V(A). Planned Program (Summary)

Program # 6

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
501	New and Improved Food Processing Technologies	0%	0%	10%	15%
502	New and Improved Food Products	0%	0%	10%	15%
702	Requirements and Function of Nutrients and Other Food Components	0%	0%	10%	10%
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	10%	0%	20%	0%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	90%	100%	50%	60%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	7.3	0.5	9.5	2.0
Actual Paid Professional	13.3	0.5	15.2	0.0
Actual Volunteer	184.0	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**
277322	99077	277523	196705
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
392374	79839	624099	201821
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1164506	0	2005404	13405

V(D). Planned Program (Activity)

1. Brief description of the Activity

Conduct educational classes, workshops, meetings, and trainings, develop products, curriculum, resources, facilitate coalitions and/or task forces, conduct assessments and community surveys, partner with community agencies and institutions to facilitate programs and community development, create/revise social systems and public policies, conduct research studies, disseminate program and research results through papers, reports, and media, develop and implement marketing strategies using various outlets to promote program participation, disseminate research-based information to consumers using a variety of media and technology resources, cooperate with media and other community agencies to seek effective means of reaching new and non-traditional audiences, and respond to consumer inquiries.

2. Brief description of the target audience

Retail and food service employees, retail and food service management, temporary food vendors, child care providers, young adults (ages 25-59), older adults (ages 60 and older), Extension educators, commercial food processors, value-added food producers and very small and small produce growers.

3. How was eXtension used?

Content by specialists has been uploaded into eXtension. Additionally, agents and specialists are listed as experts for the "Ask an Expert" link. Therefore agents and specialists have answered questions that have come through eXtension from Virginia.

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	14863	12998	1860	11

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	23	13	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of food service managers, supervisors and food handling personnel from restaurants, cafeterias, daycare and other food service facilities completing food safety training offered by extension educators in Virginia

Year	Actual
2012	782

Output #2

Output Measure

- Number of home-based food business workshops conducted for food product formulation, facility planning, food processing and safety, product evaluation, food packaging and labeling, and record keeping.

Year	Actual
2012	5

Output #3

Output Measure

- Number of short-courses provided on food safety practices including HACCP training, Good Agricultural Practices and recall workshops to industry personnel, consumer organizations, Extension Agents and to local, state, and federal health inspectors

Year	Actual
2012	10

Output #4

Output Measure

- Number of research projects completed or in progress in the area of food safety.

Year	Actual
2012	6

Output #5

Output Measure

- Food Safety - Number of home based business entrepreneurs that have products evaluated for their safety by the 'Food Processor Technical Assistance Program' to prevent foodborne illness across the commonwealth.

Year	Actual
2012	29

Output #6

Output Measure

- Number of consumers completing home food preservation training offered by extension educators in Virginia

Year	Actual
2012	777

Output #7

Output Measure

- Number of temporary food vendors or other small occasional food handlers completing food safety training offered by extension educators in Virginia

Year	Actual
2012	517

Output #8

Output Measure

- Number of Virginia fresh produce growers and farm market managers knowledgeable in using food safety principles and practices (taught through Enhancing the safety of locally grown produce?).

Year	Actual
2012	62

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increase in the number of food handlers (managers, supervisors, and food handling personnel from restaurants, public school and hospital cafeterias, daycare centers, nursing homes, university food service, correctional centers, civic/community groups and volunteers) who increase knowledge and skills in safe food handling practices.
2	Increase in number of home-based business entrepreneurs that increase awareness and knowledge in producing safe high acid and acidified food products.
3	Increase in number of discoveries from completed food related research projects which focus on enhancing the safety of the Nation's food supply and the development of value added foods.
4	Food Preservation - Increase in the number of consumers that increase their knowledge on how to safely preserve foods at home.
5	Increase in number of small direct market Virginia fresh produce growers and farmers market managers knowledgeable in using food safety principles and practices (taught through "Enhancing the safety of locally grown produce)
6	Increase in number of Virginia fresh produce growers knowledgable or certified in Good Agricultural Practices (GAPs).
7	Creation of a new workshop on preventive controls offered to Virginia food industry
8	Salmonella Rebound Study Recommends Uninterrupted Cold-chain for Produce Safety

Outcome #1

1. Outcome Measures

Increase in the number of food handlers (managers, supervisors, and food handling personnel from restaurants, public school and hospital cafeterias, daycare centers, nursing homes, university food service, correctional centers, civic/community groups and volunteers) who increase knowledge and skills in safe food handling practices.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	1299

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Centers for Disease Control and Prevention estimate that each year 1 in 6 Americans get sick, 128,000 are hospitalized and 3,000 die from foodborne illness. The overall cost to the public is high, with the estimated economic cost of foodborne illness approximately $77.7 billion dollars per year, or approximately $1626 per foodborne illness case.

Between 2007 and 2009, the state of Virginia averaged 21 foodborne outbreaks per year resulting in an average of 400 confirmed cases (sick individuals) per year. For each confirmed case there are an estimated 20-38 unconfirmed cases. Between 8,000 and 15,200 Virginians suffered from foodborne illness each of those years. The estimated economic loss from foodborne illness in Virginia during those years may be between 13 and 25 million dollars per year.

The top factors which contribute to foodborne illness are: inadequate cooking, improper holding temperatures, contaminated equipment, poor personal hygiene and food from unsafe sources. Safe food handling and preparation by food handlers can dramatically reduce illness and health costs.

What has been done
In 2012 VCE conducted food handler trainings across the state including:
?36 manager food safety certification courses (16 hour nationally recognized certification program) were provided to 379 individuals from the food service industry, schools, senior and day care centers across the state.
?32 employee food safety certification courses (6 to 10 hour trainings) were provided to 403 individuals were food handlers preparing foods in non-supervisory roles

? 24 general safe food handling and preparation courses were provided to 517 individuals. These included consumers preparing foods in their homes, individuals from non-profit organizations such as church, civic groups and public service organizations preparing food occasionally for the public.
Eleven Extension agents provided these programs in over 30 counties across the state. Over 448 restaurants, schools, day care centers, churches, civic groups, public service organizations and other locations sent individuals to VCE to complete food safety training.

Results
Of those completing the manager?s certification course, 89% became certified. All food handler trainings were evaluated to determine the knowledge and behavior changes of participants. Of those who completed pre and post evaluations, 88% increased their knowledge of food safety practices.
103 participants responded to a follow-up survey, for a response rate of 8%. Of respondents, 97% adopted at least one new food safety behavior including,
?90% improved time and temperature practices
?62% made changes to prevent food contamination
?76% made changes to personal hygiene practices
In addition, respondents shared food safety information with 431 additional food handlers.

It is conservatively estimated that if one case of foodborne illness is prevented per food handler completing proper food safety training and application through VCE, this translates into a potential annual savings of approximately $2.1 million dollars for the state of Virginia. This savings is calculated from the estimated economic burden of foodborne illness. This range of economic costs ensures a broad, accurate measure of the potential impacts.

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #2

1. Outcome Measures

Increase in number of home-based business entrepreneurs that increase awareness and knowledge in producing safe high acid and acidified food products.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	54

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food processors in Virginia are in need of guidance on formulation and regulation of their products in order to produce safe and wholesome food products that are in compliance with local and federal regulations. The importance of a good source for education and input is especially important in recent years as many Virginians are seeking to start their own food businesses as a source of supplemental income in hard economic times. Processors of acidified foods such as barbeque sauces and salsas are required by federal regulation to have their processes approved by a competent processing authority and to pass an FDA mandated course specific for acidified and low-acid canned food processors.

What has been done
The Food Innovations Program was developed to meet the demand for education and guidance for food processors in Virginia. The program has been designed to focus on 1) education material and opportunities for food processors, 2) analysis of food products and providing recommendation for formulation and processing based on the analysis, 3) providing official documents to food processors to file with the FDA when necessary, 4) providing feedback on product labeling and providing assistance in developing nutrition facts panels, 5) consulting with individuals or companies who need technical food processing assistance, and 6) providing food safety and food processing training courses to food processors, consumers, extension agents, and government agents in need.
The Food Innovations Program has implemented a website for easy access to education materials with unrestricted access. Materials have been developed and published to cover 5 areas of need, including Addressing Business Needs, The Science of Food Quality and Food Safety, Food Regulations and Compliance, Food Labeling, and Miscellaneous Food Info. There are currently 18 hand-outs related to these topics available on both the VCE publications web page, and the Food Innovations Program website.

Results
Since opening the food testing laboratory for service in September 2012, the Food Innovations Program has assisted 14 food entrepreneurs with their food enterprise. Nutrition labels have been created for 11 different products. A total of 29 products have been analyzed and accessed for safety. Of the 29 products, 16 were classified as acidified foods, and 13 products were found to be exempt from acidified food regulations. Of the 16 acidified foods submitted for process approval, 12 of the processes needed to be altered to provide a science-based adequate process for a safe acidified food product.
The Food Innovations Program has supplied a number of opportunities for support for food entrepreneurs. I have had a total of 370 phone contacts, 689 email contacts, and approximately 350 in-person contacts.

4. Associated Knowledge Areas

KA Code	Knowledge Area
502	New and Improved Food Products
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #3

1. Outcome Measures

Increase in number of discoveries from completed food related research projects which focus on enhancing the safety of the Nation's food supply and the development of value added foods.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	7

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Foodborne illnesses are a major problem in the United States. According to CDC, each year about 1 in 6 Americans (or 48 million people) gets sick, and 3,000 die of foodborne illness (FBI).

What has been done
The following research projects were conducted by faculty at Virginia Tech and Virginia State University:
?Investigation into the effects of irrigation fertilization and plant growth on Salmonella contamination of tomatoes in the field
?The antimicrobial activity of two plant essential oil compounds (trans-cinnamaldehyde and eugenol) were evaluated alone and in combination with trans-2-hexenal (a naturally-occurring apple flavorant) to determine their ability to inactivate Salmonella Typhimurium and Listeria monocytogenes in commercial apple juice.
?Antimicrobial activity of AITC in both its liquid and vapor phase against strains of Salmonella enterica serovar Michigan and Listeria monocytogenes on the surface of whole full-slip cultivars of cantaloupe (Cucumis melo L. var. reticulatus): ?Athena? and ?Hales Best Jumbo? over a treatment period of 24 h at room temperature.
?Cross contamination originating on the deli slicer or meat chub was tracked through a retail deli using an fluorescing abiotic surrogate, GloGermTM, to visually represent how pathogens may spread to different components of the slicer.

?Determine appropriate methods and parameters for bacterial inoculation and thermal treatment of wheat flour.

Results

Virginia Tech researchers made strides to enhance the safety of the food supply. Some of the key discoveries and impacts include:
?No contaminated tomato fruits with Salmonella were detected in this field study.
?Treatments with 0.05% of trans-cinnamaldehyde, eugenol and trans-2-hexenal resulted in a 5 log CFU/ml reduction in bacterial numbers within one day of storage at both 4°C and 25°C.
?Treatment with 5 µl liquid AITC on the rind of ?Athena? cantaloupe resulted in a 3 log CFU/10 g reduction in S. Michigan.
?Key areas of the deli slicer were identified as niche environments for Listeria including: hard-to-reach areas around the slicer blade, the grooves on the front of the slicer blade, cracks in the plastic handle, and areas underneath the blade.
?The minimum heat treatments required for a 5-log reduction in microbial populations (~ 109CFU/g to ~ 104CFU/g) were 5 minutes at 70°C and 30 minutes at 70°C for E. coli O157:H7 and S. Agona, respectively.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
702	Requirements and Function of Nutrients and Other Food Components
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 #4

1. Outcome Measures

Food Preservation - Increase in the number of consumers that increase their knowledge on how to safely preserve foods at home.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual

2012 777

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The number of consumers preserving foods at home continues to increase, as more consumers emphasize greater control over what they eat and where their food comes from. Failure to adequately preserve foods in the home can result in foodborne illness. Foodborne botulism is a severe form of food poisoning. Most of these cases are associated with improperly processed home-canned food. Just one case of botulism can cost $1,343,592 related to medical services, deaths, lost work, and disability. In order to prevent illness, it is essential that consumers follow validated recipes when preserving foods at home. Historically Extension educators have been recognized as a credible resource for home food preservers.

What has been done
To help ensure safe home food preservation methods Virginia Cooperative Extension agent(s) provided food preservation trainings and support across the state in 2012. Fifteen extension educators provided home food preservation support in over 30 counties.
Education offered across the state included:
?54 Food preservation classes were offered across the state with over 777 participants. Types of classes offered included:
?14 general information classes on how to can
?25 high acid (jams, jellies, pickles, fruits, etc..) canning classes demonstrating hands on canning using a boiling water bath canner
?19 low acid (vegetables, meats, fish, etc?) canning classes demonstrating hands on canning using a pressure canner
?269 dial gauge inspections for accuracy.
?305 one-on-one individualized home preservers support via phone/e-mail

Results
Home food preservers completing education through VCE programs were evaluated to determine their knowledge gain in safe home food preservation techniques and how the training impacted their future behaviors.
94% of participants increased their knowledge in the following areas
?276 individuals learned how to can low acid foods using a pressure canner
?340 individuals learned how to can high acid foods using a boiling water bath canner
?422 individuals learned the importance of pH in determining the acidity of foods
?89 individuals learned how to make jams/jellies and other fruit spreads
?103 individuals learned how to make pickles, relishes and other fermented vegetables
?123 individuals learned how to dehydrate foods
?192 learned how to freeze foods
346 participants were surveyed on what they intended to change as a result of the training. 100% intended to change behaviors including:
?60% intend to can low acid foods using a pressure canner
?100% intend to use safe food preservation techniques
?36% intend to freeze more foods
?15% intend to dehydrate more foods

If a gauge is determined to be inaccurate after testing, the Extension Educator recommends replacement of the gauge and re-testing of the new gauge to ensure accuracy. Of those tested,

132 were inaccurate and recommended for replacement. It is assumed that if one case of botulism can be prevented through replacement of an inaccurate dial gauge, the potential annual savings to the State of Virginia (or County(ies)) can be $177.4 million dollar.

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #5

1. Outcome Measures

Increase in number of small direct market Virginia fresh produce growers and farmers market managers knowledgeable in using food safety principles and practices (taught through "Enhancing the safety of locally grown produce)

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	62

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As produce consumption has increased, so have foodborne disease outbreaks associated with fresh produce. Local and/or organic small to medium farms that sell directly to consumers often do not have the resources to develop Good Agricultural Practices (GAP) plans to address food safety. Additionally, these groups have less access to food safety education and training, indicating a need for food safety training to ensure the use of ?best practices? on small farms and in markets to reduce liability and enhance safety of locally grown produce.

Between 2007 and 2009, the state of Virginia averaged 21 foodborne outbreaks per year resulting in an average of 400 confirmed cases (sick individuals) per year. For each confirmed case there are an estimated 20-38 unconfirmed cases therefore approximately 8,000 to 15,200 Virginians suffered from foodborne illness in each of those years. The overall cost to the public is high. The estimated economic cost of foodborne illness is approximately $77.7 billion dollars per year, or $1626 per foodborne illness case. The estimated economic loss from foodborne illness in Virginia during those years may be between 13 and 25 million dollars per year.

What has been done
The USDA funded project ?Enhancing the Safety of Locally Grown Produce Through Research and Extension, a multi-state research and Extension Project? under the direction of Virginia Tech addresses this issue. Curriculum packages were developed and 25 Extension Agents in Virginia were trained to deliver and evaluate the ?Enhancing the Safety of Locally Grown Produce? curriculum.

In six (6) counties, ?Enhancing the Safety of Locally Grown Produce? was offered through Extension agents. In 2012, fifty-six (56) produce growers and six (6) farmers? market managers were trained.

Results
Small direct market farmers and farmers? market managers were evaluated to determine the knowledge and intended behavior changes of participants. Of those who completed evaluations, 98% increased their knowledge of food safety practices.

The following percentage of small direct market farmers reported intending to make the following improvements on their farm as a result of the workshop:
?36% Provide more training for workers
?12% Improve water used for irrigation
?27% Improve hand washing and toilet facilities for workers
?53% Improve cleaning and sanitizing methods on the farm or packing house
?50% Make improvements in cleanliness and conditions used for transport to point of sale
?50% Monitor storage temperatures
The following percentage of farmers? market managers reported intending to make the following improvements on their farm as a result of the workshop:
?67% Enhance training / certification requirements for vendors
?50% Ask questions of vendors about how produce is grown / handled before arriving at market.
?25% Improve hand washing and toilet facilities
?0% Switch to containers that can be cleaned and sanitized
?33% Make improvements to cleaning and sanitizing methods at the market
?17% Monitor storage or holding temperatures
It is conservatively estimated that if one case of foodborne illness is prevented per risk reducing behavior incorporated by farmers and market managers, it translates into a potential annual savings of approximately $226,014 for the state of Virginia.

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #6

1. Outcome Measures

Increase in number of Virginia fresh produce growers knowledgable or certified in Good Agricultural Practices (GAPs).

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	550

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food safety in the fresh fruit and vegetable industry continues to be at the forefront of the American consumer. With the passage of the Food Safety Modernization Act of 2010, growers have become even more aware of the importance and emphasis being placed on food safety. What was first offered to growers as a voluntary compliance to requirements as requested by buyers will now become a mandatory requirement within the next year mandated by the US Food and Drug Administration. These implications will mean that growers and producers of fruits and vegetables will be doing business in a new and different way. By virtue of voluntary participation, many Virginia growers find themselves ahead of the upcoming mandates. A program developed and administered by Virginia Cooperative Extension agents to help train growers and agribusiness industries affiliated with the state?s fresh produce industry has allowed these growers to be successful in preparing their farms for third party food safety audits. At the same time, the programming materials and methods of delivery have been used repeatedly and refined so that future participants will be able to benefit and share in the successes of those first growers and educators who pioneered the training system. By offering farm based food safety education and preparation to farms of all sizes and growers of all backgrounds, Virginia?s farm based food safety program has gained notoriety from the entire Southeastern United States.

What has been done
The first GAP-GHP audit checklist issued by USDA had no information as to what was expected of a grower in order to satisfy the list of audit requirements. A distinct need for help and training materials was evident. When requests from growers to help with achieving their certifications began to be received, the first training materials were developed by agents based solely on the checklist along with practices- both good and bad- observed being practiced on various farms. As information became more available, a need for a method to organize the farm plan into a manageable document was evident. A food safety plan of action manual was developed to

include all the items required for the farm audit.

The Virginia farm based food safety initiative continues to develop. Items that have been initiated and continue to be effective are:
1.Training sessions for growers and producers.
2.Train-the-trainer sessions for agents.
3.One-on-one farm visits to conduct mock audits.
4.Farm to farm visits by growers
5.Scheduled farm audits.
6.Cost share grants to offset audit expenses.
7.Virginia Fresh Produce Safety Team to oversee food safety efforts
8.Coordinated documentation
9.Website, standard operating procedure examples, and electronic worksheets
10.Publications related to fresh produce food safety

Results
Over 550 individuals representing in excess of 250 farms and agribusinesses in Virginia and surrounding states have participated in training sessions and workshops sponsored and taught by VCE agents. Of the Virginia farms trained, approximately 15% have requested and passed third party audits- a 100% pass rate of those farms requesting!

From 2008 to 2012, the number of Virginia farms who were listed on the USDA database as having passed a USDA third party audit increased from 6 farms to 64 farms- a 10x increase. Of this number, 53 farms (82.8%) had participated in programs sponsored through VCE.

Growers have had a lot to say about their experiences and successes with the food safety trainings:

?Awesome! We were able to be here at the Maple Hill Farm that just went through GAP. That was priceless! Also extension team work is fabulous with support! Very impressed.? A participant in the GO GAP program held in Albemarle County, VA.

?If it had not been for agents helping with GAP he would have reduced acreage from 140 to less than 20.? David Mann, Mann Farms, Ft. Blackmore, VA.

?Your visit to our farm to help us prepare for GAP audit will make a difference in this year?s bottom line of over $300,000.? Robert Dodd, Dodd?s Acres, Mechanicsville, VA.

?Our orchard has sold out of apples this year. Now I have to call and turn down a new order of 4000 bushels of GAP certified apples that I don?t have.? Ricky Berrier, Berrier Orchards, Cana, VA.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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 #7

1. Outcome Measures

Creation of a new workshop on preventive controls offered to Virginia food industry

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The 2011 Food Safety Modernization Act requires a number of sweeping changes to food safety management for firms who produce or manufacture FDA-regulated products. This represents the majority of foods in the U.S. Two very significant regulations required by FSMA are related to fresh produce food safety and preventive controls for food manufacturing. This workshop was developed to address the latter.

What has been done
We developed a new workshop on preventive controls for food safety and offered it to the Virginia food industry. The workshop included the following topics: Overview of the Food Safety Modernization Act, Food Laws, Regulations, and Regulatory Agencies, Preventive Controls, HACCP-based approaches, Pertinent Foodborne Hazards, and Guidance on Preparing for Future FSMA-related Regulations. The workshop consisted of 16 hours of instruction and was offered in Richmond.

Results
Ten Virginia food companies were trained in preventive controls for food safety. For each of these companies, this was their first training on FSMA and related requirements. These companies are now a core of processors who are aware of needed changes and are assisting us in engaging the food industry in Virginia.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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 #8

1. Outcome Measures

Salmonella Rebound Study Recommends Uninterrupted Cold-chain for Produce Safety

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Produce contaminted with foodborne pathognes has caused numerous foodborne disease outbreaks in the U.S. Since field contamitation is not entirely preventable, postharvest washing of raw produce has been recognized as a significant treatment that can reduce contamination loads on prodouce. Currently, industry washes produce prior to packing to ensure product cleanliness and maketability. Cold storage subsequent to washing, although applied to protect freshness, is not considered a food safety mandate throughout distribution. Since foodborne pathogens have the capability to survive and/or multiple on produce, it is necessary to understand the rebound potential of Salmonella population and its prevention on washed produce.

What has been done
Scientists at Virginia State University studied how spray washing on rollers or revolving brushes influences Salmonella rebound on jalapeño peppers and roma tomatoes. The study discovered significant rebound of Salmonella populations on both washed and non-washed fruit surfaces in humid storage. Furthermore the study demonstrated that storage at ≤10 oC (or ≤50 oF) are adequate for preventing the rebound, whereas leaving washed produce at ≥21 oC (or ≥70 oF) in humid storage or ripening may erase the decontamination impact from prior washing. The finding highlights the benefit of unbroken cold-chain systems from the farm to the dinner table in produce safety practices, especially under moist storage conditions.

Results
The study report was published in a peer reviewed journal (Foodborne Pathogens and Disease, 2012, Volume 9, Page 361-366; Article title: Salmonella Population Rebound and Its Prevention on Spray Washed and Non-washed Jalapeño Peppers and Roma Tomatoes in Humid Storage) to support industry-wide risk assessment and control. The report was used by leading produce magazines ?The Packer? and ?Fresh Cut? to generate timely communications for their industry

subscribers and Internet postings for all stakeholders at http://www.thepacker.com/fruit-vegetable-news/Study-shows-safety-benefits-of-washing-cold-storage-147016525.html and http://freshcut.com/enews/2012/5_MAY_2012/WEB_FC_MAY_2012.html, respectively. Other news groups, including The Grower, Vegetable Grower News, and Food Production Daily, also publicized the study. Two graduate students and eight dietetic interns participated in this laboratory study at VSU to help combat foodborne illness caused by Salmonella.

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

In anticipation of the newlies announced FSMA regulations related to fresh produce food safety and preventive controls, several new outcomes were added. Specialists and researchers across Virginia quickly created new traiing opportunities to help keep Virginia companies and producers abreast of new changes and current in best practices.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

To answer the question of whether each of these programs was effective, evaluation of programs was done to determine knowledge gain, intent to change behavior and in some cases interview to determine impact of programs. To determine knowledge gain and intent to change behavior, pre-post tests or post/then/pre evaluation tools were used. in some cases, follow up 6-9 month surveys were sent out to determine changes that have been implemented since the training.

Using an economic model, we have also been able to extrapolate the number of dollars saved in illness, hospitalization, lost wages etc... as a result of preventing foodborne illness.

Key Items of Evaluation

• Of the food handlers that have been trained through Extension, over 97% adopted new practices into thier food handling. These new practices include improving behaviors related to the greatest risk factors associated with foodborne illness (time/temperature control,

personal hygeine and cross contamination).

- 132 pressure canner dial gauges were tested to be inaccurate and Extension recommneded that those gauges be replace to ensure safe canning and prevention of botulism. If one case of botulism was prevented through dial gauge replacement ove 177 million dollars could have been saved from the state of VA.
- Of the Virginia farms trained in GAPs, approximately 15% decided that it was beneficial for them to pass the third party audit required to become certified- with Extensions help, we have a 100% pass rate of those farms requesting!