V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Global Food Security and Hunger - Integrated 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
216	Integrated Pest Management Systems	100%		100%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	25.0	0.0	13.0	0.0
Actual Paid Professional	19.1	0.0	4.3	0.0
Actual Volunteer	43.0	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
215551	0	775933	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1663484	0	1075269	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
81861	0	1768263	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research
- Develop new and novel techniques for pest management and pest detection

Delivery

- Provide IPM information to a wide variety of stakeholders
- Employ new methods for delivery IPM information

Education

- Conduct IPM educational programs for stakeholders
- Conduct IPM educational training for university students
- Conduct IPM educational training for Vo-Ag and FFA students
- Conduct IPM public awareness campaign

Extension

- Work with communities, schools, businesses to help them meet their regulatory responsibilities on pesticide application
- Help growers develop scouting programs to identify pest populations before significant plant damage occurs.
- Develop pest management options to be used in an integrated or rotational program.
- Identify indicators to help growers anticipate pest problems.
- Develop monitoring techniques and population damage thresholds for selected pests.
- Provide scientifically sound advice to state regulatory bodies on pest management and pesticide issues
- Create a multidisciplinary program comprising of faculty, staff, volunteers, industry partners and government officials
- Investigate IPM methods to help growers produce top quality crops, limiting or reducing production costs.
- Evaluate all pest and crop management practices into a set of commercially used methods. These include the use of: pesticides, economic/aesthetic threshold levels, resistant cultivars, optimum horticultural practices, environmental monitoring, pest scouting, and fertility monitoring and recommendations.

2. Brief description of the target audience

- Municipalities
- Pesticide applicators and their employers
- Commercial pesticide applicators
- State Dept. of Environmental Protection
- Staff and students who gain valuable scientific experience
- Industry partners in agriculture and related commodities
- Consumers
- NJAES Faculty and Staff involved in pest management research/outreach
- Farmers
- Commodity groups
- New Jersey residents
- School faculty, staff and children
- NJAES researchers
- Secondary and university students
- Governmental agencies
- Environmental organizations
- Agricultural, landscape, fine turf and other related industries

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	22332	4264	1321	1200

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

Patent Applications Submitted

Year: 2013

Actual: 1

Patents listed

2013-040

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	12	30	42

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- A variety of strategies will be implemented to reach target audiences. This will include and not be limited to workshops, field visits, classes, newsletters, media releases, electronic communications,publications. In addition a trained volunteer teaching base will be developed. Quantitative reports of participation will be collected

Year	Actual
2013	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Short Term - Develop improved IPM delivery methods. Develop detection, monitoring and sampling methods that reliably predict pest levels. Develop novel management methods for a wide variety of pests. Develop IPM training for secondary and university students. Improve public awareness about IPM Determine the effectiveness of pheromones for mating disruption of pests. Greater understanding of entomopathogenic nematode species'effects on pests. Evaluation of the effectiveness of natural pesticides and crop management to reduce pests. Determine which types of plants attract pests to be used as a pest control method.
2	Medium Term - Research and educational programs, and public awareness campaign results in increased adoption of IPM in traditional and non-traditional systems. Research findings used to develop new projects. IPM training of students creates new IPM interns, professionals and researchers. Knowledge of various natural insecticides and their effectiveness on pests. Determining the best time and application method for IPM products. Greater understanding of pest biology and ecology. Greater understanding of entomopathogenic species biology and ecology.
3	Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.
4	Medium Term - Upland Fruit (Tree Fruit and Grape) Integrated Pest Management (IPM) Delivery - Research and educational programs, and public awareness campaign results in increased adoption of IPM in traditional and non-traditional systems. Research findings used to develop new projects. IPM training of students creates new IPM interns, professionals and researchers. Knowledge of various natural insecticides and their effectiveness on pests. Determining the best time and application method for IPM products. Greater understanding of pest biology and ecology. Greater understanding of entomopathogenic species biology and ecology.
5	Medium Term - Weed Control in Cranberries - Research and educational programs, and public awareness campaign results in increased adoption of IPM in traditional and non-traditional systems. Research findings used to develop new projects. IPM training of students creates new IPM interns, professionals and researchers. Knowledge of various natural insecticides and their effectiveness on pests. Determining the best time and application method for IPM products. Greater understanding of pest biology and ecology. Greater understanding of entomopathogenic species biology and ecology.
6	Medium Term - Improving Sustainability, Efficiency, and Efficacy of Peach Disease Management Strategies: Biofungicides, Conventional Fungicides, and Abiotic Environmental Factors - Research and educational programs, and public awareness campaign results in increased adoption of IPM in traditional and non-traditional systems. Research findings used to develop new projects. IPM training of students creates new IPM interns, professionals and researchers. Knowledge of various natural insecticides and their effectiveness on pests. Determining the best time and application method for IPM products. Greater understanding of pest biology and ecology. Greater understanding of entomopathogenic species biology and ecology.
7	Medium Term - Blueberry and Cranberry Insect Pest Management - Towards the Development and Implementation of Reduced-Risk Strategies - Research and educational programs, and public awareness campaign results in increased adoption of IPM in traditional

	and non-traditional systems. Research findings used to develop new projects. IPM training of students creates new IPM interns, professionals and researchers. Knowledge of various natural insecticides and their effectiveness on pests. Determining the best time and application method for IPM products. Greater understanding of pest biology and ecology. Greater understanding of entomopathogenic species biology and ecology.
8	Long Term - Developing and Implementing Integrated Pest Management Strategies in Urban Communities - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

Outcome #1

1. Outcome Measures

Short Term - Develop improved IPM delivery methods. Develop detection, monitoring and sampling methods that reliably predict pest levels. Develop novel management methods for a wide variety of pests. Develop IPM training for secondary and university students. Improve public awareness about IPM Determine the effectiveness of pheromones for mating disruption of pests. Greater understanding of entomopathogenic nematode species'effects on pests. Evaluation of the effectiveness of natural pesticides and crop management to reduce pests. Determine which types of plants attract pests to be used as a pest control method.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Medium Term - Research and educational programs, and public awareness campaign results in increased adoption of IPM in traditional and non-traditional systems. Research findings used to develop new projects. IPM training of students creates new IPM interns, professionals and researchers. Knowledge of various natural insecticides and their effectiveness on pests. Determining the best time and application method for IPM products. Greater understanding of pest biology and ecology. Greater understanding of entomopathogenic species biology and ecology.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Blueberry Integrated Pest Management Delivery

Blueberries are a unique agricultural commodity, since they are one of only several native foods in commercial production in the US. In New Jersey most blueberries are grown in the ecologically sensitive ?New Jersey Pinelands?, which is characterized by porous soils with high water tables, which are subject to vertical movement of a number of agricultural chemicals. Over 40 different insect and disease pests can attack highbush blueberries, including 2 new invasive pests, the brown marmorated stink bug, and the spotted wing drosophila. Pest management costs continue to increase. The Food Quality Protection Act has led to restrictions and changes in the types of pesticides that may be used to produce blueberries. Many of the new pesticides are narrow spectrum, that control only one or a few pests and must be used with degree day phenology models and other integrated pest management (IPM) practices.

What has been done
An integrated pest management (IPM) program was delivered to commercial blueberry growers. The program employed seasonal field scouts who collected weekly pest management data. The program reached all blueberry growers in New Jersey, but collected farm specific data on those farms participating in the scouting program. Results of scouting data were summarized in 2 statewide newsletters (The Blueberry Bulletin and The Plant & Pest Advisory-Fruit Edition ?Now on a Web Blog format). Results were also transferred to growers with farm visits, seasonal update meetings, and a broadcast fax system.

Results
Growers were educated, by RCE Agricultural faculty and professional staff, about novel management methods for a variety of pests in blueberries. Pesticide use for OP and carbamate pesticides was reduced. Using the results from a previous USDA/RAMP project, growers following this program had between 45% and 58% lower amounts of insecticide active ingredient applied than those grown using grower standard programs, with even greater reductions in the total amount of insecticide residue detected on leaves and fruit at harvest. Overall, growers who practiced IPM at high levels, used from 6-8 lb ai of pesticide per acre, while growers treating on a pure calendar schedule, used up to 34 lb ai per acre. Growers minimized on farm pest management costs. Some growers spent as much as $240/A for pesticides while the average IPM participant spent $132/A. The average grower using IPM practices saved about $100/A. New pest management practices such as mating disruption and whole farm GIS based monitoring were used. Small plot research/demonstration trials for Oriental beetle mating disruption continued to show that Oriental beetle could be managed with mating disruption in place of soil applied insecticide. Based on RCE research and demonstration work, a registration package is now finished, and commercial use started in 2013. In 2012, the spotted wing drosophila developed as a serious invasive pest in blueberries nationwide. While this is a serious threat to IPM programming, we made adjustments in 2013 to help protect the blueberry industry while minimizing conventional OP and carbamate insecticide use. While non-managed fields showed over 650 maggots per qt of berries, no fruit rejections were reported by IPM participants.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #3

1. Outcome Measures

Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Integrated Pest Management/Pesticide Safety Education

Pesticide Education and Safety Program (PESP): In New Jersey there are 15,000+ certified applicators registered with the New Jersey Department of Environmental Protection (NJDEP) - Pesticide Control Program. Approximately 3,000 are private applicators. To remain certified New Jersey law requires that private and commercial applicators accumulate at least 12 hours of recertification training divided between CORE (4) and CATEGORY (8) classifications during a five-year period. Integrated Pest Management Program (IPM): the IPM programs coordinated by Rutgers Cooperative Extension encompassed production agriculture in the areas of blueberries, nurseries, greenhouses, tree fruit, and vegetables.

What has been done
PESP: Approximately 30,000 applicators were recertified by this program in 2013. In addition, New Jersey initially certifies an average of 2,000 commercial applicators each year. New Jersey's PESP program currently utilizes 24 different manuals to provide initial training to both private and commercial applicators. This program also offered initial CORE training sessions in English and Spanish for commercial operators and applicators and provided training to school employees and master gardeners so they understand the proper use of pesticides and the issues surrounding their use. IPM: Work was done to develop management strategies for use against the brown marmorated stink bug in vegetables and tree fruit. In addition, the vegetable IPM program was able to impact more acreage through the use of their website that tracks weekly European corn borer and corn earworm population changes in the state. Overall, IPM adoption in

the state was seen on 7,400 acres of blueberries, 508 acres of nursery stock, 10 greenhouse acres, 8,604 acres of peaches, 2,527 acres of apples, 113 acres of peaches and 27,500 acres in vegetables (carrots, cole crops, high-tunnel tomato production, pumpkins, peppers, snap beans, staked tomatoes, sweet corn, and sweet potatoes) for a total of 66,662 acres.

Results

PESP: As a result of the program, several thousand private pesticide applicators, and commercial pesticide applicators and operators were provided with basic information that allowed them to conduct their jobs in a safe manner. In addition, information and training provided by this program gave growers and other applicators the skill set necessary to successfully complete their state pesticide licensing exams. In doing so, the application of pesticide in the state is a safer operation that is being done in a manner that does not create a hazard to applicators, workers or the general public. IPM: As a result of this program, benefits were seen in the areas of fruit, greenhouse, nursery and vegetable production systems. The various programs were able to document the following benefits: Pesticide use in tree fruit was reduced between 50 to 80% for Oriental fruit moth control. Growers in the vegetable IPM program received more timely information that resulted in less pesticide use, Nursery growers were better able to predict pest outbreaks and more effectively manage these outbreaks, Greenhouse growers were better able to manage pests and reduce insecticide and fungicide use because of the scouting program provided by the greenhouse IPM program. The impact of BMSB in tree fruit and peppers was also documented.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #4

1. Outcome Measures

Medium Term - Upland Fruit (Tree Fruit and Grape) Integrated Pest Management (IPM) Delivery - Research and educational programs, and public awareness campaign results in increased adoption of IPM in traditional and non-traditional systems. Research findings used to develop new projects. IPM training of students creates new IPM interns, professionals and researchers. Knowledge of various natural insecticides and their effectiveness on pests. Determining the best time and application method for IPM products. Greater understanding of pest biology and ecology. Greater understanding of entomopathogenic species biology and ecology.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Upland Fruit (Tree Fruit and Grape) Integrated Pest Management (IPM) Delivery

New Jersey tree fruit production is located in both southern and northern counties. According to the latest agricultural statistics, NJ peach production is valued at $39.6 million and apples at $28.5 million. The industry in southern counties is heavily oriented towards wholesale markets and peach production, while the industry in northern counties is heavily dependent on direct markets and apple production. Retail market fruit production in northern counties is valued at approx. $12-15 million. New Jersey fruit growers produce commodities that are susceptible to more than two dozen arthropod and disease pests. Management of this pest complex can cost producers up to $500 or more per acre. New invasive species such as the brown marmorated stink bug (BMSB) and the spotted wing drosophila will demand changes in pest management practices and educational and research needs on a regional basis.

What has been done
An integrated crop management (ICM) program was delivered to commercial fruit growers who produced apples, peaches, nectarines, and grapes by RCE Agricultural faculty and professional staff. Secondary participants attend extension update meetings, and receive other IPM/ICM information through personal visits, fax broadcasts, articles, newsletters and the Internet. Primary participants are those growers who access all the above information and participate in a field scouting program. Organized grower meeting contact reached a total of 784 audience members, while on-farm consultations totaled 1,238 visits. The Plant and Pest Advisory Newsletter was changed to a blog format on the Web. A total of 32 weekly articles were written in that format, with a total circulation of 181 subscribers in NJ and other states. Acreage impacted by primary participants totaled 80% of all state tree fruit acreage. Over 95% of total state tree fruit acreage was impacted by the program. IPM information reached over 90% of NJ grape growers.

Results
The program demonstrated reduced risk methods that included the use of mating disruption and ground cover management as tools to replace insecticide use for Oriental fruit moth, tarnished plant bug and stink bugs and two species of peach tree borers. In southern counties, where the bulk of commercial peaches are produced, 75% of growers used alternative, ?reduced risk? insecticides, and 80% of growers used reduced risk fungicides. In total, program participants reduced pesticide use by 26-80% compared to standard spray schedules, depending on the practices used. Other IPM practices included grower use of degree day based pest models, reducing insecticide use by 40% compared to standard calendar spray methods. Laboratory tests where completed in 2013 as part of the fertility component. Over 75% of areas sampled were shown have sufficient to excessive phosphorous levels, which led to decreased phosphorous use on those sites. A trial project conducted in 2012 and repeated in 2013, demonstrated that growers could treat field edges while using mating disruption and ground cover management to reduce insecticide use by up to 75% compared to most commercial practices now being used for BMSB.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #5

1. Outcome Measures

Medium Term - Weed Control in Cranberries - Research and educational programs, and public awareness campaign results in increased adoption of IPM in traditional and non-traditional systems. Research findings used to develop new projects. IPM training of students creates new IPM interns, professionals and researchers. Knowledge of various natural insecticides and their effectiveness on pests. Determining the best time and application method for IPM products. Greater understanding of pest biology and ecology. Greater understanding of entomopathogenic species biology and ecology.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Weed Control in Cranberries

Weeds, particularly perennials, are difficult to control in cranberry bogs. Clopyralid is a new herbicide that has been registered for use and is being used for weed control in cranberries. In recent years, pronamide, marketed under the trade name of Kerb, has been used for dodder control with section 18 Emergency Exemptions. Pronamide will no longer be available for the control of dodder in cranberries. Research to identify alternative dodder control measures is a priority.

What has been done
RCE Extension Specialist integrated effective herbicides into the current cranberry practices to improve the control of yellow loosestrife, sedges, and other weeds, prevent crop phytotoxicity, and maintain the longest practical preharvest interval. Evaluated the phytotoxicity and efficacy herbicides with the potential to control dodder and other serious weeds in cranberries. Screened herbicides registered on other crops and experimental herbicides for phytotoxicity to cranberries.

Evaluated herbicides on newly planted cranberry beds. Developed support for registration from the manufacturer(s) of herbicides with good potential for safely controlling weeds in cranberries, and cooperated with IR-4, the herbicide manufacturers, and state and federal agencies to obtain registration for herbicides, including BAS 514 and DPX 6025 that are not phytotoxic to the crop, control troublesome weeds, and are environmentally and toxicologically safe.

Results

Herbicides, including indaziflam and two formulations of diclobenil, were evaluated for crop safety and efficacy for the control of redroot in cranberries. Indaziflam injured cranberries in past studies when applied during active growth, but the herbicide did not injure cranberries when applied in early spring soon after the winter flood was removed. Results in 2013 confirmed that indaziflam could be applied to cranberries safely in early spring, and is important since indaziflam has been shown to control dodder. Growers have also expressed interest in using the new liquid formulation of diclobenil instead of the older labeled 4G (granular) formulation. Results in 2013 again confirmed previous research that indicated that the liquid diclobenil formulation is not as safe as the 4G formulation on cranberries. In addition, the liquid formulation was less effective controlling redroot than the granular formulation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #6

1. Outcome Measures

Medium Term - Improving Sustainability, Efficiency, and Efficacy of Peach Disease Management Strategies: Biofungicides, Conventional Fungicides, and Abiotic Environmental Factors - Research and educational programs, and public awareness campaign results in increased adoption of IPM in traditional and non-traditional systems. Research findings used to develop new projects. IPM training of students creates new IPM interns, professionals and researchers. Knowledge of various natural insecticides and their effectiveness on pests. Determining the best time and application method for IPM products. Greater understanding of pest biology and ecology. Greater understanding of entomopathogenic species biology and ecology.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Improving Sustainability, Efficiency, and Efficacy of Peach Disease Management Strategies: Biofungicides, Conventional Fungicides, and Abiotic Environmental Factors

Major diseases on peach and nectarine include brown rot blossom blight and fruit rot, scab, and bacterial spot. Each of these diseases, if not effectively controlled, alone can cause 100% crop loss when pathogen inoculum levels and environmental conditions are favorable for disease development. Other diseases, such as rusty spot and constriction canker can also contribute to significant yield loss if not managed properly. Unfortunately, disease-resistant cultivars are not commercially available for most peach and nectarine diseases.

What has been done

RCE Extension Specialist evaluated the efficacy of
biofungicides for management of peach diseases and their integration into current disease control programs, with particular emphasis on brown rot and rusty spot, determined the ability of new fungicides to control pathogen growth during different phases of the disease cycle to allow more effective deployment in peach disease control programs, examined the influence of environmental factors on various components of the disease cycle for peach pathogens, with particular emphasis on peach scab.

Results

Blossom blight incidence has been increasing in recent years, possibly due to warmer winters and springs as a result of climate change. In 2013, several conventional fungicides only labeled for early season usage, including two formulations of iprodione, were shown to provide 85-87% control of the blossom blight phase of brown rot under heavy disease pressure. Since the chemistries of these materials are different than those used for later season brown rot control, their usage 'up front' provides an important strategy for fungicide resistance management. In contrast, the older protectants captan and chlorothalonil were not effective, yielding only 40-51% control of blossom blight. Thus, their use for early season disease control/resistance management should be limited.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #7

1. Outcome Measures

Medium Term - Blueberry and Cranberry Insect Pest Management - Towards the Development and Implementation of Reduced-Risk Strategies - Research and educational programs, and public awareness campaign results in increased adoption of IPM in traditional and non-traditional systems. Research findings used to develop new projects. IPM training of students creates new IPM interns, professionals and researchers. Knowledge of various natural insecticides and their effectiveness on pests. Determining the best time and application method for IPM products. Greater understanding of pest biology and ecology. Greater understanding of entomopathogenic species biology and ecology.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Blueberry and Cranberry Insect Pest Management - Towards the Development and Implementation of Reduced-Risk Strategies

The blueberry and cranberry industry in New Jersey suffers major yield losses due to insect pests. Growers rely heavily on insecticides to manage pest problems.

What has been done
The Blueberry/Cranberry Entomology Program at Rutgers University directed by Extension Specialist focuses on the development and implementation of cost-effective reduced-risk insect pest management practices in blueberries and cranberries and the dissemination of this information to blueberry and cranberry growers. Several methods of information transfer including annual grower meetings, field days, twilight meetings, newsletters, and electronic media are used to serve the blueberry and cranberry industry in New Jersey. The research program also delivered presentations at meetings to the scientific community.

Results
The results of the research and outreach lead to the following outcomes: developed and implemented new tools for monitoring insect pest populations in blueberries and cranberries, worked with IR-4 on the registration of new insecticides in blueberries and cranberries, evaluated, implemented, and promoted adoption of new reduced-risk strategies for insect control in blueberries and cranberries, and delivered presentations to more than 100 New Jersey blueberry and cranberry growers on the use of new insect pest management practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #8

1. Outcome Measures

Long Term - Developing and Implementing Integrated Pest Management Strategies in Urban Communities - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Developing and Implementing Integrated Pest Management Strategies in Urban Communities

Urban pests such as termites, bed bugs, cockroaches, ants, flies, ticks, rodents, etc. cause billions of dollars of commodity loss, structural damage, and a number of diseases. They are also nuisance pests when they enter homes. In a recent survey at Irvington, New Jersey, we found 45% of the apartments in a low-income community had bed bugs. Pesticide applications for controlling urban pests pollute the environments, pose health risks to human and pets, and lead to insecticide resistance development. The public needs more effective, environmentally safe methods to reduce pests and pesticide use, and minimize health risks associated with pesticide applications.

What has been done
RCE Extension Specialist collaborated with three Housing Authorities in implementing community-wide bed bug management programs. The bed bug infestations will be monitored every 6 months for 18 months period. Bed bug control strategies will be revised. A community-wide bed bug management program that was initiated in 2012 was finished in October. Final results were presented at the annual meeting of the Entomological Society of America in November 2013. A manuscript was prepared and will be submitted in February 2014. Developed a 6 minutes video on a do-it-yourself bed bug monitor. It was posted at: http://www.youtube.com/watch?v=JbNn74Mt8XQ. Laboratory research found that only two of the 11 products evaluated were useful for controlling bed bugs. Additional studies revealed that the

essential oil-based products is related to the formulation. Found that efficacy of the insecticides is affected by feeding activities of bed bugs. These results suggest that current product testing methods must be revised. The information is useful to both manufacturers and consumers.

Results

A case study at New Brunswick Housing Authority showed a bed bug management program in 9 apartments resulted in 97% reduction in bed bug numbers and 96% reduction in pesticide use after 6 months. Implementing a bed bug management program at Jersey City Housing Authority (358 apartments) reduced bed bug infestation from 15% to 2% after one year and reduced pesticide use by > 90% compared to conventional treatment methods.

A home-made bed bug monitor using sugar, yeast, and dog bowls was developed. Field evaluations show that it is highly effective in detecting bed bugs. It is at least 15 times cheaper than the comparable commercial bed bug monitor. Residents and building managers are more aware of the use of non-chemical methods for preventing and controlling bed bugs. These methods include de-cluttering, frequent laundering of bed linens, installing mattress encasements, avoid taking used furniture from the streets, etc.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

NJAES research and extension outcomes related to this planned program were evaluated utilizing a variety of evaluation methods appropriate for each initiative to determine effectiveness on both a qualitative and quantitative level. For KASA and practice change we included the measurement of knowledge gained as measured by pre/post Likert-scale assessments. Surveys were used to measure increase in skills acquired, behavior change and practice adoption. For process evaluation we focused on program delivery, participation, relevance and timeliness. Data was collected at appropriate times for each initiative that supports this planned program. IRB approved evaluation

instruments were used to collect research and extension data. Data analyses and comparisons relevant to basic and applied research and demonstration were collected and analyzed and reported utilizing a variety of data collection methods appropriate to each research question.

The major goal of evaluating is the demonstration of social, economic, behavior and environmental changes in conditions that contribute to improved quality of life as a result of participation in programs and benefits of research solutions. See state defined outcomes for detailed results of each initiative.

Key Items of Evaluation

None to report.