

**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
503	Quality Maintenance in Storing and Marketing Food Products	5%	15%	5%	10%
703	Nutrition Education and Behavior	30%	30%	30%	30%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	30%	15%	30%	25%
723	Hazards to Human Health and Safety	30%	15%	30%	25%
724	Healthy Lifestyle	5%	25%	5%	10%
	<b>Total</b>	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	10.0	3.0	4.2	2.0
Actual Paid Professional	4.0	2.5	2.9	2.5
Actual Volunteer	5.0	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
387679	89866	164449	457963
1862 Matching	1890 Matching	1862 Matching	1890 Matching
387679	44934	315064	228982
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

## V(D). Planned Program (Activity)

### 1. Brief description of the Activity

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/develop new markets/improve commercial handling, processing, preservation and packaging to provide safe and high quality foods. Attention was given to providing consumers with scientifically based, reasonable nutrition and food safety information via the media. Food-borne illnesses were defined and conditions discussed that encourage bacteria growth. Most 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.

Research is proceeding on the DNA of a bacterium widely used as starters in yogurt and cheese. By understanding its genetic characteristics of this bacterium, scientists can improve the commercial usefulness, such as fermentation rate, flavor and sweetness.

Experiments with cottage cheese showed that as the numbers of bacterium increased, the numbers of spoilage organisms decreased. The results indicate that bacterium could help control spoilage in cottage cheese, potentially extending its shelf life. Related research also may lead to health benefits. Unlocking the genetic code may uncover DNA fragments that can be used to make proteins that attack bacterial infections. The proteins, called bacteriocins, are potentially more effective than antibiotics. Disease-causing bacteria can become res. Finding ways to make food healthier, safer and less expensive is a priority around the world. Clemson research in this area can benefit both food producers and consumers.

During the 2011 - 2012 reporting period, 1890 Extension EFNEP was being restructured. The program is a nutrition education program that focuses on simple messages related to food and nutrition. It gives participants an opportunity to apply new information through interactive activities. A food sampling, small incentive and physical activity are included with each lesson.

1890 Research is finalized on the development of nanomaterials based sensors of unusual non B-form DNA with emphasis on DNA sequences that are implicated in human diseases. Synthesized colloidal semiconductor nanomaterials were activated by cationic surface groups and characterized spectroscopically. The research was very productive resulting in the development of quantum dot biosensors with demonstrated capabilities of selectively sensing the unusual DNA structures implicated in a number of neurodegenerative diseases, as well as a normal double stranded DNA sequence. The

with sodium sulfide in presence of sodium polyphosphate at a pH of 10.3. The synthesized quantum dots were surface activated with zinc, magnesium and cadmium cations. All quantum dots were characterized by UV absorption spectroscopy and by Transmission Electron Microscopy(TEM) for size. The DNA structures selected, because of their relation to neurodegenerative diseases, were, stem looped, cruciform, and tetraplex DNAs. Disorders Caused by Stem-Looped DNA:Schizophrenia, Cornelia de Lange syndrome, FG syndrome. Disorders Caused by Cruciform DNA:Bloom's Syndrome, Werner's Syndrome, Fanconi Anemia(FA). Disorders Caused by Tetraplex DNA: Huntington's Disease, Myotonic Dystrophy, Fragile X Syndrome. A research bulletin was prepared documenting the findings.

Also, for this reporting period, two more food safety research projects were added. One project studies the determination of the presence of food-borne pathogens in poultry products to enhance food safety in Orangeburg County, while another project looks at the development of a food safety laboratory testing the efficacy of using ozone and probiotics to inhibit food-borne pathogens in poultry and meat. Project I: two objectives are: 1) Build the infrastructure for a food safety laboratory designed to conduct investigations on the presence of food-borne pathogens in poultry and meats. 2) Develop a novel and cost effective approach to control bacterial contamination in poultry and meats, by using a number of antimicrobial treatments such as ozone, probiotics and their combination. One graduate student and three undergraduate students were hired and trained to work on the project. Equipment was purchased and set up in the laboratory. Paperwork was submitted to purchase the Ozone Generator. Start-up supplies were ordered and received as well as poultry and beef samples. Experiments were performed to test the effects of lactic acid (a byproduct of probiotics) on the growth of E. coli. Project II: Investigates the prevalence, antibiotic resistance susceptibilities and use of biotechnology for quick detection of food pathogens on retail poultry products from retail food stores with the Orangeburg County Area. Supplies and equipment were purchased to start the research project.

Another 1890 Research Project was designed to examine the effects of three different resistance exercise regimens on the diabetic profile of a Type 2 diabetes mellitus patient. The researcher used innovative signal processing techniques to study kinetic patterns of muscular fatigue. The overall project goal is to reduce the incidence of and/or better the handling of the disease diabetes mellitus. Specifically, the researcher will attempt to investigate whether the type of resistance exercise a person trains with will significantly attenuate diabetes complications and/or quality of life for the diabetic. A series of pilot data collection sessions were conducted to determine the learning curve required with the exercise equipment. Also, the studies will help discover appropriate effect size and sample size determination.

## **2. Brief description of the target audience**

The target audience includes community leaders, agencies, policy makers, general public, , 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?**

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
<b>Actual</b>	1295	1949114	476	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
<b>Actual</b>	1	1	0

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Licenses

Year	Actual
2012	0

**Output #2**

**Output Measure**

- Disclosures

Year	Actual
2012	2

**Output #3**

**Output Measure**

- Number of people completing educational workshops

<b>Year</b>	<b>Actual</b>
2012	1713

**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 coalitions formed (partners, public/private, academic)
4	Number of participants reached with food safety information by volunteers who participated in an Extension training program
5	Number of new or improved food products entering the market as a result of adopting recommended practices
6	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

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	1050

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

The program promotes healthy lifestyles and improves the quality and safety of food for the citizens of South Carolina.

#### **What has been done**

Food Safety agents conducted educational programs for the general public reaching 1,126 adults. Carolina Canning is an example of an educational program that equips consumers with science-based knowledge to produce safe, high quality canned, dried, or frozen foods. Extension staff members have recruited experienced home canners as volunteer Canning Coaches and have developed training materials to update their knowledge so they can provide or assist with home food preservation programs. Forty-three volunteers from 23 counties currently have been trained as Canning Coaches. A 4-lesson canning curriculum tailored to South Carolina's specialty crops (but broadly applicable to other foods) has been produced. Workshops have been marketed by multiple means including a new Facebook page. Food Safety & Nutrition agents have delivered 47 hands-on canning workshops to audiences that included 438 members of the general public, youth and limited resource individuals.

Food Safety media activities were conducted, which included newspaper, magazines, other external publications and radio and television.

#### **Results**

Of the adults participating in the educational programs, 93% reported a gain in knowledge. Food Safety and Carolina Canning web activity: <http://www.facebook.com/carolinacanning>  
<http://www.facebook.com/#!/pages/Food-Safety-Nutrition-and-Health->  
[http://www.clemson.edu/extension/food\\_nutrition/canning/index.html](http://www.clemson.edu/extension/food_nutrition/canning/index.html)

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
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 Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	243

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

The Centers for Disease Control reports that there are five situations which cause most of the outbreaks of foodborne illness. Those situations are poor personal hygiene, improper holding temperatures, purchasing food from unsafe sources, failing to cook food adequately, and using contaminated equipment. In South Carolina, foodborne illness outbreaks from restaurant facilities numbered approximately 100 in both 2009 and 2010, according to data collected by the South Carolina Department of Health and Environmental Control. The CDC estimates for the whole nation that 5200 deaths from foodborne illness occur annually.

#### **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.

#### **Results**

A total of 243 food service employees received a course completion certificate, representing 110 food establishments. These food handlers can potentially affect thousands of people. The National Restaurant Association has estimated that the average cost of a food-borne illness outbreak to an establishment is about \$75,000. The approximate economic value of the trainings

could be as high as \$8,250,000 by preventing outbreaks.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
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

#### Outcome #3

##### 1. Outcome Measures

Number of coalitions formed (partners, public/private, academic)

Not Reporting on this Outcome Measure

#### Outcome #4

##### 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 #5

##### 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
2012	28

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

This program promotes healthy lifestyles and improves the quality and safety of food for the citizens of South Carolina.

#### What has been done

Extension Specialists assisted local food processing establishments in developing food products and process development, including HACCP planning. Commercial food processors around the USA were reached and informed about a canning workshop and processors were contacted in South Carolina through media, mail, email and phone.

#### Results

Twenty-eight new or improved food products were analyzed and entered the market as a result of adopting recommended practices.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
503	Quality Maintenance in Storing and Marketing Food Products
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

### Outcome #6

#### 1. Outcome Measures

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

#### 2. Associated Institution Types

- 1890 Extension

#### 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)

#### What has been done

## Results

### 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

### V(H). Planned Program (External Factors)

#### External factors which affected outcomes

- Economy
- Government Regulations
- Populations changes (immigration, new cultural groupings, etc.)

#### Brief Explanation

The purchase of the Ozone Generator had to be submitted through the University bidding process. Awaiting process to be completed

### V(I). Planned Program (Evaluation Studies)

#### Evaluation Results

Based on questionnaires and evaluations, participants' preservation of local fruits and vegetables will increase and they now have the knowledge to preserve South Carolina food products safely.

Three research projects are in their infancy stage. One 1890 research bulletin was published. The researcher was invited to, and has given a lecture on the research work at the 34<sup>th</sup> Annual Conference of the Bangladesh Chemical Society held in Dhaka, Bangladesh. Also, a research poster was presented at a Undergraduate STEM and Behavioral Science Research Symposium. The poster was awarded the third place prize. An informative poster including research findings on neurodegenerative diseases was developed for the general public.

#### Key Items of Evaluation