V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Food Safety

☑ 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
101	Appraisal of Soil Resources	10%		5%	
102	Soil, Plant, Water, Nutrient Relationships	5%		5%	
104	Protect Soil from Harmful Effects of Natural Elements	5%		5%	
311	Animal Diseases	0%		5%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals	0%		5%	
404	Instrumentation and Control Systems	0%		5%	
501	New and Improved Food Processing Technologies	5%		10%	
502	New and Improved Food Products	10%		10%	
503	Quality Maintenance in Storing and Marketing Food Products	10%		5%	
504	Home and Commercial Food Service	15%		10%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	10%		10%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	10%		10%	
722	Zoonotic Diseases and Parasites Affecting Humans	5%		5%	
723	Hazards to Human Health and Safety	15%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890

Plan	3.0	0.0	4.0	0.0
Actual Paid Professional	3.4	0.0	4.4	0.0
Actual Volunteer	0.0	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**
53893	0	232072	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
310165	0	973443	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
18289	0	543564	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

• Conduct training and certificate programs for growers, producers, food workers, consumers and vendors to increase knowledge of food safety practicies.
• Design strategies, tools and processes to detect and eliminate pathogens, chemical and physical contaminants during production, transportation, processing and preparation of food.
• Invesitgate the ecology of threats to the food supply from microbial and chemical sources
• Develop technologies for the detection of food supply contaminants

2. Brief description of the target audience

• Producers
• Processors
• Retail - restaurants/vendors/supermarkets
• Department of Health
• Consumers, families, youth communites
• NJAES - faculty - staff - students
• Food manufacturers
• Schools - child care providers - food service workers

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	100	0	0

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

Patent Applications Submitted

Year: 2012

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	17	22	39

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- -New methods in technologies -Educational workshops -Newsletters -Scientific publications -Patents -Website development -Extension publications -Volunteers trained -Agricultural and Industry Certifications -Train the trainer programs -Audits conducted

Year	Actual
2012	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Short Term - Increase knowledge of viable technologies, detection prevention, intervention and control techonologies and practices to ensure food safety. Increase understanding of the ecology of threats to food safety from microbial and chemical sources.
2	Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.
3	Long Term - A safe food supply resulting from reduced incidence of food-borne illnesses.
4	Food Safety Cognitions of Middle Schoolers and Parents of Middle Schoolers: Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.
5	Developing a Food Safety Extension Program that Supports Small Farms: Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.
6	Biosecurity Communications Research and Practices: Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.
7	Modeling and Risk Assessment of Food Safety: Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.

Outcome #1

1. Outcome Measures

Short Term - Increase knowledge of viable technologies, detection prevention, intervention and control techonologies and practices to ensure food safety. Increase understanding of the ecology of threats to food safety from microbial and chemical sources.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
501	New and Improved Food Processing Technologies
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #2

1. Outcome Measures

Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Control of Food-Borne Pathogens in Pre- and Post-Harvest Environments

The wholesale fruit and vegetable industry is under increased pressure to improve their food safety practices and to obtain a third party audit confirming they are improving their practices. This is even more important with the enactment of the Food Safety Modernization Act which will be implemented over the next three years.

What has been done
Experiments were conducted related to modeling the microbial safety of fresh produce; modeling the risk associated with hand washing and cross contamination in kitchen environments; modeling norovirus transmission in foodservice settings; using risk assessment to develop scientifically-based consensus food safety metrics for tomatoes; Enhancing microbial safety of fresh-cut fruit and vegetable salads using modeling and risk assessment; Validation of bacterial surrogates for the survival of norovirus on food contact surfaces; and validation of a mathematical model for holding cold foods without temperature control (ground beef and Salmonella). Eight graduate students were specifically mentored as part of these projects. Seven graduate students were given instruction in quantitative microbial risk assessment as part of special topics class offered through the food science graduate program. Four presentations were given at the International Association for Food Protection annual conference in Providence, Rhode Island in July 2012.

Results
Changes in knowledge occurred in the 7 graduate students studying quantitative microbial risk assessment through the special research topics course. Students gained knowledge regarding the use of quantitative microbial risk assessment in developing food safety policy. Students also

improved their skills in conducting quantitative microbial risk assessment. Several students gained new applied knowledge through their research, and more than 12 draft publications are in preparation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
504	Home and Commercial Food Service
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #3

1. Outcome Measures

Long Term - A safe food supply resulting from reduced incidence of food-borne illnesses.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
311	Animal Diseases
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
404	Instrumentation and Control Systems
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
504	Home and Commercial Food Service
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
722	Zoonotic Diseases and Parasites Affecting Humans
723	Hazards to Human Health and Safety

Outcome #4

1. Outcome Measures

Food Safety Cognitions of Middle Schoolers and Parents of Middle Schoolers: Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food Safety Cognitions of Middle Schoolers and Parents of Middle Schoolers

Little attention has been given to children and teens? understanding of safe food handling

knowledge and skills, despite their interests in studying food safety and preparing food, growing food shopping and preparation responsibilities, and future roles as caregivers for infants, young children, and elderly parents. Moreover, the most common jobs held by youth are in the food service industry, ranging from cashier to table buser to server to cook.
Changes in the educational system, that once taught food safety in family and consumer sciences classes in virtually every secondary school, have resulted in a reduction or even elimination of such courses over the past two decades. Opportunities for children to learn safe food handling via observation have diminished as more mothers have taken employment outside the home and as the reliance on fully or partially pre-prepared convenience foods have increased. As a result, a large proportion of teens and adults have limited food preparation experience, have never learned basic food safety principles, and, thus, lack critical knowledge needed to proactively protect themselves and their future families. These societal changes indicate that the risk of foodborne illness arising from unsafe food handling in the home is likely to rise.

What has been done
The game was evaluated with 1,268 students to promote a greater understanding of food safety knowledge and intended behavior among youth, a computer education game (Ninja Kitchen) was developed in collaboration with New Mexico State University and implemented in two states (NJ and TX) and to assess food safety knowledge, psychographic characteristics, and usual and intended behaviors.

Results
Linear mixed-effects models, controlling for gender, grade, and geographic location revealed significant time by group effects for knowledge of safe cooking temperatures for animal proteins and danger zone hazard prevention, and usual produce washing behaviors. Pairwise comparisons, adjusted for multiple comparisons, indicated that after playing the game, the experimental group felt more susceptible to foodborne illness, had stronger attitudes toward the importance of handling food safely and handwashing, had greater confidence in their ability to practice safe food handling, and had greater intentions to practice handwashing and safe food handling. Teachers and students found the game highly acceptable.

The game has the potential to promote positive food safety behaviors among youth in a fun and educational format. The Ninja Kitchen video game (freely available at www.ninjakitchengame.org) is a unique tool that can help middle schoolers develop the cognitions needed to practice safe food handling and reduce the risk of foodborne illness.

4. Associated Knowledge Areas

KA Code	Knowledge Area
504	Home and Commercial Food Service
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #5

1. Outcome Measures

Developing a Food Safety Extension Program that Supports Small Farms: Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Developing a Food Safety Extension Program that Supports Small Farms

An increasing number of wholesale producers are required to comply with a third party food safety audit, currently enforced by wholesale buyers. Many wholesale growers and some direct market producers in the state will be affected by the impending Food and Drug Administration (FDA) Food Safety Modernization Act regulations.

What has been done
Extension Agricultural Agents prepared growers in the state for audits through educational programming, farm food safety plan creation assistance, farm food safety walk through, Plant and Pest Advisory articles, document templates and general question support. Prepare growers for compliance with government and business regulations.

Twenty-seven articles focusing on the creation of a farm food safety plan were published in the vegetable crops edition of the Plant and Pest Advisory. Growers were also reached at the Vegetable Growers Association of New Jersey, The Direct Farm Market Association, Rutgers Agritourism educational events, Annie?s Project NJ, the NJ Agriculture Convention and Trade Show, the Mid-Atlantic Vegetable Meeting and other regional meetings through educational programming, program overviews and convention displays.

Results
Analysis of outreach efforts directly with farmers, including audit preparation certification, farm walkthroughs and farm food safety plan review have been highly successful. 100% of growers utilizing the above have passed their third party audit.

4. Associated Knowledge Areas

KA Code	Knowledge Area
504	Home and Commercial Food Service
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #6

1. Outcome Measures

Biosecurity Communications Research and Practices: Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Biosecurity Communications Research and Practices

While the food system in the United States is the safest in the world, food safety concerns continue to threaten the health of families and individuals. Foodborne pathogens, improper food handling and environmental factors can result in foodborne illness and even death. The CDC reports numerous cases of foodborne illness each year. Research shows that consumers either do not know appropriate food handling practices or that they say one thing or do another. Foodborne illness has both health and economic consequences.

There is an increased interest in home food preservation - canning and freezing in recent years. As more people plant home gardens, participate in CSA's or buy from local farm markets, they want to preserve the extra produce for later in the year. Many people have never preserved food at home and others are using outdated or unsafe recipes and procedures.

What has been done

through a combination of national surveys, qualitative interviews, and media content analysis, researchers at the Rutgers Food Policy Institute addressed many of the objectives of this multi-state project on biosecurity communication. NJAES researchers completed a study concerning how consumers respond to food recalls, as well as a white paper on how government and industry communicators can better respond to public needs for information during outbreaks of foodborne illness or food recalls. A final survey was conducted, which utilized an experimental design to test features of communication about intentional and unintentional food contamination.

Results
The research from this project has had an impact on the field of communicating with the American public about food contamination. By providing practical guidance about the communication process, as well as best practices regarding the content of food contamination risk messages, this research program has filled an important gap. For example, the Partnership for Food Safety Education developed a new awareness campaign that is based in part on this research.

4. Associated Knowledge Areas

KA Code	Knowledge Area
504	Home and Commercial Food Service
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #7

1. Outcome Measures

Modeling and Risk Assessment of Food Safety: Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Modeling and Risk Assessment of Food Safety

Food manufacturers are under a variety of regulatory, economic and environmental pressures. Retaining a strong manufacturing base still an essential component for the state's economic growth.

What has been done
NJAES Extension Specialist in Food Science continually assists the industry through short courses; in the current reporting year there were five different instances where his one-on-one assistance had a specific and direct economic benefit to NJ companies. In 2012, he assisted NJ-based companies with a Listeria monocytogenes-related recall; with the development of food safety plan; with application of mathematical modeling for shelf life and stability of consumer products; with response to a USDA FSIS audit and with evaluations of novel process for reduction of pathogen load in herbal teas. These outputs were directly based on the "modeling and risk assessment of food safety risks" research lab.

Results
In addition to the assistance provided to NJ-based companies, as time allows, the Extension Specialist also provides technical assistance to other states and internationally. Eleven such examples occurred in 2012 with assistance provided to companies or groups based in Washington, DC, California, Georgia and New York. Technical assistance with a specific economic benefit was provided to companies in Pennsylvania, Utah, South Dakota and New York. This assistance saved these companies more than an estimated $300,000. These impacts were directly based on the "modeling and risk assessment of food safety risks" work conducted at NJAES.

4. Associated Knowledge Areas

KA Code	Knowledge Area
504	Home and Commercial Food Service
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

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

V(I). Planned Program (Evaluation Studies)

Evaluation Results

See Qualitative Outcomes

Key Items of Evaluation

See Qualitative Outcomes