

V(A). Planned Program (Summary)

Program # 13

1. Name of the Planned Program

Global Food Security and Hunger - Pest Management

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
112	Watershed Protection and Management	5%	0%	0%	0%
211	Insects, Mites, and Other Arthropods Affecting Plants	20%	0%	30%	20%
212	Pathogens and Nematodes Affecting Plants	20%	0%	30%	0%
213	Weeds Affecting Plants	10%	0%	10%	20%
216	Integrated Pest Management Systems	20%	0%	20%	60%
403	Waste Disposal, Recycling, and Reuse	5%	0%	0%	0%
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	5%	0%	0%	0%
723	Hazards to Human Health and Safety	5%	0%	0%	0%
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	10%	100%	10%	0%
Total		100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	26.2	0.8	28.0	1.5
Actual Paid Professional	33.0	0.5	37.7	0.0
Actual Volunteer	604.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
686371	0	686869	227092
1862 Matching	1890 Matching	1862 Matching	1890 Matching
971126	0	1544645	232999
1862 All Other	1890 All Other	1862 All Other	1890 All Other
2882153	12346	7494993	143709

V(D). Planned Program (Activity)

1. Brief description of the Activity

The Virginia IPM and Pesticide Safety Education Program was extended by Virginia Tech faculty and VCE ANR agents across the Commonwealth with the help of 604 volunteers who contributed 8,060 hours. Additional funding procured included 150 competitive grants (\$3,905,637), 74 non-competitive grants (\$1,372,992), contracts (\$655,520), donations (\$14,876), in-kind donations (\$195,827), fellowships (\$21,034), and continuing education fees (\$120,279). A total of 1,468 workshops, short courses, media pieces, field days, demonstrations, seminars, presentations, and in-service training programs were presented to homeowners, Master Gardeners, public school officials, food preparation staff, pesticide dealers/distributors/handlers, growers, foresters, plant nursery, landscape, and golf course managers including 26,706 'Extended Learners'. A total of 473 Extension publications/written materials were developed, including fact sheets, peer-reviewed documents, manuals, guides, and newspaper and trade journal articles. An additional 95 web sites or other multimedia offerings were placed online. The Master Gardeners Program in Arlington County responded to the need to meet Chesapeake Bay water pollution standards and reclaim public land from invasive plant species by offering a 2-day Sustainable Landscape Symposium (70 participants), and there were an additional 30,442 clientele contacts. The Gypsy Moth Slow The Spread Program performed dozens of database, GIS, and decision support functions, trapping data processing and quality control, report generation, and map generation. The Fruit Insect IPM Program conducted several full day fruit schools and updated The Spray Bulletin for Commercial Tree Fruit Growers and guides for Commercial Vineyards, Small Fruits and Home Fruit. The Virginia Corn Earworm Advisory promoted locally operated black light traps for detecting insect activity, field scouting and field demonstrations. A Watermelon Beet Armyworm Management Program was initiated on 225 acres of commercial seedless melons. The Ambrosia Beetle Management Program promoted pest monitoring and trapping in 9 counties and cities. The Virginia Plant Disease Clinic received 1,553 samples and diagnosed 1,704 plant problems. The Virginia Potato Disease Advisory provided weekly advisories and fungicide use recommendations. The Virginia Cucurbit Disease Advisory provided disease forecasts for Cucurbit downy mildew, the most devastating disease of cucurbits in Virginia. The Weed Identification in Ornamental Landscapes and Crops Program trained over 700 individuals in the identification of common and troublesome weed species. The VT Billbug IPM Program for Orchardgrass provided timely degree-day (DD) updates to predict spring egg-laying by adults. The Reduced Fungicide Use in Soybean Program used on farm demonstrations to evaluate the economics of fungicide use. The Surveillance and Management of Brown Marmorated Stink Bug and Kudzu Bug in Soybean Program made 569 soybean field visits to 65 counties. The Northern Shenandoah Valley Tree Fruit IPM Program conducted 9 in-depth meetings that were attended by 504 clientele. The IPM in Public Schools Program was extended to 3 new school districts.

Pesticide safety education was extended through 105 local Extension units to over 20,000 certified pesticide applicators. This enabled these producers and pest managers to maintain state certification in 27 different applicator categories. Over 250 workshops were sponsored to train commercial and private applicators for certification/recertification. Pesticide safety education and IPM information was shared with over 686,961 unique visitors (4,706,954 hits) through the Virginia Tech Pesticide Programs websites. Over 300 employers enrolled over 1,500 employees in three online Extension pesticide safety education courses to help them qualify for certification in 7 different categories. Three in-service education (train-the-trainer) workshops were hosted for 139 trainers (Extension agents, specialists, pesticide investigators, and vocational agriculture teachers).

2. Brief description of the target audience

Consumers, landowners, homeowners, producers, producer groups, pesticide applicators seeking certification under federal and state laws, pesticide regulators, boards, commissions, and enforcement officials, local government, councils, and community groups, universities, colleges, K-12, youth aged 13-18, schools, advocacy and consumer protection groups and associations, pesticide safety educators, pest management specialists, and related experts, authors, journalists, other media specialists, institutional, industrial, and vector control groups and individuals, health/medical, environmental, and emergency response personnel and organizations, farm workers, migrants, and day-laborer groups and individuals, researchers, scientists, pesticide toxicologists, extension educators and related experts.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	67159	98344	4828	40

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2012

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	5	116	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of non-peer reviewed outreach citations incorporating information on the most effective IPM strategies and systems for use on selected commodities and/or at selected sites

Year	Actual
2012	10

Output #2

Output Measure

- Number of private applicators trained for certification

Year	Actual
2012	2055

Output #3

Output Measure

- Number of commercial applicators trained for certification

Year	Actual
2012	2612

Output #4

Output Measure

- Number of private applicators trained for recertification

Year	Actual
2012	2955

Output #5

Output Measure

- Number of commercial applicators trained for recertification

Year	Actual
2012	1791

Output #6

Output Measure

- Number of non-certified applicators trained

Year	Actual
2012	51750

Output #7

Output Measure

- Number of stakeholders enrolled in the IPM Stakeholder Network

Year	Actual
2012	80

Output #8

Output Measure

- Number of trainers and regulatory officials trained

Year	Actual
2012	139

Output #9

Output Measure

- Educational media website hits communicated through the Pesticide Safety Education website

Year	Actual
2012	4706954

Output #10

Output Measure

- Number of non-peer reviewed research citations incorporating information on the most effective IPM strategies and systems for use on selected commodities and/or at selected sites.

Year	Actual
2012	126

Output #11

Output Measure

- Number of presentations on IPM related topics.

Year	Actual
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2012 1468

Output #12

Output Measure

- Number of volunteer hours dedicated to pest management programming

Year	Actual
2012	8060

Output #13

Output Measure

- Number of extended learners with four or more hours of contact related to pest management

Year	Actual
2012	26706

Output #14

Output Measure

- Amount of revenue generated in dollars for pest management Extension and research programming

Year	Actual
2012	6286165

Output #15

Output Measure

- IPM publications for clientele including extension publications, manuals and guides, multi-media pieces, websites, newspaper and trade journal articles, and papers provided at production meetings and field days.

Year	Actual
2012	312

Output #16

Output Measure

- Number of samples evaluated by current and improved plant diagnostic methods

Year	Actual
2012	3553

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of individuals gaining knowledge of IPM through training course completion and/or examination
2	Number of applicators who gain knowledge in pesticide safety through certification training and pass the state certification exam(s).
3	Number of applicators who gain additional knowledge in pesticide safety through re-certification training and sufficient credit to maintain their certification
4	Number of applicators, farmworkers, and the general public who gain knowledge in general pesticide safety who are not seeking certification as pesticide applicators
5	Number of trainers who gain knowledge in pesticide safety and pesticide curriculum and program training in established train-the-trainer workshops
6	Through educational programming and collaborative efforts, support the collection and proper disposal of unwanted pesticides in Virginia localities.
7	Number of localities participating in a pesticide container recycling program.
8	Number of participants gaining knowledge about invasive NIS
9	Increase the number of stakeholders collaborating with pest management strategic planning activities which support the communication of the pest management needs of Virginia and regional agricultural interests to pesticide regulatory policymakers.
10	Increase in the number of facilities that are impacted in a positive way by IPM program activities.
11	Number of Virginia soybean growers aware of Asian soybean rust risk to their crop.
12	Number of Virginia soybean growers who apply fungicide based on Asian soybean rust detection activities.
13	Number of applicators who indicated that they understand that they need to comply with state and federal regulations as a result of VCE training.
14	Number of applicators who read pesticide labels and wear personal protective equipment as a result of VCE training.
15	Number of applicators who changed their use of application equipment or calibration to reduce spray drift as a result of VCE training.
16	More than 20% of commercial producers indicate that plant disease diagnosis and recommendations results in reduced pesticide use in their operations.
17	Pest monitoring programs result in cost and time savings and increased crop protection for an increasing number of acres

Outcome #1

1. Outcome Measures

Number of individuals gaining knowledge of IPM through training course completion and/or examination

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	60000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Federal and state pesticide laws and regulations require applicators to follow the pesticide label directions. Pesticide safety education incorporates integrated pest management (IPM) methods into training programs to encourage reduced risk and reduced use of pesticides. Pesticide safety education is mandatory for workers and handlers who must comply with federal worker protection standards. Without pesticide safety and IPM education there is an increased risk of human exposure and environmental from pesticide misuse.

What has been done

In 2012, Virginia Cooperative Extension agent, specialists, and volunteered conducted programs in pesticide safety and IPM throughout Virginia. The program(s) assisted agricultural producers, non-certified workers and handlers, and homeowners to comply with pesticide laws and regulations, to protect the environment, and safeguard human health through the safe and efficient use of pesticides and alternative pest control tactics.

Results

During 2012, over 60,000 pesticide applicators were trained in Virginia through the work of VCE agents, specialists, and volunteer Master Gardeners. These individuals were given the opportunity to gain knowledge of IPM through training courses, workshops, demonstrations, and examinations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

Outcome #2

1. Outcome Measures

Number of applicators who gain knowledge in pesticide safety through certification training and pass the state certification exam(s).

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	4667

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The federal and state pesticide laws and regulations require pesticide applicators to be certified to use restricted use pesticides. In addition, Virginia law requires all commercial applicators to be certified to use any pesticide. Without pesticide safety and integrated pest management (IPM) education to enable these individuals to do so, many would suffer economic hardships and violate the law. A lack of knowledge in pesticide safety and IPM practices threatens human health and the environment.

What has been done

In 2012, Virginia Cooperative Extension agents and specialists conducted certification preparation programs in pesticide safety and IPM throughout Virginia. These programs assisted agricultural producers and commercial pesticide applicators to comply with the law and protect the environment and human health through the safe and efficient use of pesticides and adoption of alternative pest control tactics.

Results

During 2012, 2,055 private pesticide applicators (farmers) gained knowledge in pesticide safety and IPM through certification training and passed the state certification exam(s). During 2012,

2,612 commercial applicators gained knowledge in pesticide safety and IPM through certification training and passed the state certification exam(s).

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
403	Waste Disposal, Recycling, and Reuse

Outcome #3

1. Outcome Measures

Number of applicators who gain additional knowledge in pesticide safety through re-certification training and sufficient credit to maintain their certification

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	4746

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The federal and state pesticide laws and regulations require pesticide applicators to be certified to use restricted use pesticides. In addition, Virginia law requires all commercial applicators to be certified to use any pesticide. It is mandatory that these applicators renew their pesticide licenses through continuing education every two years. Without pesticide safety and integrated pest management (IPM) education to enable these individuals to do so, many would suffer economic hardships and violate the law. A lack of knowledge in pesticide safety and IPM practices threatens human health and the environment.

What has been done

In 2012, Virginia Cooperative Extension agents and specialists conducted programs in pesticide safety and IPM throughout Virginia. The program(s) assisted agricultural producers and licensed pesticide applicators to comply with the law and protect the environment and human health

through the safe and efficient use of pesticides and alternative pest control tactics.

Results

During 2012, 2,955 private and 1,791 commercial applicators gained additional knowledge in pesticide safety and IPM through re-certification training. This enabled these applicators to maintain their licenses in order to comply with the law and sustain their businesses and employment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
403	Waste Disposal, Recycling, and Reuse

Outcome #4

1. Outcome Measures

Number of applicators, farmworkers, and the general public who gain knowledge in general pesticide safety who are not seeking certification as pesticide applicators

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	51750

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Federal and state pesticide laws and regulations require applicators to follow the pesticide label directions. Pesticide safety education incorporates integrated pest management (IPM) methods into training programs to encourage reduced risk and reduced use of pesticides. Pesticide safety education is mandatory for workers and handlers who must comply with federal worker protection standards. Without pesticide safety and IPM education there is an increased risk of human exposure and environmental from pesticide misuse.

What has been done

In 2012, Virginia Cooperative Extension agents, specialists, and volunteered conducted programs in pesticide safety and IPM throughout Virginia. The program(s) assisted agricultural producers, non-certified workers and handlers, and homeowners to comply with pesticide laws and regulations, to protect the environment, and safeguard human health through the safe and efficient use of pesticides and alternative pest control tactics.

Results

During 2012, 51,750 non-certified pesticide applicators (those not seeking certification) were trained in Virginia through the work of VCE agents, specialists, and volunteer Master Gardeners.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
403	Waste Disposal, Recycling, and Reuse

Outcome #5

1. Outcome Measures

Number of trainers who gain knowledge in pesticide safety and pesticide curriculum and program training in established train-the-trainer workshops

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	139

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Train-the-trainer programs establish the expertise and organization of any pesticide safety education program. It is critical that train-the-trainer education is held annually to maintain a

trainer network and transfer technology and methods to trainers.

What has been done

Virginia Tech has hosted two train-the-trainer workshops in 2012.

Results

The Virginia Pesticide Safety Educators Workshop was held in October 2012. with 115 agents, specialists, pesticide investigators, and program staff attending. A second train-the-trainer workshop was hosted for 24 vocational agriculture teachers. These 139 trainers returned to their localities to educate applicators and students statewide.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
403	Waste Disposal, Recycling, and Reuse

Outcome #6

1. Outcome Measures

Through educational programming and collaborative efforts, support the collection and proper disposal of unwanted pesticides in Virginia localities.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	23

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The disposal of canceled, banned or unwanted agricultural and commercial pesticides poses a significant challenge to agricultural producers and other pesticide users. Pesticide wastes are a public health and financial threat. Many waste products end up in local waste systems. Since 1990, the Virginia Department of Agriculture and Consumer Services, and Virginia Cooperative

Extension have worked together to collect and destroy 1,189,014 pounds of pesticide wastes.

What has been done

An inexpensive and efficient solution to disposing of waste products eliminates a potential threat to health and the environment and saves money. To identify and collect pesticide wastes in 2012, Virginia Cooperative Extension agents, in partnership with the Virginia Department of Agriculture and Consumer Services, conducted a pesticide waste disposal program in 23 localities throughout Southside Virginia. The program(s) helped agricultural producers, licensed pesticide dealers and pest control firms, golf courses, and homeowners properly dispose of unwanted pesticides.

Results

As a result of this collaborative pesticide waste disposal program, 42,000 pounds of unwanted pesticides were collected and properly disposed from farms, licensed pesticide dealers and pest control companies, golf courses, and homeowners in 23 Southside Virginia localities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
403	Waste Disposal, Recycling, and Reuse

Outcome #7

1. Outcome Measures

Number of localities participating in a pesticide container recycling program.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	17

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The disposal of pesticide containers poses a significant challenge to agricultural producers and other pesticide users. Improperly rinsed containers are a public health and financial threat. Many containers end up in local waste systems. Since 1993, the Virginia Department of Agriculture and Consumer Services, the Virginia Pesticide Control Board and Virginia Cooperative Extension

have worked together to collect and recycle 1,274,350 pounds of plastic pesticide containers.

What has been done

An inexpensive and efficient solution to disposing of containers eliminates a potential threat to health and the environment and saves money. To identify, collect and recycle pesticide containers in 2012, Agriculture and Natural Resource Extension agents for Virginia Cooperative Extension, in partnership with the Virginia Department of Agriculture and Consumer Services assisted pesticide container recycling programs at 29 collection sites in 17 Virginia localities. The program(s) helped agricultural producers, licensed pesticide dealers and pest control firms, golf courses, and homeowners properly recycle waste pesticide containers.

Results

As a result of this collaborative pesticide container recycling program, 88,000 pounds of properly rinsed containers were collected and properly recycled from farms, licensed pesticide dealers and pest control companies, golf courses, and homeowners in 17 localities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
403	Waste Disposal, Recycling, and Reuse

Outcome #8

1. Outcome Measures

Number of participants gaining knowledge about invasive NIS

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The nascent bioenergy industry is growing at a tremendous pace as they identify new crops, improve existing crops, and target specific growing regions. Virginia will play an important role in

this industry as we adopt new crops to replace the dwindling tobacco fields. However, as the industry develops there is a growing concern that the crops we use could escape the cultivated environment and become harmful invasive species.

What has been done

One research effort is to evaluate the threat posed by a multitude of crops throughout the Southeast, and identify mitigating strategies to reduce the threat. The concern over the invasive potential of bioenergy crops has been expressed by state and federal officials, environmental organizations, academics, and the bioenergy industry. Thus, this research program aims to present an unbiased evaluation of the invasion risk. We are conducting field, greenhouse, laboratory, and modeling studies to meet our goals.

Results

We have identified a novel mechanism by which the common understory invader *Microstegium vimineum* disperses seed: ephemeral overland flow that we tracked with fluorescent powder and UV imagery.

We have surveyed 18 naturalized populations of the invasive *Miscanthus sinensis* across the eastern US, finding that this species has a broad environmental niche, and can likely expand broadly outside its existing extent.

An Extension publication was authored outlining Best Management Practices along the bioenergy supply chain to reduce invasiveness.

Results are being disseminated via peer-reviewed publications, presentations, and extension documents.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
213	Weeds Affecting Plants
216	Integrated Pest Management Systems

Outcome #9

1. Outcome Measures

Increase the number of stakeholders collaborating with pest management strategic planning activities which support the communication of the pest management needs of Virginia and regional agricultural interests to pesticide regulatory policymakers.

Not Reporting on this Outcome Measure

Outcome #10

1. Outcome Measures

Increase in the number of facilities that are impacted in a positive way by IPM program activities.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

{No Data Entered}

What has been done

{No Data Entered}

Results

{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

Outcome #11

1. Outcome Measures

Number of Virginia soybean growers aware of Asian soybean rust risk to their crop.

Not Reporting on this Outcome Measure

Outcome #12

1. Outcome Measures

Number of Virginia soybean growers who apply fungicide based on Asian soybean rust detection activities.

Not Reporting on this Outcome Measure

Outcome #13

1. Outcome Measures

Number of applicators who indicated that they understand that they need to comply with state and federal regulations as a result of VCE training.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	9319

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Federal and state pesticide laws and regulations require applicators to follow the pesticide label directions. Pesticide safety education incorporates integrated pest management (IPM) methods into training programs to encourage reduced risk and reduced use of pesticides. Pesticide safety education is mandatory for workers and handlers who must comply with federal worker protection standards. Without pesticide safety and IPM education there is an increased risk of human exposure and environmental from pesticide misuse. It is very important that applicators understand the laws they have to comply with and this is best accomplished through training.

What has been done

Evaluation surveys were inserted into over 180 private and commercial pesticide applicator training meetings to determine if applicators understood how to comply with state and federal pesticide regulations.

Results

Survey data from 15 localities representing about 50 different sessions, indicated that 99% of 454 applicators understood how to comply with state and federal pesticide regulations as a result of VCE training. Extrapolated to the entire audience of certified applicators trained this year that

would mean that 9,319 applicators understood how to comply with the law as a result of training.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
403	Waste Disposal, Recycling, and Reuse
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
723	Hazards to Human Health and Safety

Outcome #14

1. Outcome Measures

Number of applicators who read pesticide labels and wear personal protective equipment as a result of VCE training.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	9351

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

One of the most important practices by pesticide applicators is to read and comprehend pesticide label directions. One critical part of these directions is to understand what personal protective equipment (PPE) is required to be used for application in order to avoid exposure to pesticides. More applicators are cited for violation of label directions and improper use of PPE than any other violations in Virginia.

What has been done

Label comprehension and proper use of PPE are key parts of Virginia Cooperative Extension (VCE) Pesticide Safety Education programs. Evaluation surveys were inserted into over 180

private and commercial pesticide applicator training meetings to determine if applicators were reading label directions and used PPE.

Results

Survey data from 15 localities representing about 50 different sessions, indicated that 99.3% of 456 applicators read labels and used the required personal protective equipment (PPE) as a result of VCE training. Extrapolated to the entire audience of certified applicators trained this year that would mean that 9,351 applicators read pesticide labels and used the required PPE required as a result of VCE training.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
723	Hazards to Human Health and Safety

Outcome #15

1. Outcome Measures

Number of applicators who changed their use of application equipment or calibration to reduce spray drift as a result of VCE training.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	9036

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Precision application technology is a modern convenience and a valuable tool to protect the environment, improve efficiency and efficacy, and protect pesticide applicators from exposure to pesticides. It is very important that applicators learn how to adopt and use this technology

properly.

What has been done

Precision technology information is included in every Virginia Cooperative Extension (VCE) educational program in pesticide safety education and IPM. Evaluation surveys were inserted into over 180 private and commercial pesticide applicator training meetings to determine if applicators learned more about this technology as a result of attending VCE training programs.

Results

Survey data from 15 localities representing about 50 different sessions, indicated that 96% of 454 applicators learned more about proper use of application equipment (calibration, drift minimization, and new technology) as a result of VCE training. Extrapolated to the entire audience of certified applicators trained this year that would mean that 9,036 applicators learned more about application technology as a result of training.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
216	Integrated Pest Management Systems
403	Waste Disposal, Recycling, and Reuse
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
723	Hazards to Human Health and Safety

Outcome #16

1. Outcome Measures

More than 20% of commercial producers indicate that plant disease diagnosis and recommendations results in reduced pesticide use in their operations.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	1849

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Non-commercial growers, commercial crop producers and lawn/landscape professionals require accurate diagnosis of their crops? disease and abiotic problems (e.g., chemical injury, environmental stress, cultural problems) in order to implement appropriate IPM tactics. The Virginia Tech Plant Disease Clinic (PDC) is a service lab to Virginia Cooperative Extension (VCE) agents, providing diagnosis of plant disease and abiotic problems for Virginia clientele.

What has been done

In 2012, the PDC received 1,553 samples and diagnosed 1704 plant problems. Additionally, 103 phone and 106 email inquiries were answered and 87 digital diagnoses were made. To evaluate impacts of the PDC diagnostic services, electronic surveys were sent post-season 2012 to PDC clients who included email addresses on diagnostic forms.

Results

Response rates from the three clientele surveys (three grower groups) were 31% non-commercial growers, 24% landscape/lawn professionals and 30% commercial growers. Some highlights of the survey results include: commercial growers (81%/19%), non-commercial growers (66%/20%), and landscape/lawn professionals (71%/29%) strongly agreed/agreed with the statement, "I value the services provided by the Plant Disease Clinic;" 90% of commercial growers, 59% of non-commercial growers and 57% of landscape/lawn professionals reported that PDC services increased their knowledge of pest/disease and abiotic problems; 43% percent of landscape/lawn professional, 29% of commercial grower and 18% of non-commercial grower respondents reported reduced pesticide usage through use of the PDC diagnostic services; Increased profitability and crop quality, respectively, were reported by 62% and 67% of commercial growers through use of PDC services; 71% of commercial grower respondents agreed that use of PDC diagnostic services allowed them to develop a more strategic IPM approach in their operation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

Outcome #17

1. Outcome Measures

Pest monitoring programs result in cost and time savings and increased crop protection for an increasing number of acres

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
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2012

0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Insect, weed and plant disease pests affect the lives and livelihoods on most growers and public sector clientele in Virginia. Both agricultural and urban settings are under constant pressure from many pests and the situation is made more complex by the constant invasion of new pest species from outside the US borders. Many current management strategies rely on the use of pesticides which are expensive and pose risks, both known and unknown. Knowledge of when and where a pest will occur is a powerful tool and first step in developing an effective management strategy. Pest monitoring programs can alert clientele to high risk areas or times of the season so control measures can be more precisely selected and targeted.

What has been done

Virginia Tech's IPM Program encompasses many pest surveillance programs that are as varied as the pests being monitored, from field scouting to using weather-based models to predict incidence and spread. Examples are the Gypsy Moth Slow The Spread Program, the Virginia Corn Earworm Advisory, the Watermelon Beet Armyworm Management Program, the Ambrosia Beetle Management Program, the Virginia Potato Disease Advisory, the Virginia Cucurbit Disease Advisory, the VT Billbug IPM Orchardgrass Program, and the Surveillance and Management of Brown Marmorated Stink Bug and Kudzu Bug in Soybean Program.

Results

The gypsy moth Slow The Spread program resulted in an 80% reduction in spread from the historical rate in central/western Virginia and accounted for estimated benefits of between \$34 and \$264 million per year. As a result of the Virginia Corn Earworm Advisory, growers in Southampton County, one of Virginia's largest agricultural counties, treated only problem fields and unwarranted sprays were prevented on nearly 80,000 acres of row crops. Growers in Prince George County treated only 2500 of their 11,000 acres. With an average treatment cost of \$12 per acre, this program saved growers in Southampton and Prince George Counties \$960,000 and \$102,000, respectively, and substantially reduced insecticide use on much of Virginia's farm lands. Then Watermelon Beet Armyworm Management Program resulted in more timely insecticide sprays to infested fields, and reduced expensive unnecessary treatments resulting in an estimated \$50,000 in increased revenues for local melon growers. None of the 11 nurseries that used the Ambrosia Beetle Management Program sustained any losses from ambrosia beetles. On average 6 fungicide applications were spared through the implementation of the Virginia Potato Disease Advisory. Reduced fungicide applications constituted a savings of \$360,000 in unnecessary inputs for Eastern Shore of Virginia potato producers. Using the Virginia Cucurbit Disease Advisory, Virginia cucurbit producers saved \$100,000 on unnecessary fungicide applications. The Surveillance and Management of Brown Marmorated Stink Bug and Kudzu Bug in Soybean program limited insecticide treatments to field edges, only, on 1,885 soybean acres representing a 60-80% reduction in insecticide use.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (immigration, new cultural groups)

Brief Explanation

Asian Soybean Rust has not been a problem the past several years, thus work has not resumed on this pest.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Response rates from the three Virginia Plant Disease Clinic (PDC) clientele surveys (three grower groups) were 31% non-commercial growers, 24% landscape/lawn professionals and 30% commercial growers. Survey highlights include: commercial growers (81%/19%), non-commercial growers (66%/20%), and landscape/lawn professionals (71%/29%) strongly agreed/agreed with the statement, "I value the services provided by the Plant Disease Clinic;" 90% of commercial growers, 59% of non-commercial growers and 57% of landscape/lawn professionals reported that PDC services increased their knowledge of pest/disease and abiotic problems; 43% percent of landscape/lawn professional, 29% of commercial grower and 18% of non-commercial grower respondents reported reduced pesticide usage through use of the PDC diagnostic services; Increased profitability and crop quality, respectively, were reported by 62% and 67% of commercial growers through use of PDC services; 71% of commercial grower respondents agreed that

use of PDC diagnostic services allowed them to develop a more strategic IPM approach in their operation. With the VT Billbug IPM Orchardgrass (OG) Program post-season clientele survey, results showed that of those who responded, 100% selected either strongly agree or agree to all questions. Of 5,300 total acre, the estimate of total OG acreage positively impacted by program updates in 2012 was 3,650 acres (68.9%). The number of acres on which the paired-feeding hole sampling method will be used in 2013 is 3,200 acres (60.4%). With the IPM and Invasive Pests in Tree Fruit Production post program survey, reviews of spray records indicated that 84% of the fruit growers in Planning District 9 effectively managed their crops and followed current pesticide labeling requirements for tree fruit crops. Current crop protection technology was applied on 84% orchards as a result of the IPM scouting program. Spray records indicated insecticide applications were based on the IPM scouting. One grower indicated a saving of \$18,000 by following extension recommendations. With the Northern Shenandoah Valley Tree Fruit IPM Program survey, 33 tree fruit growers offered evaluations at the Effective Fruit Spraying workshop that provided the following impacts: 45% of responders reported that they gained knowledge and skills that would allow them to reduce pesticide use by at least 11%; 67% of responders strongly agreed the sprayer demonstrations were an effective way to understand the difference amongst sprayer technologies and manufacturers; 100% of responders agreed that the workshop gave them a better understanding of factors that contribute to the effective spraying of fruit crops; 100% of responders agreed that they will be able to implement what they learned when they return to work. Fifty growers offered evaluations at the Winchester Area Fruit School provided the following statements: 11% of responders were first time attendees to the Winchester Area Fruit School;

94% of responders felt the educational program was good or excellent with 21 responders stating specifically that the information presented was useful, good, and up-to-date for tree fruit management. Response rates from VCE Pesticide Safety Education Programs surveys that were reported by agents indicated that 96.1 to 99.3% of those surveyed responded positively to Extension training by improving their knowledge of information on legal compliance, label comprehension, use of personal protective equipment, and adoption of precision application methods and technology.

Key Items of Evaluation

Not all programs are currently evaluated but a new IPM Impact Assessment project is underway that should allow for more annual evaluations of more programs.