V(A). Planned Program (Summary)

Program # 4

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
502	New and Improved Food Products	5%	0%	0%	0%
503	Quality Maintenance in Storing and Marketing Food Products	5%	20%	14%	5%
703	Nutrition Education and Behavior	0%	30%	0%	35%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	45%	20%	57%	20%
723	Hazards to Human Health and Safety	40%	10%	29%	20%
724	Healthy Lifestyle	5%	20%	0%	20%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	3.0	2.9	2.0
Actual Paid	5.0	3.5	2.5	2.0
Actual Volunteer	0.0	74.0	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**
190750	191462	192564	335866
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
190750	161195	81259	269923
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	31976	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Ongoing Clemson University research is looking to assess food safety risks in agriculture systems, develop science-based interventions to prevent and mitigate food safety threats, and communicate food safety messages to stakeholders.

Research will be conducted on nanotechnology applications for food safety and quality. There will be special efforts to develop strategies and processes that can reduce the presence and risk of pathogenic bacteria on foods. Also to be examined will be preventing food deterioration and enhancing the composition of food during storage through "enhancer coatings."

A series of experiments will be conducted to establish a model system for studying ways of eliminating or reducing red discoloration in fully-cooked poultry. Other studies will be conducted to determine the causative agent and establish methods for controlling, reducing or eliminating red discoloration of fully-cooked poultry.

Foodborne illness is a major concern in the United States as it affects approximately 1 in 6 people, according to the Centers for Disease Control (CDC). Nisin is a antibacterial substance which has been approved for use in 57 countries around the world and has been affirmed as generally recognized as safe (GRAS) in the United States. Current research looks to examine the addition of this antimicrobial into food packaging materials as a way to better protect high-risk foods against potential contamination.

Safe handling of food was taught to handlers in the food service industry and the general public. Commercial food processors were targeted in an effort to improve commercial food processing efficiencies and effectiveness, to develop new markets and improve commercial handling, preservation and packaging to provide safe and high quality foods. Agents and specialists covered topics such as common food-borne pathogens, additives, preservatives and basic kitchen safety techniques were taught. Participants increased knowledge and skills in safe handling of food. Managers and supervisors were certified to train food handlers in safe food handling techniques. Food handlers practiced safe food handling techniques. Specialists assisted in the development of new food businesses.

1890 Research continues to investigate the effects of three different resistance exercise regimens on the diabetic profile of a Type 2 diabetes mellitus patient. Plans are to use innovative signal processing techniques to study kinetic patterns of muscular fatigue. The results will be critical to addressing environmental, health and human nutrition issues. Eight papers were developed for conference

presentations. One student won first place in her paper presentation category and the same student was recognized as winner of the Southeastern Chapter of the American College of Sports Medicine Undergraduate Research Award. Another research project dealt with the development of a food safety laboratory testing the efficacy of using ozone and probiotics to inhibit food-borne pathogens in poultry and meat. Experiments were performed testing the effects of lactic and acetic acid (byproducts produced by probiotic bacteria) on the growth of Escherichia coli (E. coli). Two paper presentations were prepared and delivered. One workshop was held.

2. Brief description of the target audience

The target audience includes community leaders, agencies, policy makers, general public, limited resource families, food service managers, supervisors, food handlers, producers, commercial food handlers, processing and packaging industry, entrepreneurs seeking to start food businesses or improve existing food business, media and other marketing contacts, and publication outlets - doctors' offices and grocers.

3. How was eXtension used?

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V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2093	457907	0	0

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

Patent Applications Submitted

Year: 2014

Actual: 1

Patents listed

Nanoparticle - Biocide Treatment of Biofilms

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	1	8	9

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Licenses

Year	Actual
2014	0

Output #2

Output Measure

- Disclosures

Year	Actual
2014	2

Output #3

Output Measure

- Number of people completing educational workshops.

Year	Actual
2014	2588

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants reporting increased knowledge in safe food handling and nutrition.
2	Number of managers/supervisors/food handlers completing educational program and receiving a course certificate
3	Number of participants reached with food safety information by volunteers who participated in an Extension training program
4	Number of new or improved food products entering the market as a result of adopting recommended practices
5	Number of people reached through media outlets that utilize Extension food safety, food biotechnology and nutrition resources

Outcome #1

1. Outcome Measures

Number of participants reporting increased knowledge in safe food handling and nutrition.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1819

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The program improves the quality and safety of food for the citizens of South Carolina.

What has been done
Food Safety and Nutrition Agents have delivered 135 Carolina Canning Programs, training approximately 900 SC residents in safe preparation of canned foods. Agents have recruited and trained 94 volunteers or Canning Coaches. More than 51 canning tips have been provided to Coaches as updates on food safety during the past 3 years.

Results
Of the adults participating in the educational programs, 98% reported gaining knowledge. Coaches teach food preservation classes throughout the state.

4. Associated Knowledge Areas

KA Code	Knowledge Area
503	Quality Maintenance in Storing and Marketing Food Products
703	Nutrition Education and Behavior
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

724	Healthy Lifestyle

Outcome #2

1. Outcome Measures

Number of managers/supervisors/food handlers completing educational program and receiving a course certificate

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	192

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Center for Disease Control reports that there are five situations which cause most of the outbreaks of foodborne illness and they are poor personal hygiene, improper holding temperatures, purchasing food from unsafe sources, failing to cook food adequately, and using contaminated equipment. The CDC estimates for the whole nation that 5200 deaths from foodborne illness occur annually. The National Restaurant Association has estimated that the average cost of a food-borne illness outbreak to an establishment is about $75,000.

What has been done
In an effort to reduce food-borne illness, agents conducted ServSafe® food safety training for managers, supervisors, and other food handlers. A total of 14 Manager Certification Trainings were held in 2014, certifying 192 individuals that represented approximately 100 businesses (50% restaurants, 10% retail, 10% educational institutions, 30% other, such as Department of Corrections). In addition, agents offered employee ServSafe trainings and approximately 80 of these were offered around the state, representing 46 food establishments.

Results
The approximate economic value of the trainings could be as high as $10,950,000 by preventing outbreaks.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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**

Number of participants reached with food safety information by volunteers who participated in an Extension training program

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Number of new or improved food products entering the market as a result of adopting recommended practices

2. **Associated Institution Types**

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	104

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food entrepreneurs need knowledge on marketing and selling safe, high quality food. Their product must be in compliance with all local, state, and federal regulations. Food industry personnel who store and/or process seafood are required by the FDA and SC Department of Agriculture to be certified in Seafood HACCP.The Food Safety program promotes healthy lifestyles and improves the quality and safety of food for the citizens of South Carolina.

What has been done
Since the program began in March of 2013, the program has assisted over 300 food entrepreneurs and coordinated product testing for more than 100 food entrepreneurs. Twenty-eight people were certified through Seafood HACCP workshops.

Results

Food Safety and Nutrition Agents in the Food2Market program for food entrepreneurs has tested 338 products in 2014 with 104 of these products making it to market. The Food2Market program continues to grow and become an established program of Clemson Extension with a mission of increasing agribusiness throughout the state and ensuring that South Carolina food products that enter the market are safe for our consumers. You can learn more about the Food2Market program at www.clemson.edu/extension/food2market.

4. Associated Knowledge Areas

KA Code	Knowledge Area
502	New and Improved Food Products
723	Hazards to Human Health and Safety

Outcome #5

1. Outcome Measures

Number of people reached through media outlets that utilize Extension food safety, food biotechnology and nutrition resources

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Public Policy changes
- Government Regulations

Brief Explanation

Food industry personnel who store and/or process seafood are required by the FDA and SC Department of Agriculture to be certified in Seafood HACCP.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Of the 2,588 people who completed Food Safety programs, 98% reported that they gained knowledge.

Key Items of Evaluation