

**Annual Meeting, SERA003, 2011.**  
**March 23, 2011**  
**Caribe Hilton Hotel, San Juan, Puerto Rico.**

**Report Information:**

- Annual Meeting Dates: 03-23-2011 to 03-24-2011
- Period the Report Covers: 10/2010 to 09/2011

The Annual Meeting of SERA003 was called to order at 8:20 am, March 23, 2011 at the Caribe Hilton, San Juan, Puerto Rico by Dr. Wanda Almodóvar. The meeting was held in conjunction with the SE Branch Entomological Society of America meetings and the Caribbean Division of the American Phytopathological Society of America.

**Participants:**

- Wanda Almodóvar [wanda.almodovar@upr.edu](mailto:wanda.almodovar@upr.edu)
- Martin Draper [mdraper@nifa.usda.gov](mailto:mdraper@nifa.usda.gov)
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- Kelly Gilkerson [kgilker@clemson.edu](mailto:kgilker@clemson.edu)
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- Steve Toth [steve\\_toth@ncsu.edu](mailto:steve_toth@ncsu.edu)
- Jim Van Kirk [jim@sripmc.org](mailto:jim@sripmc.org)
- Del Delfosse [delfosse@msu.edu](mailto:delfosse@msu.edu)

**Agenda**

**Wednesday, March 23, 2011 Meeting – Room Conference 10 – Caribe Hilton Hotel**  
**7:30am - Registration\* (\$120.00 – please cash or money order)**

- 8:00 am Continental breakfast
- 8:15am Welcome to the activity by  
Prof. Rafael Olmeda, Associate Dean and Deputy Director  
UPR Agricultural Extension Service
- 8:20 Participant introductions
- 8:30 - 9:45 Update USDA-NIFA and EIPM-CS Funding - **Marty Draper**  
Application and Continuation Process - Elizabeth **Ley**
- 9:45 – 10:00 Presentation – Report Impacts – IPM in Alabama – **Henry Fadamiro**
- 10:00 - 10:15 Update Southern Region IPM Center - **Jim Van Kirk**
- 10:15 - 10:30 Friends of IPM Award - **Steve Toth**

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### **10:30 Coffee Break**

10:45 - 11:45 IPM Coordinators Reports (Limit – 5 minutes/participant, summary including major accomplishments) – submit written and electronic reports.

11:45 - 12:35 Discussion of Extension IPM Priorities - High priority and specific Extension IPM Programs needed in the region. **Facilitators: Wanda Almodóvar and Carlos Bográn**

12:35 – 1:00 Discussion of other important IPM concerns: **Facilitator: Norm Leppa**

- Possible partners in multi-state research, extension and education programs.
- Identify and discuss institutional partners for delivering IPM information.
- Consider an active year-round Southern Region liaison to NIFA – more involvement with NIFA-IPM

### **1:00 PM Lunch (New York Deli Buffet)**

2:00pm Travel to el Yunque Forest

5:00pm Return to hotel

\*The registration will cover breakfast, buffet for lunch and coffee break on 23, lunch for 24, transportation from the hotel to the Experiment Stations and El Yunque Forest, water and refreshments for the field trips and a cap to protect from the sun. Participants spouses don't have to pay registration fee, they are welcomed to the field trips and lunch for day 24 is included for them.

Dr. Almodóvar introduced herself, and her special guest Dr. Rafael Olmeda, Associate Dean and Department Director, University of Puerto Rico. She asked members of the SERA-003 to introduce themselves.

Dr. Olmeda welcomed the SERA-003 group to Puerto Rico, and shared the breadth of the PR Research and Extension program. Research focuses on 5 major crops which include coffee, plantain and banana, vegetables and citrus. The extension system employs 72 County Agents and must cover more than 25 crops that are grown in Puerto Rico.

Marty Draper presented and clarified information on some reorganization within the National Institute of Food and Agriculture (NIFA). There is now an Institute of Food Production and Sustainability. The discussion included information on the Farm Bill (continuing resolution for 2011, an appropriation proposal from President Obama for 2012, and the process beginning for 2013. The continuing resolution as of March 18 included a \$4 billion reduction with Rural Broadband zeroed out because it was duplicative. The resolution for April 8 included cuts in all Earmarks in NIFA (\$89 million). Sources of Funding are for Critical Issues, SARE. AFRI has Foundational, Fellowship and Challenge Areas.

The President's budget proposal is available on-line:

- \$11 million in Hatch
- Eliminated IPM Expert systems and PMAP, added \$1.9 million in IPM and Biocontrol.
- 406 programs: zeroed Food Safety, Regional IPM Centers, CAR, RAMP and Methyl Bromide Transitions. Organic Transitions Remained.

It was pointed out that Food Safety receives fewer applications for grants than any other program and would be an opportunity to obtain funding if the project was appropriate.

The IPM Symposium will be held in Memphis TN March 27-29, 2012. SERA 003 will be held March 26 in conjunction?

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The deadline for Symposium proposals is April 29<sup>th</sup>.

Regarding E-IPM funding:

- Discussed reporting requirements
- Continuations
- Statutory time limits
- Post-Award modifications
- Unallowable costs
- Award Face Sheet
- Common 2010 application problems

Programmatic Reports:

- Progress reports
- CRIS Form AD-421 due within 90 days before anniversary, considered late 90 days after anniversary.
- Report Unique activities for 2009, start 2010

2009 projects: Need to do a termination form AD 421, Choose Final (not Progress) at initial input screen, report on activity for entire grant, Due 90 days after expiration of grant and is required for grant closeout.

CRIS reports: Errors common include Titles not matching, IPM KA 216 is not listed in plan, and Objectives don't match award recommendations.

Discussed Needs Assessment Surveys: Examples from vegetable IPM programs were provided by Dr. Fadimero at <https://sites.aces.edu/group/evaltoolkit/default.aspx>

Discussion:

- Quality assessment/process evaluation surveys
- Outcome/impact assessments
- Satisfaction ratings
- Economic/adoption rates.

Jim Van Kirk asked to send information in bullet lists; suggested a workshop for evaluations, one-shot projects.

Van Kirk: Discussed IPM Voice and membership, want to set new regional priorities. Jim Van Kirk indicated there were resources for a 1-2 day meeting; Paul Smith is Chair Evaluation/Priorities.

Del Delfosse: E-IPM programs; need to convince administrators that State Program Coordinators are valuable. Discussion followed:

What level of faculty position is appropriate for a fully functional Land Grant IPM Coordinator (formerly State IPM Coordinator)? As a result of the USDA, NIFA Extension IPM-CS funding (Smith-Lever 3d, formerly formula funding), the IPM Coordinator position is in Extension. The full set of IPM Coordinator functions is described in Leppla, N.C., D.A. Herbert, Jr. and D.D. Thomas. 2009. *Functions, evolution, and benefits of state integrated pest management programs*. *American Entomologist* 55: 214-222.

<http://www.entsoc.org/PDF/Pubs/Periodicals/AE/AE-2009/Winter/ae2009-winter-Leppla.pdf>

WE need to talk with our administrators!

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- Work across academic departments and other units. The administration must equitably distribute faculty positions across units; therefore, the IPM Coordinator must be capable of supporting all units that engage in IPM, e.g., Entomology, Plant Pathology, Weed Science (Agronomy), Horticulture, and other units. This is essential because of current multi-disciplinary requirements for grant funding.
- Serve the faculty and administration. The IPM Coordinator serves as the point of contact for IPM research, Extension and education, thus supporting the administration in a wide variety of capacities. A fully functional IPM Coordinator is capable of helping to advance high priority activities, e.g., in-service training, field days, junior faculty mentoring, grant and document preparation, recruiting and evaluating faculty, etc.
- Obtain additional resources. The IPM Coordinator must be able to leverage the invested salary and resources by cooperatively securing grants and contracts. Relevance and stakeholder needs must be documented and the IPM Coordinator's network can provide this kind of information. The IPM Coordinator should have a strong record of securing extramural funding.
- Senior faculty member preferred. A senior faculty member will be more effective and satisfied with the position, so a junior faculty member could assume responsibilities that are left. The IPM Coordinator must have the experience and stature to serve in leadership roles, such as member or chair of faculty committees, allied stakeholder groups, advisory committees, scientific organizations, etc.
- Difficult to balance service and advancement. A junior faculty member could find it difficult to achieve tenure, if not careful to use the IPM Coordinator position effectively. The IPM Coordinator position can be an advantage due to increased visibility and involvement, or it can be a disadvantage because of the level of support for other faculty members and stakeholders.
- Continuity is essential. It takes years to develop a fully functional IPM Coordinator position. Academic institutions are very complex and diverse, requiring the IPM Coordinator to participate in a wide range of activities to determine where IPM fits and to become known. Once gained, this level of experience is extremely valuable.
- Consider a split position. A full-time IPM Coordinator is preferred but usually the position must be split with a complimentary activity, such as teaching or research. Most IPM Coordinators have allied responsibilities, with Extension being the most compatible followed by teaching and research. The IPM Coordinator must be available and responsive to stakeholder needs.

Steve Toth Discussed Friends of IPM Awards:

**Bright Idea:** Okanola Project, Dr. Thomas Peeper, Oklahoma State University

**IPM Implementer Award:** Patty Lucas, University of Kentucky

**IPM Educator:** Janet Hurley, Texas A&M University

**Future Leader Award:** Hannah Burrack, North Carolina State University.

**Pulling Together:** Mid-South Entomologists; U. of Arkansas, Mississippi State, Louisiana State University, University of Tennessee

Paul Smith was nominated to be next Secretary; Fadamiro, Collier (second); Unanimous yea!

Draper: There will be an RFA in FY 2011 for E-IPM; The goal is to hold a competition for next 3 year cycle (2013-2015). Stakeholder input is welcome on how to make process more efficient and address concerns.

Discussion initiated to address the question: Do we believe strongly that a high priority should be placed on maintaining a National Network of IPM Extension programs?

- Leppla: How to replace function of IPM centers if they don't continue?

- Liaison, formerly we had a Regional IPM liaison to coordinate meetings interact with EPA, NRCS, HUD etc.

State Reports: Attached.

Adjourned 2:00 pm, March 23, 2011.

Minutes Submitted by Tom A. Royer.

## SERA-IEG3 2010 ANNUAL REPORT FOR ALABAMA

Henry Fadamiro

*Alabama State IPM Coordinator*

### PROGRAM MANAGEMENT:

The Alabama Integrated Pest Management (IPM) program at Auburn University is an interdisciplinary, multi-departmental, collaborative effort within the Alabama Cooperative Extension System (ACES). The central mission of the program is to facilitate implementation and adoption of economically and environmentally sound IPM practices in traditional and non-traditional agriculture in Alabama. The program is a collaborative effort between Alabama's 1862 land grant, Auburn University (AU) and the state's two 1890 land grant institutions: Alabama A&M University (AAMU) and Tuskegee University (TU). Alabama currently has active IPM programs in the following key commodity areas/settings: agronomic/row crops (e.g., cotton, grain crops, soybeans, and peanuts), specialty crops (e.g., citrus, peaches, tomato, and organic vegetable production), school IPM, housing IPM, and IPM for Pest Diagnostics. We have established a team of extension/research IPM specialists with expertise from across all pest disciplines in most of these areas. General IPM-related activities in Alabama include evaluation and training of clientele, stakeholders and extension agents on IPM tactics, and applied research.

### PROGRAM DELIVERY:

The IPM coordinator continues to maintain the Alabama IPM website <http://www.aces.edu/anr/ipm/> OR [www.alabamaipm.com](http://www.alabamaipm.com). In 2010, the Alabama IPM Program/ACES was awarded a three year, \$921,360 (\$307,120/year) grant by the USDA-NIFA EIPM program to support research and extension activities aimed at promoting IPM in Alabama. The two Alabama's 1890 land grants (AAMU and TU) were collaborators on the proposal. The table below shows the distribution of the grant by emphasis areas and the PI for each area.

<i>Emphasis area</i>	<i>Budget allocation/year (\$)</i>	<i>Lead PI</i>
IPM Coordination	30,000	Henry Fadamiro
IPM for Agronomic Crops	105,500	Tim Reed
IPM for Specialty Crops	70,620	Henry Fadamiro
IPM in Schools	15,000	Fudd Graham
IPM in Housing	16,000	Xing Ping Hu
IPM Support for Pest Diagnostic Facilities	24,000	Charles Ray
IPM Impact Evaluation	16,000	Ayanava Majumdar
Collaboration with Alabama A&M – IPM in High Tunnel Vegetable Production	12,500	Cathy Sabota
Collaboration with Tuskegee University – Intercropping and IPM Demonstration	17,500	Conrad Bonsi

#### *Select outputs:*

IPM in Agronomic Crops: Research trials/surveys were conducted on soybean to determine disease prevalence and refine economic thresholds for insects. Risk maps associated with preharvest aflatoxin contamination in peanuts were published. Fungicides were evaluated for efficacy against peanut pests. Training was conducted on economic impact of pesticide use against plant bugs in cotton. New peanut IPM fact sheets were developed. Regional extension agents were given stored grain IPM toolkits. A survey assessed level of adoption of stored grain IPM tactics. Results were presented at 4 IPM scout schools, 22 IPM meetings reaching 629 people, 30 peanut meetings reaching 804 stakeholders, and 12 stored grain IPM talks reaching 215 stakeholders.

IPM in Specialty Crops: Farms were surveyed statewide to monitor 14 key insect pest species using pheromone traps. Data generated were converted into information and continuously transmitted to

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farmers via "Insect Advisories" posted on the Internet, social networks, and a project website. IPM information was disseminated to 171 vegetable producers. IPM updates were provided to Extension Agents via workshops and Web conferences (180 participants). Needs assessment and IPM impact evaluation surveys were conducted. A workshop was conducted for Extension Agents on the use of trap crops for managing plant bugs. Trap crop demonstration plots/research trials were established. IPM in Schools: IPM trainings were conducted for local school public health inspectors. The Alabama School IPM web site (<http://www.ag.auburn.edu/enpl/schoolipm/>) was maintained. IPM in Housing: Indoor IPM practices were demonstrated to HUD approved Housing Service coordinators, property managers, pest control professionals and agents. Over 58 clients were served. Collaboration with Alabama A&M: A high tunnel demonstration was established to demonstrate benefits of high tunnel crop production. Workshops were conducted at the site to train agents/producers. Number of participants ranged from 10-15 for each event. Collaboration with Tuskegee: IPM needs assessment survey was conducted for limited resource farmers. Information was used to develop IPM training documents for farmers. IPM Support for Pest Diagnostics: Pest diagnostic service was provided to clients statewide.

*Select outcomes/impacts:*

IPM Coordination: Activities resulted in increased knowledge of IPM, increased application of IPM knowledge by farmers, improved collaboration among specialists at Auburn and Alabama A&M/Tuskegee, and increased focus on IPM impact evaluation.

IPM in Agronomic Crops: Training enhanced growers' and scouts' ability to identify and quantify pests. More farmers have adopted effective management practices on stored grain compared to a 2000 survey. An easy-to-use aflatoxin kit was identified. Participation in Peanut IPM meetings has increased. The Peanut IPM Team developed an archive of IPM needs, and outcome surveys (<https://sites.aces.edu/group/evaltoolkit/Pages/PeanutSurveys.aspx>). Average change in Insect Pest ID/Diagnostic skills after the workshops was 45%.

IPM in Cotton: Growers increased knowledge of identification of pests and utilization of economic thresholds. On-farm trials showed that conventional varieties yielded slightly less than transgenics.

IPM in Fruit and Vegetable Crops: Activities resulted in increased knowledge of IPM and pesticides. Surveys indicated IPM adoption saves an average of \$5,680 per vegetable farm.

IPM in Schools: Program provided a safer educational environment for over 102,000 children.

IPM in Housing: Surveys showed a 95% increase in understanding the connection between health and housing and a 65% increase in the level of knowledge of IPM alternatives.

Collaboration with Alabama A&M: Evaluation showed a 67% increased knowledge about pest management with high tunnels, and 79% increased knowledge about high tunnel production. Grower experienced a 30% increase in income over outdoor production.

Collaboration with Tuskegee: Surveys identified key production challenges of limited resource farmers. 25% of the respondents indicated they had never heard of IPM before the farmer's day presentation on the subject. IPM training document was developed for limited resource farmers.

*Alabama IPM Communicator:* The Alabama IPM Communicator was commenced in 2010 as a source for comprehensive pest management information in Alabama. The newsletter is published weekly from May to October with information arranged into different sections ranging from IPM in home garden to IPM in field crops. About 400 stakeholders receive the report directly via email every Friday (14 issues released in 2010). The newsletter is available online at:

<https://sites.aces.edu/group/commhort/vegetable/Vegetable/IPMCommunicator.aspx>

*Alabama IPM Impact Evaluation Program:* The Alabama IPM Program Evaluation Resource Committee (ACES-PERC) was established in 2010. The impact evaluation team works with other program personnel at the three Alabama land grants (AU, AAMU and TU) to conduct on-site and off-site surveys of crop producers and consultants. The team also collaborates with various Advisory Panels to develop

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appropriate survey instruments and implementation strategies. The ACES-PERC Evaluation Toolkit is available at <https://sites.aces.edu/group/evaltoolkit/default.aspx>

*Select Workshops and Conferences:*

Majumdar, A., and H.Y. Fadamiro. (2010). Organized a symposium session entitled “Organic and Sustainable Vegetable Production: Challenges to IPM Research, Education, and Technology Adoption” at the 58<sup>th</sup> Annual Meeting of the Entomological Society of America, San Diego, California, December 12-15, 2010.

Majumdar, A., T. Reed, and H.Y. Fadamiro. (2010). Row crop production and IPM WEB conference. April 5, 2010. 36 participants.

Majumdar, A., H.Y. Fadamiro, and R. Boozer. (2010). Vegetable Production and IPM Web Conference. February 26, 2010. 26 participants.

Majumdar, A., and H.Y. Fadamiro. (2010). Alabama Vegetable IPM-CORE Project, January 22-23, 2010. Southern Sustainable Agriculture Working Group Annual Meeting, Chattanooga, TN. ~1,200 participants.

**PROGRAM INVOLVEMENT:**

The Alabama IPM Program is managed by the state’s IPM coordinator with inputs from the various specialists and the AL IPM Advisory Committee. This committee currently consists of 16 members representing different stakeholder groups and key commodity areas statewide. Members include representatives of producers in Alabama, commodity groups, researchers, Extension specialists and REAs, private consultants, and 1890 land grants.

**ADMINISTRATIVE SUPPORT:**

Administratively, the program was supported by the Directors of the Alabama Cooperative Extension System (ACES) and the chairman of the Entomology and Plant Pathology Department at Auburn University. However, no accounting or secretarial staff are assigned specifically to the program.

**PRODUCTS:**

*Select Relevant Research Publications:*

Xiao, Y., and H.Y. Fadamiro. (2010). Functional responses and prey-stage preferences of three species of predacious mites (Acari: Phytoseiidae) on citrus red mite, *Panonychus citri* (Acari: Tetranychidae). *Biological Control* 53: 345–352.

Akotsen-Mensah, C., R. Boozer, and H.Y. Fadamiro. (2010). Field evaluation of traps and lures for monitoring plum curculio, *Conotrachelus nenuphar* (Coleoptera: Curculionidae) in Alabama peaches. *Journal of Economic Entomology* 103: 744-753.

Xiao, Y., and H.Y. Fadamiro. (2010). Exclusion experiments reveal relative contributions of natural enemies to mortality of citrus leafminer, *Phyllocnistis citrella* (Lepidoptera: Gracillariidae) in Alabama satsuma orchards. *Biological Control* 54: 184-196.

Xing M., E. Coneva, H.Y. Fadamiro, J.F. Murphy, C. Ray, and F. Dane. (2010). Seasonal occurrence and abundance of sharpshooter leafhoppers in Alabama orchards and vineyards. *International Journal of Fruit Science* 10: 341-354.

Xiao, Y., and H.Y. Fadamiro. 2010. Evaluation of damage to satsuma mandarin (*Citrus unshiu*) by the leafhopper bug, *Leptoglossus zonatus* (Hemiptera: Coreidae). *Journal of Applied Entomology* 134: 694-703.

*Select Extension Bulletins, Pest Advisories, and Timely Information Sheets:*

Abney, M.R., Walgenbach, J.F., Kennedy, G.G., Smith, P., Bessin, R., Sparks, A., Riley, D., Majumdar, A., Layton, M., Hale, F., and Morgan, A.L. (2010). Insect Control for Commercial Vegetables. *In*

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Southeastern U.S. Vegetable Crop Handbook (G.J. Holmes and J.M. Kemble, eds.). ANR-1344. Vance Publishing Corporation, Lincolnshire, IL.

Bowen, K., and Hagan, A. (2010). Managing aflatoxins in corn, Alabama Cooperative Extension System Plant Pathology Timely Information Sheet.

<http://www.aces.edu/timelyinfo/PlantPathology/2010/April/Aflatoxins.pdf>

Flanders, K. (2010). Stored grain insect control recommendations (revised edition), In Insect, Disease, Nematode, and Weed Control Recommendations for 2010, Alabama Pest Management Handbook, Vol. 1. Alabama Cooperative Extension System, Auburn University. ANR-500.

<http://www.aces.edu/pubs/docs/A/ANR-0500-A/>

Graham, L.C., Caldwell, J. and Pope, K. (2010). Pest Press newsletter prepared each month and distributed to participating school systems and pest management professionals and to other pest management professionals that signed up for information at Alabama Pest Control Association. Provides information on pests, sanitation, maintenance and other information useful in an IPM program. Via email.

Hagan, A.K., Campbell, H.C., Bowen, K.L., Wells, L. and Peques, M. (2010). Impact of soil insecticide treatments on the yield of newly released runner peanut cultivars and their reaction to diseases, Alabama Cooperative Extension System Plant Pathology Timely Information Sheet PP-688.

<http://www.aces.edu/timelyinfo/PlantPathology/2010/January/pp688.pdf>

Majumdar, A. (2010). Peanut IPM for insect control (revised edition), In Insect, Disease, Nematode, and Weed Control Recommendations for 2010, Alabama Pest Management Handbook, Vol. 1. Alabama Cooperative Extension System, Auburn University. ANR-500.

<http://www.aces.edu/pubs/docs/A/ANR-0500-A/>

Majumdar, A. (2010). Incidence of Major Insect Pests in Peanuts and Vegetables. Baldwin Register & Gulf Coast Newspapers. June 22, 2010.

Majumdar, A. (2010). Insecticides for backyard vegetable production. Baldwin Register & Gulf Coast Newspapers. April 6, 2010. [Online] <http://tinyurl.com/2a6bvkk>

Reed, T. (2010). Soybean IPM for insect control (revised edition), In Insect, Disease, Nematode, and Weed Control Recommendations for 2010, Alabama Pest Management Handbook, Vol. 1. Alabama Cooperative Extension System, Auburn University. ANR-500. <http://www.aces.edu/pubs/docs/A/ANR-0500-A/>

Reed, T. and Freeman, B. (2010). Seedling insect pests a threat to cotton yields. Alabama Cotton Picksack Newsletter, May. PSK-5-10.

Sikora, E. (2010). Soybean IPM for disease control (revised edition), In Insect, Disease, Nematode, and Weed Control Recommendations for 2010, Alabama Pest Management Handbook, Vol. 1. Alabama Cooperative Extension System, Auburn University. ANR-500. <http://www.aces.edu/pubs/docs/A/ANR-0500-A/>

Majumdar, A., Nesbitt, M., and Fadamiro, H.Y. (2009). Asian Citrus Psyllid. Alabama Cooperative Extension System, Auburn University. ANR-1341. <http://www.aces.edu/pubs/docs/A/ANR-1341/>

Majumdar, A., and Fadamiro, H.Y. (2009). Farmers should watch for kudzu eating insect. ACES Newsline (M. Lawrence, ed.). Posted December 1, 2009. <http://www.aces.edu/go/90>

**SERA-IEG3 2010 ANNUAL REPORT FOR  
THE UNIVERSITY OF FLORIDA**

**Norm Leppla**

**PROGRAM MANAGEMENT:** IPM Florida has been in place since 2001 and Norm Leppla has been the full-time IPM Coordinator since its inception. The total annual EIPM-CS funding for 2010 was \$170,179 (a decrease from 2009 of \$3,380); the state added the coordinator's salary and control of the federal funds was shared with the Associate Dean for Extension, Joan Dusky. The IPM Florida office is being maintained at about the same level as in 2009 and still encompasses agriculture, communities and natural areas. Extramural funding was obtained to support cooperators, rather than in-house IPM Florida activities. Technical support was contributed by highly experienced personnel of the Entomology and Nematology Department (information technologies, graphics, administrative). The IPM Florida management structure on the website (<http://ipm.ifas.ufl.edu>, About Us) was followed with extra emphasis on information, especially website content, IPM guides, funding for cooperators, education and training, collaboration with Cooperative Extension, and regional and national liaison. Planning and priority setting were accomplished by conducting five IPM Florida Group meetings with written accomplishment reports required by all of the participants. These reports were based on logs and work schedules maintained according to the IPM Florida Employment Agreement (website, About Us). Program recognition is maintained through use of the UF/IFAS and IPM Florida wordmarks on Extension materials distributed to stakeholders. The director continued as chair of the Extension Goals and Focus Areas committee on "Protecting Florida from Existing and Emerging Pests and Diseases." He was elected President of the Entomological Society of America, Southeastern Branch. Professional development was limited to IPM and biological control meetings and reading.

**PROGRAM DELIVERY:** Maintenance of the IPM Florida website continued to be a time-consuming priority accomplished by Plant Medicine students (152,499 sessions in 2010). Pertinent international, national, state and local IPM information was distributed to the 250- to 300-member distribution list. New Extension publications available on the IPM Florida and Extension websites are listed below. Green Shield Certification by the IPM Institute of North America was obtained for the UF, Department of Housing and Residence Education. Accomplishments included completing the manual, "Integrated Pest Management Policy and Treatment Options for University Housing," submitting a manuscript to the Journal of Integrated Pest Management, "Advancement of Integrated Pest Management in University Housing," publishing an Extension guide, "Guidelines for Purchasing and Using Commercial Natural Enemies and Biopesticides in Florida and Other States," cooperatively planning and helping to conduct six mole cricket field days, and participating in the Florida statewide Small Farms Alternative Enterprises Conference by providing an IPM booth. Eleven formal presentations were delivered at scientific and IPM conferences. Extramural funding for cooperators included Joe Funderburk, PI, "State-Wide Implementation of Novel Push-Pull Strategies for IPM of Thrips" Florida Specialty Crops Block Grant (\$254,422); Amanda Hodges, PI, "Identification Tool for Arthropod Pests of Citrus, USDA/APHIS (\$18,803); and Charlie Mellinger, PI, NRCS/IPM workshop, Critical Needs and Emerging Issues, SR IPM Center (\$5,000). Education and training included UF classes in biological control, plant pest risk assessment and management, biological invaders, and agricultural and environmental sustainability. Additionally, instruction was provided in insect rearing at Mississippi State University. The benefits of IPM Florida were measured in terms of the number of collaborative projects initiated and completed with results delivered to clientele groups, plus publications, presentations, grants, and consultation, including education and training.

**PROGRAM INVOLVEMENT:** Collaboration with Cooperative Extension was extensive, particularly participation at county and statewide meetings (see Program Delivery). The IPM Coordinator served as an Extension representative and chair of the UF/IFAS Tenure and Promotion Committee. He also chaired the *SERA-3 Meeting, San Juan, Puerto Rico, March 23, 2011*

FAMU Center for Biological Control Advisory Committee. Research collaboration was through projects in mole cricket biological control, campus housing IPM, thrips IPM, and filth fly IPM. Disciplines included Entomology, Plant Pathology, Agronomy, Horticulture, Environmental Horticulture, Nematology, and Agricultural Education and Communication. Significant inter-Institutional collaboration was with USDA, APHIS, PPQ; USDA, ARS; FAMU; FDACS, DPI; NRCS; and MSU. Statewide involvement was in conjunction with projects and organization meetings: Florida Entomological Society (Jupiter); NPDN annual meeting (Miami); Florida Master Gardener annual meeting (Destin), and others. Professional activities beyond Florida were ESA-SEB (Atlanta); IOBC, NRS (Niagara Falls); and IOBC, AMRQC (Vienna). Numerous manuscripts, research proposals and projects, grant proposals, and related documents were reviewed.

**ADMINISTRATIVE SUPPORT:** IPM Florida received full support from the chairman of the Entomology and Nematology Department, the UF/IFAS administration, key clientele groups, and the Southern Region IPM Center. Professional development opportunities involved participation in the Insect Rearing Workshop at Starkville, MS, and Extension meetings around Florida.

Extension IPM Projects	Primary Cooperators
IPM Extension IPM Living Laboratory	Bob Hochmuth
IPM for Thrips in Florida Vegetables	Joe Funderburk
Internet-based Certification of Pesticide Applicators	Fred Fishel
IPM in Public Health: Mosquito-Borne Diseases	Cynthia Connolly
IPM for Pastures (weeds and insects)	Yoana Newman
IPM for Citrus (nematodes, cultural practices)	Larry Duncan
IPM for Ornamentals (roses)	Gary Knox
Filth Fly IPM, seasonal distribution, fly and parasite substrate preferences (biological control)	Erika Machtinger, Chris Geden, Jerry Hogsette

#### Extension IPM Publications

Juneau, K.J., J. L. Gillett-Kaufman, N. C. Leppla, K. W. Martin and A. W. Walker. 2010. Integrated Pest management Policy and Treatment Options for University Housing. UF/IFAS Extension Guide ([http://ipm.ifas.ufl.edu/community/structural/campus\\_IPM.shtml](http://ipm.ifas.ufl.edu/community/structural/campus_IPM.shtml)). *(making into an EDIS publication)*

Leppla, N. C., J. H. Frank and J. A. Graesch. 2010. How to Use Nematac S against Pest Mole Crickets in Pastures. UF/IFAS, EDIS IPM-147 (IN853).

Leppla, N. C., J. H. Frank and J. A. Graesch. 2010. How to Use Nematac S against Pest Mole Crickets on Home Lawns. UF/IFAS, EDIS IPM-144 (IN674).

Leppla, N. C. and K. L. Johnson, II. 2010. Guidelines for Purchasing and Using Commercial Natural Enemies and Biopesticides in Florida and Other States. UF/IFAS, EDIS IPM-146 (IN849).

Vega, R. A., F. M. Fishel and N. C. Leppla. 2010. *Herbicide Study Guide. PowerPoint Compendium describing the properties of over 70 chemical herbicides used to control weeds in Florida. UF/IFAS. (making into an EDIS publication)*

KENTUCKY State Report 2010  
SERA-IEG3-IPM San Juan, PR. March 2011  
Submitted by: Doug Johnson

### Program Structure



University of Kentucky Integrated Pest Management (UK-IPM) is a highly integrated and diversified program. The main functional units are topic-specific groups that work directly with clientele to provide pest management education and information. They appear, disappear and metamorphose as needs and interests dictate. Working groups are supported by the IPM Coordinator and an IPM specialist.

This report covers the transition of UK-IPM from formula funds to competitive funding. UK-IPM was successful in obtaining support for the one-year “bridge” grant, and subsequently was awarded a three-year budget in the second competition.

The current IPM Coordinator has been dedicated to the program by the Department of Entomology for a significant portion of his Extension Program. Smith/Lever (3)d funds (now competitive) are not used for the coordinator’s benefits package, but these funds do pay for IPM travel. The Coordinator provides linkage to the National IPM program, to various regional IPM committees both within and outside the region, and facilitates activities of the working groups. The Coordinator also strives to focus the groups on IPM questions and supervises the IPM specialist.

The IPM specialist is the only “permanent” position, with rare exception, supported by Smith/Lever (3)d funds. Support of this position is shared by S/L (3)d grants, other IPM grants, funding from the Office of the State Entomologist and CAPS. However, the position is 100% IPM! This Specialist provides support services such as development and maintenance of web sites, production and dissemination of manuals, picture sheets, guides etc., collection of program evaluation materials, completion of annual reports etc., development and submission of grants, and facilitation of communications. The position provides direct linkage to other pest/pesticide programs, e.g., Pesticide Safety Education, IR4 and serves as UK-IPM’s primary link with the Southern Region Integrated Pest Management Center (SIPMC), providing UK-IPM’s input to the center, while also obtaining information on additional funding opportunities, important pesticide/pest management issues and regional activities / concerns.

UK-IPM functions mainly through the use of integrated teams of individuals holding expertise needed to address pest and crop management questions. The UK College of Agriculture (COA) and associated cooperative individuals/organizations provide a vast array of expertise. The members of teams are by and large permanent COA and county, faculty and staff and non-COA volunteers e.g. producers, consultants, Ag-business etc. Historically, salary/benefits of individuals within the working groups does not come from Smith/Lever 3(d) funds, though their travel for IPM activities are supported in part with Smith/Lever(3)d funds. UK-IPM currently operates working groups in the following areas: Commercial Ornamental Crops, Corn/Soybean Sci., Vegetable and Fruit Crops, and Wheat Sci.

The overall UK-IPM program maintains an advisory committee which includes leaders from each working group and representatives of several clientele groups e.g. production farmers, part-time farmers, ag-industry, homeowners, etc. Additionally, each working group develops and maintains its individual steering-planning group. In total there are more than 18 individuals involved in the direct operation of UK-IPM, and nearly three times that many involved in delivery of the science.

Cooperation with college Resident Instruction – Individuals working with IPM concepts cooperate in a number of formal classes. The instructors of the classes listed below have long been associated with IPM programs in Kentucky; also, they rely on experts from various departments to fulfill a portion of their class schedule, thus continuing the team approach. These classes include PLS-490C Certified Crop Advising (Plant & Soil Sciences); ENT-530 Integrated Pest Management (Entomology); PLS 531 Plant Pest Management (Plant & Soil Science), and ENT-630 Advanced Applied Entomology (Entomology).

### Program Staff

IPM Coordinator: Dr. Doug Johnson, Professor of Entomology & IPM Coordinator

IPM Specialists: Ms. Patty Lucas, Extension Specialist, University of Kentucky

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Administrative Contact: Dr. John Obrycki, Chairman, Dept. of Entomology

UK-CES Contact: Dr. Jimmy Henning, Assoc. Dean for Extension & Director of Kentucky Cooperative Extension Service

**Programs / Working Groups Highlights**

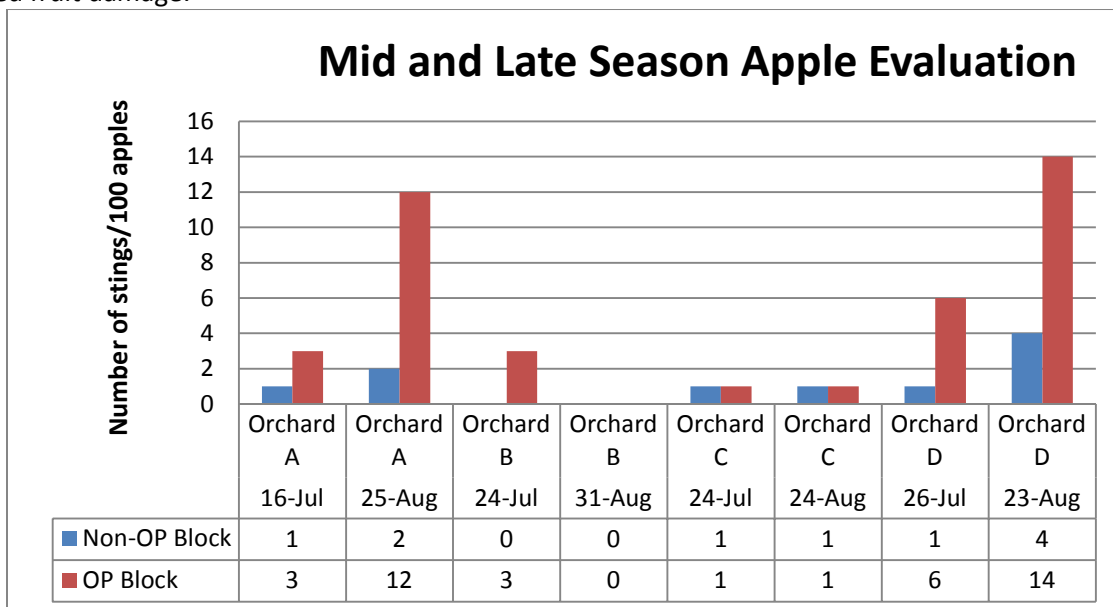
Region 4 EPA SIA Grant - (This project will be the focus of a SRIPMC article by Ms. Rosemary Halberg)

**Reducing Organophosphate Insecticide Use in Kentucky Apple Orchards –**  
 Dr. Ric Bessin and Ms. Patty Lucas (October 1, 2009 – September 30, 2011)

The first year of this project was completed in October of 2010 with four commercial apple orchards in Kentucky having demonstrated pest management programs free of organophosphate (OP) insecticides in comparison to current production practices. This is in advance of the 2012 azinphos-methyl cancellation. A survey of commercial growers prior to the initiation of the project indicated that 50% were reluctant to use OP alternatives due to their lack of experience with these products. End-of-season results demonstrated reduced codling moth captures and damage in portions of the orchards using the non-OP program. While there was a reduction in damage with the non-OP program, the non-OP insecticide program increased insecticide costs by 7%.

In each of 4 commercial orchards, a 3- to 5-acre block was managed for insect pests throughout the season without the use of organophosphate insecticides. Adjacent and comparable blocks of apples were managed without the restrictions on organophosphate use, with organophosphate sprays incorporated as needed. Codling moth and Oriental fruit moth were monitored with pheromone traps for the entire season and blocks scouted weekly for pests and diseases. The orchards selected are widely dispersed and varied in relative risk to codling moth and Oriental fruit moth.

After participating in one year of this study, two participants were so impressed with the results they are moving their entire orchard to a non OP insecticide program. While the design of the study did not allow for statistical comparisons within orchards, mid- and end- of season fruit quality assessments did not observe sizable differences in fruit diseases or insect damage other than that due to codling moth in orchards A and D. In the two orchards with a history of codling moth problems, the non-OP programs had reduced fruit damage.



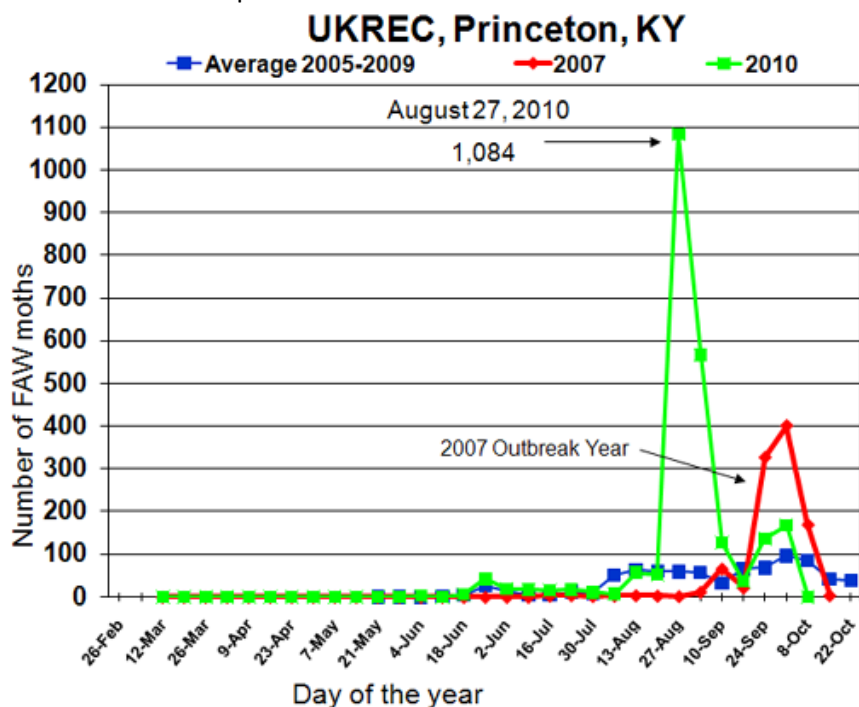
Coordination:

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Kentucky IPM Insect Trapping Network: Kentucky has continuously operated insect traps at the University of Kentucky Research & Education Center to monitor major pests of field crops since 1990. In 2007, a monitoring site was added in central Kentucky at the UK Research Farm located in Lexington. Trap counts from both sites are published weekly from March through September in Kentucky Pest News and on-line at the UK-IPM web site.

Based on the historical data, the trap counts are used to issue warnings for potentially damaging populations. Traps monitored include: Armyworm, Fall armyworm, European corn borer, Black Cutworm, Corn earworm and Southwestern corn borer. Surveys have indicated that the trap counts are used mainly by consultants.

Recently two new pieces of information have been gained from the trapping network: 1.) For the past three years, the network has included traps for both the E and Z strain of European corn borer (ECB). When first tested in the early 90's only the Z strain of ECB was found in Kentucky. However, since the introduction of Bt corn, the trap catches for ECB have been greatly reduced. Traps for both the E strain and Z strain monitored at the UK Research Center are capturing ECB. An analysis of the pheromone gland from ECB larva collected in November 2010 has indicated that only the Z strain is still present. This has raised the questions as to whether or not lures being used contain the appropriate blend of 11 tetradecenyl acetate isomers. 2.) Record high fall armyworm trap counts in August 2010 caught the attention of a USDA geneticist at Gainesville, Florida and a USDA insect migration specialist in Texas. Both are interested in the movement of fall armyworm. Using insects from UK-IPM traps the FAW strain attacking KY crops was identified as 80% Rice strain and 20% Corn strain FAW. We expect to develop cooperative work with this research which may yield information that may strengthen the usefulness of our early warnings by clarifying the strains and thus the crops at risk.



Request for Aid from Out-of-State Investigators: Because of our transitional location (ecologically) we are often asked by investigators in other states to help with collecting data. During this period we worked with investigators in New Jersey, Florida and Texas to supply information / data on European corn borer and fall armyworm. The contacts are likely to result in development of cooperative projects.

**Commercial Horticulture:** The Nursery Crops Scouting Program spanned five months and provided insect and disease scouting at three central Kentucky nurseries. A central Kentucky grower whose nursery is regularly affected by maple mites stated that he saved \$1,000 in refined spray schedules due to improved  
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timing of miticides as a result of the scouting program. Another grower saved \$3,000 in improved mite control due to the scouting program. Growers reported \$36,400 in overall pesticides and labor savings and increased quality due to the scouting program.

The Kentucky Nursery Update newsletter provided over 300 growers and Extension Agents with timely information generated as a result of the weekly scouting sessions. Growers responded that they saved an average of \$4,700 per nursery from information included in the newsletter.

### **Corn/Soybean:**

Early Bird Meetings - (three locations in early fall) Held early in the fall, specifically at clientele request. They indicate this timing has great value by hearing the previous summer's data (even if preliminary) before purchasing seed for the coming season. Surveys at these meetings also establish need for work toward compliance with resistance management program in GM corn.

Grain Crops Academy – In-depth training of selected clientele. Thirty clientele at each of two locations representing 2 counties each for four 8 hr sessions.

Soybean Verification Program – Splits fields with farmer management decision on ½ with UK recommendations on ½. Indicates ca. \$12 / Ac advantage for UK management. Also, shows a reduction in insecticide applications.

Invasive Species bug Survey – Conducted in soybean in twelve KY counties over four weeks in July / Aug. No evidence of 'variant' western corn rootworm. No evidence of invasive stink bugs (brown marmorated, red banded, bean plataspid). Data used to indicate the effectiveness of current pest management strategies (crop rotation, planting date) and the lack of need for treatment of these pests.

### **Wheat Science: IPM Wheat Science Working Group Activities Planned and Completed (8-1-09 to 7-31-10)**

Field Days and Annual Meetings which showcase research and also educate producers, county agents, consultants and agribusiness on improving and expanding no-tillage and pest control measures

- pest resistant rating in wheat variety trials - 80 entries
- partnered with Kentucky Small Grain Growers Association (KySGGA) for research on no-till and pest issues (received from KySGGA approximately \$82,000 in research grants)
- Field Day, May 28, 2010 - attendance 135
- Annual Winter Wheat Meeting, January 12, 2010 - attendance 130
- Newsletters - 2,333
- Research Report Books - 300
- Research plot trials - 50
- Special Newsletter to address controlling volunteer corn to avoid insect damage in wheat

### Success Stories

Variable Rate Nitrogen (VRN) Application on Wheat Using the Greenseeker  
Lloyd Murdock, Extension Soil Specialist

The Greenseeker is a real-time, on-the-go sensor/applicator that senses the health of the wheat crop at the time nitrogen is applied and then simultaneously adds the precise amount of nitrogen that is determined to be needed by the machine. The weak part of the process has been the algorithm (formula) that is placed in the software of the machine to tell it how much nitrogen to add based on the plant health Normalized Difference Vegetation Index (NDVI) readings. Using an algorithm developed by the University of Kentucky researchers, a replicated (6 replications) field trial in Christian County was done with the

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Greenseeker in a large field. The final results showed the Greenseeker parts of the field to yield about 5 bu/acre more. This statistically significant yield increase was probably due to better N distribution. The economic calculation shows about a \$14/acre advantage for the use of the Greenseeker, not considering the cost of the initial investment.

#### ITALIAN RYEGRASS IN WHEAT

James R. Martin, Extension Weed Scientist

It is estimated that ryegrass is present in approximately 20% of the wheat acres in Kentucky. Growers are particularly concerned about ryegrass because it is capable of limiting wheat yield by as much as 85% and spreads easily. In order to better understand the management of this weed, seven field trials were conducted to evaluate new products and potential issues associated with tillage, application timing, and tank mix antagonism. It is estimated that wheat growers gained a net savings of \$25.00/A by following UK recommendations for controlling a modest infestation of just three Italian ryegrass plants/ft<sup>2</sup>. Without following our recommendations for managing ryegrass, it is estimated the economic loss to growers, in yield loss alone, would exceed \$41.00/A. Educational activities that dealt with management issues on ryegrass control in wheat included 1 article in KY Small Grain Grower Newsletter, 6 articles in UK Wheat Science Research Reports, two magazine articles, 1 field day, 1 TV tape and 1 radio tape, 1 agent training, and approximately 10 meetings.

**Vegetables:** For the 2009-2010 year the vegetable working group did the following. We completed work on the IPM Scouting Guide for Common Pests of Solanaceous Crops in Kentucky ID 172 (<http://www.ca.uky.edu/agc/pubs/id/id172/id172.pdf>) as well as an IPM Scouting Guide for Common Pests of Cucurbit Crops in Kentucky ID-91 (<http://www.ca.uky.edu/agc/pubs/id/id91/id91.pdf>). Guide ID-172 had 2500 copies printed and all were distributed within 6 months. Approximately 2000 copies of ID-91 have been distributed thus far. In addition we completed field scouting and sentinel plots in Central Kentucky (Lexington), East Kentucky (Quicksand) and W. KY (Princeton). The sentinel plots were managed by Kenny Seebold and coincided with his work for managing downy mildew in cucurbit crops as part of another project that he is participating in with NCSU. Trapping plots for scouting information were somewhat successful as well. Due to turnover in extension associate positions the best data for insect pests came from trapping conducted in Lexington. In combination with work for other projects, Logan Minter and Dr. Ric Bessin maintained traps for cucumber beetle and squash vine borer in the 2010 growing seasons in Lexington. Traps for Corn Earworm were maintained in Lexington in 2009 and 2010 by Tim Coolong and Krista Jacobsen. Traps and pheromone lures were distributed to Mr. Vaden Fenton in Princeton, Kentucky, to monitor pests such as fall armyworm for pepper production. During the 2009 Princeton All Commodity Field Day Dr. Timothy Coolong conducted field stops for IPM management of cucurbit crops which received approximately 150-180 visitors during the course of the field day. In addition there were stops conducted at the 2010 Horticulture Research Farm Field Day which included Dr. Ric Bessin discussing integrated pest management of cucurbit crops. There were approximately 150 attendees at the 2010 Horticulture Research Farm Field Day. All Co-PIs on the Vegetable Working group have conducted numerous county meetings discussing IPM of vegetable crops during 2009 and 2010. Lastly, Timothy Coolong presented information about IPM scouting in Amish and Mennonite communities at the ASHS regional meeting in Atlanta Georgia in February of 2009.



## **SERA-IEG3 2010 Annual Report for Mississippi State University**

**Program Management:** The Mississippi Integrated Pest Management Program received \$325,000 for the granting period July 2009 – July 2010. Clarence Collison served as IPM Coordinator during this period but retired in July 2010. Blake Layton now serves as IPM Coordinator for Mississippi. Principal cooperators were all extension specialists who were members of the Department of Entomology and Plant Pathology at Mississippi State University, though some cooperators were physically located at research and extension centers. Funding was used to provide technical support, travel, materials and supplies for the IPM programs of the various specialists. Funding was supplemented by extramural funding obtained from commodity support groups, industry grants, and other sources, as well as by facilities, equipment, and support provided by MSU. Cooperators participated in a variety of professional development opportunities including: reading and literature review, attending professional meetings, attending commodity meetings, and attending information exchange and project-oriented meetings with peers.

**Program Delivery:** The Mississippi IPM Program impacts all of the state's 2.9 million citizens. Overall program outputs were: 1} a comprehensive extension IPM program on insect management for the major row crops: cotton, soybeans, and corn 2} a comprehensive extension IPM program in consumer urban and horticultural entomology 3} an extension IPM program specifically focused on disease and insect pest management in greenhouse tomatoes and 4} a field survey on prevalence of soybean cyst nematodes in north Mississippi. More specific outputs for each of these programs are summarized below.

**Row Crop IPM Program:** During the granting period, this program conducted 23 cotton, 9 soybean, 8 corn, and 1 grain sorghum demonstrations and small plot trials to test efficacy of new products, and methods to reduce insecticide usage. This information was used to update or publish 8 Extension publications. Information was also distributed through 24 newsletters, 12 producer meetings, 30 presentations and 4 in-service trainings.

**Consumer Urban and Horticulture Entomology IPM Program:** This program produced 10 extension publications, 7 popular press articles, 16 newsletters, and 10 miscellaneous publications. Information was also distributed through a total of 43 educational presentations and 4 in-service trainings. A total of 211 physical insect samples and a similar number of electronically submitted insect photos were processed for identification and control recommendations. The program also provided hundreds of one-on-one client consultations, via phone, internet, and field visits, on insect IPM issues. The overall impact of the program was greatly magnified by secondary use and distribution of information by the 82 county extension offices in the state.

**Greenhouse Tomato IPM Program:** On-farm grower/scouting visits were conducted on a routine basis. A disease identification web page is being maintained and upgraded periodically. This website is the number one google response when searching "greenhouse tomato diseases". Extension type applied research trials are conducted each year. Thirteen educational presentations were made at grower meetings, including the internationally attended Greenhouse Tomato Shortcourse. The extension publication "Greenhouse Tomatoes, Pest Management in Mississippi" was updated and made available to producers.

**Soybean Cyst Nematode Sampling Program:** Nematode populations were sampled from a total of 23 fields in north Mississippi. Excessive, prolonged rainfall during the fall and winter delayed harvest, resulted in greatly reduced yields and increased levels of crop damage and prevented consultants and growers from collecting and submitting nematode samples. As a result, the number of samples submitted was much lower than desired. Results of the survey were presented at the National Plant Diagnostic Network Meeting in Miami, FL.

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## **Program Involvement:**

Extension Specialists responsible for carrying out the various portions of the 2009-2010 Mississippi Integrated Pest Management Program are listed below. Specialists interact with their research counterparts and peers from other states to develop and maintain effective IPM programs in their respective areas of focus.

Clarence Collison, Head, Department of Entomology and Plant Pathology. Served as IPM Coordinator, including the 2009-2010 budget period for the Mississippi Integrated Pest Management Program. Retired July 2010. Duties were assumed by Dr. Blake Layton.

Blake Layton, Extension Entomology Specialist (100% Extension): Job responsibilities include urban and commercial horticultural entomology, household and structural pests, commercial vegetable entomology, and forage insect pests. Duties include developing and maintaining insect management and control recommendations for these areas and developing and presenting educational programs, also provide insect identification diagnostic services and insect control consultation services to Mississippi homeowners and commercial growers and insect management professionals in structural and horticultural pest control. Recently assumed role of IPM Coordinator for Mississippi following retirement of Clarence Collison.

Angus Catchot, Associate Professor of Extension (100% Extension): Job responsibilities include setting up research and demonstration plots in cotton, corn, soybean, wheat, and grain sorghum on insects pests in small plot and large plot grower fields. Information is gathered and presented to target audiences through presentations, mass media, and newsletters to provide target audiences information on IPM of row crops in Mississippi. Information is also used to generate extension publications for dissemination to target audiences on value of IPM. Goal is to help producers become more profitable while reducing insecticide inputs.

David M. Ingram, Extension/research professor (75%/25%) of plant pathology with responsibilities for vegetable extension plant pathology with specialization in greenhouse tomato disease identification and management. Ingram educates growers and extension agents on IPM techniques applicable to greenhouse tomato production. Ingram also conducts applied research testing efficacy of new and innovative products/techniques for disease management. The IPM project provides professional development opportunities to attend the tomato disease workshop, the MS greenhouse tomato shortcourse, and the Southeastern Vegetable Extension Workers meeting annually.

Clarissa Balbalian: Diagnostic Lab Manager (100% Extension). Manage the Plant Disease Diagnostic Lab for MSU Extension and conduct extension education programs related to plant disease identification and management. Duties related to Soybean Cyst Nematode project: Solicit soil samples from consultants and county agents, screen samples for soybean cyst nematode, relay GPS coordinates for all samples and soil from SCN positive samples to Dr. Gary Lawrence.

Dr. Gary Lawrence: Associate Professor of Nematology. Duties related to Soybean Cyst Nematode Project: Maps GPS coordinates for samples, performs SCN race testing.

Dr. Tom Allen: Assistant Extension/Research Professor. Works as Area Extension Plant Pathologist in the Mississippi Delta region. Duties related to Soybean Cyst Nematode Project: Assists with nematode sample solicitation and collection.

Dr. Chris Daves, Area Extension Entomology Specialist: Worked as Area Extension Entomology Specialist in southwest Mississippi, with statewide responsibilities for corn insect pests. Dr. Daves accepted another position prior to the 2010 growing season. His duties were assumed by Dr. Angus Catchot.

**Program Support:** The Mississippi IPM program has the full support of university administration, including the head of the Department of Entomology and Plant Pathology and the directors of the Research and Extension Centers housing off campus cooperators. Within their various focus areas specialists work closely with commodity groups such as: Mississippi Agriculture Consultants Association, Mississippi Pest Control Association, Delta Council, Mississippi Farm Bureau, Mississippi Nursery and Landscape Association, and many similar organizations.

#### Extension Publications:

Catchot, A. L., J. F. Smith, J. Gore, D. R. Cook, C. Daves, G. Andrews, F. Musser, T. Koger, S. D. Stewart, and G. Lorenz. 2009. Soybean Insect Identification Guide. MSU-ES publication 2543.

Catchot, A., F. Musser, J. Gore, D. Cook, C. Daves, G. Lorenz, S. Akin, G. Stubbaker, K. Tindall, S. Stewart, R. Bagwell and B. R. Leonard. 2009. Midsouth multi-state evaluation of treatment thresholds for tarnished plant bug in flowering cotton. MSU Extension Service Publ. E0022 and Publ. 2561. <http://msucares.com/pubs/publications/e0022.pdf>.

Catchot, A., J. Smith, J. A. MacGowan, J. Gore, D. R. Cook, C. Daves, G. Andrews, F. Musser, T. Koger, S. D. Stewart and G. Lorenz. 2009 Soybean insect identification guide. MSU Extension Service Publ. 2543 and LSU AgCenter Publ. 3127.

Catchot, A., J. Smith, J. A. MacGowan, J. Gore, D. R. Cook, C. Daves, G. Andrews, F. Musser, D. Dodds, S. D. Stewart and G. Lorenz. 2009 Cotton insect identification guide. MSU Extension Service Publ. 1640

Catchot, A., G. Andrews, B. Burdine, D. Cook, C. Daves, D. Dodds, J. Gore, R. Jackson, T. Koger, E. Larson, F. Musser, P. McKibben, J. Reed, J. Robbins, J. Smith and S. Winters. 2009. Insect control guide for cotton, soybeans, corn, grain sorghum, wheat, sweet potatoes, & pasture. MSU Extension Service Publ. 2471.

Daves, C., A. Catchot, S. Stewart, J. MacGown, J. Gore, D. Cook, G. Andrews, F. Musser, S. Akin, G. Lorenz, R. Leonard, R. Jackson, C. Allen, J. Smith, L. Owen and E. Larson. 2009. Corn Insect Identification. MSU Extension Service Publ. 2252.

Dodds, D.M., A.L. Catchot Jr., and J. Gore. 2010. 2009 County Cotton Demonstration Trials. Publication E0039 of the Mississippi State University Extension Service

Layton, M. B and J. McGown, 2009, Protect Your House from Termites, MSU-ES Publication 2568, 15 pp.

Layton, M. B., 2009, Insect Pests of the Home Vegetable Garden, MSU-ES Publication, 2347, 16 pp,

Layton, M.B., 2009, Control of Insect Pests in and around the Home Lawn, MSU-ES Publication 2331, 23 pp.

Layton, M. B., 2009, Control Fire Ants in Your Yard, MSU-ES Publication 2429, 4 pp,

Nagel, D., B. Layton, A. Henn, and D. Ingram, 2009 Garden Tabloid, MSU-ES Publication 1091, 30 pp.

Layton, M. B, 2010, 4-H Insect Identification Study Guide for Senior 4-Hers MSU-ES Publication 2591, 8 pp.  
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Layton, M. B, 2010, 4-H Insect Identification Study Guide for Senior 4-Hers MSU-ES Publication 2592, 4 pp.

Layton, M.B., J. Goddard, K.T. Edwards and J. McGown, 2010, Control Fleas: On Your Pet, In Your House, and In Your Yard, MSU-ES Publication, 7 pp.

Layton, M. B. and D. Ingram, 2010, Greenhouse Tomatoes: Pest Management In Mississippi, MSU-ES Publication 1861, 21 pp., Revised for 2010.

Goddard, J. and M. B. Layton, 2010, Spiders: Brown Recluse and Black Widow, MSU-ES Publication 2154, 7 pp.

## **SERA-3 2010 ANNUAL REPORT FOR NORTH CAROLINA**

Submitted by Steve Toth, IPM Coordinator, North Carolina State University

### **PROGRAM MANAGEMENT:**

Steve Toth serves as the Extension IPM Coordinator for North Carolina. Thirty percent of his time is devoted to his responsibilities as IPM Coordinator and the remainder to the Southern Region IPM Center as Associate Director. The responsibilities for the IPM Coordinator in North Carolina include the following: serve as the University's major contact for IPM related issues, collaborate with campus and field extension and research faculty in conducting and communicating IPM programs, assist faculty in identifying and seeking state, regional and national level funding for IPM, assure stakeholder input into and recognition of IPM programs, represent North Carolina State University in regional and national meetings as the IPM liaison, and collaborate with IPM programs at other institutions. The IPM Coordinator manages the IPM

3(d) budget and serves as the coordinator of the annual federal IPM report.

### **PROGRAM DELIVERY:**

Stephen Schoof, Agricultural Research Technician, assisted and coordinated IPM related applied research and Extension activities on fruit and vegetable crops in western North Carolina. His responsibilities were in the area of applied research include the coordination of field trials on apples and fruiting vegetables related to the effect of pesticides on pest and natural enemy populations, development of action threshold levels, sampling programs, and insecticide resistance monitoring. His Extension responsibilities included dissemination of information through weekly updating of the Southern Appalachian Apple IPM Website, DUEX phone updates on pest activity, and faxing of updates to Extension personnel, growers and the crop protection industry.

For many years, the Cotton IPM Program in North Carolina has provided applied information on the integrated pest management of insect pests of cotton in North Carolina and increased the knowledge and adoption of IPM practices by cotton growers in the state. Results from cotton IPM field trials are distributed at field days, Extension meetings, and related events, and in state and regional Extension and research publications. Growers and other stakeholders have been furnished with timely cotton IPM information through telephone calls, faxes, and the Internet. The insect landscape for cotton has been dramatically altered in recent years, with the widespread adoption of seed treatments for thrips control, the introduction and increased adoption of Bollgard and 2-gene WideStrike and Bollgard II cotton varieties that have significantly reduced boll damage by bollworms, tobacco budworms and other caterpillars, and the marked increase in stink bugs levels, their associated damage and resulting insecticide applications. Because of the similarity of pest management challenges to cotton growers across the Southeastern U.S., the North Carolina Cotton IPM Program maintains cooperative applied research and extension projects with Virginia Tech University, Clemson University, and the University of Georgia. Leadership for the Cotton IPM Program is provided by Jack Bacheler, Extension Entomologist and Department Extension Leader at North Carolina State University.

Bryan Davis, Agricultural Program Assistant, was an integral partner in the Christmas tree IPM program in western North Carolina. He worked through the county extension agents in three western North Carolina counties to provide educational programs to growers. Much of his time was spent in the field working side-by-side with growers and Hispanic farm workers to teach them scouting techniques, to calibrate spray equipment, and to identify causes of new problems. These practices resulted in lower exposure of pesticides among workers and less overall reliance on pesticides. The time spent in the growers' own fields has increased IPM adoption among Christmas tree growers.

Mike Waldvogel, Extension Entomologist, and Patricia Alder, Training Coordinator, were responsible for the implementation of Integrated Pest Management strategies for schools and municipalities in North Carolina and conducting the training programs for pest management professionals, school and municipal employees. They were also responsible for management of the Extension School IPM Program in the state (<http://schoolipm.ncsu.edu>).

Mike Stringham, Extension Entomologist, addressed the management of arthropod and vertebrate pests of livestock and poultry in North Carolina, including mites, ticks, cockroaches, lesser mealworms, flies and rodents. His training activities emphasized the use of IPM for pests affecting animals and their production environments, as well as topics relating to human health and nuisance issues associated with livestock and poultry production in the state.

The mini-grants program has been the centerpiece of the North Carolina Extension IPM Program for more than a decade. Extension and research projects funded through mini-grants from the North Carolina Extension IPM Program in FY 2009 are listed in Table 1.

**Table 1. Mini-grant projects funded by the North Carolina Extension IPM Program.**

Project Director(s)	Title of Project
Jim Walgenbach	Implementation of reduced-risk insect management programs on vegetables in Western North Carolina
Mike Waldvogel, Godfrey Nalyanya, and Patricia Alder	Train the Trainer - Site-based pest management training for public schools in North Carolina
Frank Louws and Cary Rivard	Implementation and research advancements to manage bacterial wilt and other soil-borne diseases through regional and cooperative on- farm research
Steve Frank	Evaluation of application methods to reduce insecticide use and improve IPM of Granulate Ambrosia Beetle
Mark Abney	Development of improved wireworm management practices in potato In North Carolina
Turner Sutton and Raul Villanueva	Evaluation of fescues as a management tool for Pierce's disease of grapes in North Carolina
Mike Parker	Managing replant disorders in apple orchards. Can pre-plant soil fumigation be eliminated with proper rootstock selection?

Final and/or progress reports on the accomplishments and successes of the mini-grant projects were submitted by the project directors in September 2010 and are available on the North Carolina Extension IPM Program web site at <http://ipm.ncsu.edu/minigrants/index.html>.

### PROGRAM OUTPUTS:

The North Carolina Extension IPM Program involves Extension and research faculty from North Carolina State and North Carolina A&T State universities and county Extension agents. They participated in more than 20 university-sponsored commodity field days and hundreds of area scouting schools, county growers meetings, agent training events, etc.

A web site for the North Carolina Extension IPM Program (Fig. 1) was developed by the IPM Coordinator and released in September 2010 to communicate program activities, opportunities, resources and successes to stakeholders within the state. It is available at <http://ipm.ncsu.edu>.



Fig. 1. Home page of the North Carolina Extension IPM Program web site.

Twenty-two issues of the *North Carolina Pest News* were distributed electronically to more than 300 individuals weekly throughout the growing season. The *North Carolina Pest News* provides

timely information on insect pests and diseases of field and forage crops, fruits, vegetables, ornamentals and turf, and residential and community pests.

Apple IPM Program personnel performed applied research on new pheromone mating disruption products, pheromone lures for codling moths, and new insecticides for effects on pest and beneficial arthropods. Apple growers were informed of insect activity via weekly updates in various media.

Christmas Tree IPM Program personnel made on-farm visits and provided IPM-based recommendations to growers in western North Carolina, and conducted eight meetings delivering IPM information to 338 growers.

Cotton IPM Program personnel conducted 16 IPM-oriented grower meetings and six scouting schools, emphasizing scouting-based decision making and management of key pests with lower insecticide inputs. IPM information was disseminated via the *Cotton Insect Corner* website (<http://ipm.ncsu.edu/cotton/InsectCorner/>) and weekly mp3 tapes and newsletter articles.

School IPM Program personnel prepared instructional materials (brochures, manuals, DVDs), trained pest management professionals and schools employees, and conducted surveys to assess IPM implementation in North Carolina public schools (mandated by North Carolina legislature).

A collaboration project was conducted by North Carolina A&T State University scientists with FY 2009 funding to determine effective methods of deterring deer from small market fruit and vegetable growers' fields. Demonstration sites in four counties using low cost electric fencing and bean trap crops successfully deterred deer from strawberry, blueberry and sweet corn fields. Over 50 farmers observed the sites and were educated on wildlife control.

The North Carolina Extension IPM Program conducted a competitive mini-grants program in 2009 and provided funding for seven projects addressing stakeholder-identified needs (Table 1). Outputs from these mini-grant projects include: 1) improved wireworm management practices in potatoes; 2) reduced insecticide volume and drift for granulate ambrosia beetle management in nurseries; 3) effective management of bacterial wilt on tomatoes through grafting of resistant rootstocks; 4) effective management of replant disorders in apple orchards with proper rootstock selection; 5) use of fescues as an IPM tool for Pierce's disease of grapes; 6) reduced-risk insect management on vegetables in western North Carolina; and 7) a "train-the-trainer" program for site-based training of school IPM coordinators.

#### **PROGRAM OUTCOMES / IMPACTS:**

The North Carolina Extension IPM Program has moved to a more multi-disciplined, stakeholder-driven program with the formation of six working groups (field crops, fruit and vegetable crops, ornamental and nursery crops, poultry and livestock, schools and child care centers, and small farms and organic specialty crops). Furthermore, program communication and visibility has improved through a program website (<http://ipm.ncsu.edu>).

Timely pest news and alerts allowed Extension agents and IPM stakeholders to effectively monitor and manage insects and diseases in North Carolina.



The Apple IPM Program's dissemination of insect monitoring results to stakeholders has accelerated the apple acreage under mating disruption and reduction in broad spectrum insecticide use. Based on sales data from pheromone companies, almost 65% of the apple acreage used mating disruption in 2010, compared to 55% in 2009. Based on records obtained from 39 apple growers, organophosphate insecticide use averaged 1.2 applications per grower, compared to greater than 3 applications per grower in 2008.

As a result of Christmas Tree IPM Program activities, growers can effectively calibrate air-blast sprayers, employ low cost deer repellents (90% savings over commercial products), improve IPM practices for elongate hemlock scale management, reduce late fall insecticide treatments for balsam twig aphids, and reduce nitrogen applications in young trees with clover groundcovers.

The Cotton IPM Program's applied research on planting date-based insecticide use options for thrips and development of a plant phenology-based stink bug threshold have resulted in significant refinement of insecticide use by North Carolina cotton growers.

A survey of school maintenance directors completed by the School IPM Program in 2009 showed that 63% of schools had IPM policies, a 47% increase over 2007. Results showed an 18% increase in the number of school districts using written notifications to parents and staff on pesticide applications. These data point to success toward reaching the goal of bringing 100% of schools into compliance with the state's School Children's Health Act by October 31, 2011. Overall, there is a reduction in pesticide use in more than 72 school districts in the state, impacting about 750,000 students and 57,000 employees.

Through an IPM collaboration project with North Carolina A&T State University, over 50 small market fruit and vegetable growers observed demonstrations of wildlife management using electric fencing and trap crops; crop yields for participating farmers were higher than in previous years as a result of adoption of new wildlife management tactics.

Outcomes to date from mini-grant projects include: 1) a 12x reduction of insecticide volume used to protect nursery trees from granulate ambrosia beetle damage and less drift; 2) reduction of disease incidence in tomatoes (from up to 85% plant death to 0%) through the use of grafted rootstocks, and yields more than doubled compared to non-grafted controls; 3) improved levels of insect control with early season chemigation compared to weekly foliar applications of insecticides on tomatoes, peppers and cucumbers, demonstrating the potential of chemigation to reduce insecticide use, mitigate spray drift, and increase grower profitability.

#### **PUBLICATIONS (2009-2010):**

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**PROGRAM INVOLVEMENT:**

Leadership of the North Carolina Extension IPM Program was provided by the Extension IPM Coordinator at North Carolina State University and a 20-member Advisory Committee, representing Extension faculty from North Carolina State University and North Carolina A&T State University, non-governmental agencies, environmentalists, North Carolina Department of Agriculture & Consumer Services personnel, farmers, and agricultural consultants. The Advisory Committee provides advice and oversight to the Extension IPM Coordinator regarding the direction of the IPM program. In 2010, the IPM Coordinator communicated regularly with committee members via a listserv to transfer IPM information, provide program updates and seek advice. A list of Advisory Committee members is available on the North Carolina Extension IPM Program web site at <http://ipm.ncsu.edu/advisorycommittee.html>.

The North Carolina Extension IPM Program expanded stakeholder engagement in 2010 through the establishment of the following six IPM working groups in North Carolina: IPM in Children's Environment Working Group, Field Crops IPM Working Group, Fruit and Vegetable Crops IPM Working Group, Ornamental/Nursery Crops IPM Working Group, Poultry and Livestock IPM Working Group, and Small Farms and Organic Specialty Crops IPM Working Group. The working groups were formed in November 2009 to set goals and objectives for the Extension IPM Program for 2010-2013 and will operate during this period with expanded stakeholder participation. Working group objectives and contact information are available on the North Carolina Extension IPM Program web site at <http://ipm.ncsu.edu/working/index.html>.

**PROGRAM SUPPORT:**

The North Carolina Extension IPM Program received full support from the Administration of the North Carolina Cooperative Extension Service, the Department Head and Departmental Extension Leader of the Department of Entomology at North Carolina State University, and key stakeholder groups in the state. The Smith-Lever 3(d) Extension IPM funds were managed by the IPM Coordinator. The bookkeeping staff of the Department of Entomology at North Carolina State University also provided support for the program.

In 2010, the North Carolina Extension IPM Program was awarded \$588,486 in funding for FY 2010-2012 from the USDA NIFA's Smith-Lever 3(d) Extension IPM Coordination and Support Program. These funds are designated for the following emphasis areas:

<b>EMPHASIS AREA</b>	<b>FY 2010</b>	<b>FY 2011</b>	<b>FY 2012</b>	<b>TOTAL</b>
IPM Coordination Function	\$14,651	\$14,651	\$14,651	\$43,953
IPM Implementation in Agronomic Crops	\$32,000	\$32,000	\$32,000	\$96,000
IPM Implementation in Animal Agriculture	\$58,905	\$58,905	\$58,905	\$176,715
IPM Implementation in Specialty Crops				
- Fruit, Ornamental/Nursery and Vegetable Crops	\$60,606	\$60,606	\$60,606	\$181,818
- Small Farm and Organic Specialty Crops	\$20,000	\$20,000	\$20,000	\$60,000
IPM Training and Implementation in Housing and IPM Training and Implementation in Schools	\$10,000	\$10,000	\$10,000	\$30,000
<b>TOTALS</b>	<b>\$196,162</b>	<b>\$196,162</b>	<b>\$196,162</b>	<b>\$588,486</b>

SERA-IEG3 Annual Report for IPM Oklahoma! 2010.  
Tom A. Royer, IPM Coordinator, Oklahoma State University

**PROGRAM MANAGEMENT:** In 2010, the IPM Oklahoma! was awarded funding to conduct programs in 5 program emphasis areas through Smith Lever 3d E-IPM competitive program. The projects (and funding awarded) included:

- Coordination (\$29,942.00)
- IPM Implementation of Agronomic Crops (\$113,296.00)
  - Hessian fly monitoring in winter wheat
  - IPM in cotton
  - IPM in oilseed crops
  - Herbicide resistant weeds management program.
- IPM Implementation of Animal Systems (\$23,505.00)
  - Litter beetle management in poultry houses
  - Sustainable use of ear tags for management of stable fly in cattle
  - Phorid fly survey in pastures
- IPM Training for Consumer/Urban Environments (\$11,000.00)
- IPM in Public Health (\$21,074.00)
- IPM Training and Implementation in Schools (\$19,074.00)

**PROGRAM DELIVERY:**

IPM Implementation of Agronomic Crops

- Hessian fly pheromone lures were purchased and 3 winter wheat fields are currently being monitored for Hessian fly emergence. In addition, as a member of the Wheat Improvement Team, we have seen the release and of “Duster” in 2009 a variety that was shown to be resistant to Hessian fly. Sales have increased so that Duster will become the #1 variety planted in Oklahoma this year.
- IPM in Cotton. Cotton was grown on 270,000 acres in 2010 and was worth ca. \$240 million. Transgenic cottons are being widely adopted and the Boll Weevil Eradication Program, which is in its 13<sup>th</sup> year, is in a maintenance phase with very little acres needing spraying. These factors have allowed for reduced insecticide applications and concurrently have allowed other pests, such as thrips, stink bugs and cotton fleahoppers to emerge.

Area Extension specialists and County Educators have provided timely insect activity reports on thrips, stink bugs and cotton fleahoppers during the 2010 growing season through a weekly Talkin’ Cotton Newsletter. Contributors include Randy Bowman, Director of the SW Research and Extension Center and Terry Pitts, Area Pest Management specialist. Results of the timely reporting of insect activity allowed cotton producers to correct pest problems on more than 50,000 acres of cotton, resulting in a yield savings of nearly \$1.7 million. An additional consequence of the widespread use of transgenic cottons tolerant to glyphosate herbicide is the emergence of resistance problems with weeds.

Marestail has become a problem because it is an important weed in no-till systems is not effectively controlled with glyphosate. Dr. J.C. Banks (retired) developed a marestail management program . In 2010, growers communicated that fewer acres were lost to uncontrolled marestail (confirmed by visual surveys) and resulted in an increased ratio of harvested to planted acres > 94% in 2010.

IPM in Oilseed Crops

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- Canola - Canola is a potentially valuable crop for Oklahoma wheat growers because it can help them manage difficult grassy weeds such as Italian ryegrass, and cheat and it provides an additional cash crop. Acreage has grown in Oklahoma from 41 acres in 2002 to an estimated 100,000 acres in 2010. However, several insect pests (aphids and caterpillars) attack winter canola throughout the winter and spring months causing economic damage.

Research demonstrations in 2007-08 and showed that that aphid sprays could be reduced from four applications per season to one per season by planting seed treated with imidacloprid insecticide and using treatment thresholds of 200 aphids per plant. Results of the research demonstrations showed that producers in could save an average of \$30 per acre in spray costs with no loss in yield, resulting in \$900,000 in potential cost savings from reduced pesticide applications to the 2009-2010 crop.

Emerging pest problems in winter canola in 2009-2010 included diamondback moth populations that were difficult to control, pockets of green peach aphid that were resistant to pyrethroid insecticides, army cutworms, and the presence of an aggressive species of black leg disease.

Dr. Tom Peeper and the OKANOLA project were recognized by the Southern Region IPM Center by being awarded the Friend of IPM award for 2010.

IPM Oklahoma also participated in a multi-state pheromone trapping program for sunflower moth that was coordinated out of North Dakota.

#### Herbicide Resistant/Invasive Weed Management

- Herbicide Resistance Weed Survey. A weed track sprayer was purchased to allow screening of herbicide resistant weeds throughout the state. Dr. Joe Armstrong is coordinating a statewide screening program. To date, 15 marestail (*Conyza canadensis*) populations were tested for resistance to glyphosate. All of the populations were classified as resistant to glyphosate, when compared to a susceptible population. We have also confirmed ALS-resistance in four populations of cheat (*Bromus secalinus*) in north central Oklahoma. From some dose response studies that were conducted, these populations have been shown to survive applications of 32 times the labeled rate for commonly used herbicides in wheat. Additionally, since the purchase of the track sprayer, 6 populations of Italian ryegrass (*Lolium multiflorum*) were screened for resistance to ALS- and ACCase-inhibitor herbicides. ALS-resistance has been previously confirmed as widespread throughout Oklahoma. As a result, most wheat producers have switched to using ACCase-inhibitor herbicides to control Italian ryegrass. With increased use of this herbicide chemistry, it is very likely that resistance this mode of action will quickly develop. Efforts for the next several years will focus on screening and documenting cases of ACCase-resistant Italian ryegrass.

The program is currently screening 20 pigweed populations (waterhemp, *Amaranthus rudis*, and Palmer amaranth, *Amaranthus palmeri*) for resistance to glyphosate, ALS-inhibitor herbicides, and atrazine. These populations were collected from soybean and peanut fields in northeast, northwest, and southwest Oklahoma. Results from this work will be available in the next few months.

Results from these trials have been published at the "International Survey of Herbicide Resistant Weeds" website ([www.weedscience.org](http://www.weedscience.org)) and have been presented at multiple OSU Extension meetings.

- Musk Thistle: The invasive weed, Musk thistle (*Carduus nutans* L) was first identified in Oklahoma in 1944, and is currently found in more than 62 counties. Infestations of musk thistle in improved pastures cause significant economic losses in Oklahoma. In 1998, Oklahoma legislators passed a law designating musk thistle,

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along with scotch and Canada thistles, as noxious weeds in all counties of the state.

A musk thistle IPM program was developed in the early 1990s and has been implemented statewide through cooperative efforts of researchers, Extension personnel, and landowners. It focuses on increasing public awareness of the problem, development of educational information, demonstrating various control options, and introducing new biological control agents. Three demonstration and educational meetings were conducted in 2010 to landowners and NRCS employees. Extension educators and landowners collected approximately 47,000 musk thistle head weevils and 9,000 musk thistle rosette weevils in Alfalfa, Grant and Okfuskee counties in spring of 2010 for redistribution.

To date, this program collected and redistributed more than 850,000 musk thistle head weevils and 40,910 musk thistle rosette weevils across the state. Landowners in NE Oklahoma have noted from 80% to 95 % decrease in number of musk thistle plants in areas where they are using an integrated approach that includes use of the musk thistle weevils. If the typical landowner applies 1 lb. active ingredient of herbicides per acre annually, biological control has decreased the amount of herbicides applied to the environment by 7.1 million lbs per year. There are plans to collect and redistribute more weevils this year at 3 sites. In addition, IPM Oklahoma! has established a working relationship with the Oklahoma Invasive Plants Council in 2010. IPM Oklahoma has also established a relationship with the Oklahoma Invasive Weeds Council to help advise proposed changes in the Oklahoma noxious weed law.

- Tamarix salt cedar biological control project is ongoing. IPM Oklahoma! received a grant and a permit from APHIS to hire a graduate student to supervise release *Diorhabda elongata* (Fukang strain) at the Salt Plains Wildlife Refuge. We released the beetle into one cage during the summer of 2009 and the beetle went through one successful generation, before overwintering. We are awaiting the opportunity to evaluate the beetles' overwintering survival through this winter. We are maintaining a lab colony of the beetle to conduct additional releases and predator/prey evaluations, and supplement releases this upcoming summer.

#### IPM Implementation of Animal Systems

- Litter beetle management in poultry houses  
2 poultry facilities have been identified to use as result demonstrations for biointensive IPM of litter beetles. The demonstrations will begin this April.
- Sustainable use of ear tags for management of stable fly in cattle  
Plans are underway to evaluate methods for sustainable ear tag management this spring, 2011.
- Phorid fly survey in pastures  
Surveys are planned for this spring through summer, 2011.

#### IPM Training for Consumer/Urban Environments

- Plans are underway to develop the first of three IPM demonstration gardens that will be located at the Oklahoma Botanical Gardens, Stillwater.

#### IPM in Public Health

- Bed bug management programs were initiated in 2010. A team of specialists that included a healthy housing specialist, an urban entomologist, a pesticide education specialist and the IPM coordinator was formed. Currently, the team has delivered educational programs for the Oklahoma Chapter of the National

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Association of Housing and Redevelopment Officials. We are also in contact with the Oklahoma Department of Health for future educational program opportunities.

#### IPM Training and Implementation in Schools

- School IPM – OSU (IPM and Pesticide Education) remains a partner in the Southwest Technical Resource Center for School and Childcare IPM, along with TAMU and NMSU (<http://schoolipm.tamu.edu>). Plans are underway to begin working with 1-2 schools to implement and evaluate an IPM program over 3 years.

#### Meetings:

- April 9: Canola External Advisory meeting, Wichita, OK.
- May 13: Met with David Redhage, Director, SARE PDP at the Kerr Center for Sustainable Agriculture
- August 6-12: Washington DC visits with National Program Leaders, Legislators, and Botanical Gardens.

#### Presentations:

1. January 26, 2010. Turf IPM. Estes Golf Course Service Technician Workshop, OKC.
2. January 26, 2010. Turf IPM. Estes Golf Course Superintendent Workshop, OKC
3. January 27, 2010. IPM. Tulsa County Pesticide Applicator Training, Tulsa OK.
4. February 4, 2010. IPM and Entomology in the Lawn and Garden. Master Gardeners, Shawnee. OK.
5. February 13, 2010. Wheat Entomology Update. Oklahoma Crop Improvement Association, Oklahoma City.
6. March 9, 2010. Making an IPM Master Plan: Furnish Your Toolbox. Oklahoma Fresh Market Meeting, Enid, OK.
7. March 29, 2010. Entomology/Plant Pathology In-service training, McAlester, OK.
8. March 31, 2010. Entomology/Plant Pathology In-service training, Clinton, OK.
9. April 29, 2010. Wheat In-service. Stillwater, OK.
10. May 14, 2010. Wheat insects. Lahoma Field Day, Lahoma, OK.
11. July 14, 2010. Royer, T and A. Berro. Biological Control of Weeds. Oklahoma Invasive Plants Council, Oklahoma City.
12. July 16, 2010. Insect management of sunflowers. BASF Summer Crops Meeting. Perkins, OK.
13. August 17, 2010. School IPM. Pesticide Certification on Oklahoma Tribal Lands. Stillwater, OK.
14. September 9, 2010. School IPM. Oklahoma Pest Control Association. Oklahoma City, OK.
15. September 14, 2010. IPM. Oklahoma County Master Gardeners. Oklahoma City, OK.
16. September 16, 2010. Bedbug management. National Association of Housing and Redevelopment Officials Annual Meeting. Norman, OK.
17. September 22, 2010. IPM. Canadian County Master Gardeners. El, Reno, OK.
18. November 11, 2010. Sustainable IPM for Vegetables. Oklahoma Small Farm Vegetable Workshop, Antlers, OK.

#### Publications: Refereed:

1. Franke-Dvorak, T. C., Kelsey, K. D., & Royer, T. A. 2010. Is extension still reaching stakeholders? An assessment of minor crop producers' educational needs and use of Cooperative Extension Services. *Journal of Agricultural Education*, 51(1), 56-64.
2. Royer, T.A., N.C. Elliott, K.L. Giles and S.D. Kindler. 2011. Field efficacy of winter-time insecticide applications against greenbugs, *Schizaphis graminum* (Rondani) (Hemiptera: Aphididae), on winter wheat (*Triticum aestivum* L.). Accepted for publication in *Crop Protection*.

#### Publications: Extension

1. Armstrong, J. 2010. Diagnostic service to test for herbicide-resistant weeds in Oklahoma. PSS-2779 *SERA-3 Meeting, San Juan, Puerto Rico, March 23, 2011*



2. Edwards, Jeff, B. Hunger, B. Carver and T. Royer. 2010. 2010 Wheat Variety Comparison. PSS-2142. Oklahoma Cooperative Extension Service, Stillwater, OK.
3. Royer, T.A. Worksheet for estimating economic injury levels for sorghum headworms in Oklahoma. EPP-7087. Oklahoma Cooperative Extension Service, Stillwater, OK
4. Royer, T. A., J. Edwards and K. L. Giles. 2009. Hessian fly management in Oklahoma winter wheat. EPP 7086. Oklahoma Cooperative Extension Service, Stillwater, OK.
5. Royer, T.A. 2008-2010 (rev). Management of insect pests in sunflower. CR-7197. Oklahoma Cooperative Extension Service, Stillwater, OK.
6. Royer, T.A. and K.L. Giles. 2006-2010 (rev). Management of insect and mite pests in canola. CR-7667.
7. Royer, T.A. and K.L. Giles. 2006-2010 (rev). Management of insect and mite pests in corn. CR-7192.
8. Royer, T.A. 1998-2010 (rev). Management of insect and mite pests in sorghum. CR-7170. Oklahoma Cooperative Extension Service, Stillwater, OK.
9. Royer, T.A. and K. Giles. 1998-2010 (rev). Management of insect and mite pests in small grains. CR-7194. Oklahoma Cooperative Extension Service, Stillwater, OK.
10. Royer, T.A. 1998-2010 (rev). Management of insect pests in rangeland and pasture. CR-7193. Oklahoma Cooperative Extension Service, Stillwater, OK.
11. Royer, T.A. and K.L. Giles. 2010 (rev). Management of insect and mite pests in canola. CR-7667. Oklahoma Cooperative Extension Service.
12. Royer, T.A. Control Suggestions for Canola Pests (Insects and Mites). Pp. 165-170 *In: 2010 OSU Extension Agent's Handbook of Insect, Plant Disease and Weed Control.* Oklahoma Cooperative Extension Service, Stillwater, OK.
13. Royer, T.A. Control Suggestions for Corn Pests (Insects and Mites). Pp. 175-186 *In: 2010 OSU Extension Agent's Handbook of Insect, Plant Disease and Weed Control.* Oklahoma Cooperative Extension Service, Stillwater, OK.
14. Royer, T.A. 2010. Control Suggestions for Small Grains Pests (Insects and Mites). Pp 271-276 *In: 2010 OSU Extension Agent's Handbook of Insect, Plant Disease and Weed Control.* Oklahoma Cooperative Extension Service, Stillwater, OK.
15. Royer, T.A. Control Suggestions for Sorghum Pests (Insects and Mites). Pp. 303-310 *In: 2010 OSU Extension Agent's Handbook of Insect, Plant Disease and Weed Control.* Oklahoma Cooperative Extension Service, Stillwater, OK.
16. Royer, T.A. Control Suggestions for Sunflower Pests (Insects and Mites). Pp 359-362 *In: in 2010 OSU Extension Agent's Handbook of Insect, Plant Disease and Weed Control.* Oklahoma Cooperative Extension Service, Stillwater, OK.

#### **Newsletters:**

##### *Plant and Soil Science Newsletter*

1. January 29, 2010. Armstrong, J. *ALS-resistant cheat found in Oklahoma.* Vol. 3, No. 2.
2. February 19, 2010. Royer, T. *Army cutworms reported in wheat fields.* Vol. 3, No. 3.
3. March 11, 2010. Hunger, B. *Wheat disease update.* Vol. 3, No. 4.
4. March 30, 2010. Royer, T. *Army cutworms in canola.* Vol. 3, No. 5.
5. April 9, 2010. Hunger, B. *Wheat disease update.*; Royer, T and K. Giles. "Scouting canola for diamond back moth." Vol. 3, No. 6.
6. April 23, 2010. Hunger, B. *Wheat disease update.*; Royer, T. "Brown wheat mite." Vol. , No. 7
7. July 2, 2010. Royer, T. *Garden webworm management in soybean.* Vol. 3, No. 10.
8. August 17, 2010. Armstrong, J. *Improving weed control for the 2010-2011 wheat crop.* Vol. 3, No. 11.
9. August 27, 2010. Armstrong, J. *Options of maretail control this fall and winter.*; Hunger, B and T. Royer. *Effect of planting date and seed treatment on diseases and insect pests of wheat.* Vol. 3. No. 12.
10. September 8, 2010. Royer, T. *"Get out and check pastures for fall armyworm."* Vol. 3, No. 13.  
*SERA-3 Meeting, San Juan, Puerto Rico, March 23, 2011*

11. October 26, 2010. Armstrong, J. *Getting ahead of next year's weed problems with fall-applied herbicides*; Hunger, B. *Control of foliar wheat diseases with fungicides*. Vol. 3, No. 14.
12. November 19, 2010. Hunger, B. *Wheat disease update*. Vol. 3, No 15.
13. November 19, 2010. Royer, T. *Winter grain mite in wheat*. Vol. 3, Issue 16.

#### Pest E-Alerts

1. Vol. 9, No. 1 ... Feb 3, 2010 --- *Turfgrass Disease in the Winter?* D. Smith and N. Walker.
2. Vol. 9, No. 2 ... Feb 22, 2010 --- *Time to Think about Controlling Leaf Curl Disease of Peaches and Nectarines.* D. Smith; *A New Tool Available for Prevention of Grapevine Trunk Canker Diseases*. D. Smith; *Wheat Disease Update*. R. Hunger; *Army Cutworms Reported in Some Wheat Fields*. T. Royer.
3. Vol. 9, No. 3 ... Mar 3, 2010 --- *Wheat Disease Update*. R. Hunger.
4. Vol. 9, No. 4 ... Mar 12, 2010 --- *Hay feeding and stable flies* J. Talley.
5. Vol. 9, No. 5 ... Mar 15, 2010 --- *Wheat Disease Update*. R. Hunger.
6. Vol. 9, No. 6 ... Mar 22, 2010 --- *Vegetable Transplant Health*, J. Damicone. *Wheat Disease Update*. R. Hunger.
7. Vol. 9, No. 7 ... Mar 23, 2010 --- *Army Cutworms Reported in Canola* T. Royer; *Plant Disease Corner - What we're seeing in the PDIDL!* Jen Olson.
8. Vol. 9, No. 8 ... Mar 25, 2010 *Wheat Disease Update*. R. Hunger. .
9. Vol. 9, No. 9 ... Apr 5, 2010 --- *Managing Pierce's Disease of Grape*, D. Smith; *Scouting Canola for Diamondback Moth*, T. Royer, *Wheat Disease Update*. R. Hunger.
10. Vol. 9, No. 10 ... Apr 8, 2010 --- *Don't Put Greenbugs Out of Mind Unless You Have 'Glanced' at Your Wheat Field*. T. Royer.
11. Vol. 9, No. 11 ... Apr 15, 2010 --- *Wheat Disease Update*. R. Hunger.
12. Vol. 9, No. 12 ... Apr 20, 2010 --- *Spring Dead Spot Season*. D. Smith. *Brown Wheat Mite Showing Up in Winter Wheat*. T. Royer; *Those Aren't Aliens Hanging from Your Red Cedar Trees*. D. Smith.
13. Vol. 9, No. 13 ... Apr 21, 2010 --- *Wheat Disease Update*. R. Hunger.
14. Vol. 9, No. 14 ... Apr 26, 2010 --- *Plant Disease Corner - April 2010, Large Patch is Active* D. Smith.
15. Vol. 9, No. 15 ... May 3, 2010 --- *Wheat Disease Update*. R. Hunger.
16. Vol. 9, No. 16 ... May 17, 2010 --- *Wheat Disease Update*. R. Hunger. .
17. Vol. 9, No. 17 ... May 19, 2010 --- *Wheat Disease Update*. R. Hunger.
18. Vol. 9, No. 18 ... May 24, 2010 --- *Wheat Disease Update*. R. Hunger.
19. Vol. 9, No. 19 ... May 27, 2010 --- *Pine Sawfly Activity Reported Across the State* E. Rebek.
20. Vol. 9, No. 20 ... May 28, 2010 --- *Pecan IPM - PIPE: An update and encouragement to scout* P. Mulder.
21. Vol. 9, No. 21 ... Jun 1, 2010 --- *Late Flush of Armyworms Generating Concern in Wheat*, T. Royer.
22. Vol. 9, No. 22 ... Jun 4, 2010 --- *Wheat Disease Update*. R. Hunger.
23. Vol. 9, No. 23 ... Jun 16, 2010 --- *Brown Patch is Active on Cool-Season Grasses* D. Smith.
24. Vol. 9, No. 24 ... Jun 30, 2010 --- *Pine Wilt Update, Garden Webworm Management in Soybean*. T. Royer.
25. Vol. 9, No. 25 ... Jul 2, 2010 --- *The Beetles are Coming! Japanese Beetles are Gaining Ground in Oklahoma* E. Rebek.
26. Vol. 9, No. 26 ... Jul 6, 2010 --- *Bagworm and Fall Webworm Management*. E. Rebek ; *Soybean Disease Update* J. Damicone.
27. Vol. 9, No. 27 ... Jul 13, 2010 --- *Pecan Scab Update*. D. Smith.
28. Vol. 9, No. 28 ... Jul 15, 2010 --- *Green Stink Bugs in Cotton*, T. Pitts; *Grasshopper Control in Late Planted Cotton* T. Pitts.
29. Vol. 9, No. 29 ... Jul 28, 2010 --- *Powdery Mildew on Pecans*. D. Smith; *Southern Blight in Ornamentals*. D. Smith.
30. Vol. 9, No. 31 ... Aug 16, 2010 --- *Pasture and Rangeland Pests from East to West; Effect of Planting Date and Seed Treatment on Diseases and Insect Pests of Wheat* T. Royer.
31. Vol. 9, No. 32 ... Aug 31, 2010 --- *Emergency Quarantine for Thousand Cankers Disease*. R. Grantham; *Fall Armyworms Should Be On Our "Scouting Radar" in Pasture and Seedling Wheat*, T. Royer.

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32. Vol. 9, No. 33 ... Sep 8, 2010 --- *Frogeye Leaf Spot of Soybean*. J. Damicone; *Bacterial Leaf Spot of Pumpkin.*, J. Damicone.
33. Vol. 9, No. 34 ... Sep 24, 2010 --- *Fall Armyworm Notice Part II: Check Your Pasture and Wheat!* T. Royer.
34. Vol. 9, No. 35 ... Oct 12, 2010 --- *Downy Mildew on Basil*. J. Damicone.
35. Vol. 9, No. 36 ... Nov 11, 2010 --- *Wheat Disease Update*. R. Hunger.
36. Vol. 9, No. 37 ... Dec 22, 2010 --- *Spotted Alfalfa Aphids in Alfalfa* P. Mulder.

#### *The Division Triangle (DASNR)*

14. November, 2010. "Biological Control of Saltcedar in Oklahoma."

#### **Newspaper**

##### *The Daily Oklahoman, Circulation 151,000.*

1. June 26, 2010 "Healthy population of fireflies lights up Oklahoma skies this season."
2. July 06, 2010 "Grasshoppers impact this year in Oklahoma uncertain."
3. September 13, 2010 "Spiders can be a problem in central Oklahoma."

#### **Television**

##### *Oklahoma Gardening (Viewership, 100,000)*

1. May 22, 2010. Managing Fleas and Ticks in the Landscape
2. June 19, 2010. Preventive Grub Control in Turf.

##### *Oklahoma Horizon (Viewership 20,000)*

3. December 12, 2010. "Bed bugs" hosted by Gail Banzet.

##### *Sunup (viewership 20,000).*

4. September 10, 2010. "Fall armyworm

#### **Radio**

##### *KOSU Public Radio*

1. November 5, 2010. "Everything you need to know about bed bugs" by Gail Banzet.

**PROGRAM INVOLVEMENT:** Collaboration with Cooperative Extension was excellent, with participation from OCES county, area and state specialists. The IPM Coordinator chairs the IPM Initiative Team, and is a member of 6 other Initiative Teams (Commercial Horticulture, Consumer Horticulture, Wheat Enterprises, Multi-Crops, Stored Wheat, and Turf). I am also a member of the Wheat Improvement Team which evaluates new wheat varieties that are being developed in Oklahoma.

Outside agency involvement included working with National Institute for Food and Agriculture, the Southern Region IPM Center, Great Plains Canola Association, Kerr Center for Sustainable Agriculture, Oklahoma Department of Agriculture, Food and Forestry, Oklahoma Feed and Grain Association, Oklahoma Golf Course Superintendents Association, Oklahoma Grape Growers Association, Oklahoma Invasive Plants Council, Oklahoma Pecan Growers Association, Oklahoma Pest Control Association, Oklahoma School Plant Managers Association, Oklahoma Sorghum Commission, Oklahoma Turf Growers Association, Oklahoma Turf Research Foundation,

*SERA-3 Meeting, San Juan, Puerto Rico, March 23, 2011*

Oklahoma Wheat Growers Association, Oklahoma Wheat Research Foundation, US Fish and Wildlife Service and the USDA Agricultural Research Service.

#### **COLLABORATORS**

Dr. Kristopher Giles, Professor, Entomology and Plant Pathology  
Dr. Joe Armstrong, Assistant Professor, Plant and Soil Science  
Dr. Jeff Edwards, Associate Professor, Plant and Soil Science  
Dr. Justin Talley, Assistant Professor, Entomology and Plant Pathology  
Ms. Kim Rebek Assistant Extension Specialist, Horticulture and Landscape Architecture  
Mr. David Hillock, Assistant Extension Specialist, Horticulture and Landscape Architecture  
Dr. Bradford Kard, Professor, Entomology and Plant Pathology  
Dr. Gina Peek, Assistant Professor, Human and Environmental Sciences.  
Mr. Kevin Shelton, Coordinator, Urban Pesticide Education. Entomology and Plant Pathology  
Mr. Charles Luper, Extension Associate, Entomology and Plant Pathology  
Mr. Shane Osborn, Associate Extension Specialist, SW Research and Extension Center.  
Mr. Jerry Goodson, Extension Specialist SW Research and Extension Center.  
Mr. Terry Pitts, Extension Specialist. SW Research and Extension Center.  
Dr. Norm Elliott, Research Leader, USDA ARS, Stillwater, OK.

**ADMINISTRATIVE SUPPORT:** IPM Oklahoma! received full support from the OAES/OCES administration (Dr. James Trapp, Dr. Ross Love, Dr. Jonathan Edelson, and Dr. Robert Whitson), Department Heads of Entomology and Plant Pathology, Horticulture and Plant Pathology, Plant and Soil Sciences and key clientele groups. Professional development opportunities the ESA meeting in San Diego CA, the SW Branch meetings in Cancun, Mexico, the SERA 003 meetings in Knoxville, TN, the Southwest Wheat Research and Extension Consortium in El Reno.

Respectfully submitted,

Tom A. Royer, Coordinator, IPM Oklahoma!

## SERA-IEG3 2010 ANNUAL REPORT FOR PUERTO RICO

Wanda Almodóvar

*Puerto Rico IPM Coordinator*

### **Program management:**

The Integrated Pest Management (IPM) program at the University of Puerto Rico is an effort within the PR Agricultural Extension Service (PRAES). The program promotes the development and use of IPM as a way to achieve ecological and economic sustainability of farms in Puerto Rico. Our goals are to represent the views of growers and other stakeholders, implement appropriate educational projects that address pest management priorities, and promote exchange of information among growers, agricultural professionals, and other stakeholders throughout the Island. The program's emphasis areas during 2010 were agronomic crops (citrus), specialty crops (herbs) and IPM support for pest diagnostic facilities. The IPM coordinator and collaborators have expertise in all the areas needed for program development and implementation. There are excellent professional relations with crops specialists, agricultural agents and researchers to work together as a team in joint extension and research activities. Collaborators are seriously concerned and committed with sustainability in Puerto Rico agriculture. IPM activities in the island include trainings, field demonstrations and commodity meetings to deliver IPM to farmers, extension agents and agronomists of the Department of Agriculture.

### **Program delivery:**

The IPM coordinator plans, coordinates and reports Extension IPM activities. Program strategic direction was achieved through participation of the IPM coordinator and IPM specialist in the commodity meetings and input of the PR Extension Agents, commodity leaders and personnel of the PR Department of Agriculture. The program put emphasis in educational materials; IPM guides, manuals and newsletters, and in the content of the websites of the Extension Crop Protection Specialists, <http://academic.uprm.edu/walmodovar>, <http://academic.uprm.edu/ofarrill> and <http://academic.uprm.edu/alvarado>. Surveys before and after trainings help us to evaluate program outputs and outcomes. Surveys administered to participants 6 months after the training sessions provide evidence of changes in behavior. The IPM Coordinator and IPM specialist collaborated with commodity team leaders to develop projects that address pest management needs and develop outreach activities.

### **Outputs:**

**IPM in Agronomic Crops:** In citrus the IPM specialist, the citrus commodity leader and the extension fruit specialist delivered an educational program to extension agents, agronomists of the Department of Agriculture and growers in identification and management of Citrus greening (Huanglobing) and its vector. Information about the program can be found at: <http://academic.uprm.edu/aalvarado>. Evaluations at the end of trainings assessed participant's knowledge of management tactics and provided information on how to improve the educational program.

**IPM in Specialty Crops:** The Herb IPM project included coriander and culantro. The IPM coordinator (Plant pathology specialist) and Vegetable specialist trained growers, Extension agents and agronomists of the Puerto Rico Department of Agriculture (PRDA) in identification and management of pests in herbs. Trainings were conducted in coordination with the leader of the Vegetable Commodity. Two fact sheets about production and identification and management of herb key pests were delivered to participants in the trainings. Assessment of the educational program was obtained through a brief evaluation at the end of the trainings and information obtained was used to develop educational materials (<http://academic.uprm.edu/walmodovar>). Also, the *SERA-3 Meeting, San Juan, Puerto Rico, March 23, 2011*

information detected by the Vegetable and Plant Pathology Specialists in routinely visits to hydroponic and field projects of these herbs and information obtained by samples observed and diagnosed in the Diagnostic Clinic helped us to improve the educational program.

IPM Support for Pest Diagnostics: Pest diagnostic service was provided to client's islandwide.

**Outcomes:**

IPM in agronomic crops (citrus): Activities resulted in increased knowledge of farmers, researchers and Extension personnel in the recently introduced citrus greening disease.

IPM in specialty crops (coriander and cilantro): Activities resulted in increased knowledge of producers in IPM and application of biorational pesticides.

IPM Support for Pest Diagnostics: About 180 reports were sent to clinic clientele and 68 email and phone requests answered. Stakeholders receive the report by mail or directly via email. The diagnostic plant clinic is available online at: <http://academic.uprm.edu/walmodovar/>.

**Educational activities:**

Alvarado, A., and F. Roman. (2010). Citrus greening identification and management, field diagnosis training. November 2010. 60 participants.

Alvarado, A., and F. Roman. (2010). Citrus greening identification and management training. October 2010. 45 participants.

Almodovar, W. (2010). Integrated management of diseases in vegetable and herb gardens conference. May 2010. 120 participants.

Alvarado, A. (2010). Integrated pest management in vegetable and herb gardens conference. May 2010. 130 participants.

Almodovar, W. and M. Irizarry (2010). Hydroponic vegetables integrated production training. May 2010. 45 participants.

Irizarry, M. (2010). Hydroponic vegetables integrated production training. June 2010. 20 participants.

**Program involvement:**

The Puerto Rico IPM Program is managed by the IPM coordinator and the IPM Specialist with inputs from the crop specialists, county agents and PR Department of Agriculture agronomists. Input for establishing the IPM needs is obtained from the annual commodity meetings where stakeholders meet with researchers, extension personnel and faculty members to discuss integrated crop management issues.

**Administrative support:**

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Administratively, the program was supported by the Director of the Puerto Rico Agricultural Extension Service (PRAES) and the chairman of the Crops and Agro-environmental Sciences Department at the University of Puerto Rico, Mayaguez Campus. One secretary and one IPM specialist are partially assigned to assist the program.

**Extension publications:**

Almodovar, W. (2010) The plant disease diagnostic clinic. Brochure. Agricultural Extension Service. University of Puerto Rico. Mayaguez Campus.

Almodovar, W. (2010) Identification and integrated management of diseases and insects in cilantro and coriander. Agricultural Extension Service. University of Puerto Rico. Mayaguez Campus.

Alvarado, A. (2010) Citrus greening disease. Poster. Agricultural Extension Service. University of Puerto Rico. Mayaguez Campus.

Alvarado, A. (2010) Citrus greening disease. Field guide. Agricultural Extension Service. University of Puerto Rico. Mayaguez Campus.

Zamora, J. (2010) Use of iodine to diagnose citrus greening in the field. Fact sheet. Agricultural Extension Service. University of Puerto Rico. Mayaguez Campus.

**South Carolina IPM Program Report: 2010  
2011 SERA-3-IPM Meeting, San Juan, Puerto Rico**



**Designated Coordinator:** Dr. Geoff Zehnder; [zehnder@clemson.edu](mailto:zehnder@clemson.edu)  
IPM & Sustainable Agriculture Programs B28  
Long Hall, Clemson University Clemson, SC  
29634

**Associate Coordinator:** Kelly Gilkerson; [kgilker@clemson.edu](mailto:kgilker@clemson.edu) IPM &  
Sustainable Agriculture Programs B30 Long  
Hall, Clemson University

**EIPM Program Management:** The Coordinator and Associate Coordinator devote 50% time to the IPM Program and 50% time to the Sustainable Agriculture Program. IPM Program responsibilities include:

- Responding to IPM related inquiries from stakeholders and government agencies as state contact person for IPM
- Facilitating stakeholder input into Extension IPM program planning
- Facilitating establishment of multi-disciplinary teams and coordination of Extension IPM outreach efforts
- Coordinating evaluation of Extension IPM programs and reporting on state IPM activities at regional and national meetings.
- Keeping current on IPM issues and opportunities by serving on regional and national IPM committees and grant review panels.
- Enhancing funding opportunities for pest management specialists and agents by promoting grant programs and assisting with proposal development
- Providing oversight for IPM program accounting and reporting
- Facilitating communication among project cooperators and stakeholders via an email list and program website ([www.clemson.edu/ipm](http://www.clemson.edu/ipm)).

Extension IPM (EIPM) project proposals are solicited internally via a call for proposals sent to state Extension IPM personnel. Proposals are reviewed by a panel consisting of Extension administration and the IPM Coordinator. Approvals are based on stakeholder identified needs, EIPM priorities and anticipated funding level. Successful proposals are integrated into a coordinated EIPM proposal developed by the IPM Coordinator.

For the 2010-2013 funding cycle a core IPM Program Advisory Committee comprised of the Clemson IPM Coordinator and Associate Coordinator, commodity team leaders, the Clemson Extension Director, and the Senior Extension Director for Small Farm Outreach at South Carolina State University provide oversight for the Extension IPM Program. The IPM Coordinator has collaborated



with members of the IPM Advisory Committee to review existing stakeholder identified priorities and to develop the three-year program of Extension IPM activities (outlined in the EIPM-CS proposal). The IPM Advisory Committee including commodity team leaders and key stakeholder representatives communicate regularly to review input from their representative stakeholder/commodity groups and to identify/fine-tune specific training topics and activities for the year.

The IPM Coordinator is responsible for management of the program grant funds and oversight of expenditures. The Coordinator and Associate Coordinator work with Clemson budget administration to establish separate accounts and budgets for each project leader; accounts are monitored on a monthly basis to ensure that budgets are not overspent. The Associate IPM Coordinator manages the IPM website and program communications and coordinates publicity for training events. The Clemson IPM and Sustainable Agriculture Programs maintain an email list of over 1200 stakeholders including Extension agents, NGO and industry representatives, growers and other agriculture professionals in South Carolina. In addition to email announcements, a calendar of events is made available on the IPM website ([www.clemson.edu/ipm](http://www.clemson.edu/ipm)). The EIPM Program facilitates linkages and collaborations among state IPM workers (1890 and 1862) and provides a bridge to connect IPM efforts in South Carolina with regional and national programs.

**Program Delivery and Evaluation:** Project/commodity team leaders have responsibility for development of training programs in targeted areas. This includes communications and program publicity, development of Extension publications and resources, education and training activities, and program evaluation. A logic model approach is used for program evaluation. That is, program inputs, outputs and outcomes are identified for each training activity. The IPM Coordinator and Associate Coordinator assist with development of evaluation protocols and participant surveys for training events. Short-term outcomes are measured based on written participant surveys to be completed on-site, or online surveys completed after training events. The surveys will assess the participant's level of satisfaction with the training, whether the training increased their comprehension of pest management practices such that they will be able to implement (growers) or teach (Extension agents) new pest management strategies, and also recommendations for improvement of future training events. To measure longer-term impacts select participants are surveyed 6-12 months after each event to identify evidence of outcomes and changes in behavior. Program evaluation results are discussed with IPM Advisory Committee members and at the annual stakeholder meetings and results are factored into planning for future events. The IPM Coordinator and Associate Coordinator collaborate with commodity team leaders to develop annual project reports and success stories for each commodity area.

### **Program Outputs in 2010**

**Agronomic Crop IPM (Jeremy Greene, Michael Marshall, Francis Reay-Jones):** Highlights of Extension activities and accomplishments include weekly distribution of a cotton/soybean insect newsletter during the summer of 2010 (14 issues), distribution of a scouting field card and lanyard with recommendations on scouting for stink bugs in cotton and treatment recommendations based on a revised dynamic threshold, presentations at the Beltwide Cotton Production Conferences and co-authored proceedings papers (10), updated insect control recommendations for insects important in cotton and soybean in SC, and eight in-service trainings for Extension agents including workshops on insect identification and control, a cotton insect scouting school, and a Bt cotton field day at the Edisto REC. Additional information is available at: <http://www.clemson.edu/public/rec/edisto/research/cotton.html>  
<http://www.clemson.edu/public/rec/edisto/research/soybeans.html>

<http://www.clemson.edu/public/rec/edisto/research/corn.html>

**Site Specific Nematicide Placement (SNP) Project** (*Ahmad Khalilian, Will Henderson*). Nematode management in cotton relies heavily on the use of nematicides, such as aldicarb (\$16/acre) or 1, 3- dichloropropene (\$36/acre). Farmers usually apply a uniform rate of one of these nematicides across an entire field or even farm. However, nematodes are not uniformly distributed within fields, and there may be substantial acreage in most fields where nematodes are either not present, or are not above the economic threshold. The Khalilian laboratory at Clemson has developed a site-specific nematicide placement system (SNP) system that is ready for commercial deployment and use by growers.

On-farm tests were conducted in three commercial cotton fields in South Carolina to evaluate the performance and effectiveness of the Clemson SNP technology. In each field, soil electrical conductivity (EC) maps were generated to allow visualization of textural differences referred to as "management zones". The soil EC zones were then used to develop a nematode management map for each field based on targeted sampling for assay and quantification of nematode population densities. GPS-based SNP equipment (retrofitted on growers' planters and sub-soilers) was used to apply nematicide at controlled rate to match the spatial distribution of nematodes. To document the effectiveness of the SNP systems, nematode samples were collected from these demonstration sites at planting, midseason and at harvest. Cotton in all farms was harvested with spindle type pickers equipped with yield monitors. An affordable map-based switch was developed to replace the existing manual on-off switch on growers' equipment to allow them to apply fumigant nematicides site- specifically. The SNP system reduced Temik 15G and Telone use from 40% to 47% without effecting cotton yields, resulting in an average savings of \$10/acre compared to conventional nematicide application programs.

A total of eight training workshops, field days, and presentations were organized during this reporting period. The Clemson Mobil Precision Ag Laboratory has been equipped with small table top simulators (replicas of field equipment) to demonstrate/educate our stakeholders on how site-specific application equipment work. The Mobile Lab allows the project team to travel to different growers' farms to demonstrate the SNP and other advanced IPM practices. The Lab also was used to demonstrate the benefits of the SNP technology to other producers in adjoining states (Moultrie, GA, October 2010 and Raleigh, NC, February 2011). This part of the program provided technical and promotional information that can support similar programs in other regions of the U.S.

Additional information is available at:

[http://www.clemson.edu/public/rec/edisto/research/precision\\_ag.html](http://www.clemson.edu/public/rec/edisto/research/precision_ag.html)

**Peach IPM: Precision Management of Brown Rot Disease.** (*Guido Schnabel, Achour Amiri, Phillip Brannen*). Clemson University and University of Georgia scientists developed an agar-based assay called the lipbalm tube assay to determine location-specific resistance profiles in *Monilinia fructicola*. The „Profile“ system was featured in "The Grower" and „American Fruit Grower“ magazines. It determines the sensitivity of local *Monilinia* populations to the three most commonly used fungicide classes (DMIs, BZIs, and QoIs) and identifies the most effective spray program for brown rot control based on location-specific resistance profiles. In addition, „Profile“ counteracts selection of pathogen populations for fungicide resistance, making disease management and the entire operation more sustainable for the future. The „Profile“ resistance monitoring program has been used since 2008 and almost all large-acreage producers from GA and SC are participating. It is estimated that savings

to Georgia growers resulting from reduced losses to brown rot disease is \$6-\$10 million per year with similar savings to growers in South Carolina. Additional information is available at:

[http://www.clemson.edu/extension/horticulture/fruit\\_vegetable/peach/diseases/br\\_profile.html](http://www.clemson.edu/extension/horticulture/fruit_vegetable/peach/diseases/br_profile.html)

**Beekeeper IPM** (*Mike Hood*). The small hive beetle (SHB) infests honey bee colonies throughout South Carolina, but most damage from this pest has occurred in coastal South Carolina where the beetle was active before its formal identification (Hood, 2001). This pest has become a major problem in many South Carolina beekeeping operations resulting in complete hive destruction in many cases. This project will promote an IPM approach to SHB control through in-person training and through the development and dissemination of an Extension publication that describes all currently available IPM strategies for safe and effective control of SHB. During 2010 research was done to compare the efficacy of three small hive beetle traps currently marketed in the US. These traps are an IPM tool for safely controlling small hive beetles inside beehives. Development of an Extension IPM booklet on small hive beetle IPM was begun with anticipated publication in late 2011. A series of fact sheets and other Extension publications on management of honey bee pests has been developed and are available at: <http://www.clemson.edu/extension/beekeepers/>

**Woody Ornamental IPM** (*JC Chong*). The project goal is to develop a comprehensive training and demonstration program on integrated management of wood-boring insects for the ornamental and shade tree nursery industry. The target insect pests include members of the ambrosia beetles, bark beetles, flathead borers, long-horned beetles/round-headed borers, clearwing moths and pyralid borers. Training workshops in 2010 were held in different geographic locations and each consisted of two sessions: a classroom instruction session on the biology, monitoring, identification and management of wood boring insects, and a field demonstration session at a local nursery in which the attendees learned how to deploy insect monitoring tools. For 2011, two nurseries, two botanical gardens and two Clemson University-affiliated research and education centers will host the field demonstration programs and share their management experience with the program attendees. The field demonstration projects will begin in mid-March. Two classroom training programs will be conducted in Georgetown and Spartanburg, SC in November 2011. Additional information is available at: [http://www.clemson.edu/public/rec/peedee/faculty\\_staff/chong.html](http://www.clemson.edu/public/rec/peedee/faculty_staff/chong.html)

**Vegetable IPM** (*Edoe Agbodjan, Anthony Keinath, Geoff Zehnder*).

**Diseases of Collards**. Downy mildew of collards is common in the southeastern United States, and fungicides have become an essential part of economical control strategies for the disease. Evaluation of various fungicidal formulations showed that potassium phosphite may be useful in a tank-mix with other fungicides applied to collards to prevent yield loss caused by downy mildew. The research indicates a potential increased economic return after the cost of potassium phosphate of \$144 per acre. Based on the average yield of collards, the addition of potassium phosphite could increase profits by \$555 per acre with a potential statewide impact of \$1.3 million.

**Training in Ecologically-Based Vegetable Pest Management**. Pest management information and strategies incorporated into the Vegetable IPM training program are adapted from a previously funded Southern Region SARE project led to develop a sustainable agriculture training curriculum for agriculture professionals. The curriculum, entitled "IPM for Organic Crops" was developed over four years by regional experts on disease, insect and weed management using research based information and recommendations, and is currently available on the eXtension Campus website <http://campus.extension.org>. The hands-on training is being conducted at the Clemson Organic Farm (Upstate region) and on small, diversified farms in other regions of the state. The Clemson Organic

Farm was established in 2001 and currently occupies approximately 15 acres on Clemson campus in an area dedicated for agricultural research, teaching and public outreach programs. The Farm serves as a resource for experiential learning in sustainable agriculture and organic farming and over the years has hosted many training events for Extension agents and farmers in all aspects of sustainable agriculture including IPM ([www.clemson.edu/sustainableag/student\\_farm.html](http://www.clemson.edu/sustainableag/student_farm.html)).

#### Ecologically-Based Vegetable Pest Management Extension Training Events: 2010

May 18-22: Insect pest management specialists meet to develop five Extension articles on insect pest management in organic vegetables; Clemson, SC. Articles to be published on eXtension.org.

June 5-6: Farm Tour at the Clemson Organic Farm. Four presentations on organic pest management organized in conjunction with the tour (approximately 150 attendees).

June 22-23: Ecologically Based Pest Management Workshop, Clemson University (76 attendees).

Sept. 1: NRCS state conservationist's tour of the tour of the Clemson Organic Farm and presentation on organic pest management (16 attendees).

Sept. 20: Workshop on Organic Pest Management, Coastal Research and Education Center, Charleston, SC (42 attendees).

Sept. 28: Organic Insect Pest Management Workshop, Clinton, SC (68 attendees)

The following vegetable pest management training workshops are planned for 2011:

June 4-5: Fundamentals of Organic Pest Management and Farm tour: Clemson Organic Farm

June 21-22: Ecologically Based Pest Management Workshop, Coastal Research Center, Charleston, SC and demonstration at a local organic farm

July 28: Organic Disease Management; Presbyterian College and Bush River Farm, Clinton, SC

September: Organic Weed Management: Clemson Organic Farm

IPM Training for Limited Resource and Minority Vegetable Farmers (SCSU/1890 Extension. The overall goal of the SCSU Extension Small Farm Program is to provide outreach and assistance to local farmers in order to slow the rapid decline in numbers of small, minority farms in the South Carolina low country, and to reverse the trend of economic decline of small/minority farmers and assist them with the retention of their farm land. As part of this effort the EIPM Training Project teaches farmers how to implement cost-effective pest management strategies to produce high quality produce for local retail and wholesale markets. Twenty two (22) small, part-time, and limited resource farmers in Hampton, Allendale, Beaufort, Colleton, and Jasper Counties participated in the project during 2010. An Integrated Agriculture Resource Management Team was organized comprised of Cooperative Extension agents and specialists, USDA representatives, county agriculture agency representatives, local farmers and school and community volunteers to provide resources, assist with planning, and to support program efforts. A central vegetable IPM demonstration site was established along with four

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on-farm demonstration sites for IPM training. A total of eight vegetable field days and farm tours were organized for participating farmers throughout the growing season to teach farmers about sustainable vegetable production and IPM practices.

### **Publications**

Please refer to program websites listed above for links to Extension IPM publications

## CRIS REPORT FOR TENNESSEE EIPM

Submitted by Scott Stewart and Karen Vail, 2/18/2011

**PROJECT NUMBER:** TENN-STEWART **SPONSOR AGENCY:** NIFA

**START DATE:** Jun 15, 2009 **TERMINATION DATE:** Jun 14, 2010

**GRANT PROGRAM:** EIPM COORDINATION

**GRANT PROGRAM AREA:** Smith-Lever 3d

### OUTPUTS

#### Outputs for IPM in Agronomic Crops, Including Cotton, for Each Objective

- 1) Deliver multidisciplinary IPM training and resources to the network of Extension personnel in Tennessee including UT Extension.
- 2) Cooperate with county programs in delivering multidisciplinary IPM programs to end-user groups such as growers, distributors, independent crop consultants and other agricultural professionals.
- 3) Provide IPM training to stakeholders on a state, regional and national level.

To satisfy objectives 1-3, multiple training programs were delivered to various stakeholder groups (see table below). Target audiences included growers, Extension agents, private consultants, and agricultural industry professionals. Almost all programs were multidisciplinary and also included educational programs related to IPM for insects, disease and weed control.

#### Extension educational programs presented with P.I. (Stewart) involvement during the grant period.

Descriptive title, including dates and location	# Sessions / # Attending
Ask the experts. Summer Celebration. WTREC, July 2009.	-- / 40+
Cotton Tour and Wheat Production Conference, September 2009.	2 / 120
IPM Row Crops In-service for Agents in West Tennessee, December 2009.	1 / 45
Row Crop In-service Training - Middle Tennessee (presentation on insect control), January 2010.	1 / 25
2010 Row Crops In-service Training-Middle TN, January 2010.	6 / 14
Entomology In-service (Centra) - Row Crops Update, March 2010.	2 / 60
Information exchange - status of tarnished plant bug problems in cotton (educational event for State Dept. of Ag. and EPA representatives: LA, MS, AR, TN, MO). Presented introductory information and well as round-table discussion. Stoneville, MS, August 2010.	1 / 35
Insect Control Update and Monsanto Technology Showcase (field day), Union City, August 2009 (invited).	4 / 300
IPM 101 & Resources for IPM. Nashville, TN. IPM Workshop for United South and Eastern Tribes, Inc., Sept. 2009 (also was program coordinator).	1 / 12
IPM in Tennessee. University of Arkansas Extension IPM Retreat, Stuttgart, September 2009, invited.	1 / 60
Performance of new insecticide traits in field corn. Mississippi State University Row Crops Short Course, Dec. 2009, invited.	1 / 80

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Row-crop entomology roundtable, Mississippi State University, Oct. 2009 (invited discussion leader).	1 / 65
Soybean and grain insect control update. Gibson Co., Feb. 2009.	1 / 67
Soybean IPM. Milan, TN. Look at Them Beans Field Day, Sept. 2009.	4 / 150
Soybean Scout Schools. Fayette, Dyer, Coffee and Lincoln Counties. July 2009.	4 / 160
Wheat IPM. Jackson, TN. Wheat Production Conf., Sept. 2009.	1 / 110
Benefits and methods of scouting soybean, Middle Tennessee Grain Conference, January 2010, Manchester.	1 / 70
Consultant's training and round-table discussion, February 2010, Jackson.	1 / 10
Cotton insect management - state of the union, Cotton Focus annual meeting, February 2010, Jackson.	1 / 225
Cotton Scout School, May 2010, Jackson.	1 / 70
Insect control and new technologies, Tennessee Grain and Soybean Producers Conference, Dyersburg, February 2010.	1 / 200
Managing insect pest in corn, Cotton & Rice Conservation Tillage Conference, January 2010, Tunica, MS (invited).	2 / 90
Managing spider mites (cotton tour), Milan No-till Field Day, July 2010, Milan, TN.	8 / 490
Producer roundtable - cotton insect management, Beltwide Cotton Conferences, January 2010, San Antonio.	1 / 40
Row crop insect management update for COOP, February 2010, Alcoa, Smyrna and Jackson.	3 / 180
Row crop insect management updates as part of county crop production workshops: Lake, Dyer, Lincoln, Gibson, Haywood, Crockett, Weakley, Henry, Obion, Lauderdale, Tipton/Shelby and Cannon. January – March 2010, Presentations tailored to suit location.	13 / 550
Soybean Scout Schools, July 2010, Middle and West Tennessee.	4 / 140

Substantial on-line resources were further developed to help disseminate IPM programs. [Utcrops.com](http://Utcrops.com) is utilized extensively by all clientele groups. This website is also used to further disseminate newsletters that are also directly delivered to many subscribers. Other types of information included on this website include pest control manuals, photographic libraries, variety trial results, etc. (see below). A number of on-line and/or hard copy publications were developed to further UT IPM educational programs (these publications are listed elsewhere in this report).

#### **4) Perform pest survey and detection programs to support IPM decision making in Tennessee**

The primary pest detection efforts performed in 2009/2010 were the running of pheromone moth traps for pests including the tobacco budworm, bollworm, beet armyworm and southwestern corn borer. Detection programs for exotic, potentially high impact pests are performed annually. For example, IPM colleagues at UT (Newman and McClure) continued to run a sentinel plot detection program for the detection of soybean rust. Other activities included boll damage assessments in cotton and resistance monitoring of bollworms use vial assay tests on moths. These programs are vital for determination and

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communication of significant pest threats to field crops in Tennessee. Results were published regularly in weekly newsletters that were also available on [Utcrops.com](http://Utcrops.com).

**5) Perform applied research and demonstration programs that provide unbiased evaluations of IPM tools and strategies.**

Numerous applied research and demonstration tests were performed, many in cooperation with other IPM scientists from the Midsouth. The results of these efforts were delivered at various meetings, publications and on-line resources as indicated previously. Thus, specific outputs will not be duplicated in this report. However, results for many of these efforts are also made available on-line (links below).  
<http://www.utextension.utk.edu/fieldCrops/MultiState/MultiState.htm>  
[http://www.utextension.utk.edu/fieldCrops/cotton/cotton\\_insects/publications.htm](http://www.utextension.utk.edu/fieldCrops/cotton/cotton_insects/publications.htm)

**6) Evaluate the impact of extension IPM efforts on end-user behaviors and improving sustainability.**

UT Extension collects impact assessment data from county Extension personnel and stakeholders. SUPER (or System for University Planning Evaluation and Reporting) was used by county and state Extension scientists to report program activities and impact. This included enumeration of contact hours with clientele and changes in IPM behaviors by stakeholders. In 2009, Agents and specialists reported 8,147 contact hours with clients related to IPM in cotton, soybean and corn. Tables 2 and 3 document some program impact data during 2009. 2010 data has not yet been summarized. Specific tools were also used to evaluate some individual programs such as surveys of county agents following In-service trainings and stakeholders at county and statewide production conferences (e.g., Cotton Focus, Grain Conferences, Scout Schools, etc.). These data are used to determine needs assessment and help improve the quality of training programs to fit clientele demands. In 2010, Survey Monkey ([www.surveymonkey.com](http://www.surveymonkey.com)) was used for the first time to help evaluate the effectiveness of some programs and to determine clientele needs. This survey tool generates rapid and easily summarized results.

Selected impact indicators from UT Extension reporting system (SUPER, 2009).

Did you ...	No. Positive Client Responses		
	Cotton	Soybean	Corn
adopt UT resistance management guidelines for ..... [pests]?	236	815	575
use UT resources to make changes in production practices?	239	901	537
increase income by following UT BMP recommendations?	259	968	690

Evaluation at 2009 Cotton Focus statewide production meeting. Total attendees ≈ 270, 38 total respondents representing about 100,000 cotton acres. Source: Dr. Chris Main, UT Cotton Specialist.

Question (abbreviated version)	Response
Did you use UT as a source of information for crop production?	Yes = 100%
Did you change your production practices based on information provides by UT?	Yes = 87%
What was the value of .....UT pest management recommendations in 2008?	\$27.33 / Acre

**School IPM Outputs for Each Objective**

**1) Increase school IPM adoption in rural areas through demonstrations**

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To “get our foot in the door” to increase IPM adoption, fire ant management demonstrations were conducted on the grounds of at least one school in three rural school systems (Rhea County, Cumberland County, and Moore County) located in different Department of Education regions (Southeast, Upper Cumberland and South Central). Fire ants are a serious pest around schools: they are a medical concern due to their stings, can disrupt the learning environment and can interfere with electrical equipment. Conducting the fire ant management demonstration prior to the indoor IPM program allowed us to demonstrate our commitment to managing and reducing risks from pests and pesticides at schools and establish a rapport with the school personnel, and provided a segue into an indoor IPM program. Tennessee law requires indoor pesticide applications to be conducted under a licensed person, but this does not apply to the grounds. Often school personnel are making pesticide applications without any training. The new school fire ant management publication was used to train school personnel in fire ant management. In addition to visits for fire ant treatments and 6 weeks of evaluation, at least 4 inspections of the interior pest management program were alternated with monthly phone calls to determine if our recommendations were being followed.

School pest management decision-makers were kept current on pest management strategies in schools through a newsletter. We have a current database that includes pest management decision-makers’ contact information at each Tennessee school district. A newsletter is distributed via e-mail to remind them of school IPM practices and to prepare them for seasonal pest problems. Pest management professionals (PMPs) involved with the demonstrations and all county Extension agents were emailed the newsletter so they are kept informed. The school system’s pest management decision-makers were asked to forward the newsletters to appropriate staff and their contracted pest management technicians.

## **2) Provide IPM training to stakeholders on a state-wide, regional and national level**

School IPM meetings were also conducted with other school systems, such as Franklin Co and Jefferson Co., to interest them in conducting IPM demonstrations. Posters or booths on using fire ant management demonstrations and/or school demonstrations to increase school IPM adoption were presented at the local (Moore County, Giles County), state (Tennessee School Plant Management Association, Tennessee Parent Teacher Association, Environmental Health Association, Tennessee Educators Association, Smoky Mountain Pest Management Conference, Grounds Maintenance Short Course), regional (Southeastern Branch Entomological Society of America) and national levels (Entomological Society of America and the Imported Fire Ant and Invasive Ant Conference). Pest management professionals seeking to be certified in category 7 or licensed in General Rodent and Pest Control learn about school IPM concepts in UT Pesticide Safety Education Program training they receive prior to testing and in their study manuals.

A School IPM Advisory Board Meeting was conducted in Nashville and simultaneously broadcasted interactively via the web to the counties participating in the school IPM demonstration. Members attending the meeting represented TN Dept of Public Health, Environmental Section; TN Dept. of Environment & Conservation; pest management professional from rural areas and those participating in the demonstrations, environmental advocates, and Extension agents and a school facility director from the demonstration counties (Cumberland, Moore and Rhea).

We actively participate in the Southern Region School IPM Work Group and the eXtension urban integrated pest management community of practice, editing web and written materials for the eXtension web site and participating in the conference calls. Much of our activities and materials pertaining to school IPM are made available via the [schoolipm.utk.edu](http://schoolipm.utk.edu) web site. Web pages have been

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revised to reflect the new publications produced, to archive the newsletter, *Pests and Pesticides in Child-serving Facilities: An IPM Newsletter*, to provide a list of fire ant products registered for schools, and to record our activities.

### **3) Encourage school IPM adoption through an Extension agent grass roots effort**

In 2009, the University of Tennessee Urban IPM Lab, in cooperation with UT Extension agents, undertook another strategy to increase integrated pest management (IPM) adoption in Tennessee's schools. About 50 Extension Agents received an in-service training on child-serving facility IPM. Extension agents were also involved in a grass-roots effort to get school systems to adopt IPM. Agents were requested to hand deliver a logbook binder and other educational materials introducing school IPM to the school districts' pest management decision-makers in their county. The Agents delivered these materials with the short speech provided by our program and asked the school to contact them, or the school IPM program at UT, to schedule a more detailed discussion.

### **4) Evaluate the impact of extension IPM efforts on school IPM adoption through the UT YEAH online school pest management survey and SUPER.**

School pest management decision-makers were emailed a password and user name and invited to complete the UT YEAH online school pest management survey for each school in their system or to forward the email to a contact person (IPM coordinator) in each school to have them complete the survey. Extension Agents had the opportunity to record their school IPM activities in the UT Extension's online reporting system, SUPER (System for University Planning Evaluation and Reporting).

## **OUTCOMES / IMPACTS**

### **Agronomic Crops (Including Cotton)**

Specific outcome and impacts were partly outlined above under program evaluation. Multiple evaluation tools indicated that clients routinely used UT IPM recommendations for multiple crops. Educational resources such as the internet and newsletters were widely utilized by clientele groups. In 2010, Google analytics software was installed onto the [www.utcrops.com](http://www.utcrops.com) web site. This will allow much more detailed evaluation of how much and what resources are being utilized.

Some specific impacts include: 1) cotton growers estimated an average \$27 per acre value of IPM information provided by UT, thus, have a perceived value of over 80 million dollars during 2009 in Tennessee; 2) IPM and crop management newsletters were directly and indirectly distributed to several thousand clients during 2009 and 2010; 3) insect pest management recommendations were delivered as hard copies to over 1,500 clients, 4) face-to-face clientele training programs directly contacted over 2,000 clients who directly impact IPM in cotton, corn, soybean, wheat and other crops; and 5) applied research and demonstration programs were used as educational tools and to develop or validate various IPM recommendation in corn, cotton, soybean and wheat.

### **Increase school IPM adoption**

In 2009, an evaluation at the hands-on school IPM demonstration workshop including indoor and outdoor pest management indicated that the 49 school personnel (kitchen, maintenance, and custodial staff, and facility directors) trained increased their knowledge of IPM by an average 21 points or 34%. The average post-training quiz of 82% indicated that upon completion of training the target audience had a good understanding of IPM and would be prepared to aid in the demonstration (<http://schoolipm.utk.edu/>).

The three Tennessee school systems (Cumberland, Moore and Rhea counties) , which are well on their way to using high level IPM, will be used to demonstrate IPM to surrounding school systems in 2010 and subsequent years.

## **PARTICIPANTS**

### **Agronomic Crops (Including Cotton)**

Besides County Agents, other UT Extension personnel who were involved in the planning and delivery of agricultural IPM programs included: Hayden “Gene” Miles, Extension Area Specialist, [hmiles1@tennessee.edu](mailto:hmiles1@tennessee.edu); Robert Williams, Extension Area Specialist, [jwilli31@tennessee.edu](mailto:jwilli31@tennessee.edu); Chuck Danehower, Farm Management, [cdanehow@tennessee.edu](mailto:cdanehow@tennessee.edu); Dr. Melvin Newman, Professor of Plant Pathology, [manewman@utk.edu](mailto:manewman@utk.edu); Dr. Larry Steckel, Associate Professor and Weed Science Specialist, [lsteckel@utk.edu](mailto:lsteckel@utk.edu); Dr. Russ Patrick, Professor and IPM Specialist, [russ1212@tennessee.edu](mailto:russ1212@tennessee.edu); Dr. Chris Main, Assistant Professor and Cotton and Small Grain Specialist, [cmain@utk.edu](mailto:cmain@utk.edu); and Dr. Angela Thompson McClure, Associate Professor and Corn and Soybean Specialist, [athompson@utk.edu](mailto:athompson@utk.edu). Regionally, university research, extension and industry collaborated on many projects (as indicated by authorship on the publications list).

Advisory groups such as the State Support Cotton Incorporated Committee, the Tennessee Soybean Promotion Board, and the Agricultural County Agent Association are key partners to help fund and disseminate IPM programming. These groups serve a vital role in needs assessment.

### **School IPM**

The IPM in Schools Program was initiated in 1996 by Vail, as a joint venture between the University of Tennessee and the Tennessee Department of Agriculture (TDA), Division of Regulatory Services at the request of TDA. The founding of UT YEAH in 2001 with colleagues from Family and Consumer Science (Martha Keel, [mkeel@utk.edu](mailto:mkeel@utk.edu)) and the College of Social Work (Mary Rogge, [mrogge@utk.edu](mailto:mrogge@utk.edu)) at UT expanded the program to include all child-serving facilities (youth, environment and health, <http://utyeah.utk.edu>). Pat Barnwell, student assistant, and Jennifer Chandler, Research Specialist II, support Dr. Vail’s efforts at the University of Tennessee.

The school IPM state advisory board provided valuable input into the school IPM program. This group is multidisciplinary and has included members from most stakeholder groups such as Urban Entomology, UT Extension; Pesticide Applicator Training, UT Extension; county Extension agents, state government agencies (e.g., Dept. of Agriculture, Board of Education, Dept. of Education, School Board Assoc.); pest management professionals and their associations; environmental advocates; schools; PTA; and a state education association.

Vail is an active member in the Southern Region School IPM Working Group (<http://www.sripmc.org/schoolIPM/members.cfm>) which consists of 54 members from universities, schools, pest management companies, pesticide manufacturers, USDA, EPA, state pesticide regulatory agencies or Extension. Vail also is a member of the eXtension urban integrated pest management community of practice ([http://www.extension.org/pages/Urban\\_Integrated\\_Pest\\_Management\\_Membership](http://www.extension.org/pages/Urban_Integrated_Pest_Management_Membership)) which includes 28 university faculty from across the nation. Communications with both of these entities strengthens the University of Tennessee’s programs.

## **TARGET AUDEINCE**

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### **Agronomic Crops (Including Cotton)**

The primary target audiences for our agronomics crops IPM program includes growers, county extension agents, private consultants, pesticide distributors, and other agricultural professionals.

### **School IPM**

The primary target audiences for the school IPM program include school personnel (such as facility directors, custodians, kitchen and maintenance staff, teachers, students and others), pest management professionals, and county Extension agents. Other audience members include the UT Pesticide Safety Education Program, state government agencies (e.g., Dept. of Agriculture, Dept. of Health, Board of Education, Dept. of Education, School Board Assoc.); environmental advocates; parent-teacher organizations; and a state education association.

## **PROJECT MODIFICATION**

### **Agronomic Crops (Including Cotton)**

There major modifications were made in our approach, and activities closely matched what was proposed. However, we have incorporated some new and better evaluation tools to evaluate our IPM program. These include SurveyMonkey and Google Analytics (for web resources). A newly developed news blog for crop management ([www.utcrops.com/news](http://www.utcrops.com/news)) was recently launched which will provide more interaction with clients via a “social networking” approach.

### **School IPM Evaluation Systems**

The online survey failed to produce significant activity. Only four school systems entered data and most of them had to call us for assistance because the survey failed to submit or because of other computer issues. After consultation with our IT department, we first intended to use a software program designed for surveys that would not require our IT folks to write code as they had done in the past. We later decided that the survey design was not the only impediment. We had requested each school to submit a survey. This would require some systems to submit 142 surveys. While we had intended to reward each school with a certificate and posting to our website listing their IPM level, this was not enough incentive for them to participate. Thus, we’ve modified the survey for 2010 and subsequent years. The survey format will be changed to a phone survey, reduced and simplified to include 17 questions and to be completed for the school system and not for each school. Simplifying it to 17 questions will no longer allow us to collect the detailed data as in the past, but will allow us to discern whether schools are using IPM. Much of the detailed data needed to complete impacts as outlined in the logic model will be lost. But we can’t provide impacts if the participants aren’t willing to provide the detailed data, so this was the best improvise we could devise. Also, the phone survey will allow us to further build our rapport with the school systems as they learn to recognize us.

Most Extension agents failed to record their school IPM activities in the UT Extension’s online reporting system, SUPER (System for University Planning Evaluation and Reporting). As most of their requested activity required making a small speech to their county’s school systems and did not require them to deliver a program and measure impacts, it is possible they did not take the time to report this activity in the system. It is unlikely that the data recording from this group will improve in the future and thus this will not be a reliable indicator of agent effort.

## **PUBLICATIONS LIST**

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**Agronomic Crops (Including Cotton) - Extension and research publications with P.I. (Stewart) involvement during the grant reporting period.**

- Stewart, S. (editor). 2009, 2010. IPM Newsletter (update for field crops and their pests) – 29 and 23 issues were widely distributed to clientele groups across the region in 2009 and 2010, respectively. [http://www.utextension.utk.edu/fieldCrops/cotton/cotton\\_insects/ipmnewsletters.htm](http://www.utextension.utk.edu/fieldCrops/cotton/cotton_insects/ipmnewsletters.htm)
- Akin, D. S., S. D. Stewart, M. B. Layton and J. A. Mills. *In Press*. Efficacy of cotton expressing pyramided *Bacillus thuringiensis* insecticidal proteins against lepidopteran pests. *Midsouth Entomol.*
- Tindall, K. V., S. D. Stewart, F. L. Musser, G. M. Lorenz, W. Bailey, J. House, R. Henry and D. Hastings. 2010. Distribution of long-horned beetle, *Dectes texanus*, in soybeans of Missouri, western Tennessee, Mississippi, and Arkansas. *J. Insect Sci.*, Vol. 10, Article 178.
- Musser, F. L., G. M. Lorenz, S. D. Stewart, R. D. Bagwell, B. R. Leonard, A. L. Catchot, K. V. Tindall, G. E. Studebaker, et al. 2009. Tarnished plant bug (Hemiptera: Miridae) thresholds for cotton before bloom in the Midsouth of the United States. *J. Econ. Entomol.* 102(6): 2109-2115.
- Musser, F. R., A. L. Catchot, S. D. Stewart, R. D. Bagwell, G. M. Lorenz, K. V. Tindall, G. E. Studebaker, et al. 2009. Tarnished plant bug (Hemiptera: Miridae) thresholds and sampling comparisons for flowering cotton in the midsouthern United States. *J. Econ. Entomol.* 102(5): 1827-1836.
- Stewart, S. D., F. L. Allen, and C. Graham. *In press*. Evaluation of seed treatments on stand establishment and yield of switchgrass. *Arthropod Management Tests*, 2011.
- Stewart, S. and S. Steckel. *In press*. Evaluation of foliar-applied insecticides for the control of tarnished plant bugs in cotton, 2010. *Arthropod Management Tests*, 2011.
- Stewart, S. and S. Steckel. *In Press*. Evaluation of foliar-applied insecticides for the control of tarnished plant bugs and stink bugs in cotton, 2010. *Arthropod Management Tests* 2011.
- Musser F. R., G.M. Lorenz, S. D. Stewart and A. L. Catchot, Jr. 2010. 2009 Soybean Insect Losses for Mississippi, Tennessee and Arkansas. *Midsouth Entomol. Report*, Vol. 3(1): 48-54. [www.midsouthentomologist.org.msstate.edu](http://www.midsouthentomologist.org.msstate.edu).
- Stewart, S. D., et al. 2010. Standardized evaluation of miticides in the Midsouth. Pp. 1111-1113 in *Proceedings Beltwide Cotton Conf.*
- Cook, D. R, et al. (including Stewart). 2010. In-season use of Temik for insect management in cotton. Pp. 1123-1131 in *Proceedings Beltwide Cotton Conf.*
- Gore, J., et al. (including Stewart). 2010. Bioassays and management of cotton aphids with neonicotinoids and sulfoxaflo. Pp. 1207-1211 in *Proceedings Beltwide Cotton Conf.*
- Adamczyk, J. J., et al. (including Stewart). 2010. Summary of the insect research and control conference producer roundtable. Pp. 39-42 in *Proceedings Beltwide Cotton Conf.*
- Stewart, S. 2010. Rotten bugs – implications of insect feeding on boll rots. Pp. 243-244 in *Proceedings Beltwide Cotton Conf* (invited).
- Musser, F. R., et al. (including Stewart). 2010. Pyrethroid resistance monitoring for bollworms. Pp. 1259-1264 in *Proceedings Beltwide Cotton Conf.*
- Akin, D. S, et al. (including Stewart). 2010. Evaluation of automatic insecticide applications following preventative insecticides for thrips: preliminary results from a regional project. Pp. 1119-1121 in *Proceedings Beltwide Cotton Conf.*
- Musser F. R., S. D. Stewart and A. L. Catchot. 2009. 2008 Soybean Insect Losses for Mississippi and Tennessee. *Midsouth Entomol. Report*, Vol. 2(1): 42-46. [www.midsouthentomologist.org.msstate.edu](http://www.midsouthentomologist.org.msstate.edu).
- Stewart, S.D., C. R. Patrick and A. McClure. 2010-2007 (annually revised). *Field crops insect control recommendations: cotton, soybean, field corn, sorghum, wheat and pasture*. University of Tennessee Extension. PB1768, 40 pp. [http://www.utextension.utk.edu/fieldCrops/cotton/cotton\\_insects/InsectBook.htm](http://www.utextension.utk.edu/fieldCrops/cotton/cotton_insects/InsectBook.htm)
- EPP Faculty (including Stewart). 2010-2003 (annually revised). *Insect and plant disease control manual*.
- SERA-3 Meeting, San Juan, Puerto Rico, March 23, 2011*

University of Tennessee Extension. PB1690 (field crops insect section).

<http://eppserver.ag.utk.edu/redbook/redbook.htm>

McKinley, T. L., D. C. Gerloff, S. D. Stewart, and et al. 2010-2009. Field crop budgets for 2009. University of Tennessee Extension, AE09-11. <http://economics.ag.utk.edu/budgets.html>

Catchot, A., S. D. Stewart, Smith, J., MacGowen, J., Gore, J., Daves, C., Andrews, G., and Musser, F., et al. 2009. Soybean insect identification guide. Mississippi State University Extension, Pub. 2542.

<http://msucares.com/pubs/publications/p2543.pdf>

Daves, C., A. Catchot, S. Stewart, et al. 2009. Corn Insect Identification. Mississippi State University Extension, Pub. 2252. <http://msucares.com/pubs/publications/p2252.pdf>

Catchot, A., S. D. Stewart, et al. 2009. Cotton Insect Identification Guide. Mississippi State University Extension, Pub. 1640. <http://msucares.com/pubs/publications/p1640.pdf>

Stewart, S. D., Lorenz, G., Musser, F., Tindall, K., Bagwell, R., Jackson, R., Catchot, A., and Studebaker, G., et al. 2009. Mid-south multi-state evaluation of treatment thresholds for tarnished plant bug in pre-flowering cotton. University of Tennessee Extension, W221.

[http://www.utextension.utk.edu/fieldCrops/cotton/cotton\\_insects/pubs/W221PrebloomThreshold.pdf](http://www.utextension.utk.edu/fieldCrops/cotton/cotton_insects/pubs/W221PrebloomThreshold.pdf)

Catchot, A., Lorenz, G., Tindall, K., S. D. Stewart, Bagwell, R., R. Leonard, Jackson, R., Musser, F., and Akin, D. S., et al.. 2009. Midsouth multistate evaluation of treatment thresholds for tarnished plant bug in flowering cotton. Mississippi State University Extension, Pub. 2561.

<http://msucares.com/pubs/publications/p2561.pdf>

### **School IPM - Extension and research publications with P.I. (Vail) involvement during the grant reporting period.**

Vail, K. M., and J. Oliver. 2010. Managing Fire Ants in and around Tennessee's Schools. PB 1788 University of Tennessee Extension and Tennessee State University.

Vail, K. M., J. P. Parkman, M. W. Keel and M. Rogge. 2010. Suggested Guidelines for Managing Pests in Tennessee's Schools: Adopting Integrated Pest Management. PB 1603. University of Tennessee Extension.

Vail, K. M., M. W. Keel, J. P. Parkman and M. Rogge. 2010. Getting Started with IPM in Child-serving Facilities. SP 674 University of Tennessee Extension.

Vail, K. M., J. Chandler, P. Barnwell, and J. Maples. 2010. Using Fire Ant Demonstrations to Open the School IPM Door. Conference Proceedings the 2010 Imported Fire Ant and Invasive Ant Conference. Little Rock, AR April 19-22, pp.104-114.

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**SERA-IEG3 2010 Annual Report**  
**Texas AgriLife Extension IPM Program**

**Program Management**

Texas AgriLife Extension's Integrated Pest Management Program conducted diverse and effective programs in all areas of the state in 2010. Program professional staff included Charles Allen, Statewide Program Coordinator, seventeen Extension Agents-IPM, and seven Extension Program Specialists-IPM. The Extension Agents work with producers of field crops in county or multicounty units located in the primary field crop production areas of the state. Four of the Extension Program Specialists work in Texas' major cities with urban clientele. The remaining three Extension Program Specialists work with specific disciplines and clientele groups. One leads the pecan IPM program for the state, one leads the IPM program for nursery and greenhouse growers, and one leads the state-mandated, school IPM program statewide. Each extension professional has organized a unit steering committee comprised of local stakeholders which provides guidance and direction for his or her unit. Texas Pest Management Association (TPMA) is an over-arching stakeholder group with representation from individual units and commodity groups. TPMA provides support, direction, hiring and financial services for the programs.

The Texas AgriLife IPM Program received \$311,500 in USDA-NIFA EIPM-CS COORDINATION Funding for 2010. The state of Texas provided \$1,151,932 to support Texas IPM programs and \$394,265 to support Texas Fire Ant IPM. IPM Agents and Program Specialists sought external funds to support and improve their programming. They obtained a total of \$761,390 from growers, ag. businesses, granting agencies, fee based programming and other sources to improve and supplement their programming. The Statewide IPM Coordinator wrote or co-wrote 10 grant proposals (USDA NIFA 5, TDA 3, USDA APHIS CPHST 1, and EPA 1) requesting a total of \$1,699,562 in funding support for IPM programming with collaborators. Four of these proposals were funded (USDA NIFA 2, USDA APHIS CPHST 1, and EPA 1) providing \$634,795 to support IPM collaborations. Some of these dollars supported multi-year projects.

**Program Delivery**

***Program Outputs***

IPM Agents and Program Specialists were very busy conducting educational programming in 2010. The group wrote 226 extension newsletters which reached a total of 73,818 stakeholders and they wrote articles for another 38 newsletters for private and public local newsletters which reached another 22,254 people. Members of the group were featured 296 times on radio programs and 34 times on TV programs. Texas AgriLife Extension produced nine press releases from their work. They wrote 37 articles in national trade journals which reached 302,394 people and they wrote seven articles for state trade journals which reached another 78,600 people. The group wrote or co-wrote 6 peer reviewed publications, 22 abstracts and proceedings, 10 extension publications and five fact sheets. They produced 106 slide sets. Using electronic technology, the group wrote and posted 82 blog entries, had 187,616 visits to their web pages representing 57,621 unique hosts. Four curricula for youth education were developed. The group wrote 157 newspaper articles which reached a circulation of 115,931,316 potential readers.

The IPM group made many oral presentations at meetings. They gave 10 guest lectures for college courses, 27 scientific presentations and posters, trained 247 consultants, 228 scouts/practitioners and 873 Extension Volunteers. They made presentations which provided 353 Texas Department of Agriculture Continuing Education Units (CEU's) for Pesticide Applicator Licenses and another 90 CEU's for other certifications and licences. The group met 38 times with their steering committees, giving them

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reports and updates while planning programming to meet stakeholder needs. Educational presentations were made at 478 county meetings, 53 field days and tours, 79 multicounty or regional meetings, 332 schools, 20 civic club meetings, 62 4-H club meetings, 94 professional meetings and 142 Master Gardener meetings. Direct (face-to-face) contacts in agriculture totaled 112,419 people. Another 48,007 direct contacts were made with people in areas other than agriculture.

Demonstrations and applied research projects are one of the key components of strong IPM programs. They are used to discover, demonstrate and validate best management practices. Texas IPM professionals initiated 636 demonstration and applied research projects in 2010.

### ***Selected Program Outcomes***

#### *Field Crop Programs*

On average, 12.1 million acres of corn, cotton, grain sorghum, wheat and peanuts are harvested in Texas each year. The average value of these crops to farmers in the state is \$4 billion per year (National Agricultural Statistics Service, 2007-10). In the fall of 2010 surveys were conducted in 11 of the IPM programs serving producers of these crops. A total of 636 surveys were sent and 203 stakeholders responded (32%). Ten of the programs evaluated were primarily cotton IPM programs, but two within this group had important peanut IPM components as well. The average response when producers were asked to estimate the overall value of these programs (scouting, applied research/demonstration, newsletters, educational programs, ag. tours, etc.) was \$42.03/acre. Considering only the ~60,000 acres that are scouted, an economic impact of over 2.5 million can be calculated. The benefits derived from IPM educational efforts and the adoption of technology introduced by IPM professionals helps hundreds of other Texas farmers grow crops profitably. The value of IPM work to the larger farming community is far beyond than that realized by scouting program participants.

Growers benefit by learning about current pest status and suggested management practices, variety/hybrid selection (including best fit varieties for fields with disease, weed, nematode or other pest problems), novel pest management practices, irrigation practices, harvest preparation management, fertility management, and agronomic practices (such as tillage systems and optimum plant populations).

Farmers in many Texas agricultural communities are moving rapidly into the electronic information age. IPM Agent, Monti Vandiver has developed and is using computer and cellular telephone technology to deliver field scouting information in real time to producers. This technological improvement allows growers to respond quickly to developing situations and make timely pest management decisions.

#### *Greenhouse Vegetable IPM*

The hydroponic greenhouse tomato industry is a rapidly growing industry in the US. Currently, 40% of the US retail fresh tomato market consists of hydroponically grown fruit. Village Farms is one of the largest hydroponic vegetable companies in the US. Their facility near Marfa in Far West Texas has 122 acres of greenhouse production, employs 600 people and has sales exceeding \$50 million per year.

Recently, the West Texas facility became infested with a type of whitefly that was very difficult to control. Within a short time, revenue losses from the infestation had reached \$650,000 (not including replacement costs for 35% of the plants in one greenhouse). Dr. Scott Ludwig worked with Village Farms to identify the pest – a virulent, virus transmitting biotype thought to have moved in from Mexico – and provide management information which allowed the company to bring a potentially disastrous situation under control. The pest identification allowed Village Farms to eliminate their supplier of the plants as

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the source of the infestation, thereby avoiding unwarranted issues with a key business partner. Dr. Michael Bledsoe, Vice President of Village Farms International wrote that without Dr. Ludwig's interest, knowledge and timely intersession, he believed the facility was headed toward total crop loss.

Dr. Ludwig was also praised by Village Farms for making arrangements to provide them with pesticide applicator training and worker protection training appropriate for their industry.

#### *Urban Water – Lubbock*

Water is a precious commodity in West Texas. Lake Meredith, the primary source of domestic water for the city, is at less than 5% of its storage capacity. During the summer about 50% of the water used in Lubbock is used to irrigate landscapes. For several years, Mr. Brant Baugh has worked with a coalition of Master Gardeners, City of Lubbock Water Education Team, Texas AgriLife Extension Agents and Specialists and local experts to educate Lubbock citizens about water conservation in home and commercial landscapes. Subjects taught have been xeriscape, use of native and water thrifty plants, establishment of low water use irrigation systems, mulches and soil improvement, and rainwater harvesting. Through this and other educational efforts, water use is down 21% since 1999 saving 2.6 billion gallons of water a year.

#### *Diseases of Cotton and Monocot Crops*

Phymatotrichopsis root rot is a persistent, soil-borne fungus that is widespread in many alkaline and calcareous soils in the southwestern U.S. (TX, NM, AZ and CA). The fungus can attack some 1700 plant species including many broadleaf crops, fruit trees and vegetables. Cotton root rot is the most serious cause of loss to cotton producers in South Texas, the Blacklands, the Rolling Plains and Far West Texas – some 1.5 million acres of production. Each year farmers absorb losses from the disease. When conditions favor the fungus, such as in 2010, losses reach near 10% in the affected regions. By one estimate, more than 2% of the Texas cotton crop is lost each year – an economic impact of \$30 million per year. For 100 years research, extension and cotton farmers have searched for ways to prevent or reduce the impact of the disease. The years of work have provided little help for farmers with infected fields, however.

In 2008, IPM Agent, Rick Minzenmayer began collaborating with Dr. Tom Isakeit investigating the application of fungicides via subsurface drip irrigation in a heavily infested cotton field. They found that the fungicide flutriafol controlled the disease. Since that time, the Root Rot Team has enlarged with experiments conducted by IPM Agents and others in other locations, but Minzenmayer and Isekeit continue to lead the effort to find application techniques and rates that will provide economical disease control. They are also the leaders in developing the information to support labeling of the product for this use. The company and regulatory agencies indicate a label will be forthcoming in approximately one year. The impact, for Texas cotton growers alone, is expected to be \$25-30 million per year. Growers of grapes, fruit (peaches, apricots, apples, etc.) and pecans also stand to benefit.

On the Texas High Plains - where some 3.5 million acres of cotton are grown each year – other diseases are major causes of yield loss. Verticillium wilt, caused by the fungus *Verticillium dahlia*, is responsible for some \$14-17 million dollars in losses on high plains irrigated cotton fields each year. IPM Agents and growers are working in collaboration with research and extension plant pathologists, agronomists and agricultural engineers to find varieties, agronomic practices and irrigation strategies to reduce losses from Verticillium wilt.

Similar collaborations of IPM Agents and research-extension scientists on the high plains are working on tactics (resistant/tolerant varieties, nematicides, crop rotation and tillage practices, etc.) to improve management of the root knot nematode/*Fusarium* wilt disease complex. Cotton producers lose an estimated \$7-10 million dollars annually this complex in the Texas High Plains – ample reason to continue the effort to find solutions and help high plains cotton growers produce cotton profitably.

Systems which can prevent losses from these cotton diseases may reduce losses in other crops as well.

#### *Aflatoxin on Dryland Corn*

In recent years Texas farmers have grown an average of about 1.12 million acres of dryland corn. The majority of the dryland corn crop is produced from the upper coastal bend north through the central Texas blacklands and continuing north to the counties on the Red River. Aflatoxins are highly toxic compounds produced by the fungus *Aspergillus flavus*. The fungus grows primarily on drought stressed, dryland corn grown under hot and dry but humid conditions – conditions consistent with many growing seasons in south and central Texas. As the parts per billion (ppb) of toxin increases, corn can be used for fewer and fewer uses. Corn with aflatoxin level above 500 ppb must be destroyed. And since ethanol production concentrates the toxins in the distillers grain, even ethanol production with high aflatoxin corn is problematic. A recent Southwest Farm Press Article (2-19-2009) reported Texas losses from the toxin were “tens of millions of dollars per year”.

IPM agents are working with research and extension plant pathologists, agronomists and growers evaluating varieties, cultural practices and other management techniques. A new technique being tested is the treatment of fields with *A. flavus* strains that do not produce the toxin. The strategy is that these strains will compete with the naturally present, toxin producing strains resulting in lower aflatoxin levels in the corn. IPM Agents are working with growers with the aim of optimizing the effectiveness of the aflatoxin reduction strategies, reducing the levels of the toxin and improving the economics of corn production in the region.

#### *School IPM*

The Texas public school system is the 2<sup>nd</sup> largest in the nation with some 4.8 million students and 8,435 campuses. In 1991, the Texas legislature passed a law requiring the use of IPM in public schools for the management of pests. Since that time laws and rules promulgated by Texas Department of Agriculture have guided the development of the program. Texas AgriLife Extension Service is the state agency required to provide school personnel with the training necessary to comply with the laws and regulations. Ms. Janet Hurley is Extension’s point person for providing the training. She collaborates widely with school employees, school organizations, Extension Agents and Specialists, professionals from other agencies and other states and providers of pest management supplies and services. She organizes and conducts training for school personnel in Texas and assists other states with these duties. She writes newsletters and conducts on-site training workshops. She is recognized as a leader of school IPM both in Texas and nationally. The program has resulted in safer and cleaner schools, improved air quality, improved pest management, and reductions in pesticide use in schools. In addition, experts believe it has resulted in reduced student absences due to illnesses caused by pest associated allergies as well.

#### *Urban IPM*

IPM educational opportunities for the approximately 16 million people who live in the Dallas-Fort Worth Metroplex, greater Houston, greater San Antonio and greater Austin urban communities are provided by four Extension Program Specialists in IPM. Education programming was appropriate for the urban

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environment, as thousands of people were reached through newsletters (21,133), web page visits (14,482), newspaper articles (8 in 15 papers to a circulation of 576,577) and direct contacts (13,304).

Fire ants are a serious concern in Texas cities. They sting people and pets, build unsightly mounds, damage electrical equipment and degrade the quality of life of citizens. In Austin annual expenditures for fire ant control were approximately \$21.6 million in 1998 (Drees 2000). Fire ant and other ant management programs included communitywide fire ant programs, fire ant control demonstrations, numerous ant educational programs, newsletter articles and educational meetings. Riggs et al 2002 the value of Communitywide fire ant programs in reducing ant populations, control costs and insecticide use. Communitywide fire ant management programs were evaluated in Dallas and Austin in 2010. Three Dallas area programs involving 120 households were evaluated. Seventy-one percent of survey respondents said they applied no treatments for fire ants other than the two bait treatments applied by the program. Fifty percent said they spent no further money for fire ant control and 100% said they wanted to continue the program. The communitywide program in the Austin area involved 525 households. Those responding to the survey said they saved an average of \$21.73 and used 64% less insecticide. They reported satisfaction with the program (stings and mounds were reduced and quality of life was improved).

Another signature program in the Texas Urban IPM program involves the use of a common sense non-insecticidal approach to pest management in the home, ISEC. The program was used to teach 18 groups of Habitat for Humanity prospective homeowners and reached 330 families. Surveys sent one month after the San Antonio program showed 92% of the respondents saved an average of \$32.60 because of the program and 82% said they reduced their pesticide use by an average of 42%.

Science education is a national need and initiative. The Urban IPM group reached thousands of urban youth using classroom instruction, teacher education, summer and spring break youth camps, classes for youth organizations (4-H, Boy Scouts, Girl Scouts, etc.). Evaluations of these programs documented significant interest, appreciation, learning and skills development.

#### *Pecan IPM*

Texas produces some 60 million pounds of pecans each year with a value of about \$100 million. Pecan nut casebearer is the most destructive pest of pecans in Texas. State IPM Program Specialist, Bill Ree has worked for a number of years with producer cooperators who have used pecan nut casebearer pheromone traps to determine when the pest becomes active in local orchards. From a small program involving only a few people, this program has grown to involve hundreds. Real time information on pecan nut casebearer and other pests is delivered in real-time to pecan growers across the pecan belt using an internet website. Grower surveys have estimated the pecan nut casebearer information alone has a value of \$80 per acre to growers. There are 68,000 acres of improved pecan varieties in Texas. The value of accurate information on when pecan nut casebearer emerges in improved pecan orchards is \$5.4 million per year.

Another emphasis area for the IPM Agents working with pecan growers was investigation of pesticide efficacy and insecticide resistance in pecan pests. This work involved trials against pecan nut casebearer, brown stink bug, hickory shuckworm, pecan weevil, a blotch leafminer and yellow and black margined pecan aphid. Results were communicated to growers at meetings (~200 people at Western Pecan Growers and ~200 more at Texas Pecan Growers) and via newsletters. This information will be developed further and delivered to more pecan growers in 2011.

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### *Cotton Nutrient Management*

Fertilizer is a significant input cost to Texas cotton growers. Over fertilization adds to input costs unnecessarily and can have negative environmental consequences. A program emphasizing nutrient management in cotton was conducted in the St. Lawrence farming area led by IPM Agent, Warren Multer. The program involved approximately 62 local growers, County Extension Agents and Extension Specialists. Soil testing, fertilization workshops, cotton fertility demonstrations, newsletter articles, educational meetings and personal contacts were used to educate growers on best management fertilization practices for cotton. A farmer survey indicated the program had an average economic impact of \$13 per acre. This represented an average savings of \$28,923 per participating grower, an economic benefit of about \$1.8 million to producers in the area.

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**SERA-IEG3 2010 ANNUAL REPORT (2-page summary)**  
**VIRGINIA**

*Submitted by: Ames Herbert, State IPM Coordinator*

**PROGRAM MANAGEMENT and DELIVERY:**

The Virginia IPM Program was supported in part by a USDA-NIFA Extension Integrated Pest Management Coordination Program grant titled, Virginia IPM Program in the amount of \$209,253. Program staff included an IPM Coordinator (the Program Director); nine Co-Program Directors, one from Virginia State University and eight faculty from Virginia Tech; three Key Personnel; and an Administrative Advisor.

- extended by 32.5 (FTEs) Virginia Tech specialist faculty (e.g., weed scientists, entomologists, plant pathologists, horticulturalists) and VCE, ANR agents
- a total of 536 volunteers from the private sector contributed 10,455 hours
- totals of \$3,692,067 and \$857,377 in competitive and non-competitive grants, \$743,035 in contracts, \$57,380 in donations, \$23,025 in in-kind donations, \$1,753 in fellowships, and \$6,390 in continuing education fees were generated from extramural funding sources for an annual total of \$5,381,027 (a 38% increase over 2009)
- a total of 711 workshops, short courses, media pieces (radio/television), demonstrations, seminars, presentations, and in-service training programs were presented to a varied audience, including homeowners, Master Gardeners, public school officials, food preparation staff, pesticide dealers/distributors/handlers, growers, foresters, plant nursery, landscape, and golf course managers
- 73,372 and 3,120 direct contacts with adults and youths, respectively
- 82,869 and 271 indirect contacts
- 19,577 extended learners (4 or more hours of training)
- a total of 202 research-type publications were developed, including scientific journal articles, book chapters, proceedings, reviews and reports.
- 214 Extension publications/written materials were developed, including fact sheets, peer-reviewed documents, manuals, guides, and newspaper and trade journal articles

**SELECTED ACCOMPLISHMENTS:**

- The VT Corn Earworm Advisory helped soybean growers protect over 500,000 acres from significant crop damage and yield loss.
- Field demonstrations with strip tillage have encouraged adoption by 50% of peanut and 75% of cotton growers in southeast Virginia.
- A new degree-day program is improving protection of orchardgrass from the bluegrass billbug.
- The Virginia Potato Disease Advisory helped growers protect 6,000 acres of Irish potatoes from diseases while eliminating five fungicide applications, constituting a savings of \$300,000 in unnecessary inputs.
- Over 2,000 plant nursery clients from throughout southeast Virginia learned the benefits and options for nonchemical weed control of invasive weeds.
- 'Official' School IPM Guidelines were extended to 137 school facilities managers, nurses, administrators and pest management professionals.



- A statewide soybean survey found brown marmorated stink bug in 15 counties. Growers were alerted with weekly updates via the Virginia Ag Pest Advisory.
- The Master Gardener Volunteer Program recruited, trained, and managed 371 volunteers who contributed 25,061 hours to educate 26,373 clients about proper selection and use of commercial pesticides.
- Use of Disparlure, an environmentally benign synthetic gypsy moth mating attractant, has grown from 7% in 1995 to 88% of 553,643 acres treated in 2010. Shift to Disparlure is especially valuable in areas with threatened and endangered lepidopteran species.
- A survey of commercial producers who used The VT Plant Disease Clinic services revealed that 56% increased their knowledge of alternative control tactics which allowed them to develop a more strategic pest management approach.
- The VSU 'Housing' program provided IPM and housekeeping training for (18) housing staff and (40) residents of identified troubled units. Focus groups, surveys and resident meetings resulted in a 56% rate of improvement in resident housekeeping practices.
- The VT Pesticide Safety Education Program developed 'IPM Elements for Christmas Trees', and adoption by growers in southwest Virginia and northwest North Carolina allowed them to 'brand' their crops and to establish a new Frazier fir seedling nursery.

**SERA-IEG3 2010 ANNUAL REPORT  
VIRGINIA**

*Submitted by: Ames Herbert, State IPM Coordinator*

**PROGRAM MANAGEMENT and DELIVERY:** In 2010, the Virginia IPM Program was supported in part by a USDA-NIFA Extension Integrated Pest Management Coordination Program grant titled, Virginia IPM Program in the amount of \$209,253. Program staff included an IPM Coordinator (the Program Director); nine Co-Program Directors, one from Virginia State University and eight faculty from Virginia Tech; three Key Personnel; and an Administrative Advisor.

The Virginia IPM program was extended by 32.5 (FTEs) Virginia Tech specialist faculty (e.g., weed scientists, entomologists, plant pathologists, horticulturalists) and Virginia Cooperative Extension ANR (Ag and Natural Resources) agents throughout Virginia during the reporting period. A total of 536 volunteers from the private sector contributed 10,455 hours to IPM program activities. Totals of \$3,692,067 and \$857,377 in competitive and non-competitive grants, \$743,035 in contracts, \$57,380 in donations, \$23,025 in in-kind donations, \$1,753 in fellowships, and \$6,390 in continuing education fees were generated from extramural funding sources for an annual total of \$5,381,027 to support development and extension of IPM programs, a 38% increase over 2009. A total of 711 workshops, short courses, media pieces (radio/television), demonstrations, seminars, presentations, and in-service training programs were presented to a varied audience, including homeowners, Master Gardeners, public school officials, food preparation staff, pesticide dealers/distributors/handlers, growers, foresters, plant nursery, landscape, and golf course managers. There were 73,372 and 3,120 direct contacts with adults and youths, respectively, and 82,869 and 271 indirect contacts. There were 19,577 extended learners (4 or more hours of training). A total of 202 research-type publications were developed, including scientific journal articles, book chapters, proceedings, reviews and reports. An additional 214 Extension publications/written materials were developed, including fact sheets, peer-reviewed documents, manuals, guides, and newspaper and trade journal articles. Program efforts are partially documented in the federal extension report of the [Virginia Polytechnic Inst. & State University and Virginia State University Combined Research and Extension Annual Report of Accomplishments and Results](#).

**PROGRAM INVOLVEMENT:** Collaboration with cooperating VCE agents and staff was extensive at the local, regional and statewide levels as individuals conducted local training programs and field days, as well as contributed to publications and strategic planning meetings. Outside agency collaborators included the VA Small Grains Growers Association, the VA Soybean Growers Association, the VA Cotton, Peanut, Corn and Soybean Boards, Cotton Incorporated, the VA Irish Potato Board, the VA Turfgrass Foundation, the Mount Rogers Christmas Tree Growers, the VA Christmas Tree Growers Association, and the VA Beekeepers Association. State agency collaborators included the VA Pest Management Association, the VA Pesticide Control Board, the Departments of Agriculture and Consumer Services, Conservation and Recreation, Environmental Quality, Forestry, Game and Inland Fisheries, Emergency Management, and Mines and Minerals. Other university collaborators included associated faculty at North Carolina State University, Clemson University, University of Georgia, Auburn University, Ohio State University, University of Tennessee, University of California-Riverside, University of Missouri, University of Wisconsin, University of Delaware, Pennsylvania State University, and the Virginia-Maryland Regional College of Veterinary Medicine. Federal cooperators included the USDA Office of Pest Management Policy, the USDA NRCS, EPA, APHIS, USDA Forest Service, USDA Agricultural Research Service, and the USDA Southern Region IPM Center (SRIPMC).

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**PROGRAM SUPPORT:**

As presented above, in 2010, \$209,253 via a competitive USDA-CSREES grant were used to fully or partially fund three technical positions that are critical to the Virginia IPM Program and are housed in the Department of Entomology, and Department of Plant Pathology, Physiology and Weed Science. The greatest majority of support funding was generated through extramural efforts by faculty and agents. Support was also provided by the many FTEs in CALS; faculty both on main campus and at the ARECs (Agricultural Research and Extension Centers); and many local ANR Agents across the Commonwealth. Supporters also include many volunteers in the private sector, especially graduates from the VT Master Gardeners Program, as well as in other state agencies (e.g., Virginia Department of Agriculture and Consumer Services), and organizations (e.g., the Virginia Agricultural Council, Virginia Farm Bureau). Support was also provided by the staff at the SRIPMC, especially regarding the management and maintenance of the Virginia Ag Pest Advisory.

**ADMINISTRATIVE SUPPORT:** The Virginia IPM Program received full support from the Dean of the College of Agriculture and Life Sciences (CALC), the Director of the Virginia Agricultural Experiment Station and Associate Dean for Research and Graduate Studies, the heads of the Department of Entomology, and Department of Plant Pathology, Physiology, and Weed Science, and the Director of the Tidewater Agricultural Research and Extension Center. Professional development opportunities involved annual meetings of the Advisory Committee and Steering Committee of the SRIPMC, meetings at the Beltwide Cotton Conferences (Atlanta, GA), the National Entomological Society of America (ESA) (San Diego, CA), the Eastern Branch of the ESA (Annapolis, MD), the S-1039 Regional Project, *Biology, Impact and Management of Soybean Insect Pests in Soybean Production Systems*, and the Cotton Pest Management Seminar (Savannah, GA).

**SELECTED 2010 ACCOMPLISHMENTS:*****IPM Implementation in Agronomic Crops***

- Corn earworm was a severe insect pest of soybean in 2010 with large and frequent infestations attacking fields across the state. A post-season survey of VCE agents and Ag personnel showed that The Virginia Tech Corn Earworm Advisory helped growers make good management decisions and they were able to protect over 500,000 acres from significant damage and yield loss.
- Field trials demonstrated that strip tillage of peanuts conserves soil moisture, reduces soil erosion by wind and water, minimizes sand-burn to seedlings and reduces crop production costs by \$30/acre or more compared to conventional tillage. The benefits of strip tillage have been presented at field tours, winter meetings and professional meetings and the adoption rate is now more than 50% of peanut and 75% of cotton growers in southeast Virginia.
- A survey of forage growers regarding a new degree-day program that improves protection of orchardgrass from the bluegrass billbug documents high levels of grower adoption and satisfaction.
- Soybean aphid and brown marmorated stink bug are invasive species that are threatening soybean production in Virginia. Growers lack information about infestation incidence and management options. A state-wide pest monitoring effort including 52 soybean fields in 30 counties showed none with severe aphid infestations, but fields in 15 counties became infested with BMSB. Growers were alerted with weekly updates via the Virginia Ag Pest Advisory ([www.sripmc.org/virginia](http://www.sripmc.org/virginia)) and a post season survey indicated that the insect monitoring

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program helped growers to determine which fields needed to be protected with insecticide, resulted in cost and time savings, increased crop protection, with overwhelming grower support for a continuation of the soybean aphid/BMSB monitoring program.

### ***IPM Training for Consumer/Urban Environments***

- Over 2,000 plant nursery clients from throughout southeast Virginia attended short courses and field tours to learn about the benefits and options for nonchemical weed control of invasive weeds (doveweed reed, hamberbitter, phyllanthus, mulberryweed, and yellow nutsedge). Adoption will result in fewer pesticide applications to lawns, landscape bed, and in production areas, reducing the adverse impact on the Chesapeake Bay.
- In 2010 'official' School IPM Guidelines were developed, vetted by VDACS, and distributed to the Virginia Department of Education. The program was extended to 3 DOE regions and a total of 137 school facilities managers, nurses, administrators and pest management professionals have participated in the full-day IPM training programs.
- Homeowners and green industry professionals frequently use excessive and inappropriate amounts of lawn and garden pesticides and fertilizers that often result in a waste of time and money and harm to the environment. The Master Gardener Volunteer Program recruited, trained, and managed 371 volunteers who contributed 25,061 hours to educate 26,373 clients about proper selection and use of commercial chemicals. The financial worth of these volunteers is estimated at \$20.25/hour is \$507,485. The benefits to home grounds, home garden and nursery crops, and impact to non-target watersheds are not directly measurable but are expected to be significant.
- Gypsy moth was introduced into the U. S. in the late 1860s and has spread south and west since that time. Controlling local infestations and slowing the spread are critical to maintaining hardwood trees in forests and horticultural settings. Disparlure, an environmentally benign synthetic gypsy moth mating attractant, was introduced in 1995 to replace traditional broad-spectrum, persistent, environmentally hazardous compounds. Use has grown from 7% of the 35,238 treated acres in 1995 to 88% of the nearly 553,643 acres treated in 2010. In Virginia, mating disruption was used to treat 86% of the 17,030 acres infested. This shift to Disparlure is especially valuable in areas with threatened and endangered lepidopteran species.

### ***IPM Implementation in Specialty Crops***

- Web-based Bulletins and Pest Management Guides are the primary means for distributing pest management recommendations to fruit growers. In 2010, there were 20,137 visits to the electronic version of the tree fruit spray bulletin; 2,226 visits to The Pest Management Guide for Commercial Vineyards; 1,418 visits to The Pest Management Guide for Commercial Small Fruit Growers; 1,186 visits to the Virginia Fruit web site; and 15,467 visits to The Pest Management Guide for Home Fruit.
- The Virginia Potato Disease Advisory helped growers protect 6,000 acres of Irish potatoes from potentially decimating diseases while eliminating 5 fungicide applications, constituting a savings of \$300,000 in unnecessary inputs.

### ***IPM Support for Pest Diagnostic Services***

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- The Plant Disease Clinic (PDC) serves a wide variety of Virginia growers. Survey information from commercial producers who used the PDC services revealed that 56% of respondents experienced an increased knowledge of alternative control tactics after receiving their PDC diagnostic report and nearly all of those respondents either implemented or plan to implement alternative control tactics. Twenty-nine percent reported that diagnostic recommendations help them to reduce the use of pesticide in their operation. Respondents overwhelmingly indicated that the PDC diagnostic recommendations increased the quality of their crop, profitability, knowledge of control options and knowledge of pest and abiotic problems in their operation. About half of the respondents indicated that the PDC diagnostic recommendations allow them to develop a more strategic pest management approach.

#### ***IPM Training and Implementation in Housing***

- The Virginia State University IPM Project Coordinator partnered with Virginia Tech and Petersburg, Virginia VCE Agents to provide IPM and housekeeping training for (18) housing staff and (40) residents of identified troubled units. Focus groups, surveys and resident meetings addressed the need for change in frequency of treatments, type of pesticides/methods used, and identified the most frequent types of pests seen in units. Surveys documented positive impact with a 56% rate of improvement in resident housekeeping practices. An independent IPM Pesticide Contractor was selected and a new IPM contract was designed.

#### ***IPM Education for Pesticide Applicators***

- The VT Pesticide Safety Education Programs has expanded to working directly with stakeholders to identify and promote adoption of IPM Elements (best management protocols in IPM) in specialty crops such as honeybees, Christmas trees, turfgrass, and wine grapes. In 2009, Christmas tree growers in Southwest Virginia and Northwest North Carolina adopted IPM Elements to brand and market their crops and to establish a new Frazier fir seedling nursery that will enhance their industry.