V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Global Food Security and Hunger - Agricultural Viability

☑ 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
205	Plant Management Systems	20%		20%	
211	Insects, Mites, and Other Arthropods Affecting Plants	20%		20%	
215	Biological Control of Pests Affecting Plants	20%		20%	
601	Economics of Agricultural Production and Farm Management	20%		20%	
604	Marketing and Distribution Practices	20%		20%	
	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	65.0	0.0	36.0	0.0
Actual Paid Professional	41.4	0.0	0.0	0.0
Actual Volunteer	96.0	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**
947104	0	1348247	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
3999390	0	4393230	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
515359	0	2915185	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Identify critical programmatic foci/needs based on Extension and stakeholder assessment. These can be broadly defined under three areas:

- Production BMPs (nutrient, pest, waste/by-products management, water quality and quantity, energy)
- Financial BMPs (marketing, labor, risk management, policy e.g. farmland preservation)
- Ag Systems (sustainable ag, organic ag, new crops and use/alternative)

Develop an inventory of local (county based), regional and statewide programs designed to meet these needs; identify team members and their roles.

Create a multi-task effort to generate and share research-based information with clientele through demonstrations, educational meetings and workshops, certification programs, trainings, development of recommendation and decision making guides, etc.

2. Brief description of the target audience

Stakeholders (broadly defined to include producers, processors, marketers, end-users, policymakers, legislators).

Commercial agriculture producers and end-users (such as marketers, processors, consumers, etc.).

Municipalities and other governmental and non-governmental agencies, etc.

3. How was eXtension used?

RCE faculty and staff participated in the following CoPs: E Organics, Financial Security for All, Learn Network, Farm Energy, and Organic Farming. Faculty answered ask the expert questions, developed collaborative educational products, and coducted learn professional developement sessions.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	30537	26924	10782	8207

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

Patent Applications Submitted

Year:	2013
Actual:	59

Patents listed
200700265
201200052
200800180
200700384
200800330
200800329
200700372
200700373
200700428
200700452
200700264
200700263
200900133
200900134
200900135
201000033
200900425
200700271
200900426
200700385
200800161
201000330
200700269
200900290
200900284
200800129
200900005
200700422
200700427
201300033
201300137
201300142
201300365
2001200103
201300191
201300032
201300430
201300431
201300436
201300437
201300461
201300478
201300479
201300344
201300351
201300356
201300368
201300381
201300428

201300429
2011-166
2011-167
2011-168
2011-169
2013-035
2013-040
1998-0017
2010-106

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	60	89	149

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,and 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 - Increases in knowledge and skills of agricultural and horticultural industry professionals will occur relating to: Nutrient management Pest management Waste/by-products management and utilization Improving water quality and conserving water Conserving energy Marketing skills Labor management Risk management Policy e.g. farmland preservation Sustainable ag and organic ag production methods New crops and use/alternative crops
2	Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.
3	Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
4	Medium Term - NJAES Research and Outreach to Promote Agricultural Retention and Development in Urbanizing Regions - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.
5	Medium Term - Fungicide Resistance to Important Fungicide Chemistries in Vegetable Production - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.
6	Medium Term - Organic Grower Outreach - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound

	management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.
7	Long Term - Pepper Evaluations for Phenotypic Traits, Physiological Disorders, Diseases and Cultural Practices - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
8	Long Term - Annie?s Project New Jersey - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
9	Long Term - Development of Best Management Practices for Suppression of Anthracnose Disease on Annual Bluegrass Turf - 2013 - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
10	Long Term - Turfgrass Breeding and Evaluation - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
11	Long Term - Breeding and Germplasm Enhancement for New Jersey Cranberry and Blueberry Industries - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
12	Long Term - Conservation and Utilization of Plant Genetic Resources - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
13	Long Term - Integrating Crop Pollination by Native Bees into Agricultural Pollination Management and Maintaining Native Pollinators and their Habitats - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

Outcome #1

1. **Outcome Measures**

Short Term - Increases in knowledge and skills of agricultural and horticultural industry professionals will occur relating to: Nutrient management Pest management Waste/by-products management and utilization Improving water quality and conserving water Conserving energy Marketing skills Labor management Risk management Policy e.g. farmland preservation Sustainable ag and organic ag production methods New crops and use/alternative crops

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.

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)
Biological Improvement of Chestnut through Technologies that Address Management of the Species, its Pathogens and Pests

Chestnut blight disease virtually wiped out the American chestnut in the last century. Chestnuts continue to populate the northeast US in low numbers, and one of the factors that appears to be responsible for their continued survival is debilitation of the lethal fungus, Cryphonectria parasitica, by viruses that attack the fungus. These viruses therefore provide a form of biological control. Biological control of plant pathogenic fungi such as the chestnut blight fungus has the potential to reduce the need to use pesticides while controlling plant disease, resulting in sustainable disease management. The nucleotide sequence of a second reovirus of C. parasitica, designated MyRV-2, was completed during this project. It represents the third mycoreovirus whose sequence has been determined in its entirety. MyRV-2 was originally isolated approximately 20 miles from MyRV1, which has proven to be an excellent model for examining reovirus molecular biology. MyRV-2 has properties that are distinct from MyRV-1, including diverged sequence and markedly different effects on host phenotype. Five new hypovirulent isolates of C. parasitica were identified in Hartshorne Park, Tindall Park, and Huber Woods, all near Middletown, NJ. This represents one of the only places in the state where

surviving Native American chestnut trees can still be found, and it appears that hypovirulence of the fungus is likely responsible for tree survival. The five isolates have similar colony morphology to Cryphonectria hypovirus 2-infected isolates characterized in the past from a similar area of the state. Single conidial isolations confirmed that the hypovirulent phenotype segregated in single conidial isolates, and that transmission of the presumed virus was at a rate of less than 10%. It appears that CHV-2 is common in this part of New Jersey. We continue the deeper characterization of these isolates and others from surviving trees in the area. Completion of the fungal genome sequence of C. parasitica as a community sequencing project in which we participated provides substantial understanding not only of this specific pathogen but of the fungus that is one of the most important targets of biological control with viruses. One of our roles in that effort has been the analysis of its transposable elements. Approximately 10% of the C. parasitica genome was found to represent transposable elements, most of them in the retrotransposons family Metaviridae. A key finding was the invasion of the mating type gene cluster of C. parasitica by these transposable elements. This bioinformatic analysis has not yet been completed, but will represent an important component in the epigenetic analysis of the organism, one of the key issues in the biology of eukaryotes. Seminars summarizing and updating this research have been given locally, nationally, and internationally. In addition, results from this project have directly informed and benefited scientists associated with several other federally funded research projects.

What has been done

NJAES researchers continued to develop and evaluate blight resistant chestnut trees for food and fiber through traditional and molecular techniques that incorporate knowledge of the chestnut genome, which is now being sequenced; evaluate biological approaches for controlling chestnut blight from the ecological to the molecular level by utilizing knowledge of the fungal and hypovirus genomes to investigate the mechanisms that regulate virulence and hypovirulence in C. parasitica, and investigate chestnut reestablishment in orchard and forest settings with special consideration of the current and historical knowledge of the species and its interaction with other pests and pathogens.

Results

This work resulted in the establishment of breeding orchards for generating larger number of backcross generations for forest and orchard testing of pest resistance and regional adaptability; evaluation of genomic data of Castanea to identify genes that confer desirable traits and enable rapid screening for those traits; development of in vitro mass propagation systems for Castanea spp. so that elite genotypes from breeding programs and genotypes engineered with anti-fungal genes can be clonally propagated for reforestation; evaluation of the chestnut blight fungus genome to further our understanding of the genetic basis for pathogenesis and hypovirus regulation; development and deployment of the first genetically engineered virus for enhanced biocontrol of a plant pathogen; utilization of biological control agents to reduce the impact of chestnut blight and other pests and pathogens. In the longer-term, the project will lead to the return of an important timber species, major mast species for wildlife, a new cellulosic biomass energy crop, a new commercial nut crop; and, a new 'green' alternative to pressure-treated lumber for durable wood and outdoor uses.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants

601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #3

1. Outcome Measures

Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

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)
Crop insurance Education of NJ Farmers

New Jersey is home to about 10,200 farms, which produce approximately 32,000 cattle and calves, 8,000 hogs and pigs, and 7,000 cows which produce annually 31 million pounds of milk. Furthermore 90,000 acres are in corn production and 96,000 acres of soybeans are grown annually. Recent changes in climate conditions have led to some unpredictable weather that has proven quite damaging for some crops, because of the unreliable conditions it is in the farmer?s best interests to cover their risks using crop insurance.

What has been done
Experienced educators delivered training to over 4,777 producers through a wide variety of educational venues including 175 meetings, which included 119 one-on-one sessions, 43 workshops/meetings, and thirteen conferences/sessions, all geared toward the particular interest of the producer. During the program, fourteen newsletters, nine postcards, nineteen information guides, nine bulletins, seventeen blogs, and ten radio public service announcements reached 200,029 producers and individuals in a timely manner. Utilizing press releases and issuing various bulletins in the print media allowed the program to reach a large volume of producers and individuals. A Winter and Summer Newsletter reached 7,562 producers. We placed special emphasis on providing services to small farms and ranchers, socially disadvantaged producers, and traditional commercial producers. We also targeted beginning farmers, immigrant farmers, Native Americans, and farmers seeking production changes. An essential component of the

program was the direct contact (one-on-one) with producers resulting in the education of 271 individuals. Methods for reaching producers included one-on-one visits, workshops, crop insurance meetings, county boards of agriculture presentations, agricultural conventions and trade shows.

Results
In 2013, almost 175,000 acres of New Jersey?s farmland was insured through crop insurance with 1,565 policies sold in the state. With the recent unpredictable weather, it is imperative to not only maintain but continue to increase the crop insurance policies sold in NJ through the use of crop insurance education and outreach.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #4

1. Outcome Measures

Medium Term - NJAES Research and Outreach to Promote Agricultural Retention and Development in Urbanizing Regions - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.

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)
NJAES Research and Outreach to Promote Agricultural Retention and Development in Urbanizing Regions

New Jersey is the most densely populated and highly urbanized state in the Nation, but simultaneously possesses a rich farming history and a long track record of progressive policy to sustain a vibrant agricultural industry. For these reasons, the State is a natural laboratory for policy research and scholarly work on agricultural retention and development.

What has been done
The Extension Specialist implemented a program of research and outreach advancing the current NJAES mission "to enhance the vitality, health, sustainability and overall quality of life in New Jersey by developing and delivering practical, effective solutions to current and future challenges to agriculture" This was accomplished by examining several aspects of the State's current or emerging farm retention efforts. These include: examining outcomes of the State's long standing, and nationally recognized farmland preservation program in the context of statutory goals, examining opportunities and challenges facing farmers seeking to enhance financial sustainability through agritourism, and evaluating prospects for more effective planning for agricultural retention and development at the local levels of government.

Results
A Northeast regional assessment of farmers' needs was conducted to assess engagement/interest in agritourism enterprise development, as well as perceived challenges and opportunities for future growth. This research informed the development of targeted educational training materials that are responsive to these needs. An example of programmatic impact is the contributions made to the development of policies (known formally as an agricultural management practice) needed to clarify the extent of protections afforded to direct marketers and agritourism operators under the state right to farm statute. Another example is the creation and co-management (with a farm direct marketing association) of a centralized, statewide marketing platform for agritourism and direct marketing farms. Www.visitnjfarms.org is a key economic development strategy for this sector of New Jersey agriculture. Agritourism programming is featuring directly in policy discourse. For example, an empirical assessment quantified the impact of agritourism development on farm profitability and identified the farm types that are likely to benefit the most financially from this form of alternative enterprise development. This type of information moves policy discussions from a reliance on theorized or anecdotal accounts of industry benefits to one that is empirically grounded in credible science. It similarly helped to justify the substantial programming aimed at promoting visitor and employee safety on agritourism farms and managing farmers' exposure to legal liabilities. It also has generated the support necessary to develop and launch a statewide website for agritourism/direct marketing promotion (190 farms are registered). This research informed the development and passage of legislation revising the New Jersey Farmland Assessment statute (the state's differential assessment law for qualified agricultural land).

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants

215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #5

1. Outcome Measures

Medium Term - Fungicide Resistance to Important Fungicide Chemistries in Vegetable Production - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.

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)
Fungicide Resistance to Important Fungicide Chemistries in Vegetable Production

In the mid-Atlantic region of the United States over 200,000 Acres of fresh-market and processing vegetable crops are grown on an annual basis. The development of fungicide resistance to important fungicide chemistries used in vegetable production has been documented in New Jersey and the mid-Atlantic region in recent years. A number of these commonly-used chemistries have a high-risk for resistance development if they are overused or used improperly on fungicide chemistries (i.e. modes-of-action, FRAC codes) in order to manage fungicide resistance development properly.

What has been done
20,000 fungicide resistance management guidelines have been distributed in the mid-Atlantic and surrounding region representing over 100,000 Acres of vegetable production. Approximately

1,800 of the guides were distributed to commercial vegetable growers, crop consultants, industry representatives, crop advisors, Extension agents and Extension specialists in 2013 in New Jersey and other states. The resistance management guides have become widely adopted and used by many vegetable growers to help develop effective season-long fungicide spray programs while helping to reduce the chances for fungicide resistance development in the region. Recommendations guides are updated annually and available on-line through the Vegetable Crops On-line Resource Center hosted by the New Jersey Agricultural Experiment Station (http://plant-pest-advisory.rutgers.edu/) and other state experiment station websites.

Results
Although no formal survey was done in 2013, demand for the FRAC guide remains high and each year the fungicide resistance management guide is distributed to more vegetable growers in the mid-Atlantic and surrounding region.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #6

1. Outcome Measures

Medium Term - Organic Grower Outreach - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.

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)
Organic Grower Outreach

Historically organic growers have either not relied on Extension and have expressed displeasure in the lack of outreach specific to their needs.

What has been done
The Mercer County Agriculture professional has worked on developing a relationship with NOFA NJ, by conducting partner workshops and presenting at the Annual Winter Conference. Offering organic specific programming. Holding round-table meetings with organic growers. Develop relationships with out-of-state Extension personnel engaging in organic grower outreach.

Results
Growers are made aware of Extension programming and resources. Organic growers have begun participating in more Extension programs including grower advisories and the NJ Agriculture Convention and Trade Show. Forty-Six organic growers participated in the GAPs for Small Farms workshop, as a result of this class: 93% of participants increased their knowledge of the Food Safety Modernization Act, 100% of participants increased their knowledge on Good Agricultural Practices (GAP) and small farms, 100% of participants increased their knowledge on the components of an on-farm food safety plan, 96% of participants increased their ability to identify food safety concerns and risk areas for their farms, 100% of participants increased their ability to develop a non-audit based food safety plan, 86% of participants have decided to educate workers on health and hygiene, 89% of participants have decided to create written farm policies and standard operating procedures.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #7

1. Outcome Measures

Long Term - Pepper Evaluations for Phenotypic Traits, Physiological Disorders, Diseases and Cultural Practices - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

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)
Pepper Evaluations for Phenotypic Traits, Physiological Disorders, Diseases and Cultural Practices

New Jersey grows 3,700 acres of peppers for a value of $28,800,000 a year and is ranked third in the nation. The principal disease problems with peppers are Phytophthora blight, anthracnose and bacterial leaf spot (BLS). The number one disease problem in New Jersey is phytophthora blight (phytophthora capsici) which is endemic in southern New Jersey.

What has been done
RCE Agricultural Agents continued work on bell pepper cultivar evacuation to: select cultivars that have tolerance or resistance to phytophthora blight with good horticultural characteristics; evaluate cultivars for the presence of skin separation (silvering); determine if any phytophthora tolerant or resistance cultivars are acceptable for red pepper production; and determine the races of bacterial leaf spot found in New Jersey. In 2013, 22 cultivars and advanced breeding lines were arranged in a randomized complete block design with four replication at one location to assess disease tolerance, fruit type and susceptibly to silvering. Advanced breeding lines and commercially available cultivars are screened in a naturally infested field. Materials which have both tolerance to disease and good horticultural characteristics are recommended to growers for trial planting on their farms.

Results
Growers have saved around $22,000,000 over the last fifteen years from using culivars tolerant or resistant to phytophthora blight. All the recommended cultivars and the main ones grown in New Jersey were evaluated through our screening system. Since new cultivars are being release each year, growers and seed companies ask for this research to continue.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #8

1. Outcome Measures

Long Term - Annie?s Project New Jersey - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

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)
Annie?s Project New Jersey

According to the 2007 Census of Agriculture, 22 % of New Jersey?s 10,327 farms are managed by a woman, and that number is increasing. The 2007 Census also reported that 267 New Jersey women farmers have two years or less on-farm experience, 429 have three to four years? experience, and 1,289 have five to nine years? experience. These statistics demonstrate that we have a large women farm population that are beginning farmers and would benefit from Annie's Project New Jersey: Risk Management for Beginner Farmers and the other Annie?s Project New Jersey programming.

What has been done
Extension Specialists and Agricultural Agents developed and implemented Annie?s Project II: New Jersey Farm Women?s Conference 2013 designed to improve the economic stability of traditional underserved women farmers. It focuses on creating a farm business plan throughout the training, the use of social media education and adoption for marketing and business development, the use of social media tools to assist the participants in networking that is sustainable and interactive, long after the course is completed, using a unique combination of in-

person education and distance learning opportunities to expand the audience within the program, and recording the distance learning sessions for asynchronous education of participants and additional women farmers following the completion of the ?live? course.

Results
Annie?s Project New Jersey has resulted in scholarly deliverables as well as positive changes in the lives of program participants. In addition to serving as a resource for farmers in New Jersey, these resources are being used in other states. Participants reported they are able to make discussion on purchasing and updating insurance calculate net worth, create a household budget and assess current financial situation in order to create a financial plan. Draft an estate plan and become aware of networking opportunities with other farm women. This program has been modified for local conditions and taken to Turkey and Guyana where it has received equally positive results, local support, and tremendous local press. See: http://aesop.rutgers.edu/~farmmgmt/suzannes_project2013/suzannes_project.html.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #9

1. Outcome Measures

Long Term - Development of Best Management Practices for Suppression of Anthracnose Disease on Annual Bluegrass Turf - 2013 - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

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)
Development of Best Management Practices for Suppression of Anthracnose Disease on Annual Bluegrass Turf - 2013

Turfgrass is a valuable and rapidly expanding component of our urban and rural landscape. Turfgrass is used to stabilize soil and produce a playing surface on more than 17,000 golf courses in the US. Golf courses are an important component of the turfgrass industry providing a source of green space in the urban environment and offering recreation and enjoyment for approximately 36 million Americans. Golf courses also generate jobs, commerce, economic development, and tax revenues for communities throughout the country.

What has been done
Due to the increasing severity of anthracnose on golf courses in North America, studies were initiated at ten universities (CA, CT, IN, MD, MI, NC, NJ, NY, PA and ON [Guelph, Canada]), including Rutgers as part of a multistate turf regional research project (NE-1046). The anthracnose portion of this project was to develop and disseminate a set of best management practices (BMPs) to golf course superintendents that would result in successful control of anthracnose in a sustainable manner, while reducing pesticide inputs and maintaining acceptable turfgrass quality.

Results
Based on a validation of the research conducted for this project in 2012 and 2013, different combinations of BMP cultural management factors resulted in the following reductions in fungicide usage (i.e., few fungicide applications required to control the disease compared to a 14-day calendar-based application schedule): a 10% reduction was documented where the BMP mowing height (0.125 inches) and non-BMP N rate (2 lb N 1000 ft-2 yr-1) was implemented; a 50% reduction where a BMP N (4 lb N 1000 ft-2 yr-1; i.e., more vigorous turf that is better able to resist infection) and non-BMP mowing (0.09 in) regime was used; and an 80% reduction in fungicide applications with a combination of BMP N and BMP mowing heights. In addition, when BMP N fertility and BMP mowing practices were followed, acceptable disease control (<10% turf area infected) was achieved at fungicide rates as low as 50% of label rate during 2013. During the past two years (2012-2013), the macronutrient potassium has been shown to significantly reduce anthracnose disease severity compared to turf not receiving potassium applications in research trials at Rutgers University, a finding that may further reduce turf managers reliance on fungicides to control this disease. In summary, implementation of our BMPs by practitioners has resulted in improved management practices that are sustainable, cost-effective, and have provided improved control of anthracnose often with reduced pesticide inputs (reduced rates and few fungicide applications). This multi-state research project has also improved the exchange of information about anthracnose between turfgrass scientists and practitioners throughout North America, and has greatly enhanced our understanding of the general biology and ecology of this disease on golf course putting greens.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants

601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #10

1. Outcome Measures

Long Term - Turfgrass Breeding and Evaluation - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

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)
Turfgrass Breeding and Evaluation

The turfgrass industry is important to the residents of New Jersey and surrounding states. There is more turfgrass growing within a 100 mile radius of New Brunswick, NJ than anywhere in the world. In a 2003 survey, there were over 860,000 acres in turf in
New Jersey with a value of over 1.5 billion dollars (Govindasany et al., 2005). Quality turf beautifies and enhances an environment, conserves soil, reduces pollution and provides a site for recreation. The development and use of new improved cultivars continues to be the greatest need in the turfgrass industry.

What has been done
NJAES Researchers, faculty and staff evaluate. utilize, enhance and preserve turfgrass germplasm and useful endophytes from the USA, Europe and North Africa. Emphasis is on collecting sources of Kentucky and Texas bluegrasses, tall fescue, perennial ryegrass, fine fescues, colonial, creeping and velvet bentgrasses and orchardgrass. Developed more effective breeding and evaluation techniques with emphasis on evaluation of single clonal mowed space plants and seeded single replicated turf plots in open-sun environments. All of these species were tested under worn and unworn conditions. A new emphasis was placed on the genetic control of different growth habits in tall fescue and breeding for drought tolerance in tall fescue. Researched breeding for brown patch resistance in tall fescue and on hybridization of Kentucky

bluegrass and Kentucky x Texas bluegrasses with new winter active European sources and breeding for disease resistance for rust in Kentucky bluegrass, dollar spot and red thread in fine fescue and red thread dollar spot, gray leaf spot and summer leaf spot in perennial ryegrass. Demonstrated the usefulness of these techniques in the development and release of improved germplasm and cultivars. Educate students and stakeholders. Publish and disseminate information. Maintain and monitor cultivars developed at the New Jersey Agriculture Experiment Station to continue the assurance of quality seed. To reduce pesticide, fertilizer and water requirements to maintain 100% turf cover cool-season turfgrass.

Results

Over 40 new cultivar and germplasm agreements were executed in 2013 with turfgrass seed organizations. Eighteen new varieties were increased and named in
2013. During 2013, there were 21 U.S. Plant Variety Protection (PVP) Applications made and 29 U.S. PVP certificates were issued. Turfgrass cultivars from the Rutgers turfgrass breeding program represented over 90% of the top 30 cultivars in the (NTEP) National Turfgrass Evaluation Trials for tall fescues, fine fescues, and perennial ryegrasses. More than fifty percent of the top 25 cultivars in the 2005 and 2010 NTEP Kentucky bluegrass trials were from Rutgers. All of the highly resistant gray leaf spot varieties of perennial ryegrass in 2013 were from Rutgers. More than 50% of the NTEP top creeping, velvet and colonial bentgrasses were from Rutgers. In 2013, over 11,588 new turfgrass plots were established with over 108,784 plants in spaced-plant nurseries and 10,000 mowed single clone selections. In 2013, there were over 224,000 Kentucky bluegrass hybrids screened. The progenies of 180 new hybrid Kentucky bluegrasses were screened in spaced plant nurseries to determine apomixes levels and seed production. In the winter of 2012-2013, 20,000 tall fescue plants were screened for tiller and rhizome production. There were 50,000 perennial ryegrasses and 28,000 fine fescues screened in the winter of 2012-2013.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #11

1. Outcome Measures

Long Term - Breeding and Germplasm Enhancement for New Jersey Cranberry and Blueberry Industries - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

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)
Breeding and Germplasm Enhancement for New Jersey Cranberry and Blueberry Industries

New Jersey is a major producer of both cranberries and blueberries with a current total industry crop value of over $111 million per annum. Since 2010, there are approximately 7,900 acres of blueberry and 3,200 acres of cranberry production in the state.
Both crops can suffer major yield losses due to insects, disease, and adverse climatic conditions. Critical pesticides currently employed by the blueberry and cranberry industries may be restricted or have loss of label in the near future, making alternative approaches essential for the sustainability of these two industries.

What has been done
NJAES Researchers? focus was towards increasing production efficiency due to the fluctuation of cranberry prices in recent years, and developing cultivars with increased resistance to the fruit rot disease complex. Classical plant breeding procedures, breeding and selections cycles, was followed for both blueberry and cranberry, involving identification of prepotent parents, crosses for trait complementation and enhancement, and selection for adaptation, productivity, fruit quality, etc. The major impact of this program was the development of cranberry and blueberry cultivars better adapted to a warmer climate thereby enhancing reliable production and economic sustainability, environmental compatibility, and 'value-added' nutrition. Research results and implications were presented at scientific meetings including North American Cranberry Research & Extension Workers, American Chemical Society, and American Phytopathological Society. In an effort to educate growers and extension personnel, presentations were made to several hundred growers at meetings and Field Days in New Jersey, Washington, Oregon, Quebec and British Columbia. Outreach activities included providing cultivar information to numerous blueberry and/or cranberry growers. In addition, tours were regularly provided to primary school students and their teachers to learn about cranberry and blueberry production, IPM, the impact of fruit rot, and plant breeding.

Results
Overall, 3% of the progeny were highly resistant, while 50% were highly susceptible. A few progeny were identified with both good yield and FFRR. The top 10 progeny had a 3-yr mean percent rotten fruit of 35% or less, while the most resistant progeny had a 3-yr mean percent rot of only 16%, compared to 87% rotten fruit in Stevens, the industry standard. Nicholi Vorsa,

director of the NJAES Marucci Center, was named a 2013 NJ Investor of the Year by the New Jersey Inventors Hall of Fame for his scientific research and monumental contributions to disease-resistant cranberries and the cranberry industry.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #12

1. Outcome Measures

Long Term - Conservation and Utilization of Plant Genetic Resources - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

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)
Conservation and Utilization of Plant Genetic Resources

All tree fruit cultivars have defects which reduce fruit quality, marketable yields and/or their ornamental value. Susceptibility to bacterial diseases, small size, lack of fruit firmness, inability for the fruit to store, poor fruit color, and lack of flower bud hardiness are common drawbacks of currently available varieties.

What has been done

NJAES research lead to the identification of new sources of genetic diversity to develop peach, apricot, and apple cultivars which will be better adapted to northeastern growing conditions. We have continued to acquire and characterize Prunus and Malus plant genetic resources for its potential use in plant breeding programs in the Northeast, elsewhere in the US, and other similar temperate environments in Europe, North Africa, South America, Australia and New Zealand. Annually, accessions and elite selections were evaluated for hardiness, bloom date, flower bud set, crop load, fruit size and weight, fruit quality, fruit firmness and disease resistance. Quantitative and qualitative information about each accession/selection was entered into a database, analyzed, and compiled into reports that are disseminated to researchers, nurserymen, and grower cooperators. The apricot (Prunus armeniaca L.) breeding program focused on the development apricots with improved eating quality and a broader range of adaption. The focus of our peach and nectarine [Prunus persica (L.) Batsch] crosses was to develop cultivars with large, firm fruit that soften slowly, and are tolerant to bacterial spot (Xanthomonas campestris pv. pruni). The apple (Malus Xdomestica Borkh.) breeding program was to develop high quality desert apples with durable resistance to apple scab (Venturia inaequalis). Information about this research and new varieties that are developed is disseminated by presentations at grower meetings, variety showcases, newspaper articles, publications in professional journals, and published patents.

Results

The consistent development of a steady stream of new and improved tree fruit varieties is critically important to our long-term agricultural competitiveness. As a result of this research, many peach, apricot, and apple selections have been distributed to researchers, growers, and nurserymen for further testing. Several of these selections were determined to be superior to the cultivars that are currently being grown, and the decision was made that they should be commercialized. Consequently, patent applications were filed on one apricot, three peach, and one nectarine selection(s), and patents issued on five peach, one nectarine, and one apple selection(s). Information about these new and improved tree fruit varieties was disseminated during presentations at grower meetings, variety showcases, newspaper articles, publications in professional journals, and published patents.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #13

1. Outcome Measures

Long Term - Integrating Crop Pollination by Native Bees into Agricultural Pollination Management and Maintaining Native Pollinators and their Habitats - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

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)
Integrating Crop Pollination by Native Bees into Agricultural Pollination Management and Maintaining Native Pollinators and their Habitats

Little information exists about the habitat needs of most pollinators, and in particular, about how they are affected by increasing human land uses such as agricultural intensification and suburban/urban development (Aizen and Feinsinger 2003; Cane 2001; Winfree et al. In preparation). New Jersey is so densely populated and has little remaining natural habitat, it is particularly important to maximize the effectiveness of the remaining natural areas by including pollinators in natural resource management.

What has been done
NJAES Researchers identified the habitat types and plant species most beneficial to pollinators in New Jersey, and will continue an ongoing collaboration with the Natural Resource Conservation Agency (NRCS) in New Jersey to provide research-based guidelines for pollinator-friendly land management practices.

Results
Researchers collected and identified 10,000 specimens of 100 pollinator species. We identified the plant species that were significantly preferred by pollinators. This work has resulted in multiple outreach publications in both print and web format and these have been utilized by the USDA-NRCS programs, the Xerces Society for Invertebrate Conservation, and by private landowners to effectively restore beneficial insects. Findings, crop pollination: We have generated very large (10,000 records) data sets on these projects. We found that native, wild pollinators contribute 20-63% of the total crop pollination, across different crops. The remainder of the pollination is contributed by honey bees. We have also used this work in multiple outreach publications in both print and web format and these have been utilized by the USDA-NRCS programs, the Xerces Society for Invertebrate Conservation. The result of this work was used as recommendations to the New Jersey NRCS for modifying buffer and riparian planting standards to incorporate important plants for pollinators. The NRCS plans to create buffer habitat on 5% (30,000 acres) of the agricultural area of New Jersey over the next ten years, and NJAES recommendations will be included in these plans, thus having a large and immediate impact on conservation of pollinators

in the state.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

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

None to report.

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.