Florida State Horticultural Society, Florida Entomological Society, Florida Tomato Institute, Florida Agricultural Conference and Trade Show and others. Publications will be prepared for the proceedings of these meetings, along with departmental fact sheets and pointers, county and state newsletters, and trade magazines. In addition, other electronic means of information dissemination will be used, such as videos, Web sites and EDIS.

Teaching of IPM will be enhanced by delivering training to county extension faculty, providing slide sets and PowerPoint presentations of pests and associated natural enemies, developing and disseminating other educational materials, and encouraging team teaching. To assist with the teaching program, we will continue to maintain an IPM Web site and construct at least one list server to facilitate and increase communication; maintain linkages to county, state, regional, national and international IPM, and connect with Pest Alert, Featured Creatures, and other sources of information.

IPM is often delivered most effectively by the private sector, so we will help increase opportunities for IPM business in Florida, encourage technology transfer and natural enemy production and supply within the state, provide access to the greater biological control community, assist with regulatory process for importation and release of beneficials, and interface with county and state IPM programs. Additionally, we will determine educational and technical needs and opportunities for commercial IPM, conduct strategic planning and establish shared objectives for targeted pests, identify promising natural enemies, and attempt to make rapid progress in solving problems of Florida's agricultural clientele.

2. Program Resources. (Norm Leppla and Joan Dusky)

Funding for the Florida IPM program is $180,000 per year of federal 3-d support. It is being used to establish and maintain an IPM Office, fund travel and meetings, implement a mini-grants program, and fund IPM workers. There will be opportunities to augment this appropriation with grant funds generated by the IPM program. The IPM Office is housed in the Department of Entomology and Nematology, and some funding will be required to access facilities, equipment, and key personnel, i.e., computer and graphic design support. The IPM staff consists of a full-time IPM Coordinator, half-time equivalent assistance, and half-time equivalent OPS support, as needed. It is expected that the half-time OPS support could become full-time within two years. In the near future, most of the funds will be used for the IPM mini-grant program.

The federal 3d funds will be augmented with Department of Entomology and Nematology office, computer, graphics and facilities support, and IFAS financial support to accomplish the following immediate actions:

1. Establish an IPM office that is responsive- Current Department of Entomology and Nematology support, OPS assistance, and recruit an Assistant IPM Coordinator.

2. Establish an IFAS, IPM Advisory Committee- Major stakeholders.
3. Identify IPM and biological control (BC) expertise in IFAS- Survey to be conducted.
4. Inventory the successes in Florida IPM and BC- Survey to be conducted and report prepared with Extension assistance.
5. Add pertinent IPM and BC talks to existing Web sites- Obtain talks from departments and centers and prepare one or two talks in house.
6. Provide access and linkages to IPM and BC information- Renew the Florida IPM and Biological Control Web site within the Department of Entomology and Nematology.
7. Compile and gain approval for the CSREES, IPM 5-year plan- Work with CSREES administration.
8. Increase the visibility and delivery of IPM and BC in county Extension programs- Conduct 2-4 commodity reviews to determine IPM potential and develop working groups, support key State Major Programs
9. Establish a competitive IPM and BC mini-grants program- Design in Year 1 and implement in Year 2 when funds are available.
10. Increase collaboration among entomologists, plant pathologists, weed scientists and others who control pests with colleagues focused on production agriculture, including growers- Accomplish primarily through objectives 1, 2, 3, 6, 8, and 9.

Long-term actions for IFAS IPM include:

1. Incorporate biologically based pest management options into the pest management guides.
2. Collaborate with authors and IFAS, IT to publish and disseminate IPM and BC information.
3. Increase financial support for IPM and BC research and education.
4. Link Florida IPM to regional and national programs.
5. Survey Florida for systems that could significantly advance IPM and help build coalitions.
6. Incorporate the IFAS, IPM program with the Florida First Initiative.
7. Advance IPM and BC in Florida.

3. Program Contacts. (Norm Leppla and Joan Dusky)

The IPM Coordinator is Dr. Norman C. Leppla who reports to the chairman of the Department of Entomology and Nematology. The IPM Coordinator will compile the IPM reports. Administrative oversight from the Extension Director's office will be provided equally by the UF, IFAS Dean for Extension and Dean for Research:

Dr. Christine T. Waddill, Dean for Extension
1038 McCarty Hall
P.O. Box 110210
Gainesville, Florida 32611-0210
352-392-1761
cw@gnv.ifas.ufl.edu

Dr. Richard L. Jones, Dean for Research
1022 McCarty Hall
P.O. Box 110200
Gainesville, Florida 32611-0200
352-392-1784
rlj@gnv.ifas.ufl.edu

4. Planned Activities and Major Areas of Emphasis.

IPM – Area of Emphasis

Area of Emphasis. Ornamental Plant Nursery Production (Dr. Lance Osborne)

Major Pests. Aphids, whiteflies, mealybugs, mites and fungus gnats.

Description of Extension Effort. Clearly, the most important method of reducing pesticide use is to monitor or scout for pests and make decisions concerning the need for intervention based on sound, scientifically developed biological data from each field or nursery. The Florida extension effort in nursery IPM has concentrated on educating clientele in the principles and benefits of IPM, and training people in the skills needed to fulfill the scouting requirements of the industry. Demonstration nurseries and scout training schools scheduled around the state have been very successful at drawing attention to the benefits of IPM. However, only 42% of ornamental plant nurseries reported scouting for pests. The lack of pest biology data for Florida is also a constraint in implementing IPM. Generally, nursery managers are poorly trained in recognizing life stages of insect pests and beneficials, and do an even poorer job of managing diseases.

Data Collection (Program Impact). Specific programs that resulted in contacts with over 40,000 individuals were developed for (1) training introductory and advanced pest management scouts, (2) establishing a group of IPM demonstration sites in production nurseries, (3) enlisting cooperating nursery firms to study the biology of key pest organisms and provide the data needed for successful management of these pests, (4) developing a comprehensive set of IPM education resources for the nursery industry, and (5) providing elementary and advanced training programs on all phases of general IPM principles, strategies and tactics. Educational programs emphasized the judicious use of chemicals and least toxic pesticides, eliminating preventive, routine pesticide applications, and replacing pesticides with scouting and cultural, mechanical or biological control strategies. IPM is implemented, where appropriate, based on knowledge of insect biology, plant characteristics, and environmental and cultural conditions. Programs also covered the conservative use of water, fertilizers, and pesticides; appropriate plant selection and placement; and other plant production practices that minimize pest problems and environmental degradation. IPM can also enhance the beauty and functionality of the plant environment. As a result of the implementation of worker protection standards and industry education about the possible loss of pesticides through FQPA legislation, nursery producers in Florida are more interested in IPM practices. A well-organized extension effort that presents a unified and strong message on IPM to

producers, has enabled us to reach our targeted goals. However, much work remains to more fully implement available and new IPM technologies. Scout training, demonstration nurseries and grower participation in developing field biological data on pests were very effective.

IPM – Objectives and Indicators

Area of Emphasis. Ornamental Plant Nursery Production

Objective 1: To safeguard human health and the environment through improved use of integrated pest management strategies and systems.

Indicator 1.1: The total number of production units (acres) on which one or more new IPM practices are adopted as a direct result of the state's IPM program.

Year	Targeted	Actual
Baseline	10,000	0
2000	4,600	0
2001	5,100	0
2002	5,600	0
2003	6,100	0
2004	6,600	0

Indicator 1.3: The total amount of high risk pesticides applied to selected commodities or at selected sites (number of sites) as measured on a standardized basis.

Year	Targeted	Actual
Baseline	17	12
2000	12	0
2001	12	
2002	7	
2003	6	
2004	5	

Objective 2: To increase the range of benefits obtained through improved use of integrated pest management strategies and systems.

Indicator 2.1: The economic benefit obtained by clientele (new services or products) who adopt IPM strategies and systems.

Year	Targeted	Actual
Baseline	200	0
2000	200	0
2001	200	
2002	200	
2003	200	
2004	200	

Objective 3: To increase the implementation of effective integrated pest management strategies and systems.

Indicator 3.2: The number of educational materials delivered.

Year	Targeted	Actual
2000	2	2
2001	2	
2002	2	
2003	2	
2004	2	

Indicator 3.3: The number of people participating in IPM programs.

Year	Target	Actual
Baseline	1,650	825
2000	1,700	0
2001	1,800	0
2002	1,900	0
2003	2,000	0
2004	2,001	0

Indicator 3.4: The number of producers trained.

Year	Targeted	Actual
2000	200	200
2001	200	
2002	200	
2003	200	
2004	200	

Indicator 3.5: The number of private sector personnel trained.

Year	Targeted	Actual
2000	1000	2000
2001	2000	
2002	2000	
2003	2000	
2004	2000	

Indicator 3.6: The number of public sector personnel trained.

Year	Targeted	Actual
2000	20	20
2001	20	
2002	20	
2003	20	
2004	20	

Objective 4: To enhance collaboration among stakeholders interested in the development and implementation of improved integrated pest management strategies and systems.

Indicator 4.1: The number of public events involving collaboration.

Year	Targeted	Actual
2000	50	30
2001	50	
2002	50	
2003	50	
2004	50	

IPM - Area of Emphasis

Area of Emphasis. Vegetable Production (emphasizing tomato) (Dr. Kenneth L. Pernezny and Dr. David J. Schuster)

Major Pests.

1. Bacterial spot (*Xanthomonas campestris pv. vesicatoria*)
2. Silverleaf whitefly (*Bemisia argentifolii*) and associated whitefly-vectored plant viruses, especially tomato yellow leaf curl virus (TYLCV)
3. Soil-borne pest complex, including the root knot nematode (*Meloidogyne incognita*), nutsedge and *Fusarium* diseases.

Description of Extension Effort. The extension effort in vegetable production has focused on controlling bacterial spot, the major aerial disease of tomato in Florida. The disease is favored by the warm temperatures and high humidity, conditions that are common in Florida. Growers use frequent applications of copper and maneb to manage the disease but obtain marginal control at best. Recently, non-pesticide alternatives have been developed including applications of bacteriophages and chemicals inducing acquired systemic resistance. In addition, cultural controls have been recommended, including periodic hand washing by farm workers, seed treatment and destruction of volunteer tomato plants.

Growers have relied almost exclusively on soil fumigation using pre-plant applications of methyl bromide/chloropicrin combinations to control soil-borne pests that may limit tomato production in Florida. Methyl bromide has been listed as an ozone-depleter and, according to the Montreal Protocol, will be phased out of use by 2005. Alternative fumigants and non-fumigant alternatives, such as soil solarization, have been developed and are ready for implementation.

Delivery strategies will include presentations at grower meetings on the local, regional and state level. These will be based on the plans of work for county extension faculty. Annual statewide meetings include the Florida Tomato Institute, the Florida Agricultural Conference and Trade Show and the Florida State Horticultural Society. Publications will be prepared for the proceedings of these meetings, along with departmental fact sheets and pointers, county and state newsletters and trade magazines. In addition, other electronic means of information dissemination, such as videos, Web sites and EDIS will be used. On-farm demonstrations will also provide major opportunities for information transfer.

Data Collection (Program Impact).

Data will be collected on the percentage of growers educated and likely to change practices, and the acreage on which recommended practices are implemented. The number of times that videos are used and Web sites and educational materials at EDIS accessed will be recorded. Our effort will focus on Objective #3 of the four recognized national objectives: To increase the implementation of effective integrated pest management strategies and systems. The number of fact sheets, pointers, meeting proceedings and other extension publications; newsletters, Web sites and trade journals; and hits on Web sites and EDIS will be tabulated. The numbers of growers, scouts and industry personnel attending information meetings will be counted and they will be asked to complete questionnaires. Some sample questions might include whether they found the information new and useful, and whether they are likely to adopt the recommended IPM practices. If funds are available, additional grower surveys will be conducted to determine actual behavioral changes.

IPM - Objectives and Indicators

Area of Emphasis. Vegetable Production (emphasizing tomato)

Objective 1: To safeguard human health and the environment through improved use of integrated pest management strategies and systems.

Indicator 1.1: The total number of production units (percent of acres) on which one or more new IPM practices are adopted as a direct result of the state's IPM program.

Year	Targeted	Actual
2000	20	20
2001	30	
2002	45	
2003	60	
2004	75	

Objective 3: To increase the implementation of effective integrated pest management strategies and systems.

Indicator 3.2: The number of educational materials delivered.

Year	Targeted	Actual
2000	7,011	7,011
2001	7,511	
2002	8,011	
2003	8,511	
2004	9,011	

Indicator 3.3: Number of people participating in IPM programs. The unit is the number of "hits" on the IPM Web site.

Year	Targeted	Actual
2000	7000	7000
2001	7500	
2002	8000	
2003	8500	
2004	9000	

Indicator 3.4: The number of producers trained.

Year	Targeted	Actual
2000	20	20
2001	30	
2002	45	
2003	60	
2004	75	

Indicator 3.5: The number of private sector personnel trained.

Year	Targeted	Actual
2000	151	151
2001	184	
2002	201	
2003	218	
2004	268	

Indicator 3.6: The number of public sector personnel trained.

Year	Targeted	Actual
2000	74	74
2001	91	
2002	99	
2003	107	
2004	132	

Objective 4: To enhance collaboration among stakeholders interested in the development and implementation of improved integrated pest management strategies and systems.

Indicator 4.1: The number of public events involving collaboration.

Year	Targeted	Actual
2000	3	3
2001	4	
2002	4	
2003	4	
2004	4	

IPM - Area of Emphasis

Area of Emphasis. Cotton Production (Dr. Richard K. Sprenkel)

Major Pests. The major pests that will be included in this program are the fall armyworm, beet armyworm, cotton bollworm, cotton aphid and stink bug.

Description of Extension Effort. Each year county extension faculty in cotton producing counties will be requested to conduct surveys of selected key growers, crop consultants and agrichemical retailers to determine usage patterns of chemical controls and genetic engineering technology. These data will be compiled along with field observations throughout the season and used to quantify the Performance Indicators. A variety of IPM delivery methods, including newsletters, a toll-free hotline, the World Wide Web, grower

meetings, and field days and demonstrations will used to introduce and promote new IPM methods for Florida cotton farmers. These pest management methods include new insecticides with unique modes of action that also have low mammalian toxicity and will be used in an integrated manner to reduce and delay resistance, use of natural enemies (biological controls) to reduce the need for chemical controls, and new transgenic technology in the form of Bollgard II cotton varieties.

Data Collection (Program Impact). The impact of the Cotton IPM program will be measured by the number of production units/entities using recommended IPM strategies and systems. These include new pesticide chemistries with low mammalian toxicities and minimal disruption of natural enemies, biological controls that are endemic in the cotton ecosystem, and transgenic plant technology. We will record the total amount of high-risk pesticides applied, including the organophosphates, methylcarbmates and pyrethroids.

IPM - Objectives and Indicators

Area of Emphasis. Cotton Production

Objective 1: To safeguard human health and the environment through improved use of integrated pest management strategies and systems.

Indicator 1.1: The total number of production units (acres) on which one or more new IPM practices are adopted as a direct result of the state's IPM program.

Year	Targeted	Actual
2000	10,000	5,800
2001	20,000	0
2002	30,000	0
2003	70,000	0
2004	30,000	0

Indicator 1.3: The total amount of high risk pesticides (lbs ai/A) applied to selected commodities or at selected sites as measured on a standardized basis.

Year	Targeted	Actual
2000	1.75	1.55
2001	1.65	0
2002	1.55	0
2003	1.45	0
2004	1.35	0

Objective 3: To increase the implementation of effective integrated pest management strategies and systems.

Indicator 3.4: The number of producers trained.

Year	Targeted	Actual
2000	45	35
2001	50	0
2002	50	0
2003	50	0

Indicator 3.5: The number of private sector personnel trained.

Year	Targeted	Actual
2000	10	5
2001	10	0
2002	10	0
2003	10	0
2004	10	0

Indicator 3.6: The number of public sector personnel trained.

Year	Targeted	Actual
2000	5	3
2001	5	0
2002	5	0
2003	5	0
2004	5	0

Objective 4: To enhance collaboration among stakeholders interested in the development and implementation of improved integrated pest management strategies and systems.

Indicator 4.1: The number of public events involving collaboration.

Year	Targeted	Actual
2000	4	4
2001	5	0
2002	5	0
2003	6	0
2004	6	0

IPM – Area of Emphasis

Area of Emphasis. School IPM (Dr. Philip G. Koehler)

Major Pests. Cockroaches, ants, rodents, wasps, head lice, spiders, landscape pests, weeds

Description of Extension Effort. The major audiences targeted are the county extension faculty, commodity and interest groups, and key growers and supporters in Florida. Close cooperation will also be maintained with researchers and extension specialists. Florida activities are organized into State Major Programs with Design Teams that synthesize, evaluate, integrate and apply information. The IPM program will provide

leadership for IPM research and extension activities in State Major Programs, coordinate resources and expertise for IPM projects, develop and disseminate educational materials, assist faculty in delivering information, identify audiences, describe technical needs, establish goals and determine resource needs, monitor implementation and evaluate outcomes. Educational materials will be used by growers, farm supply dealers, sales representatives, agricultural consultants, urban planers and developers, environmental groups and others. Communication will be increased among Florida and other states, particularly within the southern region. Visibility of IPM will be increased through media channels and interdisciplinary cropping system demonstrations. An advisory committee will be established that will involve all concerned parties and recipients of IPM benefits. This committee will be the central focus for constant review and revision of IPM priorities. The IPM program will strengthen ties between organized grower groups, crop commodity organizations, and our research, extension and education programs.

Regional school IPM educational meetings will be held in various areas of the state. Pest control companies providing pest management services to schools and school employees implementing School IPM will attend. Usually, 4-5 educational workshops are held annually, so all school districts and pest control companies have an opportunity to attend. Additionally, information on establishing IPM in schools and associated technical materials will be provided on a Web site (http://www.ifas.ufl.edu/~school ipm/). All schools in the U.S. have access to this site. County extension offices will work with school districts in their respective counties to provide information and education about pesticide application and pest management in schools.

Data Collection (Program Impact). Data on School IPM implementation was collected from a formal survey in 1996 to develop a baseline for activities and determine needs. The survey was repeated every two years to determine the effectiveness of the educational effort. County extension activities are documented through POW reports. We record enrollment in educational seminars and the number of school districts that participate. Evaluations of all educational activities are conducted at the end of the program. The number of "hits" is recorded for the School IPM Web site.

IPM - Objectives and Indicators

Area of Emphasis. School IPM

Objective 1: To safeguard human health and the environment through improved use of integrated pest management strategies and systems.

Indicator 1.1: Number of entities using IPM strategies and systems: unit is the number of school districts (67 total in Florida) using IPM to manage pests.

Year	Targeted	Actual
Baseline	----	30
2000	40	40
2001	45	--
2002	50	--
2003	55	--
2004	60	--

Indicator 1.3: Total amount of high risk pesticide applied to selected commodities or at selected sites as measured on a standardized basis. The unit is the number of grams of active ingredient of an organophosphate and carbamate insecticide per child.

Year	Targeted	Actual
Baseline	----	0.73
2000	0.50	0.26
2001	0.40	--
2002	0.30	--
2003	0.20	--
2004	0.10	--

Objective 3: To increase the implementation of effective integrated pest management strategies and systems.

Indicator 3.2: The number of educational materials delivered. The unit is the total number of fact sheets (hard copy and Web-based), IPM pamphlets and annual reports.

Year	Targeted	Actual
2000	60,000	60,000
2001	65,000	
2002	75,000	
2003	80,000	
2004	85,000	

Indicator 3.3: Number of people participating in IPM programs. The unit is the number of "hits" on a school IPM Web site.

Year	Targeted	Actual
2000		3,000
2001	3,250	
2002	3,500	
2003	3,750	
2004	4,000	

Indicator 3.5: The number of private sector personnel trained. The unit is the number of personnel trained.

Year	Targeted	Actual
2000		1,000
2001	1,100	
2002	1,200	
2003	1,300	

Indicator 3.6: The number of public sector personnel trained. The unit is the number of personnel trained.

Year	Targeted	Actual
2000		1,000
2001	1,100	
2002	1,200	
2003	1,300	

Objective 4: To enhance collaboration among stakeholders interested in the development and implementation of improved integrated pest management strategies and systems.

Indicator 4.1: The number of public events involving collaboration.

Year	Targeted	Actual
2000		3
2001	4	
2002	5	
2003	5	
2004	5	