2014 South Carolina State University and Clemson University Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

All five of the NIFA high priority issues are addressed in South Carolina's annual report, including Global Food Security and Hunger, Food Safety, Nutrition and Childhood Obesity, Climate Change, and Sustainable Energy. In addition, the state is reporting on five other priority program areas: Natural Resources Management, Sustainable Animal Production Systems, Sustainable Agriculture Production for (non-food) Horticultural Crops, Community Leadership and Economic Development and 4-H Youth Development. Research and Extension delivery through outreach of research results to the clients promotes the economic growth and development of agriculture and forestry sectors throughout the state.

The 1890 Research and Extension Program had approximately 16 active research projects during the 2013 - 2014 reporting period. Faculty submitted 9 papers for publication, conducted 37 oral/poster presentations and finalized 7 research projects, which led to publishing research bulletins for distribution. 1890 Extension delivered approximately 14 programs throughout South Carolina, reaching 14,082 people. Sixty-one Memorandums of Understanding (MOU) or articulation agreements with external agencies were established. One hundred seventy individuals volunteered their time to assist with the various 1890 Extension Programs. Some 1,193 workshops were conducted across the state.

Leadership is important to making sure outreach programs and services as well as research projects are maintained and delivered according to the designated guidelines. To assist with making sure the rules and regulations are followed, the 1890 Research and Extension Program at South Carolina State University received new leadership during the 2013 - 2014 reporting period when a permanent Vice-President of Land-Grant Services and Executive Director of 1890 Programs was appointed.

In 1890 Research, the leadership continues to promote the involvement of faculty in Evans-Allen projects. The funding of research grants to 16 faculty members resulted in a cost savings to the university's educational and general budget of approximately $281,000.00. In addition, the National Professional Agriculture Workers Conference (PAWC) is held once a year in Tuskegee, AL. Undergraduate and graduate Minorities in Agriculture, Natural Resources and Related Sciences (MANRRS) student researchers compete in the Annual Conference. Four students won honors with their poster presentations, while four other students placed in oral presentations.

The 1890 Research Program has intensified its efforts on advancing the research capacity of South Carolina State University. The Program has expanded research grant opportunities; broadened the research portfolio with an emphasis on health and wellness, food safety, alternative energy and education; and reformed several administrative and operational procedures to enhance and strengthen 1890 Research.

The 1890 Research and Extension Programs value the integration of research, teaching and public service. Researchers constantly address issues pertaining to quality of life opportunities for citizens in South Carolina. To highlight some of the research being conducted by the 1890 Program, research under the Sustainable Animal Production Systems focused on a computer simulation model for livestock emergency response in South Carolina. A multi-agent framework was used to design and implement a

computer-based epidemiological simulation model that combines the traditional herd-based epidemiological methods with the role of transportation and the interferences of individual objects for herds. Five farms were selected for the simulation phase. A stochastic simulation module for herd-based disease spread evaluation was designed and verified; multi-agent based simulation modules to represent the interferences among herds, human workers and individual animals transported were designed and verified as well as graphical user interface modules to control the overall simulation process was developed. The simulation model is capable of representing the behavior of individual animals, in addition to the benefits of stochastic herd-based simulation. The module provides accurate and flexible simulation results to assist those who must provide early responses for emergency outbreaks. With the knowledge learned from the research, a grant application was submitted to the National Science Foundation for review.

Research conducted under the goal of Food Safety looked at weight training effects on elderly diabetic patients. The researcher investigated three types of resistance exercise (free weights, exercise bands and machine resistance) to see if the type of exercise was significant. Through a systematic training protocol, the subjects got stronger and improved their metabolic and biochemical profiles as well as functional measures of the quality of mobility. The impact of the research would reduce the costs of medical care, if the patient needed fewer drugs and was less likely to develop complications from diabetes. Healthcare costs would be greatly impacted, since diabetes is the largest growing disease in the United States. The research findings have developed an improved way of investigating fatigue for non-athletes. The findings will be published in physical therapy, strength and conditioning, and geriatric journals. After several months of training, one subject put away their cane. Another subject improved strength and flexibility and was able to perform simple tasks of tying shoelaces, using a dust pan when sweeping floors for the first time in years. Another project focused on the development of a food safety laboratory testing the efficacy of using ozone and probiotics to inhibit food-borne pathogens in poultry and meat. Experiments were performed testing the effects of lactic and acetic acid (byproducts produced by probiotic bacteria) on the growth of Escherichia coli (E. coli). The next step of experimentation is to use ozone and ozonated water on poultry and beef.

Investigations were conducted involving the goals Climate Change, Natural Resource Management and Sustainable Energy. In climate change, research focused on disaster relief supply chain optimization and simulation for rural communities. The researcher reviewed optimization and simulation models used in the field of disaster relief supply chain. An optimization model was developed to make integrated decisions on transportation, facilities location and inventory issues for a disaster relief supply chain. Hypothetical input data were created to test and improve the model. The model was capable of selecting the optimal locations of SSAs (State Staging Area) and FOSAs (Federal Operational Staging Area) for disaster relief supply chain. The model could determine the optimal shipping amount of relief supplies between different stages of the disaster relief supply chain. It could, also, keep track of the inventory level at different stages of the supply chain. The V. C. Summer Nuclear Power Plant (Jenkinsville,SC) was selected as the potential disaster site for the case study. A simulation model was developed to model the disaster relief supply chain networks using arena simulation software by Rockwell Automation.

Research involving natural resource management focused on characterizing, remediating, managing and monitoring the Edisto River mercury contaminated water and sediments and assessing the processes that govern ecological and human health risks. The research is supported by advanced science and technology such as sensor technology and fate of contaminant transport modeling. Fate and transport modeling is a method to quantify whether contaminants remain in place, are buried over time or move through the aquatic system and into ecological and human receptors. An environmental research and teaching lab was established, which includes computer network connection, software such as GIS, JAVA, MATHEMATICa, METLAQB, etc. The researcher and staff were taught how to use software equipment. They reviewed literature and collected existing field measurement data and site

characterization information. They searched and tested existing numerical modeling codes with different computer language for future modification and development.

In studying sustainable energy, the researcher addressed energy problems by converting plastic waste to fuel, contributed to environmental safety by providing a technique for reducing plastic waste in landfills and involving four undergraduate students in research by publishing the results in peer-reviewed journals and attending scientific conferences in community education. The goal of reducing the amount of plastic waste materials in (Orangeburg, SC) landfills were developed in three related phases: 1. basic research; 2. demonstration thermolysis reactor and 3. pilot plants. The results of the basic research were applied to build a demonstration reactor. Plastic shopping bags and other polyethylene-based plastic wastes were thermally decomposed to liquid and gases suitable for fuel. One of the important points revealed by the research was the recovery route of every plastic waste depends on the condition and kind of materials. Depending on the kind of waste, the most economically feasible process and treatment were used.

Under the Global Food Security and Hunger goal, a study was conducted on the impact of the Panama Canal expansion on corn exports in the Southeastern Region of the United States. The basic Ordinary Least Square (OLS) model to predict regional corn exports was developed. The researchers, also, built a time series regression model. Both models were run and the results compared. The time-series model seemed to be a better model with a higher R-square, better F-statistics and reasonable beta co-efficient. The transportation model to forecast corn exports was built by several major ports: Savannah, Mobile, New Orleans, Los Angeles and San Francisco. In addition, research was conducted on automatic identification technology usage for farm produce traceability. Traceability equipment was implemented into the supply chain for the selected businesses. Training was provided for proper use of the equipment. Data collection was conducted from small scale farms for summer crops. The process for determining the necessary requirements and feasibility for integrating the RFID (Radio Frequency Identification) system used in the research with the inventory systems was processed by a medium scale farm participant's distribution centers. The traceability technologies have great potential to be valuable tools in the efforts being made to make the domestic food supply more secure.

In conducting research in the area of community, leadership and economic development, interviews and city council minutes revealed that the majority of the municipalities focused on revitalizing and maintaining adequate municipal services downtown. Downtown revitalization was concentrated on beautification projects, parks and art and culture centers. This was done to increase the number of visitors to the city as a way of generating growth and development. Some officials argued the strategy neglected the needs of low-income neighborhoods. Surveys showed racial differences in municipal services satisfaction. Black municipal officials hold more negative views of municipal services than do white municipal officials. For instance, over 55% of white municipal officials reported they were very satisfied with the overall performance of municipal government compared to 32% of black municipal officials. Findings show 17% of black municipal officials and only 2% of white municipal officials saw poor street lighting as a problem for their constituencies. The differences were even greater when the services were disproportionately needed by low-income populations. In this regard, 39% of black municipal officials and only 13% of white municipal officials saw public transportation as a problem for their constituencies. The completed report will be published in a research bulletin for distribution.

More research was conducted on investigating the barriers to international trade faced by small scale agribusiness enterprises in South Carolina. Data was analyzed using trend analysis and an Input Output model to estimate the impact of various parts of state agribusiness on total economic activity. South Carolina continues to contribute toward international trade in agricultural products with total agricultural exports valued at $959.3 million. The top five commodities exported were broilers (young chickens), greenhouse and nursery products, turkeys, cattle and calves and tobacco. The three main agribusiness sectors included farming/agricultural production, food processing and forestry-based

business. The total economic impact of the three core agribusiness sectors was 188,317 jobs or about 8% of the 2.4 million jobs in SC. The results of the study indicate export promotion program usage by small businesses brings a measurable and significant increase in specific resources and capabilities necessary for export market participation. Since the research suggests businesses that have used the programs have benefited in augmenting their resources, it becomes necessary to inform and to motivate other potential exporters to engage with such programs to increase their chance of success. The findings will be published in a research bulletin. A special business course was developed based on the project findings as an elective for students pursuing a minor in international business.

The goal of Nutrition and Childhood Obesity has drawn the attention of four researchers. Childhood obesity has become epidemic in South Carolina and across the nation. Overweight children are becoming obese adults. A report by the SC Department of Health and Environmental Control (DHEC) revealed at least one in five children ages 6 - 17 in the nation are overweight and the trend is spiraling upward. One researcher is investigating the impact of nutrition intervention on pregnancy outcomes of obese pregnant women in Orangeburg, SC. The project is in its preliminary stages. Another researcher looks at physical activity and nutrition through the use of technology to combat overweight and obesity in elementary school-aged children. Each quarterly session, awards were given to students who met the 3% weight loss and/or significant weight loss. Four participants had a change (decrease) in BMI (Body Mass Index). Daily food logs indicated all participants increased their daily intake of fruits and vegetables and decreased their intake of non-nutritious foods/snacks. A video was made of participants sharing how the PAAN (Physical Activity and Nutrition) Camp changed their life over the three years participating in the project. A recipe book was issued to parents to provide copies of the items cooked in the nutrition lab at camp.

Other investigations continued on DNA damage caused by obesity and diabetes. The possibility of DNA involvement in glycoxidation reactions as a possible source of complications in diabetes, mutations of DNA, synthesis of protein such as insulin, energy transformation and other disease processes was reviewed. Fasting venous blood and urine samples were collected from diabetic and obese people, both male and female, with a different age group and body mass index (BMI). The participants were recruited through the Regional Medical Center. To date, HPLC (High Performance Liquid Chromatography) analysis has identified the glycoxidatively modified nucleosides carboxymethyl-2'-deoxycytidine (N4-CMdC) and carboxymethyl-2"- deoxyadenosine (N6-CMdA) as important probable biomarkers of the kinds of reactions of DNA in diabetes.

Another researcher focused on appetite control and achievement motivation in relation to obesity avoidance in the young adult population. In lab activities, a total of 25 participants were processed. Participants attended once per week. Each visit included the following: anthropological measurements (waist and hip circumference, weight, body mass index and blood pressure) and experiment sessions with biofeedback and achievement motivation training as well as achievement motivation counseling. On a voluntary basis, the participants were advised by a sport physiologist and nutritionist. Blood samples were collected (twice) from all participants. All were processed with the ELISA (enzymelink immunosorbent assay) kits for hormones ghrelin, leptin and obestatin. Leptin receptor was also processed.

There were more than 114 active Clemson research projects in the reporting period. Researchers issued fourteen intellectual property disclosures and submitted seven patent applications. Two patents were awarded. Faculty also submitted 119 technical contributions for publication.

New research is beginning in all program areas. In sustainable animal production systems, research is looking to optimize calf and heifer performance through increased understanding of feeding strategies, management systems, well-being, productivity and environmental impact. Another research goal is to find solutions toward the control and management of two major hive pests by better understanding the biology

and mechanisms of resistance in honey bees. In sustainable agriculture production for (non-food) horticultural crops new research aims to examine and provide solutions for some of the most recalcitrant pathology problems in golf course bermudagrass greens at this time and to develop sustainable remediation technologies to encourage use of alternative water resources, especially recycled irrigation runoff.

Under natural resource management research proposals seek to identify potential areas of conflict between the conservation needs and the demands of water users before they become critical, and to assist in conservation planning that seeks to address and mitigate those conflicts, how climate change disturbances affect the coastal forests, and how coastal forests react to these disturbances, and to provide an overview of South Carolina's sustainable forest resources. New food safety research will attract and retain food industries in the region to improve the economic status of South Carolinians, will examine different types of biofilm formation to determine how biofilms become established and persist, and will develop a rapid, sensitive, specific, and cost-effective bioassay for detection of viable Mycobacterium avium subspecies paratuberculosis (Map) in milk and fecal samples.

New research in community, leadership, and economic development will assess the economic impacts of agricultural research by measuring the impacts of the Experiment Station in terms of job creation/preservation, increased crop quality, increased crop yield, increased efficiency in use of fertilizers, pesticides, and irrigation, and increased water and other environmental qualities and providing an objective information source for assessing resource needs at the research and education centers to maximize their impacts. New climate change research addresses the effects of severity and frequency of prescribed burns on the production and exports of pollutants and nutrients in forested watersheds and also looks to quantify the growth differences and differential disturbance responses between loblolly and longleaf pine.

Global food security and hunger has thirteen new research projects starting this project period. This new research ranges from the development of soybean varieties that are more adapted to withstand these types of stress to creating a tablet application for field and laboratory studies to record phenotypes, take pictures, and submit to the appropriate database. One new project looks to increase breeding efficiency for bacterial spot and/or brown rot tolerant/resistant high quality peach varieties suitable for the southeastern USA by discovering markers associated with leaf resistance to bacterial spot, and brown rot resistance in green and ripe peach fruit and enabling marker assisted breeding. Another looks to improve irrigation water management in South Carolina by using real-time soil and weather inputs to automate irrigation scheduling of a center pivot equipped with variable-rate irrigation (VRI) technology.

Clemson Extension Service delivered over 7,032 programs throughout the 46 counties of South Carolina, reaching some 223,492 people. A brief overview of Clemson Extension's programs follow. Clemson Extension's Agronomic Crop Production programs impact the management and production of agronomic crops on over 1,330,000 acres in South Carolina each year. This includes corn, cotton, peanuts, small grains, sorghum and tobacco. Total value of these crops was $658,351,000 in 2013. The largest acreage for a single crop is the 440,000 acres planted to soybean but the cotton crop has the greatest total value at $131,501,000. Research and Extension programs in agronomic crops address issues ranging from proper variety selection to protecting crops from weeds, insects and diseases as well as developing more efficient irrigation and harvest equipment. All of these programs result in millions of dollars of increased profits for growers, improved food quality and safety, and environmental conservation.

Multi-state research activities were on-going as Extension specialists and researchers participated in multi-state projects with their colleagues in other states in the region and across the country. The Southern Region Fruit Consortium is a collaboration between institutions from North Carolina, South Carolina, Georgia, Virginia, Tennessee, and Arkansas. The consortium is a method used to develop the expertise of agents who may not have the opportunity in their state for training in fruit. The Regional Forestry Position

is a liaison of the southern land-grant universities and the USDA Forest Service - Southern Region. The forester worked closely with the Extension System and the USDA Forest Service to identify opportunities for natural resource professionals. The Orchard Floor Management program provides leadership and direction to orchard and vineyard floor management in South Carolina, North Carolina, and Georgia. The Orchard Floor Management program conducted research trials and on-farm demonstration plots related to weed management in fruit crops. The program developed weed control recommendations, regional publications and regional newsletters. The Regional Peach Initiative is a partnership between South Carolina and Georgia. The specialist annually updates the peach IPM guide, collaborates on peach research, and continued fruit export facilitation work in conjunction with USDA, APHIS, GA Department of Agriculture, Clemson University's Division of Plant Industry, Georgia Peach Council & South Carolina Peach Council. Additional details are listed in the Multistate Extension narratives.

According to public health and food safety experts, 76 million illnesses in this country can be traced to food borne bacteria each year. Moreover, the Food and Drug Administration estimates that two to three percent of all food borne illnesses lead to secondary long-term illnesses. Food Marketing Institute research shows that consumers know that food safety is important and know that they personally should observe sound food-handling practices. However, it also shows that they often either do not fully comprehend some of the most important messages or that they fail to use food safety measures. In an effort to reduce food-borne illness, Clemson Extension Agents conducted food safety training for managers, supervisors, and other food handlers. The Clemson Carolina Canning program has expanded and now supports all counties in the state.

The prevalence of overweightness and obesity has become one of the most critical health issues in both South Carolina and the United States. Overweightness and obesity cut across all ages, economic levels, and racial and ethnic groups. In South Carolina, over 60% percent of all adults are now either overweight or obese. Nutrition education and research focused on the topic of preventing childhood obesity.

Forestry and forest products manufacturing are one of the largest economic drivers of South Carolina's economy, employing 90,000 people across the state and adding $17 billion annually to the state's economy. Extension agents and specialists provided educational programs in partnership with other agencies in the areas of Sustainable Forest Management, Environmental Enhancement, and Natural Resources. The length of time between investments in timber production and revenue from timber sales is often long-term. Extension programs have focused on the use of alternative silvicultural systems from the traditional southern pine management and other programs to teach ways to diversify land use and management. Thousands of forest acres were affected by Extension programs when best management practices were adopted; thus yielding more economic benefit for landowners. Farm Bill meetings were held by specialists and agents from several program teams to inform audiences about updated policies.

Water Resources are essential to South Carolina's agriculture productivity, energy generation, industrial operations, economic vitality, tourism and overall quality of life. Clemson Extension's Water Resources team largely provides pollution prevention programming in most of the state's metropolitan areas and in numerous rural counties. Most partnerships are driven by regulation and generate nearly $800,000 annually in revenue, which in turn funds agent and staff positions for Extension and facilitates student engagement and applied research.

Extension provided education to horticulture professionals, master gardeners, master naturalists and consumers to help them improve their homes and communities through the use of environmentally sound horticultural practices. In turn, these volunteers answered consumer gardening questions, assisted with landscapes and gardening projects in their local communities, helped eradicate identify invasive plants, renovated and maintained trails, and restored habitats. Volunteers are involved in projects to educate and interpret nature to other audiences such as schools, assisting at parks and providing docent help for our

many museums, nature centers and aquaria spread throughout the state. They also give back to our program by assisting Extension with the delivery of new courses and by taking or leading advanced training classes throughout the state.

The Economic and Community Development (ECD) program promotes community improvement and sustainable economic development. The Palmetto Leadership program provides participants with a venue for community service and the ability to grow their professional and personal networks and provide new opportunities for collaboration and more efficient and effective community service. ECD offers groups help with business plans, strategic planning, and economic studies.

An example of partnerships established through ECD includes work between Clemson Extension and students from the Clemson University Architecture Center Charleston (CACC) to design a relatively low-cost shed that can be disassembled and moved if a tenant farmer has to relocate. The portable shed allows small farmers to attain certain food standard certifications, an important requirement that helps them grow their businesses and enhance the local food chain.

The 1890 Adult Leadership and Community Development Program provides communities with the leadership training, financial management, business and job development, family and consumer education and child development capacity that creates opportunities for continuous and sustained growth. With a focus on resource building, education and training, leadership and organizational development, strategic and sustainability planning, the community development program assists socially disadvantaged and economically depressed communities build the potential to enhance their own resource development capacity from the inside out. The program promotes computer literacy and internet safety to youth and adults; improves the quality of life for youth, adults and families as well as develops affordable, safe and decent housing for the citizens of South Carolina.

Over 70,000 youth and families were reached through Clemson's 4-H Youth Development programs. Over 4,000 adult volunteers were trained, who then trained youth in leadership development; hunting safety; plant and animal projects; science, technology and engineering projects; day and overnight camping; nutrition, health and fitness, natural resources; water quality and conservation. Youth applied skills learned in their homes, schools, communities, and in various state and national competitions. Youth participated in hands-on experiences with nature. Research reveals that when children participate in these activities, they can develop improved self-esteem, enhanced brain development, and a sense of connectedness to the community and the environment. In 4-H, youth use math skills, critical thinking, and creativity, which are valuable life skills.

The Extension Programs, at both institutions, deliver the Expanded Food and Nutrition Education Program (EFNEP), which provides nutrition education at schools as an enrichment of the curriculum, after-school care programs and 4-H EFNEP clubs, day camps, residential camps, community centers, neighborhood groups and home gardening workshops. In addition to lessons on nutrition, food preparation and food safety, youth topics may also include related topics to include physical activity and health. The hands-on, learn-by-doing approach allows the participants to gain the practical skills necessary to make positive behavior changes. Participants, also, experience increased self-worth, recognizing they have something to offer their families and society.

The South Carolina State University 1890 Research and Extension Small Farm Program offers four major Outreach Projects to all farm residents of South Carolina with more emphasis on small scale landowners, limited resources, socially disadvantaged farmers and ranchers in South Carolina. The Small Farm Program is implemented in five 1890 Extension Clusters and surrounding counties across the state. The four major Outreach Projects are animal production system, vegetable production system, sustainable agriculture production (IPM) practices and risk management education. The outreach effort addresses landowners, limited resources, socially disadvantage farmers and ranchers needs in South

Carolina throughout various educational activities and projects. One of the underlining objectives is to equip all farmers and more specifically limited resource, socially disadvantage farmers, ranchers and landowners with sound management practices as a must for farming enterprises success and sustainability. They are business men and women and their operations should be considered an integral part of their county or cluster rural economic development.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	160.0	42.0	36.6	13.0
Actual	136.0	41.0	53.8	13.0

II. Merit Review Process

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

- Internal University Panel
- External Non-University Panel
- Expert Peer Review
- Other (Research Results Reviewed by selected growers and commodity groups and associations)

2. Brief Explanation

The Research and Program Development Committee of the South Carolina State Extension Advisory Council reviews and comments on new programs initiated by Clemson University and South Carolina State University. The seven-member Research and Program Development Committee is one of the Council's three committees that review the list of programs and descriptions. The committee serves as the external non-university panel for program review. The committee members are knowledgeable of South Carolina's social and economic demographics and are sensitive to the needs of underserved and underrepresented populations. The total Council has the opportunity to give input about programs. There are Extension volunteers, producers, a community center program coordinator, public school educators and business owners.

There are internal university review panels at both Clemson and South Carolina State. Programs are reviewed by state Extension Program Team Leaders and by administration, at each institution. A joint review of programs occurs periodically. Both panels review projects and programs at their institutions based on organizational capacity, relevance and impact. This internal university panel periodically reviews South Carolina's Plan of Work. The Research and Program Development Committee is kept abreast of new national priority areas and the realignments of research and extension activities at both institutions. The program review activities of the committee will complement the scientific peer review process established at both institutions.

An internal review panel meets to review all research outputs and outcomes with faculty members in preparing to initiate new research projects. As a part of the review process, summaries of the outputs and outcomes of research projects and programs are sent to selected growers, commodity groups and associations to give them an opportunity to provide input on the overall research program strategies. In addition, all research projects go through a review process as outlined under Hatch or

Evans-Allen regulations. This serves as the Expert Peer Review process, as each project is sent for external review and comments and suggestions are examined and incorporated into the new project, as appropriate.

III. Stakeholder Input

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

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey specifically with non-traditional groups

Brief explanation.

Stakeholder input remains a key to successful Extension programs. Clemson and South Carolina State universities have a long history and tradition of seeking stakeholder input into the Plan of Work process. The process of seeking stakeholder input includes identifying stakeholders that should have input in the POW process and determining the process used in seeking stakeholder input. Meetings with commodity groups are particularly helpful in determining research priorities and needs for on-farm Extension support. Input from participants and graduates from programs available statewide, such as the Master Gardener Program is used to upgrade and enhance the quality of the program and identify new participants.
Stakeholders are identified and invited to attend meetings. Stakeholders included those internal to the Cooperative Extension System--administrators, extension agents, agent associations, specialists, faculty, department chairs, associate deans and faculty, as well as, those external to the system. External stakeholders are Extension advisory board members, commodity group representatives, community leaders, human service providers, business/industry representatives and collaborators (Farm Bureau, Chamber of Commerce, Farm Service Agencies, etc).

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
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys

Brief explanation.

Individuals who are involved in the Research and Extension Programs and/or receive services as well as persons who may have an interest or concern are identified and contacted.

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
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Meeting specifically with non-traditional groups
- Survey specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public

Brief explanation.

The most recent process used in collecting stakeholder input included regional meetings that were held with representatives from all counties in the state to identify issues and set priorities for agricultural Research and Extension. In addition, a Customer Satisfaction Survey was administered to collect data from citizens who have received services sponsored by the Extension Service. The goal was to help county staff and administrators find ways to improve program quality, information delivery, and to assist in the accountability process.

Commodity groups, the SC Farm Bureau, the Department of Natural Resources and the SC Department of Agriculture as well as individual growers and producers are in on-going dialogues to identify issues and make decisions on the use of available research resources.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities

Brief explanation.

County data is compiled from stakeholder meetings and the information is used to make recommendations and adjustments in program design and implementation. The Customer Satisfaction Survey report was shared with Extension administrators, State Extension Advisory Council members, and the Extension system. In general, respondents felt that Extension was a valuable service and a great use of public funds. When respondents reported dissatisfaction, there were two major issues mentioned. One was that services have been hurt by down-sizing. Several comments reflected the wishes of clientele to have an agent assigned to their county and to have more access to an agent or Extension information. The other concern was that clientele wanted more affordable and better publicized training sessions. A hiring plan has been developed and new

agents, program assistants, and specialists are being hired to serve programs and counties. There is a marketing plan being developed. The plan is to train those in the system on how to effectively market Extension information.

Brief Explanation of what you learned from your Stakeholders

The stakeholders are cognizant of the kind of resources and services the Research and Extension Program can offer them. Over 85% of the people surveyed rated satisfaction with Extension services. Stakeholders indicated that Extension was a valuable service and a great use of public funds. Stakeholders are comfortable communicating suggestions for the delivery of services.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
5813728	1851203	4290709	2274596

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	5243272	1851203	3380711	2274596
Actual Matching	5243272	1557212	3043382	1828032
Actual All Other	0	0	337330	0
Total Actual Expended	10486544	3408415	6761423	4102628

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	2549834	0	0	0

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Sustainable Animal Production Systems

☑ 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	10%	10%	25%	20%
302	Nutrient Utilization in Animals	10%	20%	8%	20%
303	Genetic Improvement of Animals	30%	15%	17%	10%
307	Animal Management Systems	10%	20%	8%	15%
308	Improved Animal Products (Before Harvest)	20%	15%	17%	15%
311	Animal Diseases	15%	10%	17%	10%
315	Animal Welfare/Well-Being and Protection	5%	10%	8%	10%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	10.0	7.5	3.5	1.0
Actual Paid	11.0	8.0	5.8	1.0
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**
445318	323284	480412	244455
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
445318	271926	280295	196465
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	794	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Current Clemson University research is focusing on the development and expanded usage of genomic and proteomic analyses to further improve beef quality and consistency. Also being examined are ways to identify and monitor the prevalence of abortigenic agents in the South Carolina bovine population and compare these results to those of other U.S. regions. Researchers are working to identify the prevalence of four microorganisms, which play a significant role in calf illness and production loss in beef and dairy operations. Data could provide essential information about the effectiveness of control and vaccinations programs currently in place.

Research is underway to determine impacts of varying lengths of pre-breeding exposure to toxic tall fescue (d-28, d-12, and d-8 versus toxic negative control) on conception rates of 2 and 3 year old beef cows. Research is also being conducted to assess bull semen quality and fertility, sperm cell composition, and hormonal response to the toxin found in tall fescue Kentucky 31.

Research has also developed the Atlantic killfish as a model aquatic organism for understanding how environmental carcinogens induce liver tumors and how inflammation may contribute to carcinogenesis. We also generated a tool box of PCR primers and monoclonal antibodies that quantify the expression of pro-inflammtory proteins in association with developing tumors. One of the most important outputs of this project is the understanding that COX-2 is highly expressed in livers of animals with liver tumors resulting from exposure to environmental chemicals.

In Extension, activities conducted included the Bull Test program, the Master Cattleman educational series, the Grass Masters program, an "Advanced Grass Master" / Grazing School, and a forage/beef field day and workshop. A grant was received to develop, demonstrate and distribute mobile applications as tools for cattle operations. Agents worked with producers to develop cost management strategies for rations, budgets and other input costs. Specialists provided eight two hour Confined Animal Manure Management Recertification Classes across the state. Other programs included Master Cattleman, small flock poultry workshops, Pasture Ecology Schools, Bovine Artificial Insemination Schools, beekeeping short course, Beef Quality Assurance certification trainings, biosecurity programs, meat goat workshops, and quality milk initiative surveys.

1890 Research will continue to focus on the use of a multi-agent framework to design and implement a computer-based epidemiological simulation model that combines the traditional herd-based epidemiological methods with the role of transportation and the interferences of individual objects for herds. Since the proposed simulation model will be capable of representing the behavior of individuals, in addition to the benefits of stochastic herd-based simulation, it will provide more accurate and more flexible

simulation results that can be used to facilitate the early responses to emergency outbreaks.

Under the planned program, 1890 Extension conducted the following: 1. workshops, meetings, etc., 2. delivered services, 3. developed resources for the farmers to utilize, 4. provided training and counseling, 5. made assessments of farms and partnered with individuals and agencies.

2. Brief description of the target audience

Producers, Limited-Resource Farmers and agency personnel, etc.

3. How was eXtension used?

-

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	20642	589462	463	260

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

Patent Applications Submitted

Year:	2014
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	1	24	25

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Disclosures

Year	Actual
2014	1

Output #2

Output Measure

- Licenses

Year	Actual
2014	7

Output #3

Output Measure

- Number of people completing educational workshops.

Year	Actual
2014	10966

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of publications authored or co-authored (fact sheets, papers presented at meetings, etc.)
2	Number of people reporting increased knowledge.
3	Increased income due to producers and growers improved production efficiency of confined animal systems.

Outcome #1

1. Outcome Measures

Number of publications authored or co-authored (fact sheets, papers presented at meetings, etc.)

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of people reporting increased knowledge.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	2141

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Livestock producers are interested in increasing the carrying capacity or stocking rate of their acreage. By increasing the stocking rate, more animals will be available to market, which will increase the profit of the enterprise.

What has been done
A workshop was held focusing on pasture management, management intensive grazing, electric fencing materials and components and constructing temporary portable electric fences. Forty (40) producers attended the workshop.

Results
As a result of attending the workshop, six (6) producers subdivided their large pastures into smaller paddocks by constructing temporary portable electric fencing, which allowed them to increase their stocking rate by 50%. The increased stocking rate resulted in an increase in the number of marketable animals. Therefore, the profit increased by an average of $7,554 per producer based on current feeder calf prices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #3

1. Outcome Measures

Increased income due to producers and growers improved production efficiency of confined animal systems.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1200096

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Sustainable Animal Production Systems program aims to improve the production efficiency, environmental sensitivity, and profitability of animal production systems and reduce the environmental impact of animal waste in South Carolina.

What has been done
Some 270 programs were conducted reaching 8,431 people. Specialists provided eight two hour Confined Animal Manure Management Recertification Classes across the state. Other programs included Master Cattleman, Grass Masters, small flock poultry workshops, Pasture Ecology School, Bovine Artificial Insemination Schools, beekeeping short course, Beef Quality Assurance certification trainings, biosecurity programs, meat goat workshops, and quality milk initiative surveys.

Results
Producers participating in livestock and forage masters programs indicated a 90% rate of knowledge gained. Other programs increased market awareness and marketing strategy, leading

producers to sell feeder calves directly from the farm, which increased the value of these cattle by an average of $96/head compared to traditional marketing options. Increasing the value of 2.5% of South Carolinas total cattle inventory (approximately 360,000) would lead to a $1,200,096 impact.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
307	Animal Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Producers and growers improved production efficiency of confined animal systems and adopted animal management practices. Programs led to increased market awareness and marketing strategy, leading producers to sell feeder calves directly off the farm, which increased the value of these cattle by an average of $96/head compared to traditional marketing options. Increasing the value of 2.5% of South Carolina's total cattle inventory (approximately 360,000) would lead to a $1,200,096 impact.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Sustainable Agriculture Production for (non-food) Horticultural Crops

☑ 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
111	Conservation and Efficient Use of Water	0%	0%	30%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	10%	0%
204	Plant Product Quality and Utility (Preharvest)	20%	0%	0%	0%
205	Plant Management Systems	20%	0%	10%	0%
211	Insects, Mites, and Other Arthropods Affecting Plants	15%	0%	20%	0%
212	Diseases and Nematodes Affecting Plants	10%	0%	20%	0%
215	Biological Control of Pests Affecting Plants	15%	0%	0%	0%
216	Integrated Pest Management Systems	20%	0%	0%	0%
601	Economics of Agricultural Production and Farm Management	0%	0%	10%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	20.0	0.0	5.8	0.0
Actual Paid	16.0	0.0	7.4	0.0
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**
571305	0	516801	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
571305	0	311310	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	43043	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Within Sustainable Agriculture Production for non-food Horticulture Crops, Clemson University researchers are working to develop research-based Best Management Practices for South Carolina turfgrasses, which would include pest management strategies, evaluating new weed control products and techniques, and developing new turf varieties based on desirable characteristics such as color, texture, pest tolerance, resistance, etc. The quantity and quality of primary water sources currently available in various regions of the United States is also being examined.

Research has begun to discover an effective and environmentally sensitive control for scale insects in ornamentals and to develop an integrated pest management strategy based on the life history of soft scales. Also in the ornamental industry, research is being conducted to investigate diseases of ornamental plants and trees caused by Phytophthora spp., to improve our methods for detecting propagules of these pathogens in plants, soil, and water, and to develop and evaluate effective disease management strategies.

During the past six years, researchers at Clemson University have monitored the efficacy of two constructed wetlands to facilitate removal of nutrient and pathogen contaminants from runoff. The wetlands reduced export of total nitrogen by 69%, phosphorus by 39%, and Phytophthora spp. (a pathogen) by 80%.

Disease management programs have been refined for bentgrass and bermudagrass putting greens. Results of trials has led to better recommendations for control in a season-long format, so that turfgrass quality is not compromised and businesses remain viable.

Extension horticultural programs were conducted such as Ornamental Plant Schools and shortcourses, landscaping programs, pesticide applicators recertification classes, orchard management programs, turf school, Carolina Yards On-line Shortcourse, and an Environmental Conservation Lecture Series. Master Gardeners were trained and later conducted programs and plant clinics. A School Gardening for SC Educators Online Course for area teachers learning basic gardening skills and techniques for gardening with youth. Agents taught fire ant control, lawn care, shrubbery, and composting. They hosted the Making It Grow live television show to address consumer horticulture questions and hosted the call-in radio program, Your Day, to answer plant problem and landscaping questions. Presentations were made to high school students to expose them to Horticulture careers. The beginning farmers workshop covered organic certification, GAP certification and marketing strategies. Agents assisted local towns with information about greenhouses. Evaluation reports were provided to growers with comprehensive and updated information on performance so that they can make informed

decisions.

There were 3,811,027 visits to the Home and Garden Information Center (HGIC) web site. During 2013-14 thirteen new fact sheets were added for a total of 648 fact sheets on the Clemson Home and Garden Information Center website. In addition, 259 fact sheets, 67 educational documents and 9 user guides were mailed to South Carolina citizens last year.

2. Brief description of the target audience

The audience will include producers, small farmers and Extension personnel, horticulture professionals, residents in counties with Master Gardener programs, Master Gardeners, and consumers.

3. How was eXtension used?

-

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	30562	2391514	0	0

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

Patent Applications Submitted

Year:	2014
Actual:	4

Patents listed

Methods and Compositions for Transgenic Plants with Enhanced Resistance Biotic and Abiotic Stress
Overexpression of AsHSP17, a Creeping Ben tgrass (Agrostis stolonifera) Small Heat Shock Protein, Increases Abiotic Stress Sensitivity in Transgenic Arabidopsis haliana
Genetic engineering of crop species with a microRNA 528 gene for enhanced abiotic stress tolerance
System for Plant Development

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	2	9	11

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Disclosures

Year	Actual
2014	5

Output #2

Output Measure

- Licenses

Year	Actual
2014	0

Output #3

Output Measure

- Number of people completing horticultural educational workshops

Year	Actual
2014	10875

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants gaining knowledge

Outcome #1

1. Outcome Measures

Number of participants gaining knowledge

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	10360

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Sustainable Agriculture Production for non-food horticultural crops program at Clemson University seeks to inform horticulture professionals and consumers on environmentally sound horticultural practices that will improve communities.

What has been done
Extension provided over 331 educational programs to horticulture professionals and consumers to help them improve their homes and communities through the use of environmentally sound horticultural practices. Approximately 40,000 acres of sod was affected. Assistance was offered to nurseries and floriculture producers.

Results
Some 998 newly validated IPM-based products, services, tactics or practices were used in landscape and ornamental plant efforts. There were 25 joint educational efforts with industry, state or federal agencies and/or trade associations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems
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
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Over 330 programs were conducted reaching 10,875 people. Of those participating in programs 95% reported that they gained knowledge.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Natural Resource Management

☑ 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
111	Conservation and Efficient Use of Water	20%	0%	0%	30%
112	Watershed Protection and Management	35%	0%	61%	20%
122	Management and Control of Forest and Range Fires	10%	0%	0%	0%
123	Management and Sustainability of Forest Resources	10%	0%	13%	0%
131	Alternative Uses of Land	5%	0%	0%	20%
133	Pollution Prevention and Mitigation	10%	0%	13%	20%
134	Outdoor Recreation	5%	0%	0%	10%
135	Aquatic and Terrestrial Wildlife	5%	0%	13%	0%
	Total	100%	0%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	20.0	1.0	8.7	1.0
Actual Paid	16.0	0.0	4.7	1.0
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**
591749	0	310194	223146
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
591749	0	371009	179340
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	122414	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Current Clemson University research will help develop cost-effective technologies that can be deployed throughout the Farm and Forest to both understand the impact of land cover and management on water quality/quantity and to help develop strategies to maximize the efficiency of water use in agriculture and forest production.

Ongoing research is underway to determine the impacts associated with recreational trails on the water quality of streams they intersect with. More research looks to understand the cellular and molecular mechanisms that govern virulence of the food-borne pathogen, Entamoeba histolytica. Also, our research on the fate and effects of nanomaterials in aquatic ecosystems is being continued.

Research is being conducted to develop a decision support framework that can be used to choose cyanobacterial bloom monitoring and management options based on application of various decision criteria.

Extension programs sought to inform and involve audiences that directly impact water resource quantity and quality. Nearly 5 million impacts were achieved from direct programming assistance and indirect outreach methods.

Sustainable forest management activities encouraged landowners to develop management plans by providing them with alternative silvicultural systems and methods that are suitable for their individual objectives. Agents and specialists delivered educational programs on wildlife conservation and management on private lands, explored and developed synergistic solutions and techniques to overcome wetland and urban wildlife challenges to the benefit of people and wildlife in South Carolina. Clemson Extension continues to deliver forestry programs through County Forestry Associations and the SC Forestry Commission. Clemson Extension Forestry & Natural Resources Agents offered programs that included the use of herbicides in longleaf management; Urban Species Selection (www.treessc.org); upgrading the Certified Tree Farm Program to provide more tree farm benefits (i.e., landowner involvement, forest education, advocacy and financial sustainability); delivering the US Forest Service Open Space Webinar Series; the online Deer Steward program; the online Forest Roads program; the online Master Wildlifer program; an entomology webinar; Tax School; assisting with logging cost analysis; and teaching forestry ethics. They aided with disease and insect identification, helped landowners with wildlife food plots and provided advice on timber management.

Master Naturalist training was conducted to expand the statewide corps of volunteers who provide education, outreach and service dedicated to the beneficial management of natural resources in South

Carolina. Those trained provided 16,398 hours of service. SC Master Naturalists have participated in projects such as the backyard bird count, conducted water quality sampling, assisted youth with 4H20 activities; taught students about the salt marsh ecosystem; and collected, measured, and tagged horseshoe crabs for study. They assist in the delivery of new courses and by taking or leading advanced training classes throughout the state.

Under the 1890 Research Natural Resource Management goal, the researcher presented one paper at a conference as well as published one paper. An environmental research and teaching lab was established on the SC State campus. The researcher reviewed literature and collected existing field measurement data and site characterization information.

2. Brief description of the target audience

The target audience includes farm and forest landowners, Extension agents, administrators, natural resource professionals, land management agency personnel, user groups, nature-based tourism operators/industry, South Carolina citizens, tourists, children in school, after-school, summer and 4-H programs, agents and volunteers, urban, suburban and rural residents, farmers, ranchers, poultry and swine producers, foresters urban agents, agency personnel, urban planners and land owners/managers, municipal officials, and local community groups statewide, managers, government officials and recreation and tourism operators.

3. How was eXtension used?

-

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	25352	807881	0	0

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

Patent Applications Submitted

Year:	2014
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	30	30

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Disclosures

Year	Actual
2014	1

Output #2

Output Measure

- Licenses

Year	Actual
2014	0

Output #3

Output Measure

- Number of people completing educational workshops

Year	Actual
2014	16502

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of people gaining knowledge.

Outcome #1

1. Outcome Measures

Number of people gaining knowledge.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	16014

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Natural Resources Management Program promotes the use of Best Management Practices of forest systems, water, and other natural resources to improve and promote natural resource conservation and productivity in South Carolina. While water resources seem to be abundant in South Carolina, many of the rivers and beaches are suffering from impaired water quality largely from non-point pollution from urban runoff.

What has been done
Extension partnered with other agencies to conduct a program covering aspects of prescribed burning and the benefits to the ecosystem. Extension Forestry Specialists delivered programs that included on-site tours, the US Forest Service Open Space Webinar series, and the Deer Steward online program and surveys. Over 187,000 forest acres were affected by Extension programs. Master Naturalist volunteers provided 16,398 hours of service, which is valued at $330,424 in program support. Water quality and/or quantity best management practices were installed as demonstrations.

Results
Over 6,375 pounds of trash removed from regional waterways. Landowners and producers reported enhanced income opportunities from natural resources. Nearly 5 million impacts were achieved from direct programming assistance and indirect outreach methods. As an example, one contractor-focused program that provides state regulatory certification supported 1,260 jobs and $57.3M in salary and wages in FY 13-14 for participating technical staff.

4. Associated Knowledge Areas

KA Code	Knowledge Area

111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
131	Alternative Uses of Land
133	Pollution Prevention and Mitigation
134	Outdoor Recreation

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Efforts have been made to restore the longleaf pine ecosystem within its natural range after the devastating effects of the February 2014 ice storm. Agents represented SC to the USDA Task Force during the Southern Regional Farm Bill symposium.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Of the 16,502 persons attending Natural Resource Management programs, 97% gained knowledge. Over 70% indicated that they used the information that they learned.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Food Safety

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
502	New and Improved Food Products	5%	0%	0%	0%
503	Quality Maintenance in Storing and Marketing Food Products	5%	20%	14%	5%
703	Nutrition Education and Behavior	0%	30%	0%	35%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	45%	20%	57%	20%
723	Hazards to Human Health and Safety	40%	10%	29%	20%
724	Healthy Lifestyle	5%	20%	0%	20%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	3.0	2.9	2.0
Actual Paid	5.0	3.5	2.5	2.0
Actual Volunteer	0.0	74.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
190750	191462	192564	335866
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
190750	161195	81259	269923
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	31976	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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

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

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

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

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

1890 Research continues to investigate the effects of three different resistance exercise regimens on the diabetic profile of a Type 2 diabetes mellitus patient. Plans are to use innovative signal processing techniques to study kinetic patterns of muscular fatigue. The results will be critical to addressing environmental, health and human nutrition issues. Eight papers were developed for conference presentations. One student won first place in her paper presentation category and the same student was recognized as winner of the Southeastern Chapter of the American College of Sports Medicine

Undergraduate Research Award. Another research project dealt with the development of a food safety laboratory testing the efficacy of using ozone and probiotics to inhibit food-borne pathogens in poultry and meat. Experiments were performed testing the effects of lactic and acetic acid (byproducts produced by probiotic bacteria) on the growth of Escherichia coli (E. coli). Two paper presentations were prepared and delivered. One workshop was held.

2. Brief description of the target audience

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

3. How was eXtension used?

-

V(E). Planned Program (Outputs)

1. Standard output measures

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

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

Patent Applications Submitted

Year:	2014
Actual:	1

Patents listed

Nanoparticle - Biocide Treatment of Biofilms

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	1	8	9

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Licenses

Year	Actual
2014	0

Output #2

Output Measure

- Disclosures

Year	Actual
2014	2

Output #3

Output Measure

- Number of people completing educational workshops.

Year	Actual
2014	2588

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1819

3c. Qualitative Outcome or Impact Statement

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

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

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

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	192

3c. Qualitative Outcome or Impact Statement

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

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

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

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #3

1. **Outcome Measures**

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

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

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

2. **Associated Institution Types**

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	104

3c. Qualitative Outcome or Impact Statement

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

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

Results
Food Safety and Nutrition Agents in the Food2Market program for food entrepreneurs has tested 338 products in 2014 with 104 of these products making it to market. The Food2Market program continues to grow and become an established program of Clemson Extension with a mission of increasing agribusiness throughout the state and ensuring that South Carolina food products that

enter the market are safe for our consumers. You can learn more about the Food2Market program at www.clemson.edu/extension/food2market.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

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

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Public Policy changes
- Government Regulations

Brief Explanation

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

V(I). Planned Program (Evaluation Studies)

Evaluation Results

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

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Community, Leadership, and Economic Development

☑ 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
608	Community Resource Planning and Development	15%	25%	29%	20%
609	Economic Theory and Methods	10%	10%	14%	10%
610	Domestic Policy Analysis	15%	10%	0%	20%
801	Individual and Family Resource Management	15%	20%	0%	10%
802	Human Development and Family Well-Being	15%	10%	0%	15%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	15%	15%	57%	20%
806	Youth Development	15%	10%	0%	5%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	12.0	4.0	3.0	1.5
Actual Paid	9.0	6.0	2.3	1.5
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**
358481	394429	170796	336039
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
358481	331687	120976	270062
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	13664	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Because African Americans comprise almost one-third of the population in South Carolina and hold significant acreages of rural property, understanding how they view and manage natural resources such as timber and wildlife can have a significant impact on the economic well-being of families, communities and larger areas. Clemson University Research will document the African-American sense of rural place, discover patterns of African-American land ownership and ultimately learn how African-Americans value natural resources in South Carolina.

Current research is looking to assess the changing coordination and supply chain management strategies being implemented in the fruit and vegetable sector and identify strategic organizational and marketing implications for a set of firms that are diverse in terms of commodity, marketing approach and size of operation (including small and mid-size farms).
Research is ongoing to outline a research strategy to generate information on the economic dimensions of Black soldier fly (BSF) [hermetia illucens] larvae to reduce organic waste streams while producing valuable animal proteins, biodiesel feedstocks, soil amendments, and industrial/pharmaceutical products at the farm, non-farm commercial, and community/municipal level.

Clemson Extension's Institute for Economic and Community Development (ECD) staff supported the state and local agribusiness community. The Palmetto Leadership program provided participants with a venue for community service, the ability to grow their professional and personal networks, provide new opportunities for collaboration, and provide more efficient and effective community service. ECD assisted groups with business plans, strategic planning, and economic studies. Working with the USDA, ECD at Sandhill has initiated the development of a farm incubator. This effort is designed to bring new farmers into the industry and to strengthen our local food supply system.

Clemson Extension is working with the Clemson University Architecture Center Charleston (CACC) and the College of Charleston to develop a more resilient value added activity support infrastructure by increasing supply chain activities between local farmers and local school systems. The availability of commercial kitchens to farmers interested in pursuing the farm to school markets will enable them to increase activity by providing freezing and canning capabilities, making locally grown products available to schools outside of the harvest season. This project aims to improve the viability of farm-to-school programs by using Clemson graduate students to design and build a replicable localized low-cost 'farm kitchen' (Crop Stop). By keeping structure and equipment costs under $40,000, the financial model allows local start-ups to use the kitchen for under $10 per hour (current estimate is $6 per hour). The facility also serves as a center to develop collaborative products, branding and a sense of community among its users. All using the facility are required to contribute to our public school systems in some form, whether it

is through providing some of their local products for sale, education sessions, or both. This provides new markets and product recognition to our farmers and vendors, while providing the student and faculty population access to education models using local system dynamics. One facility (Johns Island) has been completed and one (Greenville) is under construction. Two more are scheduled to be built during the summer of 2015.

Working with the Charleston County Extension office, students with the Clemson's Architecture Center designed a low-cost portable shed that can be disassembled and moved if a tenant farmer has to relocate. Not only is the shed portable, it also means small farmers can attain certain food standard certifications, an important requirement that helps them grow their businesses and enhance the local food chain. The shed and cooler was built on leased land farmed by a nonprofit that provides local produce to charitable food-distribution agencies in South Carolina. The farm sells a portion of its produce for income to sustain the enterprise. Clemson hosted the Community Development Society conference and 220 members from around the world attended. The estimated direct spending impact from attendees was about $200,000, benefitting our local merchants and service providers. NxLeveL Entrepreneur training for existing or potential entrepreneurs is aimed at entrepreneurs in creative or uncommon businesses and has led more recently to new classes aimed at agriculture and food related businesses. During this period, Clemson Extension began working with a local nonprofit group to develop a business plan contest aimed at addressing the needs of food deserts. Two contests have been completed. Implementation of the first winner's plan began during the fall of 2014.

In 1890 Research under the goal of community, leadership and economic development, interviews were conducted and city council minutes were reviewed. A refined Nvivo database with both city council meeting minutes and documents for five city governments and an updated endnotes database was developed. The interviews have been transcribed and imported into Nvivo. A research bulletin illustrating the final results has been submitted for editing and publication.

In addition, more research was conducted using a list of agribusiness exporters of SC was acquired from the Department of Commerce. A judgment sample of 50 firms was drawn from the population of SC agribusiness exporters to test the developed instrument. Representatives from 20 agribusiness export firms were consulted through a structured interview method to test the survey instrument. A survey was mailed to 50 export firms representing all counties in SC. A special topics in business course was developed based on the project findings as an elective for student pursuing a minor in international business. Presentations at conferences were made. Articles were submitted to peer-reviewed publications in academic journals and proceedings. A final research bulletin has been submitted, which detail the findings of the research.

In 1890 Extension, the adult leadership and community development program provided communities with the leadership training, financial management, business and job development, family and consumer education and child development capacity that creates opportunities for continuous and sustained growth. Activities were offered in technology education, community outreach and home ownership. Technology education included workshops in Cyber Safety 101 and community education classes. Over 500 youth were reached through the Cyber Safety 101 classes. Senior citizens learned how to operate computers, utilized various software and established email addresses for their use. Community outreach included exhibition booths at county fairs and expos across the state. Home ownership included the rehabilitation and weatherization program, implemented through the Northeastern Corridor of Orangeburg Community Development Corporation. One memorandum of understanding was signed with a external agency. Nine owner-occupied low-to-moderate homeowners' living conditions were improved due to the successful completion of the Rehabilitation/Weatherization Project.

2. Brief description of the target audience

The target audience includes students, child care providers, limited-resource persons, community leaders, board/council members, nonprofit organization boards and groups, adults, youth, business and workforce preparation agencies and disadvantaged citizens and communities, state, federal, and local agency personnel, association members, citizens faced with public issues, and citizens engaged in economic and tourism development.

3. How was eXtension used?

-

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	8788	446061	504	504

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

Patent Applications Submitted

Year: 2014

Actual: 1

Patents listed

Deposition of Nanocrystalline Calcite on Surfaces by a Tissue and Cellular Biomineralization

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	13	13

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Publications, business plans and housing grants.

Year	Actual
2014	21

Output #2

Output Measure

- Total number of people completing educational workshops.

Year	Actual
2014	4058

Output #3

Output Measure

- Number of board members trained.

Year	Actual
2014	9

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Total number of people reporting increased knowledge as a result of participation in CLED activities
2	Number of participants engaged in community promotion projects
3	Number of community members increasing the value of their homes through rehabilitation/weatherization services.

Outcome #1

1. Outcome Measures

Total number of people reporting increased knowledge as a result of participation in CLED activities

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	556

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Teenagers between the ages of 12 - 17 are "mobile Internet users" who say they access the Internet on cell phones, tablets and other mobile devices on occasion. Teens are more likely to share information about themselves than in the past. Statistics suggest youth may benefit from clear Internet Safety Instruction, which would enable them to make safe decisions online.

What has been done
Cyber Safety 101 workshops were facilitated based on the Internet Safety Project NetSmartz, a national curriculum. All-inclusive information sessions were held on topics such as what the Internet is, Internet etiquette, sharing personal information, recognizing predatory behavior and identity theft. The participants were led in presentations which included discussions, videos and a pre and post-test evaluation.

Results
When the pre-test was administered the participant numbers were very low to various questions. However, after participating in Cyber Safety 101, the numbers rose significantly. In the pre-test, if a kindergartener to 2nd grade was asked online, "Let's meet so we can go get some toys!" the respondents answered "no" by 46.21%. However, after the class and the post-test was administered, the response numbers increased to 95.06% of the participants. The responses during the post-test for middle school as well as high school students continued to increase compared to the pre-test.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

803	Sociological and Technological Change Affecting Individuals, Families, and Communities
806	Youth Development

Outcome #2

1. Outcome Measures

Number of participants engaged in community promotion projects

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Community, Leadership and Economic Development (CLED) Program promotes engagement, community enhancement and community improvement that are linked to community image, sustainable economic development and improved quality of life for the citizens of South Carolina.

What has been done
A total of 153 programs reached over 13,511 persons. Clemson provided guidance and training support to Farmers Market Advisory Boards. Sixteen agencies or groups collaborated on a task. Over 660 participants engaged in community promotion projects, including storm drain marking and community beautification projects. Working with the Charleston County Extension office, students with the Clemson Architecture Center designed a low-cost portable shed to help farmers them grow their business and attain certain food standards. Clemson Extension worked with nonprofit groups to develop business plans.

Results
Participants strengthened their community awareness and ability to access community resources, built partnerships, and strengthened their capacity to respond to future issues and opportunities. Participants have a greater knowledge about the county in which they live and/or work including education, economic development, healthcare and social issues. Approximately 70% of the graduates in leadership programs were still involved in a responsible community project three years after graduation. Graduates have been elected or appointed to serve in leadership such as county council seats, municipal officers, board directors, community action groups, judges, and

task forces to help the community. Local produce is being provided to charitable food-distribution agencies in South Carolina. New farmers entered into the industry and helped to strengthen our local food supply system.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
806	Youth Development

Outcome #3

1. Outcome Measures

Number of community members increasing the value of their homes through rehabilitation/weatherization services.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	9

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The residents, Orangeburg communities, and the SC State University community have a vested interest in improving the environment, economic condition and quality of living for the citizens of Orangeburg, SC. The renovating and rehabilitation of time-worn and inefficient homes has an economic impact to the community by making the communities more attractive. The weatherization of the homes assists in improving the health, safety and energy efficiency of homes, while helping to save money for the homeowners.

What has been done
Community meetings were held, flyers were disseminated and an advertisement was placed in the local newspaper. A request for bids for repairs to homes was advertised and bids were received from the contractors. Contractors were selected through a bidding process on completing work that consisted of installing metal roofing, heating and cooling systems, windows, handicap accessible showers; updating plumbing, electric; and installing smoke detectors, etc.

Results

As a result, nine homes were rehabilitated for qualified low-to-moderate income owner-occupied homes. Deficiencies or health and safety items were removed, energy efficiency was improved and useful life of properties was extended. All of the homeowners were appreciative and thankful for the repairs, contractors and timeliness in doing the work. The 1890 Program was the overseer of the grant funds to implement the rehab/weatherization program. Because of the delight of one of the recipient's daughters, she spoke to the South Carolina Congressional Delegation relating her father's experience with the program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Approximately 70% of the Palmetto Leadership graduates were still involved in a responsible community project three years after graduation. Of the 4,058 persons participating in programs, over 99% indicated that they gained new knowledge.
A business course was developed based on the project findings as an elective for students pursuing a minor in international business.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

4-H Youth Development and Families

☑ 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
801	Individual and Family Resource Management	5%	10%	0%	0%
802	Human Development and Family Well-Being	15%	20%	0%	0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	30%	20%	0%	0%
806	Youth Development	50%	50%	0%	0%
	Total	100%	100%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	24.0	15.0	0.0	0.0
Actual Paid	23.0	10.5	0.0	0.0
Actual Volunteer	0.0	96.0	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**
788100	460114	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
788100	386863	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Over 70,000 youth and families were reached through 4-H Youth Development programs. Over 4,000 adult volunteers were trained, who then trained youth in leadership development; hunting safety; plant and animal projects; science, technology and engineering projects; day and overnight camping; nutrition, health and fitness, natural resources; water quality and conservation. The 4-H Science on the Move (SOTM) program obtained two mobile trailers, one for the upstate and one for the coastal region of the state, to house hands-on science projects related to Geospatial Science, Energy, Environmental Science, Plant and Animal Science, Health Science and Robotics and Engineering. County agents exhibited the SOTM Trailer (mobile classroom) during in-school and afterschool events. Youth participated in activities that included exploring geospatial sciences, geocaching, and community mapping. 4-H volunteers led a 4-H Soapbox racer car building project and taught lessons on simple machines, potential energy, acceleration, kinetic energy, aerodynamics, inertia and friction. In 4-H, youth use math skills, critical thinking, and creativity, which are valuable life skills. Kids Farm Days allowed youth to learn about crop and soil science, life cycle and ag mechanization. Agents conducted a weeklong curriculum writing session with teachers from three counties, which produced 100 lesson plans.

4-H is a youth development educational program that is committed to assisting youth and adults in acquiring knowledge, life skills and attitudes that will enable them to become self-directing, contributing and productive members of society. Additionally, 4-H participants are youth ages 5 - 19 who are currently taking part in programs offered by 1890 Extension personnel in cooperation with volunteers. 4-H is characterized as being community centered, volunteer led, Extension staff supervised, research based, home and family oriented, publicly and privately funded and responsive to change. The 1890 Extension Program focuses on four programmatic areas: healthy lifestyles; science, engineering and technology; citizenship and financial management.

1890 Extension was responsible for planning and conducting the 4-H Biennial Conference. The purpose of the conference was designed to provide participants with an enhanced understanding of the requirements to develop and deliver quality and impactful programs that were measureable and relevant to participants with knowledge and skills to derive practical and innovative solutions that address emerging issues based on stakeholders' needs, foster and strengthen quality extension educational programming throughout the Southern Region. Also, to provide opportunities for networking, program sharing and observation. Sixty-two professionals were in attendance. Youth and adults were taught sound financial management practices and conducted experiments through hands-on activities. Young people were taught ways to be active and the importance of eating nutritious meals. Overall, youth were encouraged to become productive citizens.

2. Brief description of the target audience

The 4-H program will target the following audience:
All youth between the ages of five and eight
All youth between the ages of nine and nineteen
Parents and other adults interested in the development of South Carolina youth.
Parents and young adults ages 30-44
Mature volunteers ages 45-64
Grandparent and Senior Volunteers ages 65+
Adult learners (college students)
Teachers

3. How was eXtension used?

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	4757	568552	61252	17307

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

Patent Applications Submitted

Year: 2014
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	1	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of people participating in educational workshops conducted

Year	Actual
2014	53817

Output #2

Output Measure

- Total number of adult volunteers (including non-Extension staff) trained in club, school enrichment, and special interest program delivery and management in all 4-H project areas.

Year	Actual
2014	4814

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of trained adult volunteers and staff, (including non-Extension staff) who teach subject matter and life skills to youth
2	Number of youth who gain knowledge in leadership and citizenship project areas
3	Number of youth participating in service learning projects for the community and to improve themselves, and help others.
4	Number of youth who gain knowledge and skills about plants, livestock and/or pets.
5	Number of youth who develop knowledge and skills in science, engineering, and technology (including electricity, computers, pontoon classroom, etc.).
6	Number of youth gain knowledge in nutrition and fitness.
7	Number of youth who gain knowledge in natural resources and shooting sports.
8	Number of youth who develop and improve communication skills through speaking and debating.

Outcome #1

1. Outcome Measures

Number of trained adult volunteers and staff, (including non-Extension staff) who teach subject matter and life skills to youth

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	4814

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a need for an effective system to develop volunteer trainers in 4-H Youth Development.

What has been done
Clemson Extension and 1890 Extension trained over 4814 adult volunteers, who then trained youth in leadership development; hunting safety; plant and animal projects; science, technology and engineering projects; day and overnight camping; and nutrition, health and fitness. Agents and volunteers used Facebook, web pages, Skype, exhibits, and traditional media to promote youth development programs.

Results
Volunteers were equipped for leadership roles and have made positive impacts and contributions in their communities and trained youth with new knowledge and skills. 4-H adults and teens contributed 30,184 hours of volunteer service, which represents a $608,207 value of program support. Volunteers reported seeing significant improvement in the children's overall problem-solving skills as well as the children's willingness to work together as a team to solve problems and make decisions. In addition, there were reports that youth used creativity and displayed increased self- confidence and self-pride as they accomplished projects.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
806	Youth Development

Outcome #2

1. Outcome Measures

Number of youth who gain knowledge in leadership and citizenship project areas

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	7328

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth have basic needs that include developing a sense that they are valuable contributing members of their family and community.

What has been done
Clemson's 4-Hers participated in State Congress and statewide Ambassador Training, Senior Leadership Training, and Senior and Junior Teen Weekend and officer training to help them serve more effectively in their leadership roles at the club, county, regional, or state levels. 1890 Extension held a series of workshops on leadership, self-esteem, basic life skills, character education and conflict resolution.

Results
Some 34 Clemson 4-H youth were trained to be 4-H Ambassadors. Ambassadors represent 4-H to the public and are involved in writing and speaking to the media. Gains have been reported in knowledge of civic engagement, improvement in self-esteem, new skills demonstrated, and improved connections to the community. In regard to 1890 Extension, as a result of the evaluations, 75% of the participants indicated their intent to adopt citizenship and basic life skills principles taught.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

Outcome #3

1. Outcome Measures

Number of youth participating in service learning projects for the community and to improve themselves, and help others.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	688

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Recent findings from the 4-H Study of Positive Youth Development indicate that young people in 4-H are three times more likely to contribute to their communities than youth not participating in 4-H.

What has been done
Youth participated in educational programs on service learning. Six hundred eighty-eight youth provided leadership in service learning community projects. Teen leaders read books to youth during National Young Readers Week, participated in National Public Forums, surveyed customers at a local Farmers Market with regards to expansion of services, filled and delivered over 1,000 bags of non-perishable items for special needs populations, conducted a puppet show at the SAFEKIDS Event, and made 25 blankets for the Wounded Warrior Project.

Results
Studies show that youth develop in areas of civic engagement, respect, and social responsibility through participating in service-learning projects. Service learning can also have a positive effect on students' ability to relate to culturally diverse groups (Fox, 2010). These traits have been observed in youth participating in service projects.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
806	Youth Development

Outcome #4

1. Outcome Measures

Number of youth who gain knowledge and skills about plants, livestock and/or pets.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	579

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Research reveals that when children have hands-on experiences with nature, the results can lead to fewer incidents of anxiety and depression, improved self-esteem, enhanced brain development, and a sense of connectedness to the community and the environment. They have opportunities for such development by participating in the 4-H Plants and Animals project.

What has been done
Over 479 Plants and Animals programs were conducted. Youth in Clemson Extension 4-H programs are involved in hands on nature based programs such as Jr. Master Gardener, 4-H20, Dairy Heifer, Livestock, Barrow, Swine, Sheep, Beef, Poultry/Embryology, Gardening, Goat, Horse, Rabbit and other plant and animal projects. County 4-H units continued to partner with school districts to establish and maintain butterfly gardens. The sites incorporated rainwater harvesting (rain barrels) for the purpose of irrigating.

Results
The youth were able to experience gardening and gardening yields from soil to the table. 4-H Community Gardening efforts alone have impacted more than 3000 youth and families through active participation and community outreach. They learned about their communities and were contributing members in them. By raising show animals and competing in livestock shows, youth

learned valuable animal husbandry lessons in nutrition, genetics, reproduction, animal health, and handling techniques. Youth also were able to increase their ability to select good livestock and learned the responsibility needed to raise and manage these animals. Showing livestock also helps build confidence and teaches responsibility.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #5

1. Outcome Measures

Number of youth who develop knowledge and skills in science, engineering, and technology (including electricity, computers, pontoon classroom, etc.).

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	17901

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Science and technology skills are needed if youth are to keep up with the rapidly changing knowledge-based and knowledge-transfer society. Most careers that began in 2012 required some knowledge of geospatial technology and systems. The 4-H program in South Carolina offers youth the opportunity to develop knowledge and skills in science, engineering, technology and math.

What has been done
The 4-H Science on the Move (SOTM) program obtained two mobile trailers, one for the upstate and one for the coastal region of the state, to house hands-on science projects related to Geospatial Science, Energy, Environmental Science, Plant and Animal Science, Health Science and Robotics and Engineering. Youth participated during in-school and after school activities via the trailers. In addition, 4-H volunteers led a 4-H Soapbox racer car building project and taught lessons on simple machines, potential energy, acceleration, kinetic energy, aerodynamics, inertia and friction.

Results
Youth demonstrated the use of math, critical thinking, problem solving, and creativity, which are valuable life skills.

In addition, evaluations indicated 90% of the participants increased their interest in a science related career.

4. Associated Knowledge Areas

KA Code	Knowledge Area
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
806	Youth Development

Outcome #6

1. Outcome Measures

Number of youth gain knowledge in nutrition and fitness.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	909

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Childhood obesity is an epidemic in South Carolina. It is mostly due to physical inactivity and unhealthy dietary behaviors. State data indicates that 20% of the total population is physically inactive.

What has been done
1890 Extension coordinated a healthy lifestyles program to address the health concerns in South Carolina. The healthy lifestyles program consists of 6 projects, which resulted in 275 workshops, activities and demonstrations. The program focused on healthy food choices, exercise options, team sports and cooking alternatives.

Results
One hundred percent of the participants indicated an increase in knowledge at the end of the

program. Eighty-three percent indicated intent to adopt daily exercise options and physical activity principles. It was concluded that adoption of daily healthy practices, could decrease the need for health care visits, which would result in fewer tax dollars spent on health care coverage for those in welfare related programs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
806	Youth Development

Outcome #7

1. Outcome Measures

Number of youth who gain knowledge in natural resources and shooting sports.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	2114

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many youth either participate in hunting or have family members who hunt and, therefore, have access to guns. Many youth do not have any formal training in the safe use and handling of firearms. Although rare, accidents with firearms do occur, and often are the result of improper handling of firearms. Exposing youth to firearms and teaching both adults and youth the proper way to safely handle firearms can reduce the risk of accidents. In addition, this program promoted natural resource conservation.

What has been done
Some 136 programs were conducted reaching over 3,526 persons. Youth participated in hunting safety programs, natural resource clubs, shotgun and rifle clubs, 4-H archery clubs, forestry camps, 4H20 camps, recycling clubs, and Food and Cover Establishment for wildlife programs. Youth learned components of wildlife habitat, water quality, and environmental stewardship. In addition, a SC 4-H Forestry Team participated in the National 4-H Forestry Invitational.

Results
Youth demonstrated wise decision-making skills and self-confidence. They demonstrated caring for their environment and established food plots to benefit small game and other wildlife species. They demonstrated proper shotgun handling.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #8

1. Outcome Measures

Number of youth who develop and improve communication skills through speaking and debating.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	130

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth need opportunities to develop good communication skills, organizational abilities, reasoning skills, and self-confidence. They have opportunities for such development through participating in the Communication and Expressive Arts projects.

What has been done
Seventeen programs were conducted reaching 130 youth. Youth gave presentations and demonstrations during club and county level contests and gave speeches at community organizations promoting 4-H.

Results
Youth successfully prepared and gave presentations. They demonstrated good communication skills, organizational abilities, reasoning skills, and self-confidence. Youth researched various topics and presented information.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Strategies have been implemented to reach the increasing Hispanic populations through 4-H clubs and outreach.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Observation and pre-post tests were conducted. 4-H youth used math skills, critical thinking, and creativity to address issues and solve problems which are valuable life skills. They contributed to their communities, learned how to work in teams, and demonstrated leadership.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Nutrition and Childhood Obesity

☑ 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
701	Nutrient Composition of Food	0%	10%	0%	10%
702	Requirements and Function of Nutrients and Other Food Components	0%	10%	0%	10%
703	Nutrition Education and Behavior	50%	30%	0%	40%
723	Hazards to Human Health and Safety	5%	30%	0%	10%
724	Healthy Lifestyle	45%	20%	0%	30%
	Total	100%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	19.0	3.0	0.0	2.0
Actual Paid	23.0	5.0	0.0	4.0
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**
672747	158630	0	618561
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
672747	133615	0	497097
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Clemson University Cooperative Extension as well as 1890 Research and Extension focused on nutrition and wellness programs for youth directed towards the prevention of childhood obesity, increasing physical activity and the development of food preparation skills that fit current nutritional needs and lifestyles. Over 3,232 educational programs were conducted reaching approximately 31,342 people.

Agents reached youth and adults during in-school and after school programs, healthy lifestyles day camps, summer camps, community centers, senior action centers, Head Start, churches, and libraries. Some of the topics taught by agents included basic nutrition, how to make healthy food choices, reading food labels, the importance of eating a balanced breakfast and food safety in preparation and storage. Youth participated in hands-on activities using recipes using fresh fruits and vegetables, whole grains, planted gardens, and learned the importance of physical fitness. In addition, agents used various media, including social media outlets to publicize nutrition information.

Agents organized and taught Step Up to My Plate, Cooking Schools, Healthy Lifestyles Clubs, Kids in the Kitchen Club, 4-H Cooking Clubs, Health Fairs, 4-H Health Rocks and a 4-H Health Summit at Cafe Cultura. Lessons in nutrition and physical activity were taught to the children whose mothers are participating in the nutrition education program in Spanish Celebrating Health. Youth and adults participated in the Annual Family Fun Day and Café Cultura. In addition, youth participated in the 4-H Healthy Lifestyle Contest and 4-H Expanded Food and Nutrition Education Programs. Through a series of lessons, 4-H EFNEP participants learn basic nutrition, and the importance of daily physical activity.

2. Brief description of the target audience

The target audience includes agencies that serve all income levels, including limited resource families and youth and general youth and adult audiences.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	29169	657864	9437	0

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

Patent Applications Submitted

Year:	2014
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	4	3	7

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of children and youth reached in healthy eating programs.

Year	Actual
2014	9550

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of people gaining knowledge as a result of participating in educational workshops
2	Number of children and youth gaining knowledge in eating healthy foods.

Outcome #1

1. Outcome Measures

Number of people gaining knowledge as a result of participating in educational workshops

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	25531

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
An estimated 25% of children in South Carolina are obese. An increasing number of the children are being treated for obesity related conditions such as Type 2 diabetes and hypertension. The cause is due to several factors, which include limited access to healthy foods, lack of knowledge of simple ways to create healthy dishes and not being introduced to different types of food at an early age.

What has been done
Clemson Extension programs reached youth and adults in schools, summer camps, community and senior centers, alternative school, Head Start, churches, and libraries. Agents assisted groups with the formation of community gardens, taught nutrition labeling and provided nutrition training to nutrition providers. Providers received one hour nutrition credit needed for DSS annual certification. Agents partnered with 1890 Extension to teach the Health Rocks! train the trainer session. Volunteers distributed 1000 sets of senior vouchers, $25 each for use in the purchase of fresh vegetables at a farmers market. Youth participated in educational activities that demonstrated the use of recipes for fresh fruits and vegetables and whole grains. Youth planted gardens and learned the importance of physical fitness.

Results
As a result, 81% of youth have shown an increase in knowledge on living a healthier lifestyle with 61% stating they plan to implement the information taught in the program to their daily lives. Staff noticed a change in the eating habits of the students. They were more willing to try to eat more fruits and vegetables, often referring to key phrases used during classes that helped reinforce

learning.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

Number of children and youth gaining knowledge in eating healthy foods.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	3823

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The prevalence of being overweightness and obese has become one of the most critical health issues in both South Carolina and the United States. Overweightness and obesity cut across all ages, economic levels, and racial and ethnic groups. In South Carolina, over 60% of all adults are now either overweight or obese. Children learn eating behaviors from adults and peers. In the US, nearly one out of three children and teens ages 2 to 19 is overweight or obese. South Carolina ranks 2nd in the nation of obesity among those ages 10-17.

What has been done

Extension agents and EFNEP Nutrition Educators conducted educational programs reaching adults and youth to improve nutrition practices, food safety, and food resource management practices such as planning meals, comparing prices, and using grocery lists. Volunteers were trained, who in turn, taught food preservation methods to youth. Agents and specialists also taught food preservation classes, including canning, pickling, freezing, making jams and jellies, and preserving locally grown food.

Results
More than 78% improved in one or more food safety practices; 96% improved in one or more nutrition practices; 34% of participants increased the amount of physical activity; 96% of participants improved their diet; 54% increased fruit consumption; 68% increased vegetable consumption; and 56% increased consumption of calcium-rich foods.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Expanded Food and Nutrition Education Programs (EFNEP) were conducted for 624 adults and 3,823 youth to improve nutrition practices, food safety, and food resource management practices such as planning meals, comparing prices, and using grocery lists. More than 78% improved in one or more food safety practices; 96% improved in one or more nutrition practices; 92% improved in one or more food resource management practices; 34% of participants increased the amount of physical activity; 96% of participants improved their diet; 54% increased fruit consumption; 68% increased vegetable consumption; and 56% increased consumption of calcium-rich foods. Evaluation data shows the 319 adults and youth donated 3,723 hours at a rate of $20.25, which is equivalent to $75,390 of program support.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Climate Change

☑ 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
132	Weather and Climate	0%	0%	0%	100%
205	Plant Management Systems	0%	0%	100%	0%
	Total	0%	0%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.3	0.5
Actual Paid	0.0	0.0	1.0	0.5
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	79971
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	6049	64285
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Across the Southeast, land managers share the challenge of restoring longleaf pine (LLP) forests to support red-cockaded woodpeckers (RCW) and associated species of concern, while retaining critical

habitat features, including mature trees. Restoring longleaf pine is readily accomplished if existing trees are clearcut and seedlings planted. However, managers need alternative protocols that restore LLP on sites where canopy pines are retained. Current Clemson University research looks to develop protocols for restoring longleaf pine (LLP) to stands currently occupied by loblolly pine (LBP).
In focusing on the goal climate change, an 1890 research project looks at developing a robust disaster relief supply chain, as it is among the most critical aspects of emergency management. A literature review was completed and a paper was developed for presentation. The paper reviewed optimization and simulation models used in the field of disaster relief supply chain. To test the validity of the model, various hypothetical input data were created to test and improve the model. A case study was conducted to demonstrate the capability of the optimization model. A simulation model was developed to model the disaster relief supply chain networks using Arena simulation software by Rockwell Automation. The simulation working paper was submitted to the Southeast Decision Science Institute (SEDSI) for a conference presentation as well as to Review of Business Research for a peer-reviewed journal publication.

2. Brief description of the target audience

The target audience will include general public, regulatory agencies, resource managers, local county and municipal officials and public works staff.

3. How was eXtension used?

-

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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:	2014
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	7	7

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Disclosures

Year	Actual
2014	0

Output #2

Output Measure

- Licenses

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Provide knowledge to policy makers to assist in coping with the effects of climate change, particularly in the coastal region.
2	Identify models to help disaster relief officials measure the vulnerabilities of rural areas to potential disasters.

Outcome #1

1. **Outcome Measures**

Provide knowledge to policy makers to assist in coping with the effects of climate change, particularly in the coastal region.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Identify models to help disaster relief officials measure the vulnerabilities of rural areas to potential disasters.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

A 1890 research bulletin will be published at the conclusion of the project detailing the results. Overall, the Clemson LLP study found a low occurrence of trees in poor health (2.9%). Tree health was positively correlated with site productivity, whereas poor tree health was more common on coarse textured soils than on fine textured soils.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Sustainable Energy

☑ 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
123	Management and Sustainability of Forest Resources	100%	0%	0%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	20%	0%
402	Engineering Systems and Equipment	0%	0%	20%	10%
403	Waste Disposal, Recycling, and Reuse	0%	0%	0%	60%
511	New and Improved Non-Food Products and Processes	0%	0%	60%	30%
	Total	100%	0%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	2.5	0.5
Actual Paid	4.0	0.0	2.8	1.0
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**
124480	0	203710	183403
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
124480	0	139209	147404
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	33386	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Clemson University researchers are analyzing more than 400 varieties of sorghum grown in South Carolina to determine which are most easily converted into biofuel. They also are using genetics and bioinformatics to find sorghum genes that maximize sugar release from the whole plant (not just grain and juice), enabling sorghum plant breeders to naturally engineer next-generation bioenergy feedstock to improve the crop-to-fuel conversion process. In addition, discoveries of genetic controls in sorghum for traits such as drought tolerance, pest resistance and improved yields will aid producers of related crops, including corn, rice and turfgrass.

Research found that switchgrass can produce profitable yields of 3 to 9 tons per acre. A 2-day BioEnergy Summit was held on September 19-20, 2013 in Florence, SC. Approximately 300 attended over the 2 days. Representatives of several different end users of biomass presented, identifying woody, switchgrass, and sorghum biomass as the biomass most needed in the near future. A subcommittee of the SC Biomass Council and SC BESTA programs was formed to address the needs of these future end users. Since the Summit, this group met twice with the economic development association for the region (NESA) for the first time to collaborate on recruiting more bioenterprises to the Pee Dee region of SC.

Current research aims to generate and evaluate the effectiveness of genetically modified poplars for enhanced disease resistance and identify key genes that are involved in the response to S. musiva infection.

An 1890 researcher proposed to reduce the amount of plastic waste material in the Orangeburg, SC landfill. The plan is to recycle waste plastics into fuel and valuable alternatives. The researcher is looking at development in three phases: basic research, demonstration thermolysis reactor, and pilot plants. The results of the basic research were applied to build a demonstration reactor. Plastic shopping bags and other polyethylene-based wastes were thermally decomposed to liquid and gases suitable for fuel. One of the important points revealed by the research was that the recovery route of plastic waste depended on the condition and kind of material. Depending on the kind of waste, the most economically feasible process and treatment was used. Paper presentations were made at conferences, meetings, etc. Two articles were written and submitted for publication to peer-reviewed journals. Presently, a final bulletin is being written of project findings for publication and dissemination.

Switchgrass is a perennial feedstock and native grass being considered for production throughout the USA. It has many beneficial characteristics such as high yield potential, good drought tolerance, provides good wildlife habitat, has low input costs, and can be produced and harvested using traditional hay production equipment. The Clemson Pee Dee Research and Education Center has been studying switchgrass and other feedstocks since 2007. Ongoing studies include effects of harvest timing and quality, soil type effects on management, and N fertility levels on switchgrass yield and nutrient removal.

2. Brief description of the target audience

All consumers in the state will benefit from research and education programs related to lower cost energy options. Target audience also includes producers, landowners, and tree farm inspectors.

3. How was eXtension used?

-

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	4610	41173	0	0

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

Patent Applications Submitted

Year: 2014

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	7	7

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Disclosures

Year	Actual
2014	0

Output #2

Output Measure

- License agreements

Year	Actual
2014	0

Output #3

Output Measure

- Number of people completing educational workshops

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of people gaining knowledge as a result of participating in educational workshops

Outcome #1

1. Outcome Measures

Number of people gaining knowledge as a result of participating in educational workshops

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	2029

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
This program promoted the use of Best Management Practices for forest systems and other natural resources to improve South Carolina's forest productivity, environmental sustainability and sustainable energy. In addition, farm and forest landowners in South Carolina were seeking management and diversification strategies to generate additional income and profitability.

What has been done
The Clemson Pee Dee Research and Education Center is continuing studies of switchgrass and other feedstocks. Ongoing studies include effects of harvest timing and quality, soil type effects on management, and N fertility levels on switchgrass yield and nutrient removal. Workshops were conducted on the topics of prescribed fire, timber harvesting, forest herbicides, forest taxation, timber income tax, the SC Tree Farm program and estate planning. Articles were published to promote the stewardship of South Carolina's urban and community forests. Resource information was made available through the quarterly Woodland Magazine, Tree Farmer Bulletin, newsletters, and webinars . A link to www.MyLandPlan.com was made available on the web to help landowners manage their property.

Results
Bales of switchgrass are being stored for future microbial degradation studies. Of the 2058 people attending programs, 99% reported that they gained knowledge.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Of the 2058 people attending programs, 99% reported that they gained knowledge.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 10

1. Name of the Planned Program

Global Food Security and Hunger

☑ 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
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	10%	10%	8%	15%
204	Plant Product Quality and Utility (Preharvest)	10%	25%	21%	10%
205	Plant Management Systems	15%	25%	30%	10%
211	Insects, Mites, and Other Arthropods Affecting Plants	25%	0%	8%	10%
212	Diseases and Nematodes Affecting Plants	10%	0%	17%	10%
213	Weeds Affecting Plants	20%	0%	4%	0%
216	Integrated Pest Management Systems	0%	20%	4%	10%
601	Economics of Agricultural Production and Farm Management	5%	20%	8%	30%
701	Nutrient Composition of Food	5%	0%	0%	5%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	33.0	3.0	13.8	2.0
Actual Paid	29.0	8.0	27.3	2.0
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**
1500342	323284	1506234	253155
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1500342	271926	1733275	203456
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	92053	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Clemson University has a large number of global food research studies underway. Some examples are research that develops and demonstrates integrated micropropagation systems that capture several values of the process including superior clonal material, vigor in nursery conferred by nutrient charge in plant tissue, cleanliness of packaged plantlets, transportability of small unit mass, and rapid finish of young plants under environmental control.

Researchers are also developing and refining strategies for managing insect pests of cotton and soybeans, including research into electronic monitoring and detection methods for insects and/or population indices, research on thrips control, and research into monitoring and/or management of resistance development, treatment thresholds, and overall fit of Bt technologies for bollworm. Research was conducted to survey corn, soybean, and cotton producing areas of South Carolina to determine the extent of herbicide-resistant weed problems. Success was found in the control of herbicide resistant Palmer amaranth in corn, cotton, and soybeans.

Research also developed sensors, controls and instrumentation technologies for site-specific application of pesticides, nutrients and water for precision agriculture and to demonstrate use, benefits and effectiveness of such technologies in the southeastern United States.
A current study is looking at spatial ecology of key pests of field crops (cotton, soybean, corn, wheat) and their natural enemies, and developing environmentally friendly management practices. Available peach germplasm has been evaluated for fruit quality and disease resistance using phenotypic and molecular approaches. Sources of new fruit quality traits as well as disease resistance have been acquired and incorporated into newly developed hybrids. Markers associated with bacterial resistance in peach fruit and red fruit skin coloration have been developed, validated and are in use in marker-assisted selection.

Extension's Agronomic Crop Production programs impact the management and production of agronomic crops on over 1,330,000 acres in South Carolina each year. This includes all corn, cotton, peanuts, small grains, sorghum and tobacco. Total value of these crops was $658,351,000 in 2013. The largest acreage for a single crop is the 440,000 acres planted to soybean but the cotton crop has the greatest total value at $131,501,000. Research and Extension programs addressed issues ranging from proper variety selection to protecting crops from weeds, insects and diseases as well as developing more efficient irrigation and harvest equipment. All of these programs resulted in millions of dollars of increased profits for growers and improved food quality and safety.

Federal law requires that pesticide applicators be trained for competency in order to reduce pesticide misuse and enhance environmental protection. In South Carolina, Clemson Extension provides the training

needed to obtain a private applicator license for purchasing and applying restricted use pesticides. In order for individuals to obtain a private applicator license in 2013-2014, attendees received training and took the private applicator exam. In January of 2014, updated training materials were produced by the Clemson University Extension Pesticide Safety Education Program Coordinator. The new initial private applicator training highlighted updated DVD training and a more extensive fifty question exam.

An 1890 research project looked at the proper implementation and usage of traceability technology as an important aspect in allowing the attainment of Good Agricultural Practices (GAP) certification for South Carolina farmers. The project selected a group of South Carolina farmers and value-added producers to purchase, implement and utilize the RFID (Radio Frequency Identification) equipment necessary to provide traceability throughout their food product supply chains. Training was provided for proper use of the equipment. Data collected was conducted on seasonal crops. Paper presentations were developed and presented at conferences, meetings, etc. One article was submitted to the International Organization of Scientific Research Journal of Engineering.

In addition, another 1890 researcher focused on the impact of the Panama Canal Expansion on corn exports in the Southeastern Region of the United States. The study examined the potential impact of the Panama Canal Expansion on exports and job opportunities related to rural farmers and transportation systems. A basic Ordinary Least Square (OLS) model was developed to predict regional corn exports. Also, a time series regression model was built. Both the OLS and time-series models were run and the results compared. The time-series model appeared to be a better model. The transportation model was built to forecast corn exports by several major ports: Savannah, Mobile, New Orleans, Los Angeles and San Francisco. A database was built will all variables collected from the USDA official website and other resources.

2. Brief description of the target audience

Research in this program has the potential to benefit growers, state, federal and international agencies dealing with food production and distribution and with end users in countries around the world.

The target audience includes producers, Limited-Resource Farmers and Extension personnel, agency personnel, transportation system authorities, producers, master gardeners, and growers.

3. How was eXtension used?

-

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	37419	582724	3758	135

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

Year:	2014
Actual:	3

Patents listed

Methods and Compositions For The Inhibition Of Meristematic Growth on Cucurbit Rootstock
Impact Flow Sensor for Monitoring Peanut Harvest Yields
Chemical Control of Terminal Buds in Cucurbit Rootstock Seedlings Used for Grafting

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	31	31

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Disclosures

Year	Actual
2014	5

Output #2

Output Measure

- Licenses

Year	Actual
2014	1

Output #3

Output Measure

- Number of people completing educational workshops

Year	Actual
2014	15426

Output #4

Output Measure

- New Variety Releases

Year	Actual
2014	0

Output #5

Output Measure

- Number of youth participating in 4-H food systems programs

Year	Actual
2014	3549

Output #6

Output Measure

- Number of farmers educated on the importance of soil/nutrient management through soil testing.

Year	Actual
2014	744

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of people reporting increased knowledge
2	Number of youth gaining knowledge of food systems
3	Number of producers indicating adoption of recommended agronomic crop production practices
4	Number of Master Gardeners reporting activities.

Outcome #1

1. Outcome Measures

Number of people reporting increased knowledge

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1788

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Small commercial vegetable producers and home gardeners are interested in the most up to date production practices and techniques to improve the production and quality of their crops. Producers are realizing changes in the fresh market as it relates to improved varieties, productivity and shelf life of new crops. In order to keep pace and grow crops more productively, the producers and gardeners need updated information and training.

What has been done
Production meetings, group meetings, training sessions, workshops and field demonstrations were conducted to train producers and gardeners on updated crop production practices to include sustainable practices and variety trials.

Results
One hundred two (102) adults received training in the area of vegetable production and home gardening. The updated production practices were adopted by 90 participants. One hundred two producers/gardeners gained knowledge and increased skills, while 50% increased production and 40% increased income. One success story is a small farm operator was a part-time vegetable vendor at roadside markets, prior to participating in the 1890 Small Farm Program. He joined the Outreach Program and began participating in commercial vegetable production and marketing training sessions. He wanted to increase his marketing skills. There was a need to grow his own produce rather than purchase from the State Market and other farms. He followed up on recommended practices and utilized best practices. He is now a proud vegetable producer & vendor.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants
601	Economics of Agricultural Production and Farm Management

Outcome #2

1. Outcome Measures

Number of youth gaining knowledge of food systems

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	3549

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food

Outcome #3

1. Outcome Measures

Number of producers indicating adoption of recommended agronomic crop production practices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	14327

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Sustainable agronomic and horticulture crop production programs will develop and implement production systems in South Carolina that are economically sustainable, safe and environmentally sound.

What has been done
Research and Extension programs in agronomic crops address issues ranging from proper variety selection to protecting crops from weeds, insects and diseases as well as developing more efficient irrigation and harvest equipment. Agents assisted farmers by conducting peanut maturity clinics and farm visits. Specialists demonstrated the Weed Wiper as a method of controlling Johnsongrass in fescue hay fields.

Results
The Extension Agronomic Crop Production programs impact the management and production of agronomic crops on over 1,330,000 acres in South Carolina each year. This includes all corn, cotton, peanuts, small grains, sorghum and tobacco. Total value of these crops was $658,351,000 in 2013. The largest acreage for a single crop is the 440,000 acres planted to soybean but the cotton crop has the greatest total value at $131,501,000. Information generated from Official Variety Trials allows growers to select varieties that perform best in their region of the state. Increasing yields just 5% through proper variety selection results in an additional $26,777,400 in revenue for South Carolina producers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #4

1. Outcome Measures

Number of Master Gardeners reporting activities.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	333

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Horticultural Program at Clemson University seeks to inform consumers on environmentally sound horticultural practices that will improve communities.

What has been done
Some 88,523 people received information from Master Gardeners through telephone calls, office visits, workshops, and activities. These volunteers conducted school programs, oral presentations, newsletters, radio programs, and TV appearances. An online course was created as supplemental material for the Master Gardener program. The Master Gardener Facebook page serves 6569 viewers.

Results
Master Gardeners contributed over 61,106 hours of service at a value of $1,231,286 in program support.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Of the 14,327 persons participating in educational programs, 86% indicated that they gained knowledge.

Key Items of Evaluation

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
4399	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
0	Number of new crop varieties, animal breeds, and genotypes whit climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
14327	Number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources.
Global Food Security and Hunger (Outcome 2, Indicator 1)	
104	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
0	Number of viable technologies developed or modified for the detection and
Sustainable Energy (Outcome 3, Indicator 2)	
0	Number of farmers who adopted a dedicated bioenergy crop
Sustainable Energy (Outcome 3, Indicator 4)	
0	Tons of feedstocks delivered.