V(A). Planned Program (Summary)

Program # 13

1. Name of the Planned Program

Food Safety

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
403	Waste Disposal, Recycling, and Reuse	0%		5%	
501	New and Improved Food Processing Technologies	0%		25%	
502	New and Improved Food Products	2%		10%	
503	Quality Maintenance in Storing and Marketing Food Products	15%		5%	
504	Home and Commercial Food Service	33%		5%	
702	Requirements and Function of Nutrients and Other Food Components	10%		10%	
703	Nutrition Education and Behavior	15%		5%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	10%		25%	
724	Healthy Lifestyle	15%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Actual	3.6	0.0	18.4	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**
44927	0	524721	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
59620	0	532114	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
406702	0	8408076	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The Division of Agriculture faculty and staff will develop, evaluate and disseminate education and curricula incorporating research and teaching.

Programs include:
Quarterly HACCP Roundtable meeting
Food safety and preservation workshops
Better Process Control School
Labeling workshop
ServSafe workshops
Online distance education in food safety and manufacturing
Assistance to small food companies and entrepreneurs in the form of services, workshops, and consulting
Research

Research activities in food safety include work to improve food processing systems to minimize food pathogens and to improve detection systems for Listeria, Salmonella and other major food pathogens.

2. Brief description of the target audience

Audiences include, but are not limited to:

- Food Companies
- Entrepreneurs and restaurants
- Food service employees and/or food handlers
- Employers and employees
- School personnel
- Child care providers
- Youth, adults, and seniors

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	{NO DATA	{NO DATA	{NO DATA	{NO DATA
Actual	2776	33102	84386	1590

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

Patent Applications Submitted

Year: 2010

Plan:

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Actual	0	20	20

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of participants in educational programs leading to certification for food handlers (ServSafe and Better Process Control School).

Year	Target	Actual
2010	{No Data Entered}	259

Output #2

Output Measure

- Number of participants in quarterly HACCP roundtables.
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of ServSafe classes offered.

Year	Target	Actual
2010	{No Data Entered}	18

Output #4

Output Measure

- Number of Food, Nutrition, and Health clientele from education classes, workshops, group discussions, one-on-one interventions, demonstrations, and other educational methods.

Year	Target	Actual
2010	{No Data Entered}	2494

Output #5

Output Measure

- Number of Food, Nutrition, and Health education classes, workshops, group discussions, one-on-one interventions, demonstrations, and other educational events.

Year	Target	Actual
2010	{No Data Entered}	769

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants who indicated that they increased their knowledge related to food, nutrition, and health following an educational class, seminar or workshop.
2	Number of participants receiving certification in Better Process Control, Culinary Scientist, and ServSafe.
3	Number of participants who adopted positive nutrition practices.
4	Number of participants who indicate that they intend to adopt one or more healthy food nutrition practices.
5	Consumer perceptions impact the demand for organic foods at farmers' markets
6	Impact of sanitation of deli slicers on foodborne illness
7	Foodborne Salmonella Typhimurium Survival and Virulence Expression during Food Processing

Outcome #1

1. Outcome Measures

Number of participants who indicated that they increased their knowledge related to food, nutrition, and health following an educational class, seminar or workshop.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	9163

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
504	Home and Commercial Food Service
703	Nutrition Education and Behavior
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
724	Healthy Lifestyle

Outcome #2

1. Outcome Measures

Number of participants receiving certification in Better Process Control, Culinary Scientist, and ServSafe.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	154

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #3

1. **Outcome Measures**

Number of participants who adopted positive nutrition practices.

2. **Associated Institution Types**

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	7010

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #4

1. **Outcome Measures**

Number of participants who indicate that they intend to adopt one or more healthy food nutrition practices.

2. **Associated Institution Types**

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	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
703	Nutrition Education and Behavior
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
724	Healthy Lifestyle

Outcome #5

1. Outcome Measures

Consumer perceptions impact the demand for organic foods at farmers' markets

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	400

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Growth in sales of organic and all natural foods have been increasing at an astonishing 3 to 7 times the growth of every other conventional food category. Organic food and beverage sales represented approximately 4 percent of overall food and beverage sales in 2009 according to the Organic Trade Association's 2010 Organic Industry Survey. According to this same survey US sales of organic foods have grown from $1 billion in 1990 to almost $25 billion in 2009. Reports from the literature have shown that Consumers perceive organic foods are safer because they don't contain "harmful chemicals" and are more nutritious and higher quality than their conventional counterparts. Administrators of farmers' markets in Arkansas were interested in whether shoppers at their markets would be interested in purchasing organic foods at their farmers' markets.

What has been done
To answer this question, we surveyed more than 300 consumers at three farmers' market locations in Northwest Arkansas: Fayetteville, Springdale and Eureka Springs.

Results
Only 42% of those surveyed purchased most of their organic foods at farmers' markets, and 80% surveyed answered "yes" that they would buy more organic if its price was similar to that of conventional foods. We also surveyed these shoppers as to their concerns and beliefs about safer foods. The largest category (36%) said their major reason for shopping at farmers' markets was that they wanted their food to be free from chemicals, with pesticides being the biggest safety concern of 45% of the respondents. Only 2-6% of respondents were concerned about presence of harmful bacteria on their food. An overwhelming majority of the respondents (76%) believed that organic foods are inherently safer than conventional. We repeated these surveys with consumers at three metropolitan farmers markets in Little Rock, Hot Springs and Texarkana. A majority of these shoppers (71%) also believed organic foods were safer than conventional foods. Surprisingly, three times as many patrons in southern Arkansas were concerned about harmful bacteria in conventional foods than organic. The number one reason for shopping at farmers' markets was to support local farmers. Clearly, there is a considerable individual difference among perception and the potential for food safety problems. Therefore, an immediate need exists to develop applicable interventions for organic food and poultry processing.

4. Associated Knowledge Areas

KA Code	Knowledge Area
502	New and Improved Food Products

Outcome #6

1. Outcome Measures

Impact of sanitation of deli slicers on foodborne illness

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Listeria monocytogenes causes a rare but potentially fatal disease, listeriosis. The mortality rate from this disease is approximately 28%, particularly in immunocompromised individuals, who are most at risk. The economic burden for US citizens for a single case of listeriosis is estimated to be $1,659,143. L. monocytogenes has been strongly linked to the consumption of deli foods and meats sliced in the deli. It has been apparent for many years that meat slicers in retail establishments can harbor large populations of bacteria and some of the pathogenic bacteria have the potential to cross contaminate sliced, ready-to-eat foods.

What has been done
Various methods of cleaning and sanitizing the deli slicer were evaluated as were different cleaners and sanitizers.

Results
Dry thermal treatment at 80 degrees C and times up to 15 h are not sufficient to achieve a 5-log reduction of residual Listeria that may have survived improper cleaning and sanitizing of the deli slicer. However, a three-hour treatment at 80 degrees C produced a 2 or 3 log reduction, which would likely be adequate for a machine that had been cleaned and sanitized prior to heating. Dry thermal heating overnight could provide an extra hurdle for Listeria contamination in the worst case scenario of an inadequately cleaned and sanitized slicer. Barrier II, a commonly used sanitizer in deli's was found to be a good sanitizer, used with a common white bar towel. Sanitation wipes, which are used in many deli's to wipe slicer blades between slicing, were found to be inadequate.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Foodborne Salmonella Typhimurium Survival and Virulence Expression during Food Processing

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Salmonellosis is one of the most common foodborne diseases in the United States. Given that Salmonella can originate from a wide variety of food production environments, reduction of this organism at all stages of food production is critical. This project has three components designed to address this problem. Our specific research program goal reflects an integrated approach for controlling Salmonella spp. and other foodborne pathogens at all stages of food production. The relative incidence of Salmonella spp. foodborne disease continues, despite the growing body of information regarding the most common contamination routes. During its life cycle Salmonella enterica serotype Typhimurium can encounter various environmental stress conditions which may have dramatic effect(s) on its survival and virulence. Although there is considerable information regarding environmental signals that control growth and pathogenesis in animals and humans, little is known about the biology of Salmonella during food processing. Research is needed to determine the environmental factors that are critical for survival of this pathogen and therefore must be modified to prevent the early establishment of Salmonella in food processing environments and virulence expression under these conditions.

What has been done
Our current food production Salmonella spp. research projects have emphasized studies on the growth, survival and pathogenesis of the organism under conditions encountered during poultry processing. However, the success of Salmonella spp. in becoming re-established in the gastrointestinal tract of food animals during certain phases of processing indicates that Salmonella spp. can competitively interact with the dynamics of the food matrix. Based on these observations, our research is focused on salmonellae metabolism and genetic regulation of stress responses when grown under processing conditions and determines how these overlap with expression of virulence when foodborne Salmonella spp. become pathogenic.

Results

The outcome of this research has implications not only for persistence of foodborne salmonellae in processing, but raises practical issues regarding the choices of antimicrobials as intervention steps in processing. Issues we are now pursuing include whether thermal treatment predisposes salmonellae to be more resistant to particular antimicrobials and how these conditions might influence virulence and pathogenic characteristics of salmonellae. Molecular techniques will delineate some of the phenotypic responses we have observed thus far and examine virulence expression of Salmonella under typical food production and processing conditions.

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

- Economy
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

External factors that impacted outcomes included the following: 1) Program realignment impacted efforts expended in several of the listed programs within the new Food Safety initiative; 2) Several state defined outcomes were moved from the Food, Nutrition, and Health State Planned Programs to the Food Safety Initiative; 3) The Food Preservation program was a relatively new focus after being dormant for many years. New programs materials were developed and trainings offered; 4) A reduction in staff (FTEs), which reduced the amount programming at the state level and in several counties, had a negative impact on program delivery for the Food Safety and Food Preservation component; 5) The economic downturn impeded the replacement of staff and the attainment of resources for program implementation; 6) Data not collected due to reporting and incorrect placement of state defined outcome.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- During (during program)
- Case Study

Evaluation Results

Growth in sales of organic and all natural foods have been increasing at an astonishing 3 to 7 times the growth of every other conventional food category. Reports from the literature have shown that Consumers perceive organic foods are safer because they don't contain "harmful chemicals" and are more nutritious and higher quality than their

conventional counterparts. Administrators of farmers' markets in Arkansas were interested in whether shoppers at their markets would be interested in purchasing organic foods at their farmers' markets. To answer this question, we surveyed more than 300 consumers at three farmers' market locations in Northwest Arkansas: Fayetteville, Springdale and Eureka Springs. Only 42% of those surveyed purchased most of their organic foods at farmers' markets, and 80% surveyed answered "yes" that they would buy more organic if its price was similar to that of conventional foods. We also surveyed these shoppers as to their concerns and beliefs about safer foods. The largest category (36%) said their major reason for shopping at farmers' markets was that they wanted their food to be free from chemicals, with pesticides being the biggest safety concern of 45% of the respondents. Only 2-6% of respondents were concerned about presence of harmful bacteria on their food. An overwhelming majority of the respondents (76%) believed that organic foods are inherently safer than conventional. We repeated these surveys with consumers at three metropolitan farmers markets in Little Rock, Hot Springs and Texarkana. A majority of these shoppers (71%) also believed organic foods were safer than conventional foods. Surprisingly, three times as many patrons in southern Arkansas were concerned about harmful bacteria in conventional foods than organic. The number one reason for shopping at farmers' markets was to support local farmers. Clearly, there is a considerable individual difference among perception and the potential for food safety problems. Therefore, an immediate need exists to develop applicable interventions for organic food and poultry processing.

Key Items of Evaluation

UA Cooperative Extension service in 33 counties partnered with 64 schools to teach children proper hand washing techniques. County Extension faculty utilized the Fight BAC curriculum and Germ City interactive walk-through exhibit to teach children what germs are and when, why, and how to wash their hands. In FY10, more than 14,600 contacts with youth in grades pre-K through 9th grade provided 742 learning experiences on the importance of proper hand washing. More than 78% of youth participants reported they more often practice desirable personal hygiene such as hand washing after the Fight BAC and Germ City lessons.

In Sharp County, 915 students learned proper hand washing techniques through Fight Bac and Germ City classes.

One month later a first grade teacher form Cave City Elementary reported: I heard a kid in the bathroom this week signing the ABC song while scrubbing her hands. She'd remembered how long you are supposed to wash your hands and she was really trying to get them clean.

An administrator from Cherokee Elementary reported: I can tell the students are more cognizant of germs on their hands and how important it is to keep them clean. It is hard, of course, to always wash our hands here at school when we need to, but they are sure going through the hand sanitizer - more than before Germ City.

In Nevada County, 218 students learned to wash their hands properly using black-light sensitive "germ lotion". According to the school nurse, school absences decreased an average of 3.27 days after hand washing lessons compared to the previous year

. "Hopefully, we will see a trend continue with absences decreasing as students remember to wash their hands frequently and correctly, decreasing the potential for illness which keeps them out of school." Lindsey Casey, school nurse.