

2013 Tennessee State University Research Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

This report consists of the FY 2013 research results and accomplishments of the Tennessee State University College of Agriculture, Human and Natural Sciences. In the attached report, you will see that agricultural research at TSU is heavily aligned with priority research areas previously outlined by NIFA, and productive research is being conducted in areas of state, national and global concern. In a continuation of our recent expansion efforts, this past year we have again enhanced our research capacity through new construction and hiring a number of new faculty. The most recent targeted areas for faculty expansion have been food science, climate studies, environmental sciences and forestry. Our FTEs are slightly less than expected due to some delays in planned hiring.

We have a talented faculty who have dedicated themselves to improving the lives of others. Examples of research accomplishments include:

- Research about supply chains of fruits and vegetables to southern states with high obesity values
- Information showing that fruit and vegetable consumption were more important in fighting obesity than physical activity or smoking cessation
- Better utilization of timber stands of small farmers in Tennessee and the use of multi-function land management techniques for enhanced incomes
- Improved understanding of biofuel production for limited-resource farmers
- Research to maximize the energy production from bioenergy feedstock through improved harvest timing and techniques
- New techniques to develop novel varieties of biofuel crops
- Controlling invasive pests with techniques that minimize environmental impact
- Development of cost-saving insect control techniques in nursery crop production
- Research to enhance alternative energy use in greenhouse and nursery production systems
- Research to develop crop production techniques to reduce sediment run-off in streams
- Methods to identify and reduce food-borne illness
- Research and education to directly target at-risk youth to reduce childhood obesity

The review of our Annual Report last year cited two concerns: that the report was not submitted as a combined state report (with the University of Tennessee) and that some of the outcomes seemed to have an Extension emphasis. Beginning this year, the NIFA Plan of Work from the state of Tennessee will be a combined report representing both Tennessee State University and the University of Tennessee. The Annual Reports are not yet combined due to the differing program structure under which the work was conducted, however, this year's combined POW will produce a combined 2015 Annual Report. Output measures have been added to programs to better demonstrate the level of research. Emphasis continues to be placed on capturing the ultimate impact of our research using the logic model format.

During the past six years, the College of Agriculture, Human and Natural Sciences at TSU has experienced transformational change, however the goal of agriculture research at TSU remains the same: to generate and communicate new knowledge in the agricultural and environmental sciences for the prosperity of the citizens of Tennessee, the nation and the world. We employ a dedicated faculty and staff who have received their education and training from many of the best institutions and training centers in the United States and several countries around the world. This group of individuals takes pride in

partnering with NIFA to advance agricultural and environmental research at Tennessee State University and make a positive difference in our society. The research detailed in this report illustrates our commitment to educating our students, serving our stakeholders and improving the lives of the world's citizens.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	70.0
Actual	0.0	0.0	0.0	61.7

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- Internal University Panel
- Expert Peer Review

2. Brief Explanation

Each Planned Program in this Annual Report was approved by an internal review panel; some programs had the benefit of an additional review by an external panel. These panels are composed of agricultural researchers and administrators in the 1890 University system. Faculty proposals for Planned Programs are evaluated for relevance, scientific soundness, and appropriateness of planned outcomes. Only those proposed programs that successfully meet all criteria are developed into executable Planned Programs. A number of strategies have been developed to ensure that approved programs are successful, meeting goals and remaining relevant: (1) prior to the initiation of research projects/programs, researchers initiate contact with appropriate stakeholders, i.e. government agencies, community groups/representatives, professional organizations, extension personnel, or industry groups, to identify and prioritize critical needs; (2) periodically during research projects, researchers initiate contact with appropriate stakeholders to evaluate the degree of program/project success; (3) an administrator within the College of Agriculture, Human and Natural Sciences meets with every project leader semiannually to monitor the progress of the planned programs; (4) if the program is not progressing as planned, appropriate remedial steps are initiated. We feel these procedures contribute significantly to ensuring the Planned Programs are executed completely and with maximum benefit to stakeholders.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Targeted invitation to traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Other (Solicitation via social media)

Brief explanation.

We are continuing to utilize an increased level of stakeholder input in our hiring processes, with stakeholders participating in all phases of the selection of new faculty. For the research activities conducted in the planned programs, community groups, industry associations or individual stakeholders were contacted and solicited for participation. For example, our research programs relating to forestry work closely with the Forestry Division of the Tennessee Department of Agriculture, and with the Tennessee Urban Forestry Council; those programs examining new sources of feed stock for biofuels utilize the expertise and stakeholder evaluation available in our state Plant Material Advisory Committee and Plant Materials Committee; our environmental programs maintain a close relationship with the Cumberland River Compact, a non-profit organization concerned with the health and wellbeing of the Cumberland Watershed which encompasses much of Middle Tennessee, and so on. In projects that have clientele who are low income and have young children, agencies such as Head Start, Habitat for Humanity, and Good Food for Good People are involved. In programs where needs were more commodity-based, trade organizations (i.e. Tennessee Nursery and Landscape Association, Professional Grounds Maintenance Association, Tennessee Goat Producers Association, Southern Nursery Association, Guinea Fowl Breeders Association) are routinely utilized for input and direction. In other cases, individuals are contacted and participation is requested. For much of the research in the area of nursery plants, surveys of nursery producers were performed and periodic meetings were held with a Nursery Advisory Group that is maintained by the University. A number of different programs maintain an active presence on social media (Facebook, Twitter) and utilize feedback gained from those sources.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Needs Assessments
- Use Surveys
- Other (See explanation below.)

Brief explanation.

Our methods to identify appropriate stakeholders are consistent with those used in previous years. We do not employ a single defined strategy to identify stakeholders, rather they are identified through methods most suitable for a specific program. Our goal is to identify stakeholders in a manner that will provide the most useful and accurate feedback as possible about stakeholder concerns. Groups that serve the stakeholders (community based groups) or groups that represent stakeholders (industry and trade associations) are a primary source of input. Individual stakeholders are utilized where there are no associated groups representing the program area, or when an opportunity for face-to-face interaction (i.e. at an association meeting, field site visit, or community event) is presented. In these cases, individuals involved the program outputs are identified and queried for input.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Other (Feedback received via social media)

Brief explanation.

Most stakeholder input is collected either in face-to-face discussions or via survey instruments. Each of these methods is effective. The face-to-face discussions are often held with community group representatives or trade association representatives, or with individual stakeholders in a group setting, this allows for questions and answers to direct and stimulate discussion of areas of importance to stakeholders. Survey instruments are a useful tool to assess information from broader groups of stakeholders. While some stakeholders prefer the anonymity and brevity of a survey instrument (often resulting in increased participation), a survey instrument does not always allow for discussion of previously unrecognized areas of concern. Recently, the use of social media has increased. Feedback gained from Facebook and Twitter has been used to collect information on stakeholder needs and concerns.

3. A statement of how the input will be considered

- To Identify Emerging Issues
- Redirect Research Programs
- To Set Priorities

Brief explanation.

As previously stated, we have increased the use of stakeholder representatives in our hiring processes. Insights provided by these individuals place emphasis on the communication skills and knowledge of current discipline needs/trends rather than the traditional items such publication and grant history/potential. New faculty hired in these positions reflect these qualities. An example of stakeholder feedback is in our forestry programs. We interact and receive feedback regularly from an established group of logging firms and loggers in Tennessee. These stakeholders have taught us that loggers will benefit tremendously from knowing more about how to calculate price/costs for their operations. As a result, they are more likely to express a more accurate market price for their labor and products removed, thus increasing the efficiency, profitability and sustainability of this industry. Also, as in most recent years, a concern of stakeholders, regardless of area of research, is in the areas of economics and health. Examples of concerns are curtailing expenses, increasing efficiency, finding new markets and, finally, staying in business. Much of our research, regardless of topic or emphasis, addresses these economic themes.

Brief Explanation of what you learned from your Stakeholders

As in most recent years, a concern of stakeholders, regardless of area of research, is in the areas of economics and health. Examples of concerns are curtailing expenses, increasing efficiency, finding new markets and, finally, strategies to simply stay in business. Much of our research, regardless of topic or emphasis, addresses these economic themes.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	3020433

2. Totaled Actual dollars from Planned Programs Inputs				
Extension			Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	0	2802884
Actual Matching	0	0	0	2802884
Actual All Other	0	0	0	2995447
Total Actual Expended	0	0	0	8601215

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	0	2154142

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Global Food Security and Hunger - improving animal production for small producers
2	Global Food Security and Hunger - enhancing sustainability of agricultural plant production
3	Sustainable Energy - new feedstocks and improved feedstock production
4	Climate Change- low-impact alternatives for ornamental crop production
5	Childhood Obesity - youth active and media savvy
6	Food Safety - contaminant-free, healthier foods
7	Climate Change- improving the quality of water runoff from agricultural production

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security and Hunger - improving animal production for small producers

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
301	Reproductive Performance of Animals				20%
302	Nutrient Utilization in Animals				20%
303	Genetic Improvement of Animals				10%
307	Animal Management Systems				10%
601	Economics of Agricultural Production and Farm Management				20%
604	Marketing and Distribution Practices				20%
	Total				100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	9.5
Actual Paid Professional	0.0	0.0	0.0	9.1
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
0	0	0	413391
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	413391
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	441910

V(D). Planned Program (Activity)

1. Brief description of the Activity

Conduct seminars, conferences, hands-on clinics, provide written and hands-on training to producers, participate in industry events and develop industry-targeted publications based on research findings. Conduct research on the longitudinal survival and reproductive output of meat goat does. Conduct research on nutritional requirements for Guinea fowl. Perform genome mapping of important production qualities in Guinea fowl. Conduct literature review of available secondary information. Conduct focus group meetings to collect information from producers and consumers. Develop and administer surveys to selected producers and consumers. Collect and analyze available marketing data. Identify selected meat goat consumers/ethnic groups/communities.

2. Brief description of the target audience

Dairy and meat goat producers
 National meat goat industry
 Institutions of meat goat research
 Ruminant livestock producers
 Students
 Public officials
 Guinea fowl and poultry industries
 Small farmers
 Scientific community
 Extension specialists

3. How was eXtension used?

Workshops were conducted through webinars

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	575	2000	150	0

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

Patent Applications Submitted

Year: 2013
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	4	4

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Producer workshops to improve animal production in small farm and limited resource populations.

Year	Actual
2013	4

Output #2

Output Measure

- Dietary recommendations for improved Guinea fowl production.

Year	Actual
2013	2

Output #3

Output Measure

- Research presentations related to goat and alternative poultry production.

Year	Actual
2013	12

Output #4

Output Measure

- Research publications related to goat and alternative poultry production.

Year	Actual
2013	4

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Direct contact meat goat producers will have increased knowledge of altered doe selection techniques (Enhanced capacity of a sustainable global food system including new/improved plants, animals, technologies and management systems).
2	Direct contact meat goat producers will practice altered doe selection techniques (Enhanced capacity of a sustainable global food system including new/improved plants, animals, technologies and management systems).
3	Goat producer doe non-recorders will have knowledge of the advantages of doe record keeping (Enhanced capacity of a sustainable global food system including new/improved plants, animals, technologies and management systems).
4	Goat producer doe non-recorders will practice doe record keeping (More sustainable, diverse, and resilient food systems across scales).
5	Guinea fowl producers will have knowledge of calcium and phosphorus recommendations for optimal nutrition (Enhanced capacity of a sustainable global food system including new/improved plants, animals, technologies and management systems).
6	Guinea fowl producers will adopt calcium and phosphorus recommendations for optimal nutrition (Enhanced capacity of a sustainable global food system including new/improved plants, animals, technologies and management systems).
7	Guinea fowl producers will adopt lysine recommendations for optimal nutrition (Enhanced capacity of a sustainable global food system including new/improved plants, animals, technologies and management systems).
8	Guinea fowl producers will have knowledge of lysine recommendations for optimal nutrition.
9	Guinea fowl producers will experience increased profitability of production (More sustainable, diverse, and resilient food systems across scales).
10	Goat producers will have an increased knowledge of meat goat marketing channels.
11	Goat researchers will have an increased understanding of the constraints and prospects of the meat goat industry.
12	Goat producers will expand their marketing to identified channels and markets.
13	Consumers will be aware of the healthy benefits of goat meat consumption.
14	Meat goat producers will be aware of consumer preferences for meat goat products.
15	Meat goat producers and researchers will have a better understanding of how maternal genetics can affect meat goat carcass yield (Enhanced capacity of a sustainable global food system including new/improved plants, animals, technologies and management systems).
16	Meat goat producers will have increased income by marketing through new channels (More sustainable, diverse, and resilient food systems across scales).

Outcome #1

1. Outcome Measures

Direct contact meat goat producers will have increased knowledge of altered doe selection techniques (Enhanced capacity of a sustainable global food system including new/improved plants, animals, technologies and management systems).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Producers need to better assess the ability of breeds to contribute to an efficient production of market kids under limited inputs.

What has been done

A set of presentations about research findings were developed and distributed.

Results

Because of our research, 500 commercial producers gained a better understanding of the benefits and techniques to evaluate breeds for use in commercial meat goat herds.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
303	Genetic Improvement of Animals
307	Animal Management Systems

Outcome #2

1. Outcome Measures

Direct contact meat goat producers will practice altered doe selection techniques (Enhanced capacity of a sustainable global food system including new/improved plants, animals, technologies and management systems).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Meat goat producers need to better assess the ability of breeds to contribute to an efficient production of market kids under limited inputs.

What has been done

A set of presentations of research findings were developed and distributed to various producer groups.

Results

Based on our research findings, an increasing number of experienced and new producers are altering their breed selection to establish or improve their meat goat breeding programs. It is estimated that 25% have altered their techniques.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
303	Genetic Improvement of Animals
307	Animal Management Systems

Outcome #3

1. Outcome Measures

Goat producer doe non-recorders will have knowledge of the advantages of doe record keeping (Enhanced capacity of a sustainable global food system including new/improved plants, animals, technologies and management systems).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	80

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Meat goat managers raising seedstock recognize the need to properly select breeding females within breeding herds for enhanced fitness.

What has been done

A system of doe herd evaluation has been offered to record and select breeding stock based on objective performance measurements.

Results

As demonstrated by our research findings, producers (80%) have begun to reconsider the need to record performance to improve the genetic and economic status of their meat goat breeding programs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
303	Genetic Improvement of Animals
307	Animal Management Systems

Outcome #4

1. Outcome Measures

Goat producer doe non-recorders will practice doe record keeping (More sustainable, diverse, and resilient food systems across scales).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	30

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Meat goat managers raising seedstock recognize the need to properly select breeding females within breeding herds for enhanced fitness.

What has been done

A system of doe herd evaluation has been offered to record and select breeding stock based on objective performance measurements.

Results

Implementation of performance recording within purebred meat goat herds has occurred on a limited basis (about 30%).

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
303	Genetic Improvement of Animals
307	Animal Management Systems

Outcome #5

1. Outcome Measures

Guinea fowl producers will have knowledge of calcium and phosphorus recommendations for optimal nutrition (Enhanced capacity of a sustainable global food system including new/improved plants, animals, technologies and management systems).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

While the guinea fowl industry is growing in the United States, there are constraints in developing a thriving and sustainable industry because of lack of established nutrient requirements to guide the formulation of least-cost rations. Information on the required dietary levels of calcium, phosphorus and lysine, a limiting amino acid that would ensure optimum performance of these birds, is limited.

What has been done

Dietary calcium (Ca) and phosphorus requirement for optimum growth performance of the Pearl Grey guinea fowl replacement pullets and laying hens were evaluated.
Dietary Lysine requirement for both the French and Pearl grey varieties of the Guinea Fowl were evaluated.

Results

Pearl Grey guinea fowl replacement seems to utilize more efficiently diets containing 0.8% Ca and 0.32-0.48% available phosphorus. Pearl Grey Guinea Fowl laying hens utilized more efficiently diets containing 3.25 to 3.75% calcium and 0.35 to 0.40% available phosphorus. Number of producers with knowledge of these values has not yet been calculated.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals

Outcome #6

1. Outcome Measures

Guinea fowl producers will adopt calcium and phosphorus recommendations for optimal nutrition (Enhanced capacity of a sustainable global food system including new/improved plants, animals, technologies and management systems).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The costs associated with the production of guinea fowl need to be minimized for producers to realize maximum profit as this species becomes more accepted in American diets.

What has been done

Data on calcium, phosphorus and lysine requirements of the pearl grey guinea fowl replacement pullets and laying hens were shared with the scientific community at the International Poultry Scientific Forum and also the annual Poultry Association Conference, and the guinea fowl industry.

Results

Assessment of number of producers who have adopted the recommendations has not been completed.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals

Outcome #7

1. Outcome Measures

Guinea fowl producers will adopt lysine recommendations for optimal nutrition (Enhanced capacity of a sustainable global food system including new/improved plants, animals, technologies and management systems).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Lysine is an essential amino acid in poultry and lack thereof in diets of the guinea fowl will compromise optimum growth and production performance. Currently the lysine requirements of the guinea fowl are not known.

What has been done

The lysine requirement of both the French and Pearl grey guinea fowl broiler were evaluated.

Results

Feeding the French Guinea fowl broilers diets containing 1.10% lysine during the exponential growth phase seems to be more economical and optimal. There were no significant differences ($P>0.05$) in body weight gain, feed consumption, feed conversion and carcass components of birds fed the 1.10, 1.16 and 1.22% lysine diets. Female Pearl grey guinea fowl responded better to diets containing 1.16% lysine from hatch to 16 WOA, whereas males responded better to diets containing 0.98-1.22% lysine. Therefore, we recommend that Pearl grey guinea fowl replacement pullets (females) and males be fed diets containing 1.16% and 0.98-1.22% lysine, respectively.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals

Outcome #8

1. Outcome Measures

Guinea fowl producers will have knowledge of lysine recommendations for optimal nutrition.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The costs associated with the production of Guinea fowl need to be minimized for producers to realize maximum profit as this species becomes more accepted in American diets.

What has been done

Research to determine the optimum levels of lysine is just now being completed, some is still in progress.

Results

Optimum levels have not been communicated to producers, thus no opportunity for producer knowledge/adoption of optimized levels yet.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals

Outcome #9

1. Outcome Measures

Guinea fowl producers will experience increased profitability of production (More sustainable, diverse, and resilient food systems across scales).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Feeding constitutes more than 65% of the total cost of poultry production. Establishing the lysine requirement will minimize this cost of production and encourage participation in guinea fowl production.

What has been done

Data on profitability has not been collected yet.

Results

No results yet, have not reached this point in the project yet.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals

Outcome #10

1. Outcome Measures

Goat producers will have an increased knowledge of meat goat marketing channels.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	260

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Goat producer need to know what consumers are looking for in their goat meat and goat products. Consumers are looking for information on alternative to red meets to meet nutritional and cultural needs with goat meat. Processors want connection with producers and consumers to maximize the use of facilities. Researchers seek opportunities to gain new knowledge about meat goat and goat meat. Students desire to learn about goat meat marketing research, how to conduct survey, and analyze data. Goats are important in the economy of Tennessee and relatively little is known about this industry.

What has been done

Project developed and submitted abstracts and titles, conducted training, demonstrations and workshops; presented papers, posters, educational information and networks while addressing meat goat and goat meat marketing issues with target audiences (producers, consumers, researchers, students and stakeholders) at various educational and outreach settings in Tennessee and elsewhere.

Results

Producers received information about new techniques in goat production. Nine graduate and undergraduate students were trained in research on the project.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
604	Marketing and Distribution Practices

Outcome #11

1. Outcome Measures

Goat researchers will have an increased understanding of the constraints and prospects of the meat goat industry.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	455

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Researchers, students, producers, consumers and stakeholders interested in addressing marketing issues in marketing, assisting producers and consumer enhance their incomes by meeting the demand for goat meat.

What has been done

Developed abstracts, titles, papers, posters, and updates; conducted marketing educational seminars, symposium, conferences and presentations; trained and mentored students in research methods and marketing survey; collected and analyzed data; collaborations with extension and stakeholders enhanced outreach for addressing goat meat marketing needs for target audiences.

Results

175 researchers, 280 students with increased understanding of constraints & prospects of goat industry. Project produced educational materials and disseminated 7-peer reviewed articles, (4-papers, 2-theses and 1-abstract) were published in journal and proceedings. Selected socio-demographic and geographic characteristics (age, culture, disability, household-income, gender, knowledge, race, religion, seasonality, special occasions, markets/store, processing facility, travel distance) influenced meat goat purchasing decisions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
604	Marketing and Distribution Practices

Outcome #12

1. Outcome Measures

Goat producers will expand their marketing to identified channels and markets.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	43

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Meat goat producers, beginning farmers, individual seeking alternative income opportunities, researchers, students, processors, consumers, stakeholders and legislators interested in goat meat, sustainable agriculture and the economy of Tennessee. Small-scale goat producer need to know what consumers are looking for in their goat meat and goat products. Also, consumers are looking for information on alternative to red meats to meet nutritional and cultural needs.

What has been done

Conducted research based educational activities including analyzing marketing survey; extending educational outreach to producers and stakeholders. Conducted workshops, outreach, and seminar about consumer preferences, addressed factors influencing ethnic demand in Tennessee.

Results

Project implementation has enabled 43 producers to expand their marketing to identify channels and markets. Producers learned the benefit of goat enterprise in Tennessee; value added opportunities in goat marketing; Producers selected goat enterprise, identified additional marketing channels for meat goats and goat meats in some 13 states to supplement their farm income.

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices

Outcome #13

1. Outcome Measures

Consumers will be aware of the healthy benefits of goat meat consumption.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	476

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Health conscious consumers seeking alternative to red meat or reduce their cholesterol tend to choose goat meat. Immigrants who have a taste for goat meat, or want to satisfy nutritional needs and first time eaters also may enjoy eating goat meat. These individuals need education and information about availability of meat goat and goat products in Tennessee. Many consumers are looking for information on alternative to red meats to meet nutritional and cultural needs. An opportunity to fill their demand with the abundant supply of goat meat by Tennessee producers.

What has been done

These immigrants and potential consumers do not know any grocery or restaurants in their area that sell goat meat. In Tennessee, goat meat eaters often are unable to find goat meat when they want it. Many of them have to travel a distance of more than 50 miles in search of goat meat. Others don't find custom slaughtering facilities to process live goats for them.

Results

As a result of goat meat marketing education, 476 potential consumer now are aware of the healthy benefits of goat meat consumption.

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices

Outcome #14

1. Outcome Measures

Meat goat producers will be aware of consumer preferences for meat goat products.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
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2013 0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Producers and marketers seeking to expand their farm operations, alternative farm income generating opportunities and sustainable agriculture may consider adding the goat enterprise to their ranch or farm operation.

What has been done

Research results were used in implementing educational seminars, workshops and outreach goat meat for target audiences.

Results

Research results from consumer data showed that 73% of the buyers preferred fresh goat meat. While 27% had no preferences; they would buy nearly any part of goat meat for special occasions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #15

1. Outcome Measures

Meat goat producers and researchers will have a better understanding of how maternal genetics can affect meat goat carcass yield (Enhanced capacity of a sustainable global food system including new/improved plants, animals, technologies and management systems).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	80

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The meat goat industry has been directed towards the production of market kids over the last 10-15 years under the assumption that Boer germplasm is superior for carcass yield among goat breeds.

What has been done

Our research data were provided to industry participants to provide new insight on relative breed evaluations for meat goat carcass traits.

Results

A reassessment of long-held beliefs regarding breed selection for carcass traits is occurring among researchers and producers engaged in meat goat production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals
307	Animal Management Systems

Outcome #16

1. Outcome Measures

Meat goat producers will have increased income by marketing through new channels (More sustainable, diverse, and resilient food systems across scales).

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Appropriations changes
- Government Regulations
- Competing Programmatic Challenges

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Project evaluation have been developed and implemented. Four evaluations have been implemented before and after evaluation of participation in educational seminars, symposiums, workshops and outreach conferences with producers, students/researchers and consumers. These instruments captured knowledge gain by participants in these events.

Opinions from the evaluations showed that producers thought that consumers wanted their goat meat slaughtered, skinned, cut, and frozen; others said they wanted theirs processed into goat burgers, sausages, chops and related meat demand for goat meat. On the other hand, immigrant goat meat eaters often prefer their meat fresh, custom processed, special or ethnic slaughtered (halal/smoked). Some stated they were not sure, don't know, have no information or idea where to purchase goat meat. Although the internet, social media and related electronic tools are used to locate all sorts of information including buying and selling, the participants stated they did not know how to find where to buy goat meat.

While 87% of the participants improved their knowledge enabling them to list various uses of goat such as food -dairy, fiber, meat, nutrition, cosmetics,-beauty, cleaning, skin protection, agro-tourism-pets, brush, and related valuable uses.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Global Food Security and Hunger - enhancing sustainability of agricultural plant production

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
102	Soil, Plant, Water, Nutrient Relationships				20%
111	Conservation and Efficient Use of Water				5%
131	Alternative Uses of Land				30%
133	Pollution Prevention and Mitigation				5%
204	Plant Product Quality and Utility (Preharvest)				10%
212	Pathogens and Nematodes Affecting Plants				5%
601	Economics of Agricultural Production and Farm Management				25%
	Total				100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	10.5
Actual Paid Professional	0.0	0.0	0.0	13.5
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
0	0	0	613272
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	613272
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	655614

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct workshops and stakeholder meetings.
- Provide training.
- Conduct research experiments.
- Set up a soil carbon laboratory.
- Develop a course description and course material pertinent to the program.
- Conduct research experiments on nutrient uptake, translocation, accumulation and partitioning in plants using various elements using organic and mineral fertilizers.
- Explore the potentials of plug transplanting and grafting technology for organic transplants.
- Conduct hands-on training and workshops on visual nutrient deficiency symptoms of food crops and ornamentals.
- Train and educate students and extension agents in plant mineral nutrition management.
- Develop alley cropping agroforestry systems for carbon storage.

2. Brief description of the target audience

- Organic and conventional growers of food crops and ornamentals
- Professional design practitioners
- Community stakeholders
- Farmers, forest landowners, environmental and conservation conscious individuals
- Undergraduate and graduate students
- Scientific community, extension agents

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	440	640	51	70

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

Year: 2013
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	3	2	5

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of venues to inform stakeholders about characteristics, trends, and significant changes in farm distribution and supply of produce commodities.

Year	Actual
2013	3

Output #2

Output Measure

- Number of workshops held on use of specialized fertilizer formulations to reduce environmental nutrient contamination.

Year	Actual
2013	13

Output #3

Output Measure

- Number of workshops held to educate landowners on carbon sequestration strategies.

Year	Actual
2013	1

Output #4

Output Measure

- Number of exotic species/cultivars introduced as alternative crops.
Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Number of workshops held addressing agricultural sustainability.

Year	Actual
2013	1

Output #6

Output Measure

- Number of venues to inform stakeholders about current issues on fruit and vegetable consumption/demand and its impact on overweight/obesity.

Year	Actual
2013	3

Output #7

Output Measure

- Research presentations relating to enhancing sustainability of agricultural plant production.

Year	Actual
2013	11

Output #8

Output Measure

- Research publications related to enhancing sustainability of agricultural plant production.

Year	Actual
2013	10

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Producers will adopt use of specialized fertilizer formulations to reduce environmental nutrient contamination (Enhanced capacity of a sustainable global food system including new/improved plans, animals, technologies and management systems).
2	Producers will realize reduction in crop loss through the use of specialized fertilizer formulations to reduce environmental nutrient contamination.
3	Producers will realize increases in crop yield and income as a result of the use of specialized fertilizer formulations.
4	Producers will be informed about online tools to optimize evapotranspiration, biomass, and air quality in row crops (Improve climate mitigation strategies and their adoption).
5	Producers will use an online tool to optimize evapotranspiration, biomass, and air quality in row crops (Improve climate mitigation strategies and their adoption).
6	Producers will achieve improved water, air quality, and agricultural management as a result of using the online tool (Improve climate mitigation strategies and their adoption).
7	Producers will have increased knowledge of characteristics, trends, and significant changes in farm distribution and supply of produce commodities in selected states (More sustainable, diverse, and resilient food systems across scales).
8	Students with increased knowledge about characteristics, trends, and significant changes in farm distribution and supply of produce commodities in selected states in the U.S. (More sustainable, diverse, and resilient food systems across scales).
9	Farm/forest landowners will have an increased knowledge of multi-function land management techniques(Improve climate mitigation strategies and their adoption).
10	Farm/forest landowners will adopt multi-function land management techniques(Improve climate mitigation strategies and their adoption).
11	Farm/forest landowners will realize increased income as a result of multi-function land management techniques (Improve climate mitigation strategies and their adoption).
12	Educators (i.e. Extension agents, state forestry officials) will have increased knowledge of multi-function land management techniques
13	Number of breeders incorporating low-level pathogen inducer genes in to germplasm
14	Number of people with increased knowledge about current issues on fruit and vegetable consumption/demand and its relationship with overweight/obesity in the U.S.
15	Number of students with increased knowledge of current issues on fruit and vegetable consumption/demand and its impact on nutrition and overweight/obesity in the U.S.

Outcome #1

1. Outcome Measures

Producers will adopt use of specialized fertilizer formulations to reduce environmental nutrient contamination (Enhanced capacity of a sustainable global food system including new/improved plans, animals, technologies and management systems).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Challenges of cultural practices including water management for healthy seedling production. Utilization of alternative nutrient sources such as banana peels, potatoes, and greensand as a source of potassium in organic seedling establishment will be beneficial.

What has been done

Presentation of papers at scientific conferences.

One presentation at the American Society for Horticultural Science Annual Conference 2013 entitled "Organic seedlings production using organic amendments and substrate".

Two presentations at the International Plant Nutrition Colloquium

1) Impact of Macro and Micronutrient Deprivation on Iron Uptake in Bedding Plants

2) Bell Pepper (*Capsicum annum* L.) Fruit Mineral Nutrients as Affected by Shade Level

Results

Research outcomes were communicated to the scientific community, extension specialists, extension agents, graduate students, undergraduate students and growers. This information will improve nutrient management in seedling establishment of food crops, and hydroponic production system and optimal nutrient management for blueberry. Alternative nutrient sources may also represent a cost savings factor in sustainable production of food crops. In addition, we expect additional research interest in tropical and sub-tropical fruits, water management and enhancing the nutritional value of food crops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water

Outcome #2

1. Outcome Measures

Producers will realize reduction in crop loss through the use of specialized fertilizer formulations to reduce environmental nutrient contamination.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	13

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There is a lack of information on the precise fertilizer requirements and techniques of management for production for specialized crops, i.e. blueberry production.

What has been done

Three studies were conducted to investigate optimal nitrogen forms and pH levels for blueberry production and established high resolution images of macro and micronutrient deficiency symptoms.

Results

Research results were communicated to Master gardeners, blueberry producers and scientists to inform them of new fertilizer application practices for nitrogen in blueberry production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water

Outcome #3

1. Outcome Measures

Producers will realize increases in crop yield and income as a result of the use of specialized fertilizer formulations.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Producers will be informed about online tools to optimize evapotranspiration, biomass, and air quality in row crops (Improve climate mitigation strategies and their adoption).

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Producers will use an online tool to optimize evapotranspiration, biomass, and air quality in row crops (Improve climate mitigation strategies and their adoption).

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Producers will achieve improved water, air quality, and agricultural management as a result of using the online tool (Improve climate mitigation strategies and their adoption).

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Producers will have increased knowledge of characteristics, trends, and significant changes in farm distribution and supply of produce commodities in selected states (More sustainable, diverse, and resilient food systems across scales).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

An evaluation of trends and significant changes in farm and supply distribution of produce commodities will provide empirical evidence and perspectives for policy makers, producers and businesses to evaluate needs and opportunities, and to effectively design and implement policies and programs that create market access and opportunities for fresh produce farmers and businesses. Research on these issues, though invaluable to various stakeholders, is very limited or not up to date. This study provides the most up-to-date empirical evaluation of the recent developments in the fresh produce market.

What has been done

We selected four states for study, collected data on farms, especially small farms and produce farms in these states from NASS and reports from respective states' departments of agriculture, collected and assembled data on market environment including data on farmer's markets and food hubs and data on food deserts and demographics and consumer information. We are compiling data on farm distribution and characteristics with data on market environment and analyzing farm distribution in conjunction with analysis of market environment in selected states.

Results

Findings in this period suggest high obesity rates, low consumption of fruits and vegetables, and clusters of food deserts are associated with each other in many states in the south. The growth of direct-to-consumer sales paralleled that of the agriculture value from 2002 to 2007. The south has a larger share of small farms but accounted much less in direct-to-consumer sales compared with the rest of the nation. The above may suggest that direct-to-consumer sales have potential for growth for small farms and in the south, as well as that potential barriers exist that prevented direct-to-consumer sales in the south.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management

Outcome #8

1. Outcome Measures

Students with increased knowledge about characteristics, trends, and significant changes in farm distribution and supply of produce commodities in selected states in the U.S. (More sustainable, diverse, and resilient food systems across scales).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	50

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Skilled personnel are vital to sustainable growth in the produce industry and increasing supply of healthy foods for consumers. It is important to inform and educate students of critical issues, recent developments, current situation, and future perspectives and opportunities in the produce industry.

The knowledge gained will help students make informed decisions on their careers and beyond and encourage them to make contributions in their own ways.

What has been done

Activities of the project include teaching, training, professional development activities for students at TSU. Many students reached by the project are minority students such as African American, African, Asian, and Middle-eastern students.

Three graduate students have worked on this project through graduate research assistantships. All these three graduate students received one-on-one mentoring, training, and hands-on experiential learning.

Results

Fifty students enrolled in these two courses in 2013 were introduced to background, literature, needs, critical and emerging issues, data sources, methodologies, and findings and implications. These students also practiced a pedagogical student project developed from the data and analysis of this study. The study has directly increased the knowledge of at least 50 students about characteristics, trends, and changes in the U.S. fresh produce industry, and is estimated to impact even more people as the students spread the knowledge. This will have a spillover and long-term impact on the labor force in the fresh produce industry.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management

Outcome #9

1. Outcome Measures

Farm/forest landowners will have an increased knowledge of multi-function land management techniques(Improve climate mitigation strategies and their adoption).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	110

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Small producers generally lack the knowledge and skill-sets needed to properly manage their natural resources, are frequently underserved by existing education programs, or are simply unaware of the many opportunities available to them at the state and federal level. High investment costs, combined with the long rotation periods until forest products are ready for market deter many from investing more substantively in traditional forestry operations. Training in multi-function land management techniques will offer limited-resource landowners opportunity to successfully attain their goals with forest land management practices and flexibility of establishing a mixed-use system.

What has been done

Various outreach activities were held to communicate research findings to small acreage land holders.

Results

A total of 110 small-holding farmers, forest landowners, and ranchers increased their knowledge of research-based multi-function land management techniques.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land

Outcome #10

1. Outcome Measures

Farm/forest landowners will adopt multi-function land management techniques(Improve climate mitigation strategies and their adoption).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Small producers generally lack the knowledge and skill-sets needed to properly manage their natural resources, are frequently underserved by existing education programs, or are simply unaware of the many opportunities available to them at the state and federal level. High investment costs, combined with the long rotation periods until forest products are ready for market deter many from investing more substantively in traditional forestry operations. Training in multi-function land management techniques will offer limited-resource landowners opportunity to successfully attain their goals with forest land management practices and flexibility of establishing a mixed-use system.

What has been done

Research was conducted to on strategies to enhance the multi-use income capacity of property. Limited resource landowners were then trained in the strategies.

Results

It is too early in the project cycle to determine the level of change in land management.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land

Outcome #11

1. Outcome Measures

Farm/forest landowners will realize increased income as a result of multi-function land management techniques (Improve climate mitigation strategies and their adoption).

Not Reporting on this Outcome Measure

Outcome #12

1. Outcome Measures

Educators (i.e. Extension agents, state forestry officials) will have increased knowledge of multi-function land management techniques

Not Reporting on this Outcome Measure

Outcome #13

1. Outcome Measures

Number of breeders incorporating low-level pathogen inducer genes in to germplasm

Not Reporting on this Outcome Measure

Outcome #14

1. Outcome Measures

Number of people with increased knowledge about current issues on fruit and vegetable consumption/demand and its relationship with overweight/obesity in the U.S.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	50

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The analysis of demand for fruits and vegetables and related issues is critical to study the future development of the produce industry. This study examines the relationship between fruit and vegetable consumption and adult obesity prevalence. The study also investigates whether and how obesity rates differ among various demographic and socioeconomic groups and factors that affect the propensity for consuming more fruits and vegetables.

What has been done

The project is assessing the needs and demand for fresh produce. We added an analysis of trends and across-state distribution of fruit and vegetable consumption rates and overweight/obesity rates and conducted further hypothesis tests.

Results

Many states in the northeast have the highest or higher-than-average consumption rates, and many in the south have the lowest or lower-than-average consumption rates among all; the highest consumption rates changed very little over time, whereas all the lowest consumption rates have decreased even lower over time; obesity rates increased across all states during the study period, however, obesity prevalence gets worse much faster for those states that already have very high obesity rates in the south; fruit and vegetable consumption appears to have higher and statistically significant effect on obesity compared with other two health-rated behavior/choices, physical activities and smoking.

A master-degree thesis was defended and filed in June 2013 as a result of the updated and revised study. The thesis is entitled 'An Empirical study of Fruits and Vegetable Consumption and Adult Overweight and Obesity in the U.S.'

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management

Outcome #15

1. Outcome Measures

Number of students with increased knowledge of current issues on fruit and vegetable consumption/demand and its impact on nutrition and overweight/obesity in the U.S.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

It is important to inform and educate our students about the current and critical issues on food, agriculture, health and nutrition so that they can make informed decisions on their consumptions and career choices, and make contributions to and have positive influence on communities.

What has been done

The study and its findings were incorporated into the curricula of two graduate-level courses in three ways in spring and fall semesters in 2013. Students were introduced to background and critical issues, literature, and findings of this study. The students in a statistics class all completed a student pedagogical project developed from the project, including data analysis, regression estimation, and a write-up. The pedagogical student project was published on the class website and can be assessed worldwide.

Results

Fifty students were enrolled in these two graduate-level courses in 2013. These students were introduced to background and critical issues, literature, and findings of this study. Over forty students were introduced to the pedagogical case study. They have conducted the designed data and statistical analyses and analyzed results. The teaching module has also been posted on the statistics teaching website. During this reporting period, people from 27 countries and 32 states in the US. visited the sties; and the site had 3060 visits, 811 unique visitors, and 12,177 page views. We estimate a direct contact of 53 students at TSU and at least another indirect contact of 50 people through the website worldwide.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Twin-track measuring impact approach were used to evaluate the success of the project. During the training session at conference, questionnaires were filled by participants to get feedbacks. These feedbacks were used to guide for future planning. In addition, a systematic client consultation was used to elicit feedback from the intended beneficiaries on the effectiveness of the design of project subcomponents and adoption of best multifunction land management practices.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Sustainable Energy - new feedstocks and improved feedstock production

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
202	Plant Genetic Resources				30%
204	Plant Product Quality and Utility (Preharvest)				30%
213	Weeds Affecting Plants				10%
511	New and Improved Non-Food Products and Processes				30%
	Total				100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	10.7
Actual Paid Professional	0.0	0.0	0.0	8.5
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
0	0	0	386136
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	386136
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	412605

V(D). Planned Program (Activity)

1. Brief description of the Activity

Disseminate research findings to the scientific community, stakeholders, agricultural, environmental, life science industries.
 Conduct agronomic and economic analysis.
 Recruit and train students, incorporating research training into teaching and extension curricula.
 Design and implement field and laboratory research.

2. Brief description of the target audience

State, local and federal agencies, small and limited-resource farmers, researchers, educators, policy makers, consumers and bioenergy companies.

3. How was eXtension used?

Project PIs worked as part of the leadership team for the Farm Energy CoP at eXtension.org.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2013
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	1	1	2

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of workshops and presentations concerning new or alternative biofuel feedstocks.

Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Publications relating to improved/optimized biofuel production.

Year	Actual
2013	19

Output #3

Output Measure

- Presentations related to research on new feedstocks and improved feedstock production.

Year	Actual
2013	25

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Producers will have increased knowledge of production options available for growing bioenergy feedstocks (Increased knowledge and understanding of the biofuels supply chain).
2	An increased number of producers will adopt production of bioenergy feedstocks (Implementation of sustainable biofuels systems).
3	Students will receive training in bioenergy production (Develop a diverse and educated workforce for a biofuels industry).
4	Protocols will be developed for mutagenesis and selection of herbicide resistant biofuel feedstock varieties (Increased knowledge and understanding of the biofuels supply chain).
5	Desirable biofuel feedstock varietal mutants will be recovered (Increased knowledge and understanding of the biofuels supply chain).
6	New varieties of biofuel feedstocks will be developed (Increased knowledge and understanding of the biofuels supply chain).
7	Producers will have knowledge of camellia as biofuel feedstock (Increased knowledge and understanding of the biofuels supply chain).
8	Demonstration sites for camellia as alternative feedstock will be established (Increased knowledge and understanding of the biofuels supply chain).
9	Camellia lines produced with enhanced fatty acid will be developed (Increased knowledge and understanding of the biofuels supply chain).
10	Producers in Tennessee will grow camellia as biofuel feedstock (Implementation of sustainable biofuels systems).
11	Producers will have knowledge of costs of production (from land preparation to final ethanol production) for two biofuel crops (Miscanthus and switchgrass) through the construction of enterprise budgets.
12	Stakeholders will have knowledge of the energy efficiency of biofuel production from switchgrass and Miscanthus through the calculation of energy balance sheets for these crops, providing indicators of sustainability for biofuel production
13	Factors responsible for improved efficiency of biofuel production will be determined.
14	Research to determine optimal harvest timing for switchgrass in Tennessee

Outcome #1

1. Outcome Measures

Producers will have increased knowledge of production options available for growing bioenergy feedstocks (Increased knowledge and understanding of the biofuels supply chain).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	322

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Bioenergy, and biofuels in particular, are a mainstream concept as an alternative to the security and environmental issues related to fossil fuels. Many producers may be understandably skeptical about growing biofuel crops because of the lack of information available to them and the fact that there is currently no major market available for them to sell these products. However, it is important to disseminate this assistance to these producers because once the infrastructure and markets are fully established, producers will have the optimal tools available to them to succeed.

What has been done

Presentations of research data on the use of switchgrass or native-warm season grasses in general for forage and bioenergy (verbal, video, scientific meetings). Demonstrations using a mobile biodiesel demonstration purchased through USDA NIFA Capacity Building grant funds were conducted. One fact sheet was developed, published, and uploaded to the TSU Cooperative Extension website. A Twitter account (@TSUBioenergy) and website (<http://www.tnstate.edu/faculty/jdekoff/>) were maintained to provide information on the bioenergy program at TSU as well as other bioenergy-related topics.

Results

Based on survey results from outreach meetings:

73% of respondents increased their interest in growing native warm-season grasses

87% of respondents increased their knowledge in using native warm-season grasses for biofuel production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)

511 New and Improved Non-Food Products and Processes

Outcome #2

1. Outcome Measures

An increased number of producers will adopt production of bioenergy feedstocks (Implementation of sustainable biofuels systems).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Bioenergy, and biofuels in particular, are a mainstream concept as an alternative to the security and environmental issues related to fossil fuels. Many producers may be understandably skeptical about growing biofuel crops because of the lack of information available to them and the fact that there is currently no major market available for them to sell these products. It is important, however, to disseminate this assistance to these producers because once the infrastructure and markets are fully established, they will have the optimal tools available to them to succeed.

What has been done

Research on optimization of production of feedstocks is conducted. Various outreach and educational efforts of research data and market conditions, similar to those employed for Outcome #1.

Results

Research in optimizing feedstock production in the Southeast is progressing, but project has not progressed far enough to measure grower adoption, nor have the commercial markets been established.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
511	New and Improved Non-Food Products and Processes

Outcome #3

1. Outcome Measures

Students will receive training in bioenergy production (Develop a diverse and educated workforce for a biofuels industry).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Bioenergy is a new, environmentally-focused field that encompasses a range of scientific disciplines. It has great impact on the environment due to its importance in maintaining the world's environmental and economic integrity. The U.S. has recently increased its focus in the area of bioenergy through federal mandates and funding for research, infrastructure and feedstock development, and education to enhance the nation's energy portfolio. This emphasis has created new opportunities in the 'green jobs' market which will require new efforts and new programs for training future professionals.

What has been done

Research has been conducted on optimal harvest timing of switchgrass for bioenergy production. This research has been performed with assistance from two graduate students.

Results

One graduate student graduated in May 2013 after successful thesis defense ('Identifying Strategies for enhancing switchgrass quality for use as a bioenergy feedstock'). This graduate student also presented her research during the University-Wide Research Symposium at Tennessee State University and won 2nd place in her division.

The second graduate student had the opportunity to work at the University of Tennessee in July 2013 to be trained and analyze data using NIR. She successfully presented her research proposal in October 2013 ('Effect of harvest timing on the quality of switchgrass for biofuel: changes in lignocellulose and potential energy production').

4. Associated Knowledge Areas

KA Code **Knowledge Area**
511 New and Improved Non-Food Products and Processes

Outcome #4

1. Outcome Measures

Protocols will be developed for mutagenesis and selection of herbicide resistant biofuel feedstock varieties (Increased knowledge and understanding of the biofuels supply chain).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Competition from weeds is one major cause for inferior switchgrass establishment under field conditions, presenting an increased risk and cost for the growers.

What has been done

We expect that the tetraploidy genome structure of 'Alamo' could be a reason for screening mutant with phenotypes in the M0 generation. We have obtained diploid foxtail millet seeds to continue the mutagenesis selection for herbicide sensitive or tolerance traits.

Seeds were produced from those plants, and reseeded for the M1 generation. Some phenotypes were observed for seed production and more vigorous growth. Because we are only able to harvest a limited number of seeds, and those seeds have a very low germination rate, the major effort is to propagate those seeds and continue to observe those traits. We are planning on herbicide screening in the next season.

Results

One protocol for treating switchgrass 'Alamo' with sodium azide was developed. More mutations were done in switchgrass 'Alamo' and *Panicum hallii*.

4. Associated Knowledge Areas

KA Code **Knowledge Area**
213 Weeds Affecting Plants

Outcome #5

1. Outcome Measures

Desirable biofuel feedstock varietal mutants will be recovered (Increased knowledge and understanding of the biofuels supply chain).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

New sources of genetic variation are needed for biofuel feed stocks. Genetic improvement of switchgrass may lead to increased sustainability of biofuel production.

What has been done

Seeds of *Panicum hallii* as well as switchgrass were treated with sodium azide to evaluate for treatments with different types of stresses, to find more useful mutations.

Results

There are no new phenotypes created in the switchgrass mutation population. But in the *Panicum hallii*, we have seen several M1 plants that are flowering and producing a few fertile seeds during Dec. 2013-Feb. 2014. Those plants are growing in greenhouses. Those plants are evaluated to see if those traits continue in the next generation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
213	Weeds Affecting Plants
511	New and Improved Non-Food Products and Processes

Outcome #6

1. Outcome Measures

New varieties of biofuel feedstocks will be developed (Increased knowledge and understanding of the biofuels supply chain).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Tolerance to environmental stress including drought and salt and temperature are significant issues for biomass crop production in the face of climate changes.

What has been done

Testing of mutants for herbicide resistance and abiotic stress tolerance has continued, including *Panicum hallii*, which is a diploid and was sequenced. Genomic study of this species will be easier once mutants with phenotypes are selected.

Results

Continuing evaluation of putative lines. No final results can be provided in this year because of the difficulties in propagating those plants.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

Outcome #7

1. Outcome Measures

Producers will have knowledge of camellia as biofuel feedstock (Increased knowledge and understanding of the biofuels supply chain).

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Demonstration sites for camellia as alternative feedstock will be established (Increased knowledge and understanding of the biofuels supply chain).

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

Camellia lines produced with enhanced fatty acid will be developed (Increased knowledge and understanding of the biofuels supply chain).

Not Reporting on this Outcome Measure

Outcome #10

1. Outcome Measures

Producers in Tennessee will grow camellia as biofuel feedstock (Implementation of sustainable biofuels systems).

Not Reporting on this Outcome Measure

Outcome #11

1. Outcome Measures

Producers will have knowledge of costs of production (from land preparation to final ethanol production) for two biofuel crops (Miscanthus and switchgrass) through the construction of enterprise budgets.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Producers need to know the profit they could earn from growing bioenergy crops. They need credible information on production costs and revenue to make decision on long term investment. From biofuel processor point of view, information price need to pay for feedstock producer is important since it affect the feedstock cost per gallon of ethanol.

What has been done

Have completed data collection and analysis, constructed benefit:cost sheets considering 25 year project period for ethanol production.

Results

Net returns, feedstock cost per gallon of ethanol, breakeven price (minimum price needed to cover production and processing cost) of feedstock. A refereed journal article in the journal Renewable Energy.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

Outcome #12

1. Outcome Measures

Stakeholders will have knowledge of the energy efficiency of biofuel production from switchgrass and Miscanthus through the calculation of energy balance sheets for these crops, providing indicators of sustainability for biofuel production

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Environmental groups have concerns over the net energy benefits of growing energy crops hence need justification. Policy makers also need information on energy benefits to promote bioenergy.

What has been done

Net energy balance model construction, data collection and analysis. Energy inputs were calculated for major inputs of feedstock production and Energy output were assessed based on per acre production of ethanol.

Results

Net energy model, energy input value tables for production inputs and Net Energy Values for each feedstock. Manuscript is in preparation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

Outcome #13

1. Outcome Measures

Factors responsible for improved efficiency of biofuel production will be determined.

Not Reporting on this Outcome Measure

Outcome #14

1. Outcome Measures

Research to determine optimal harvest timing for switchgrass in Tennessee

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Bioenergy, and biofuels in particular, are a mainstream concept as an alternative to the security and environmental issues related to fossil fuels. As feedstock markets emerge, it is important for producers to maximize their yield to maintain as much profitability as possible.

What has been done

In 2013, switchgrass samples were harvested in the field by students and are currently being processed for analyses. Data from switchgrass harvests in 2011 and 2012 is being prepared for manuscript publication.

Results

A research presentation was made to scientist at the American Society of Agronomy International Annual Meetings in November 2013 - 'Harvest Timing and Switchgrass Quality in Tennessee.' Two graduate theses were concluded "Identifying strategies for enhancing switchgrass quality for use as a bioenergy feedstock" and "Effect of harvest timing on the quality of switchgrass for biofuel: changes in lignocellulose and potential energy production."

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
511	New and Improved Non-Food Products and Processes

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Other (Changes in faculty personnel.)

Brief Explanation

Camilina research has not progressed as scheduled to faculty vacancy in this area.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The following items will be measured to assess the success of this program: Increase in number of producers adopting production of bioenergy feedstocks. Number of students receiving training in bioenergy production. Number of new varieties of biofuel feedstocks developed. Number of camellia lines produced with enhanced fatty acid. Number of producers in Tennessee growing camellia as biofuel feedstock.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Climate Change- low-impact alternatives for ornamental crop production

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
133	Pollution Prevention and Mitigation				25%
211	Insects, Mites, and Other Arthropods Affecting Plants				25%
212	Pathogens and Nematodes Affecting Plants				25%
605	Natural Resource and Environmental Economics				25%
	Total				100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	15.7
Actual Paid Professional	0.0	0.0	0.0	14.1
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
0	0	0	640529
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	640529
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	684679

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Identify new pesticide, biopesticide, and treatment methodologies for container and field-grown nursery stock to manage disease and insect problems.
- Determine the lowest effective rates for synthetic petroleum-based pesticides and develop new reduced rate insecticide / biopesticide combinations.
- Identify new biopesticides that can substitute for synthetic petroleum-based pesticides and reduce worker exposure risk and environmental impact.
- Release phorid-decapitating flies in Tennessee to provide imported fire ant biological control.
- Provide extension training and literature to producers on imported fire ant and Japanese beetle management and train students in pest management and research techniques.
- Provide data to support new treatments in the Domestic Japanese Beetle Harmonization Plan and the Federal Imported Fire Ant Quarantine, as well as data to support new insecticide label amendments.
- Conduct assessment of current and future energy use by greenhouse and nursery businesses.
- Identify alternative energy sources for the greenhouse and nursery industry.
- Hold focus group meetings with greenhouse and nursery business owners.

2. Brief description of the target audience

- Nursery growers, extension specialists, consumers and policy makers.
- Regulatory agencies (e.g., U.S. Environmental Protection Agency, USDA-APHIS, Tennessee Department of Agriculture).
- Agrochemical manufacturers.

3. How was eXtension used?

The program was involved in reviews of web content for the eXtension Imported Fire Ant Community of Practice (IFA-CoP), including the new OnyxPro Insecticide regulation change that is described under Outcome #5 and now promoted on eXtension. New fire ant related extension publications were shared with the leader of the IFA-CoP for evaluation and consideration for posting on eXtension. The TSU scientist on this project is a leader of the IFA-CoP (<http://www.extension.org/pages/12258/imported-fire-ants-leadership>), and his activities and involvement in the IFA-CoP are described online as follows: "Dr. Oliver leads the fire ant eXtension activities for Tennessee, and is assisting in engaging the public via webinars. He will provide content for various work teams." The 2012 webinar given by Dr. Oliver and reported during the last reporting period is still archived and available for continued public viewing (<http://www.extension.org/pages/33719/fire-ant-webinars>). This program also promoted eXtension to growers and stakeholders at all educational workshops during this evaluation period.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1300	28550	1050	110

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

Patent Applications Submitted

Year: 2013
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	6	10	16

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Workshops to inform producers about alternative insect control methodologies.

Year	Actual
2013	3

Output #2

Output Measure

- Disease resistant cultivars developed.

Year	Actual
2013	2

Output #3

Output Measure

- Extension factsheets about alternative methods to control disease and insects in nursery production.

Year	Actual
2013	4

Output #4

Output Measure

- Workshops held to inform/encourage nursery producers about alternative energy use.

Year	Actual
------	--------

2013 2

Output #5

Output Measure

- Extension publications to inform nursery and greenhouse growers about alternative energy options.

Year	Actual
2013	0

Output #6

Output Measure

- Research publications low-impact alternatives for ornamental crop production.

Year	Actual
2013	17

Output #7

Output Measure

- Presentations relating to research on low-impact alternatives for ornamental crop production

Year	Actual
2013	20

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Producers educated on proper management of invasive pests through presentations and workshops.
2	Producers educated on proper management of invasive pests through publications and factsheets.
3	New treatments for invasive pests.
4	New reduced-risk treatments developed for invasive pests.
5	New treatments for invasive pests approved by quarantine regulatory agencies.
6	Confirmed establishments of new invasive pest parasites.
7	Producers are informed about new or emerging diseases.
8	Producers are informed about new biological control treatments.
9	Producers that are informed about new sources of host resistance.
10	New cultivars exhibiting disease resistance available to growers.
11	Nursery/greenhouse operators trained in alternative energy use.
12	Nursery/greenhouse operators utilizing alternative energy.
13	Organisms identified as potential biocontrol candidates.

Outcome #1

1. Outcome Measures

Producers educated on proper management of invasive pests through presentations and workshops.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Invasive pest species disrupt natural ecosystems and are detrimental to agriculture because they exhibit rapid population growth that can cause greater crop damage and harm to human health and welfare. Multiple invasive pests now impact the U.S. nursery industry. Many producers must manage multiple invasive pests simultaneously with limited, ineffective, and costly treatments, which threatens economic viability and undermines integrated pest management efforts.

Producer education via workshops and other training outlets is essential for providing up to date information on rapidly evolving modifications to agro-ecosystems and guidance on successful and profitable control tactics.

What has been done

Research was conducted control of imported fire ant, Asian ambrosia beetle and other invasive insects. Producers and other agricultural stakeholders were trained at workshops, field day demonstrations, and educational venues on the latest management techniques developed from field research on invasive insects.

Results

Producers were educated on research results guiding proper management of invasive insects at several local, regional and national workshops. Total number of growers/stakeholders educated at workshop and field day trainings during this reporting period was about 1,111. In addition, the project had about 1,469 and 28,444 adult direct and indirect contacts, respectively pertaining to information on pest management by producers, stakeholders, and extension personnel and another 1,005 and 100 direct and indirect non-producer youth contacts.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
211	Insects, Mites, and Other Arthropods Affecting Plants

Outcome #2

1. Outcome Measures

Producers educated on proper management of invasive pests through publications and factsheets.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	600

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Due to time constraints with managing and running farm operations, as well as expense, some producers are not able to physically attend educational workshops to obtain information on management of invasive insects. As a result, publications, factsheets, and internet available materials are another route to indirectly reach these producers and stakeholders with guidance, training, and the latest successful measures for effective and sustainable pest management.

What has been done

Producers and stakeholders were educated on new techniques developed via our research by multiple printed and internet based outlets.

Results

Producers/stakeholders were educated by three new publications that were developed and placed online. One of those eXtension web contents highlighted the new OnyxPro Insecticide regulation changes described under Outcome #5, which was new and important information to relay to growers. Research data results from this project have been posted on the USDA-APHIS Imported Fire Ant website, where it is publicly available to agricultural producers and other stakeholders. The program documented 1,508 information requests from producers during this reporting period either from direct requests or via other extension personnel.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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133 Pollution Prevention and Mitigation
211 Insects, Mites, and Other Arthropods Affecting Plants

Outcome #3

1. Outcome Measures

New treatments for invasive pests.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Treatment methods for cleansing nursery stock of imported fire ant, Japanese beetle, and numerous non-indigenous ambrosia beetles are expensive, hazardous, impractical or ineffective, and often require shipping delays. Imported fire ant treatment methods like the Federal drench protocol are hazardous due to producer handling exposure and early site re-entries, labor intensive, and expensive. Most treatments for these pests rely on only a few active ingredients (i.e., chlorpyrifos, imidacloprid, or permethrin), providing producers with only limited alternatives. New biopesticide treatments that are under development may have a role in reducing climate change by offering producer alternatives for synthetic petroleum based agrochemical inputs. Invasive borers also have major impacts on forest systems and landscape plantings supplied by the nursery industry, which serve as important carbon-sinks, so improved treatments for borers may indirectly reduce climate change. It is also important that new treatments that are developed are made available to producers through modifications of federal and state regulations governing these quarantine pests.

What has been done

Research with a new in-field drench treatment for imported fire ant and Japanese beetle (JB) larvae utilizing common grower accessible items was repeated for a second season during this reporting period. The same biopesticides and conventional pesticides tested in the last reporting period were repeated in combination with a pesticide synergist. Data from IFA studies are being shared with the USDA-APHIS person responsible for regulatory decisions (i.e., Anne-Marie Callcott; Entomologist and Biloxi Station Coordinator). JB data will be shared with the U.S. Domestic Japanese Beetle Harmonization Plan (JBHP) Regulatory Treatments Committee for consideration as new treatments in the JBHP, but more data is required before results can be shared. A flatheaded borer multi-rate imidacloprid test examining insecticide interaction with

herbicides has been initiated at a commercial nursery during this reporting period.

Results

Rates and drench volumes for the in-field chemigation studies performed in 2013 were highly effective at controlling Japanese beetle (JB) for most products at rates lower than had previously worked. The Exponent pesticide synergist appears to have increased potency of insecticides against JB at rates much lower than normally effective. In addition, one biopesticide (Armorex) appears to have also been synergized by the Exponent product for JB control.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
211	Insects, Mites, and Other Arthropods Affecting Plants

Outcome #4

1. Outcome Measures

New reduced-risk treatments developed for invasive pests.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

New treatments for invasive pests approved by quarantine regulatory agencies.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	9

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Imported fire ants (IFA) have expanded their range into multiple nursery production systems in the southern United States. Currently, only three IFA quarantine treatments are approved for

fieldgrown nurseries. All treatments are expensive, rely on one active ingredient (chlorpyrifos), and the post-harvest treatments are hazardous. More options are available for Japanese beetle quarantines than IFA quarantines, but treatments are still expensive for producers due to the limited number of options.

What has been done

Data on pre-harvest banding of three generic imidacloprid products for Japanese beetle control in field-grown nurseries were published in the Journal of Economic Entomology. Subsequently, the published data were shared with the U.S. Domestic Japanese Beetle Harmonization Plan Treatment Review Committee. Data on management of imported fire ants were also shared with the USDA-APHIS.

Results

Pre-harvest imidacloprid research published in 2013 enabled the U.S. Domestic Japanese Beetle Harmonization Plan (JBHP) Treatment Review Committee to approve 3 new nursery treatments in JBHP. The new generic treatments are saving producers about \$0.06-\$0.33 / treated plant over existing protocols.

In addition to these outcomes, USDA-APHIS approved 2 new regulations in the Federal IFA Quarantine (FIFAQ) with project data support, including 1) a new IFA nursery plant immersion treatment and 2) a new IFA sod treatment. The bifenthrin immersion treatment allows producers to certify balled and burlapped nursery plants for 6 months, instead of the 1 month with the currently approved chlorpyrifos.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
211	Insects, Mites, and Other Arthropods Affecting Plants

Outcome #6

1. Outcome Measures

Confirmed establishments of new invasive pest parasites.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Imported fire ants (IFA) cause billions of dollars in damage in the United States each year and are a human, livestock, and wildlife health threat. To slow IFA spread and provide region-wide sustainable suppression of IFA populations, the USDA has an on-going classical biocontrol program to establish phorid-decapitating fly parasitoids of IFA from South America into the United States. There are about 20 species of these flies in South America, therefore, to effectively manage IFA with Pseudacteon flies, it will likely require introductions of a suite of fly species.

What has been done

We made the largest phorid-decapitating fly release (~20,830 flies) to date in summer 2013. Multiple Pseudacteon species also have been released in Tennessee over several years, including *P. obtusus* (23,288 flies between 2009-2012), *P. curvatus* Formosan biotype (8,840 flies between 2004-2008), *P. curvatus* Los Flores biotype (18,000 flies between 2000-2003), mixtures of *P. curvatus* biotypes (2,856 flies between 2011-2012), and *P. tricuspis* (10,812 flies between 1999-2006 and 2011-2012).

Results

Efforts to recollect and confirm establishment of *P. obtusus* from the 2013 and previous releases been unsuccessful to date. We have also not recovered *P. tricuspis* from previous releases. We have recovered large numbers of *P. curvatus* at all sites checked and *P. curvatus* is now established statewide. It may take several years for the newly released *P. obtusus* species to reach levels where field detections are possible.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
211	Insects, Mites, and Other Arthropods Affecting Plants

Outcome #7

1. Outcome Measures

Producers are informed about new or emerging diseases.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Nursery growers need to be informed about new and emerging diseases so that they can be prepared for the disease by taking preventive measures and minimize the potential economic impact of the disease.

What has been done

Research was performed on the epidemiology of nursery diseases i.e Cherry Leaf spot and Boxwood Blight. Studies on the source of initial infection and the timing of infection establishment were performed to confirm previous results.

Results

Studies on this disease have shown the source of initial infection and how to avoid economic impact from this disease. Disease management strategies developed have confirmed previous results on effective fungicides and the timing of fungicide applications as well as cultural practices that can reduce disease incidence.

Research-based information on disease control was communicated to nursery producers. Information on boxwood disease was well received by nursery growers and they are informed on how to recognize the disease and what to do in case they notice the disease in their production system.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
212	Pathogens and Nematodes Affecting Plants

Outcome #8

1. Outcome Measures

Producers are informed about new biological control treatments.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Nursery production systems use high rates of chemical fungicides to control powdery mildew of dogwood; this is detrimental to the environment and grower income by increasing dogwood production costs. Alternatives to chemical fungicides would be desirable.

What has been done

Microorganisms selected for bioactivity against powdery mildew of dogwood were evaluated on other pathogens, whether they interact with each other, and their mechanism of action.

Results

Results confirmed previous studies on bioactivity against powdery mildew; improved plant growth, bioactivity against other pathogens and the involvement of secondary chemical metabolites in their bioactivity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
212	Pathogens and Nematodes Affecting Plants

Outcome #9

1. Outcome Measures

Producers that are informed about new sources of host resistance.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Growers need to know options they can use to minimize plant damage from diseases.

What has been done

New plants that display powdery mildew resistance were generated through conventional crossing between plants and mechanism of resistance was determined; resistant as well as moderately resistant offspring were identified and await resistance confirmation.

Results

Growers were informed about research results that support the availability of disease resistance and biological microorganism that can be used in integrated disease management system.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
212	Pathogens and Nematodes Affecting Plants

Outcome #10

1. Outcome Measures

New cultivars exhibiting disease resistance available to growers.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Disease resistance is the best method for disease control by farmers. New generation of cultivars that are resistant to powdery mildew would be a great contribution to nursery growers in that they would not require routine fungicide applications.

What has been done

Powdery mildew resistant selections have been identified and characterized for release as new disease resistant cultivars.

Results

Two selections are ready for release as new powdery mildew resistant cultivars and five other lines are under evaluation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
212	Pathogens and Nematodes Affecting Plants

Outcome #11

1. Outcome Measures

Nursery/greenhouse operators trained in alternative energy use.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Increase in energy cost has raised the cost of operating nursery/green house operations in the last few years. This has a negative impact on profitability of their operations as well as on other issues such as employment and capacity utilization. Energy use is essential especially for Green house growers as plants require heating during the winter and cooling during the summer. Thus, there is need to address the issue by examining alternative energy sources that are cost effective. Understanding growers? intentions in adopting them is also important.

What has been done

A database of certified greenhouse and nursery growers was used to conduct a survey of certified greenhouse and nursery growers to assess their current energy use and preferred alternatives for the future.

Results

Descriptive analysis shows that rising energy cost is the second most important factor affecting profitability of nursery/greenhouse operations after the economic downturn. Availability of skilled personnel in the areas of management and sales represents another challenge. Despite the challenges they face the growers indicated that they will stay in the nursery/greenhouse business. Further analysis of the data will be conducted.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics

Outcome #12

1. Outcome Measures

Nursery/greenhouse operators utilizing alternative energy.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	22

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Exploring alternative sources of energy is needed to identify lower cost sources. Sources range from bioenergy operated by an individual operator to others available through private businesses in the energy business. There are also various public sector stakeholders.

What has been done

This project introduced research in an important emerging area. It can promote efficient and cost effective management practices that can overcome some of the challenges faced by the nursery/greenhouse growers.

Results

Preliminary results show that in addition to those already utilizing alternative energy, a majority of the respondents will consider adopting alternative energy sources.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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Outcome #13

1. Outcome Measures

Organisms identified as potential biocontrol candidates.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Alternatives to fungicides in powdery mildew control are needed to reduce the amount of fungicide used in production. Biopesticides and biological agents provide good alternatives to chemical fungicide either individually or as part of an integrated disease management system.

What has been done

Research on how to integrate biological organisms or biodegradable biopesticides with host resistance was initiated.

Results

The integration of moderate resistance with biological agents and with biopesticides improved disease control. Results are preliminary at this stage.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Government Regulations

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Research impact and relevance was measured by one-on-one interaction with nursery growers in educational workshops and at field research sites, counting the number of requests from producers for research-related information or assistance, and surveying producers for impact and content relevance at workshops and meetings. One-on-one interactions with nursery producers, the Tennessee State University Nursery Advisory Group, and regulatory stakeholders has indicated our research objectives are addressing their critical needs and our outcomes are reducing their costs. Direct requests from producers or related stakeholders for research-related information during the 2012 to 2013 reporting period totaled 1,237 in-person, 105 phone, and 1,220 email requests. Information exchanges with nursery growers and extension personnel included 647 grower and 737 extension exchange events. We estimate indirect contacts at 28,844. A survey given to nursery growers during this evaluation period at the

Tennessee Master Nursery Program class revealed 100% were somewhat to very satisfied with relevance of program to their needs, 91.2% agreed or strongly agreed that they would plan to adopt information, and 85.3% agreed or strongly agreed that information would save their business money. The estimated savings by nursery growers to their businesses included \$500 (n=1), \$501-\$1,000 (n=5), \$1,001-\$5,000 (n=17), \$5,001-\$10,000 (n=8), and >\$10,000 (n=3).

In addition to this survey, nursery extension has informed our program that 12 Tennessee nursery growers have adopted flatheaded borer systemic insecticide treatments that our program research has demonstrated to be effective. The grower reasons for adopting the research-based results was because the treatments were preventing tree losses, had lower labor costs, and were saving their businesses money. It was also learned that the growers adopted the new systemic treatments as either a direct result of attending educational workshop trainings by our program or from second-hand experiences of other satisfied growers. It is anticipated that the use of the research supported borer treatments will increase as this core group of growers relay their financial benefit and gains to other growers, as well as exposure to continued educational trainings by our program and nursery extension relaying the information.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Childhood Obesity - youth active and media savvy

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
703	Nutrition Education and Behavior				40%
724	Healthy Lifestyle				40%
806	Youth Development				20%
	Total				100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	6.9
Actual Paid Professional	0.0	0.0	0.0	4.1
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
0	0	0	186253
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	186253
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	198961

V(D). Planned Program (Activity)

1. Brief description of the Activity

Media literacy research and education
 Nutrition education
 Nutrition perception research
 Physical activity programs
 Field trips

2. Brief description of the target audience

African American children, ages 8 to 14 years, living in Davidson County, Tennessee.

3. How was eXtension used?

Rita Fleming, Assistant Professor of Health Education and co-PI, conducted a kitchen hygiene and safety tutorial.

Dr. Tyrone Miller, Leadership Specialist, provided leadership training to camp facilitators and peer educators and oversaw the challenge course field trip activities designed to build the esteem and skills of campers. He also conducted debriefing sessions after the camp and oversaw team-building activities at the TSU Agricultural Research and Education Center's Challenge and Ropes Course.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	61	60	98	86

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

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	1	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of focus groups held to determine perceived benefits, value and needs for relationships by probing habits, needs, preferences, values and lifestyles associated with food and media

Year	Actual
2013	0

Output #2

Output Measure

- Number of summer camp sessions held to collect data and educate youth in healthy eating and physical activities

Year	Actual
2013	3

Output #3

Output Measure

- Research publications on modifying lifestyles for healthy youth.

Year	Actual
2013	1

Output #4

Output Measure

- Presentations relating to research on modifying lifestyles for healthy youth.

Year	Actual
2013	4

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Target youth attending summer camp sessions (Children Engage in Healthy Levels of Physical Activity).
2	Following intervention, youth with intentions to limit television viewing, internet surfing and video games to less than one hour per day each (Children Engage in Healthy Levels of Physical Activity).
3	Target youth with intentions to increase fruit and vegetable intake (Children Practicing Healthy Eating).
4	Target youth with intention to increase level of daily physical activity (Children Engage in Healthy Levels of Physical Activity)
5	Youth with intention to limit fast food meals to fewer than four per month (Children Practicing Healthy Eating).
6	Target youth with increased self-efficacy and self-esteem
7	Target youth maintaining healthy behaviors 12 months post-intervention (Children Engage in Healthy Levels of Physical Activity).

Outcome #1

1. Outcome Measures

Target youth attending summer camp sessions (Children Engage in Healthy Levels of Physical Activity).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	98

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

African-Americans have disproportionately higher rates of obesity and reportedly watch more television than other Americans. Although many social, cultural, and environmental factors influence childhood and adolescent risk for obesity, marketing may have an especially powerful impact on food and beverage consumption. Using a summer camp setting, YAMS was developed to combat the influences of media, insufficient nutrient intake and excess caloric consumption, and inactivity on childhood obesity through media literacy, nutrition education, and physical activity, respectively.

What has been done

Three, 2 week long camps were held with a total of 95 participants attending. Campers received journals to record thoughts regarding their awareness, attitudes and behaviors regarding the daily media, diet and physical activity lessons. Camp participants were instructed using activities adopted from the Media Smart Youth© and Nutrition Detective© curricula. Recipes, nutrition lessons, and cooking were planned, prepared, and taught by a Registered Dietitian. Participants prepared their lunches after receiving food safety preparation lessons beforehand. Each day, campers were involved in 60-minutes of physical activity. Campers participated in cultural and self-esteem empowering activities in gender specific social circles daily. Field trips taken include a trip to a grocery store, the local farmers market, Fisk University's campus radio station (WFSK), Wave Country Water Park, and the Challenge Course at the Agriculture Research and Education Center in Ashland City.

Results

Youth created and presented various forms of media and artistic expressions (i.e. posters, songs, raps, poems and videography) concerning deceitful food marketing, healthy habits, the YAMS camp, and positive self-images of their culture. Observations and self-reports from camp participants and their parents/guardians affirm that campers were motivated to implement and

share healthier food alternatives at home.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle
806	Youth Development

Outcome #2

1. Outcome Measures

Following intervention, youth with intentions to limit television viewing, internet surfing and video games to less than one hour per day each (Children Engage in Healthy Levels of Physical Activity).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Media usage contributes to childhood obesity by reducing the amount of daily physical activity and by encouraging the consumption of high calorie foods via advertising and marketing of primarily candy, cereal and fast food.

What has been done

Twenty-five media literacy lessons were given using Media Smart curriculum. Camp participants learned to: 1) analyze and recognize marketing techniques used to gain viewers' attention; 2) evaluate obvious and subtle messages for accuracy and consistency with what they learned is healthy; 3) expressed their thoughts by developing their own messages.

Results

Campers created audio (radio clips) and video productions (commercials) using resources facilitated and provided by Mr. Joseph Richie and Sean Laflin within the TSU Communications Department. The youth also created and presented various forms of media and artistic expressions including posters, songs, raps, and poems about advertising, healthy habits, YAMS, and positive self-esteem affirmations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
806	Youth Development

Outcome #3

1. Outcome Measures

Target youth with intentions to increase fruit and vegetable intake (Children Practicing Healthy Eating).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	57

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Campers created audio (radio clips) and video productions using resources provided by the TSU Communications Department. Youth also created and presented various forms of media and artistic expressions including posters, songs, raps, and poems about advertising, healthy habits, YAMS, and positive self-esteem affirmations.

What has been done

Delivered twenty-five healthy cooking lessons using Nutrition Detective© that include food and kitchen safety information. Lessons and meals emphasized increasing consumption of fruit, vegetable, whole grains, and food sources of calcium and vitamin A. Nutrition lessons encouraged limiting added sugar, fats and salt, controlling portion sizes, reading a nutrition label, and eating whole (unprocessed) food. Daily meals included three to five servings of fruit and vegetables. Youth prepared thirty healthy lunches, one daily. Delivered healthy breakfast and snacks daily.

Results

Youth, including camp facilitators and peer educators increased consumption of water, fruits and vegetables. Youth expressed intent to limit portion sizes of meals, soda, and high calorie snacks. Campers and parents reported preparing the recipes and meals served at home, as well as making more informed decisions on what to consume based off the ingredient list on the nutrition

label.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #4

1. Outcome Measures

Target youth with intention to increase level of daily physical activity (Children Engage in Healthy Levels of Physical Activity)

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	46

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Lack of physical activity is linked to overweight and obesity.

What has been done

Participants learned the importance of physical activity in promoting health and participated in daily physical activities for a minimum of 60 minutes.

Results

The youth committed to increase their daily physical activity after the week of camp.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
806	Youth Development

Outcome #5

1. Outcome Measures

Youth with intention to limit fast food meals to fewer than four per month (Children Practicing Healthy Eating).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	46

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Eating fast food contributes to childhood obesity by increasing the amount and type of calories consumed. It is recommended that children limit their consumption of high fat/high calorie foods which are typically served at fast food restaurants.

What has been done

Participants read calories tables of fast food menus to learn about the amount of calories from fat and sugar in their favorite fast foods. Participants watched documentaries and short news clips about how fast food meat products are manufactured. Campers also learned about the importance of portion sizes and limiting soft drink intake.

Results

Youth indicated they understood the benefits of reducing fast-food consumption. Children reported reading the food labels while shopping with parents and food items in their parents have in the home.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #6

1. Outcome Measures

Target youth with increased self-efficacy and self-esteem

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Self-esteem is important to building self-efficacy needed to read food labels, prepare healthy meals, etc.

What has been done

Delivered thirty sessions that involved cultural and self-esteem empowering activities in gender-specific groups according to and influenced by, the principles of Kwanzaa (unity, self-determination, collective work and responsibility, cooperative economics, purpose, creativity, faith, legacy/heritage, beauty and/or personal hygiene, respect).

Results

It is too early to determine if their understanding of the issues will translate in to sustained action.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #7

1. Outcome Measures

Target youth maintaining healthy behaviors 12 months post-intervention (Children Engage in Healthy Levels of Physical Activity).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

All stakeholders care because of the health impact obesity has in our community.

What has been done

A 12 month post-intervention has not been captured.

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The Media Smart Youth© curriculum was adapted by using the media lessons only. Youth viewed the media lessons favorably when coupled with a hands-on activity that requires creativity in a group setting. Participants enjoyed making various forms of media using the audio/visual studio at the Tennessee State University Communications Department. Participants retained the most information provided by the Nutrition Detective curriculum. Six months post intervention, some parents reported that their children still read food labels, and parents have adopted reading food labels to determine the foods they consume. Parents reported that their children are more open to eat vegetables.

Challenges were found in facilitating activities that were culturally relevant and applicable to the Kwanzaa theme in Bro Code.

Peer educators were reduced from eight to two based on the previous year's findings. It was discovered that peer educators need to be carefully selected as many were easily influenced by peer pressure and uncomfortable with taking authority with campers.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Food Safety - contaminant-free, healthier foods

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
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources				50%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins				50%
Total					100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	9.5
Actual Paid Professional	0.0	0.0	0.0	7.1
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
0	0	0	322536
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	322536
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	344586

V(D). Planned Program (Activity)

1. Brief description of the Activity

Identify risk factors for cross contamination by investigating storage practices of refrigerated foods. Determine the likelihood and mechanisms of cross contamination by mapping the fingerprints for strains of bacteria from the same refrigerator.

Change potentially unsafe consumer practices through effective intervention strategies.

Characterize, analyze, and identify antibiotic-resistant bacteria in the farm environment (animal manure, soil) and irrigation water.

Train students on isolation and characterization of foodborne pathogens in fresh produce and the farm environment.

Develop and deliver educational materials on hygienic agricultural practices needed to reduce the use of antibiotics and safe fresh produce handling practices.

The development, maintenance, and revision of an educational website and brochure on safe fresh produce handling practices and judicious use of antibiotic in agriculture.

2. Brief description of the target audience

Fresh produce farmers, consumers, food scientists, food production industry, households in the metropolitan Nashville area.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	60	90	0	0

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

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	4	4

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Website developed to educate consumers on antibiotic resistant pathogens on fresh produce.

Year	Actual
2013	0

Output #2

Output Measure

- Database of characterized antibiotic resistant microorganisms isolated from animal manure.

Year	Actual
2013	1

Output #3

Output Measure

- Database of characterized antibiotic resistant microorganisms isolated from irrigation water and watersheds.

Year	Actual
2013	1

Output #4

Output Measure

- Factsheets on improvement of kitchen cleanliness and prevention of cross-contamination

Year	Actual
2013	1

Output #5

Output Measure

- Research publications on contaminant-free, healthier foods.

Year	Actual
2013	4

Output #6

Output Measure

- Research presentations on contaminant-free, healthier foods.

Year	Actual
2013	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Consumers will be educated via booklets on the occurrence and prevention of antibiotic resistant pathogens on fresh produce (Increase adoption of recommended safe food handling practices at the individual, family, community, production, and supply system levels.)
2	Producers will practice judicious use of antibiotics on farms through improved agricultural practices (Increase adoption of recommended safe food handling practices at the individual, family, community, production, and supply system levels).
3	Consumers will practice safe fresh produce handling practices via food safety education (Increase adoption of recommended safe food handling practices at the individual, family, community, production, and supply system levels).
4	Consumers will have increased knowledge of improved kitchen cleanliness (Increase adoption of recommended safe food handling practices at the individual, family, community, production, and supply system levels).
5	Consumers will have increased knowledge of means to reduce the chance of cross contamination(Increase adoption of recommended safe food handling practices at the individual, family, community, production, and supply system levels).
6	Consumers will adopt safer food storage practices (Increase adoption of recommended safe food handling practices at the individual, family, community, production, and supply system levels).
7	Consumers will adopt improved cleaning skills (Increase adoption of recommended safe food handling practices at the individual, family, community, production, and supply system levels).

Outcome #1

1. Outcome Measures

Consumers will be educated via booklets on the occurrence and prevention of antibiotic resistant pathogens on fresh produce (Increase adoption of recommended safe food handling practices at the individual, family, community, production, and supply system levels.)

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	24

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A majority of consumers have become increasingly aware of the risks of foodborne pathogens associated with fresh produce; more concern especially if the pathogens were antibiotic resistant. Data obtained in this study will be used to educate on risks of using contaminated irrigation water, animal manure, and safe handling practices. Consumers, who adopt to food safety practices, reduce the risks of cross contaminating their fresh produce.

What has been done

A survey was developed and disseminated to growers to assess the current level of knowledge. Based on analysis of data, results were communicated to educate and answer to some of the challenges produce growers were facing. Information on best practices to prevent cross contamination while harvesting, handling, irrigating, cleaning, sorting, grading, packaging and transportation of fresh produce. The risks of using untreated animal manure and contaminated water were also highlighted to the growers.

Results

Six months after conducting a one-day workshop, produce growers showed increased knowledge on fresh produce safety from the time of planting, harvesting and channeling to the markets. At the end of the workshop, the participants were aware that food safety standards will become increasingly more stringent in the near future. Some of the participating producers indicated they were now taking their water samples to be tested for pathogen contamination. Produce growers also requested future training on fresh produce safety, especially the Good Agricultural Practices (GAPs). They expressed that with GAPs training, they will be in a position to compete in the fresh produce industry.

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 #2

1. Outcome Measures

Producers will practice judicious use of antibiotics on farms through improved agricultural practices (Increase adoption of recommended safe food handling practices at the individual, family, community, production, and supply system levels).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	11

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Antibiotic resistant foodborne pathogens in fresh produce may cause personal distress, preventable death, and avoidable economic burden. Profiles of antibiotic resistant bacteria obtained from animal manure and irrigation water is applied to educate growers the importance of judicious use of antibiotics in the fields. This contributes to the efforts in reducing the prevalence of antibiotic resistant bacteria in farms.

What has been done

A focus group was conducted to collect data on change of behavior/farm practices after producers were made aware of data on contamination pathways.

Results

Record keeping and Best Management Practices (BMPs) implementation increased.

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 #3

1. Outcome Measures

Consumers will practice safe fresh produce handling practices via food safety education (Increase adoption of recommended safe food handling practices at the individual, family, community, production, and supply system levels).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	15

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Contaminated produce is a risk to the public. This is an increased concern now, because more consumers have increased consumption of raw greens in their diets due to increased knowledge of the health benefits of consumption of raw greens.

What has been done

Research concerning best handling practices was conducted. Research data were presented to consumers via booklets explaining best handling practices. Data were also distributed to counties through extension agents.

Results

Research data were used to educate consumers on how to prevent contamination while handling fresh produce and meats in domestic kitchens. Survey questions on safe handling of fresh produce intended to measure any changes in consumer behavior/practices were collected from consumers and the data is being analyzed.

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 #4

1. Outcome Measures

Consumers will have increased knowledge of improved kitchen cleanliness (Increase adoption of recommended safe food handling practices at the individual, family, community, production, and supply system levels).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Cross-contamination during food handling, preparation, and storage is one of the major contributing factors in the transmission of foodborne diseases at home. Improving the effectiveness of microbiological control measures in home kitchens is crucial in preventing foodborne diseases.

What has been done

Microbiological evaluation of swab samples collected from consumer home refrigerators was conducted. Information on consumer cleaning practices was collected through in-person interviews and in-home observations. The importance and effective procedures of cleaning refrigerator to control microbiological contamination in home refrigerators were discussed with target consumers during home visits.

Results

Results indicate that consumers who clean their refrigerators regularly had significantly lower bacteria contamination on the refrigerator shelves. Target consumers have learned proper cleaning methods to improve refrigerator cleanliness

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 #5

1. Outcome Measures

Consumers will have increased knowledge of means to reduce the chance of cross contamination(Increase adoption of recommended safe food handling practices at the individual, family,community, production, and supply system levels).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	30

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Home refrigerators can harbor pathogenic bacteria that pose a potential to contaminate stored foods. Consumers should be informed about safe handling of refrigerated foods to reduce the risk of food contamination.

What has been done

In-home research observations were conducted to evaluate the situations that may cause contamination of the foods stored in the refrigerators. Information on proper storage of refrigerated foods was discussed with the target consumers during home visits.

Results

Research data collected informed consumers of potential issues in their refrigerators that may cause contamination to the foods and the proper storage of refrigerated foods to reduce the chances of cross contamination.

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 #6

1. Outcome Measures

Consumers will adopt safer food storage practices (Increase adoption of recommended safe food handling practices at the individual, family, community, production, and supply system levels).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Cross-contamination during food preparation and storage is one of the major contributing factors in the transmission of foodborne diseases. Many foods, such as raw poultry, meat, eggs, fish, shellfish, fruits and vegetables have been cited as the potential contamination sources of foodborne pathogens. Proper food handling and storage practices by consumers will reduce the risk of foodborne illness at home.

What has been done

Follow-up interviews telephone were conducted with the consumers who had participated in the prior in-home food storage data collections. Consumers were queried regarding the adoption of the recommended food storage practices.

Results

Improvement of refrigeration storage was assessed by the follow-up interviews. Results indicated that most (83%) of the target consumers reported improvements in their storage practices.

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

Consumers will adopt improved cleaning skills (Increase adoption of recommended safe food handling practices at the individual, family, community, production, and supply system levels).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	28

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Consumer hygiene practices have been frequently reported to be inefficient in controlling bacterial growth and survival in the kitchen environment. Practice of effective cleaning methods by consumers will reduce microbial contamination in home kitchens.

What has been done

Follow-up interviews were conducted by phone with the consumers who had participated in the prior data collections. Consumers were asked the questions regarding the adoption of the recommended cleaning practices.

Results

The improvement of refrigeration cleaning practices by consumers was assessed by the follow-up interviews. Results indicate that almost all (93%) of the target consumers reported improvements in their cleaning practices.

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The following items were measured to assess the success of this program: (1) number of target consumers adopting safer food storage practices and (2) number of target consumers adopting improved cleaning skills. Of the thirty target consumers, twenty-five reported taking safety measures to prevent cross contamination when storing raw meat and poultry in their refrigerators; and twenty-eight reported an increase of frequency in cleaning refrigerator and checking refrigerator temperature.

Focus groups and workshop were conducted to determine if there were any changes in consumers' behavior/practices after delivering educational materials.

This project was evaluated on the following principles:

1. Number of produce growers with increased knowledge on how to reduce the risks of fresh produce contamination on the farm
2. Number of animal producers practicing judicious use of antibiotics and maintaining proper record keeping.
3. Consumers with increased knowledge on safe handling of fresh produce during food preparation. Produce producers, animal producers, and consumers increased in knowledge on safe handling of fresh produce on the farm, record keeping on antibiotic usage, and safe handling of produce in domestic kitchens, respectively.

Key Items of Evaluation

Produce growers were well informed on how to prevent contamination while growing and harvesting fresh produce; and animal producers learned the importance of record keeping. Consumers also increased their knowledge on how to prevent cross contamination in the kitchens.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Climate Change- improving the quality of water runoff from agricultural production

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
112	Watershed Protection and Management				50%
133	Pollution Prevention and Mitigation				50%
	Total				100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	7.2
Actual Paid Professional	0.0	0.0	0.0	5.3
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
0	0	0	240767
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	240767
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	257092

V(D). Planned Program (Activity)

1. Brief description of the Activity

Conduct research in water quality monitoring.
Develop outreach materials.

Communicate findings to producers/end users.
Train students.

2. Brief description of the target audience

Agricultural producers, environmental scientists, environmental regulatory agencies.

3. How was eXtension used?

While eXtension was not used per se, agricultural and natural resource agents (ANR) from TSU were encouraged to attend in-service training and/or listen to webinar(s) that dealt with pollution abatement strategies.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2013
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	1	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Workshops to communicate research findings to stakeholders.

Year Actual

2013 0

Output #2

Output Measure

- Workshops to educate producers in the target population on how to reduce sediment load to surface water.

Year	Actual
2013	0

Output #3

Output Measure

- Research publications about improving the quality of water runoff from agricultural production.

Year	Actual
2013	1

Output #4

Output Measure

- Presentation relating to research on improving the quality of water runoff from agricultural production.

Year	Actual
2013	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Nursery producers in the target population will be aware of non-point source pollution from field production of specialty crops.
2	Students will be trained in water quality monitoring.
3	Producers in the target population will have increased knowledge of the relationship between land cultivation practices and sediment load to surface water.

Outcome #1

1. Outcome Measures

Nursery producers in the target population will be aware of non-point source pollution from field production of specialty crops.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

During storm events, large volume of sediment can be added to creeks from surface runoff, especially in field plots where the landscape has been disturbed (plowed or disked). Nursery crop growers are not aware of the impact of this management practices on surface water. Water managers and residents that live in the Collins River sub-watershed and the State regulatory agency (Tennessee Department of Environment & Conservation, TDEC) are concerned about this issue because plowing, liming and fertilization of nursery fields can result in the runoff of tons of soil and essential crop nutrient such as phosphorus to inflow creeks (tributaries) of the Collins River. Phosphorus, metals and many organics adsorb to fine silt and clay, resulting in increased potential for surface water contamination. Fine silt and clay are some component of sediments.

What has been done

Hills Creek and Mountain Creek in Warren County Tennessee were sampled for eight (8) consecutive weeks in the summer and fall of 2013. These creeks are major tributaries of the Collins River. Water samples were collected mostly during base flow (normal stream flow) and in very few instances after rainstorm events. The creeks were monitored for the following water quality parameters: turbidity (because of the strong correlation between turbidity and sediment), specific conductance, total dissolved solids, dissolved oxygen, pH and temperature. Nitrogen, phosphorous, calcium, magnesium and potassium were also monitored in the creek water samples.

Results

While growers are being viewed as contributors to surface water quality degradation, our data thus far indicate otherwise. We found during base flow that essential crop nutrients like phosphorus (P) were relatively low in the creeks monitored; the dissolved P in the creeks monitored ranged from 0.02 ppm in Mountain Creek to 0.10 ppm in Hills Creek. Dissolved form of (P) usually serves as potential nutrient for algae in surface water and as such could support

eutrophication in the water. However there was no visual evidence of eutrophication in either creek.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

Outcome #2

1. Outcome Measures

Students will be trained in water quality monitoring.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There is the need to train future workforce (students) to meet the need of water resource issues, especially in the area of surface and ground water quality assessment and monitoring.

What has been done

Three students (one graduate student and two undergraduate students) hired as student workers were involved in the project; they gained both research and extension experiential training. The graduate student developed and completed a thesis on one of the primary objectives of the project.

Results

The students assisted in instrument calibration, the analyses of stream water quality parameters and data entry. A completed MS-thesis.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

Outcome #3

1. Outcome Measures

Producers in the target population will have increased knowledge of the relationship between land cultivation practices and sediment load to surface water.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	15

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Nursery crop production activities can contribute to both point and non-point source pollution. While the majority of ornamental plants in the sub-watershed are field grown, plowing, liming and fertilization of nursery fields can result in the runoff of soil and essential crop nutrients at the watershed scale. And there is a strong correlation between surface water quality and land use within a watershed. The residents, including nursery growers, in the Collins River watershed care about the water quality of the water bodies that drain the watershed.

What has been done

Results of our research findings have been shared with field nursery crop growers and county agents in forums such as field days, organized workshops and in-service training of ANR agents.

Results

Winter sampling season showed turbidity values that ranged between 2- 5 NTU during base flow; and 10- 40 NTU during rainfall events. Spring sampling showed turbidity values that ranged from 0-5 NTU during base flow; and turbidity values that ranged from 2-12 NTU during storm events. In conclusion, turbidity values were slightly higher during the winter sampling seasons. Concentrations of essential crop nutrients such as phosphorus were also found to be low in the creeks monitored; suggesting fertilizer use efficiency by growers. Fifteen growers in the sub-watershed indicated an increase in knowledge concerning land use and water quality.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Government Regulations
- Competing Public priorities

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The project was evaluated during random surveys of nursery crop growers at field day(s) and at nursery trade show(s). There was a heightened awareness of surface water quality problems and solutions due to best management practices (BMPs) adopted by growers for individual nursery fields.

The primary deliverable of this project is creating a new paradigm for field nursery crop growers, especially in Middle Tennessee, so that they are well educated on surface water quality and watershed management principles. Growers were able to make improved field-scale decisions such as testing their soils before lime and fertilizer applications. The effectiveness (success) of the project is evaluated by a) the heightened local awareness of surface water quality problems and solutions; b) best management practices (BMPs) adopted by growers for individual nursery fields; c) demand by growers for better and efficient fertilizers that are not prone to excessive surface runoff during storm events and d) better trained students in the environmental protection and enhancement area.

Key Items of Evaluation