

2015 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

The five 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.

There were 86 active Clemson research projects in the reporting period. Researchers issued nine intellectual property disclosures and faculty submitted 105 technical contributions for publication. The 1890 Research Program had 12 active research projects for the 2014 - 2015 reporting period. There were 14 presentations made throughout the United States informing people of the research going on at South Carolina State. Five documents were submitted for publication. Twenty articulation agreements with external agencies were established.

New research is beginning across multiple program areas. In sustainable agriculture production for (non-food) horticultural crops new research aims to address management strategies for anticipated decreasing availability and quality of water for irrigation use by the green industry and well as to mine natural genetic variation in maize for genes and genetic elements controlling stalk strength, a key agronomic trait imparting lodging resistance, and to use these genes as entry points to gain insights into mechanisms regulating this trait. Under natural resource management research proposals seek to increase the knowledge base in understanding the impact of land uses and storm water management practices on water quantity and quality in the coastal landscape as well as build a framework of understanding that will take into consideration such things as agricultural and forestry land use, flow conditions and economic parameters regarding both the land use and flow conditions of the Savannah River Basin. New food safety research will address, at least in part, the gap in information related to the presence and possible impact of antimicrobial resistance (AMR) in enteric organisms in terms of prevalence and phenotypic patterns of resistance of chickens in South Carolina.

New research in community, leadership, and economic development will create awareness and interest at the middle and high school levels for careers in the agricultural sciences, and will prepare students for success in college, leading to a sustainable supply of well-educated agricultural scientists. Global food security and hunger new research seeks to advance the tools for identification of nematode species and characterization of intraspecific variability and elucidate molecular and physiological mechanisms of plant-nematode interactions to improve host resistance. Additional research will conduct trials to examine insect injury and yield in corn using a range of seed treatments in addition to untreated seed. And a final project employs a number of different methods to analyze how food supply chain innovations are being implemented in an effort to meet increased consumer demand for food products that are source identified and/or certified as to their specific production techniques.

Extension's Agronomic Crop Production programs impacted the management and production of agronomic crops on over 1,055,097 acres in South Carolina last year. This included all corn, cotton, peanuts, small grains, sorghum and tobacco. 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. With the passage of the 2014 Farm Bill came many changes to the governmental side of agricultural production. Cotton was no longer a program crop, crop yield records needed to be updated, base acre assignments needed to be reallocated, and program coverage needed to be chosen. Clemson Extension partnered with the USDA Farm Service Agency and South Carolina State University to present a series of educational meetings across the state to assist farmers in understanding the important decisions that they were faced with making.

Agents developed educational modules for a Certified Landscape Professional online course, developed Frequently Asked Questions for using constructed wetlands to treat water (posted on the Cleanwater3.org), responded to questions received from across the nation as an Ask an Expert on eXtension.org, and served as panel guests answering horticulture questions on the award-winning Making It Grow television show. Agents conducted gardening presentations and demonstrations at local schools for students and teachers, some offered presentations through the online course for school gardening, conducted the Sustainable Small Farms and Backyards Course and the Carolina Yards and Gardening School workshop and Lecture Series. An agent created surveys for the SCBG Children Garden to assess pre and post renovation visitation.

The SC SeaGrant Consortium and SC Department of Natural Resources collaborated to plan the Seeds to Shoreline youth wetland restoration program. A Carolina Schoolyards Curriculum Writing Workshop was conducted to teach five South Carolina Educators how their schoolyards can become environmentally friendly and then installed a rain garden at a Carolina Yards demonstration site. As part of the workshop, teachers began writing curriculum for the Carolina Schoolyards program.

Agents taught and promoted water resource stewardship and litter prevention. Agents met with county and city groups to discuss water education plans. Pond surface water television segments were produced. Agents led volunteers in invertebrate collections in Crabtree Canal for stream bio assessment. They facilitated the Master Pond Manager Online Course, which included two field days. They organized installation of a vegetated freshwater shoreline as a demonstration project at Carolina Hospital. Agents educated groups about rain garden design and gardening with native plants, proper disposal of pet waste, storm water best management practices, and they trained Master Naturalists and Master Gardeners. Agents and specialists installed a cistern at the Fort Johnson Marine campus at the SC Department of Natural Resources sea turtle program headquarters and will be used for demonstration of rainwater harvesting systems and one in a sensory garden that was created at a school for disabled children.

The Institute for Economic and Community Development staff supported the state and local agribusiness community. Launched in 2014, the Catawba Fresh Market allows customers to shop 24 hours a day from their computers. Once orders are placed online, local growers process them, and orders are delivered within 24 hours. The goal of the program is to provide the best local produce in a convenient and sustainable manner while promoting the success and future of our local agriculture. The market is made possible through a partnership between Clemson Extension, the Catawba Farm and Food Coalition and Eat Smart Move More York County. Currently, the site has 20 active farmers selling items such as meat, eggs, produce, breads and other value-added products. (www.catawbafreshmarket.com)

The South Carolina Women's Agricultural Network (SC WAgN) provided through Clemson Institute for Economic and Community Development continues to grow. The primary purposes of SC WAgN are to encourage and support women in agriculture; provide and strengthen networks for women in agriculture; provide educational and mentoring opportunities for women in agriculture; raise community awareness of agricultural related issues and concerns; and sustain farming livelihoods. The network is comprised of women farmers, agricultural professionals, agricultural educators, and informed consumers committed to supporting and providing educational opportunities to women working in agriculture and ag-related businesses. To learn more about SC WAgN: www.clemson.edu/scwagn.

The Pee Dee Food and Farm Guide builds connections between consumers and producers of local agricultural products that are the critical foundation for a robust local foods distribution system. By connecting tourist sector businesses with growers, producers, and distributors of locally produced crops and value added products, this project will enhance small farm enterprise opportunities while increasing overall access for all other consumer segments of the population. Last summer 10,000 copies of the Pee

Dee Food and Farm Guide were distributed in communities throughout the region. The guide features information on agritourism farms, farmers markets, roadside stands, pick your own farms, specialty crop producers, specialty product businesses, all of whom place special emphasis on supplying products derived from local sources. The development of a local foods system is as much dependent on the education of the consumer as it is on education of the producer. The Pee Dee Food and Farm Guide directly impacts consumer awareness of local agricultural production and is intended to increase consumer demand for scaled up supply. Efforts such as this are just one of the ways that Clemson Extension Agents in all program teams are working to plan and develop robust local food economies that capitalize on small farms assets throughout the state.

The Livestock and Poultry Health (LPH) division of Public Service Activities at Clemson University is the only National Animal Health Laboratory (NAHLN) in South Carolina. This division is directed by the State Veterinarian and has a team of scientists focused on animal health and regulatory programs. As such LPH provides many services to all animal producers in South Carolina which includes limited resource producers. LPH scientists participated in research projects related to animal health and infectious diseases affecting the animal industry. These scientists are funded through Hatch dollars to conduct this research.

Extension Specialists are inspecting for Southern Rust and other disease that move very quickly and can negatively affect corn yields under irrigation. They are working with the University of GA Extension to develop a safe alert system for the region. Webinars have been presented to assist with the coordination of emergency preparedness of Extension to support ESP17 mandate. Other biosecurity collaborations and presentations have covered topics such as radiation plan, Commercial Poultry NPIP Testers class and Biosecurity Workshop, Scrapie Flock inspection at local farms and Scrapie Flock Certification Program Export category annual inspection at Brookgreen Gardens, SC Foreign Animal Disease Stop Movement issues (with SCDOT officials), Equine Infectious Anemia (equine board), National Alliance of State Animal and Agriculture Emergency Programs Summit on Animal Emergency Response Resource Typing (veterinarians and emergency managers), Evacuation and Mass Care in SC for pets and other animals (animal shelter groups and SC school districts), National Plans for Secure Food Supply and Swine Enteric Coronavirus Diseases (SC pork producers), overview of National and MidAtlantic Secure Milk Supply Plans, PPE (Personal Protective Equipment), Hoof and Mouth Disease, and Decontamination, Indemnity, Depopulation, Disposal for food and agriculture in a radiation event (SC county emergency responders).

Clemson Agents and volunteers conducted 4,595 4-H programs that reached 79,657 youth and family members with programs on agriculture, science and technology, natural resources, food safety and nutrition, and leadership skills. In STEM programs, youth used critical thinking and problem-solving skills. Four youth represented SC at the 2015 National 4-H Conference in Washington, DC. Youth participated in the SC Jr. Beef Round Up, Breed Classes, Cloverbud Beef Cattle Knowledge College, Poultry Showmanship Clinic. 4H Agents provided 4H Embryology Curriculum and Brooder Equipment for students at schools that was used in classrooms as science school enrichment. Agents partnered with Master Gardeners, businesses and other agencies to sponsor an Ag Day for Kids at the Pee Dee Research and Education Center. 4-H teams from South Carolina participated in national 4-H livestock judging contest and national 4-H Public Speaking Contest. A South Carolina team won the National Equine Hippology Bowl competition. 4-H Community Gardening efforts alone have impacted more than 3000 youth and families through active participation and community outreach. Youth learned about composting, rainwater harvesting, and watershed pollutants. Youth learned about their communities and were contributing members in them. Youth led and participated in citizenship and service projects. Youth used math skills, critical thinking, and creativity, which are valuable life skills.

The overall mission of the 1890 Research and Extension Program was to promote an organized Research and Extension system that addressed quality of life opportunities for residents of South Carolina with a special emphasis on underserved communities. The 1890 Program provided effective stakeholder outreach programs and services in the area of agricultural/natural resources, family life, health and nutrition, youth development, community economic development, education and technology. The intent of the 1890 Program was designed to enhance the overall quality of life and economic viability of the resident of South Carolina.

The 1890 Research Program was the catalyst that kept SC State University at the forefront of agricultural and rural research problems and issues confronting South Carolina. The 1890 Researchers worked to combat obesity among youth, enhance bioremediation technology and improve food safety and security. In addition, research was conducted on preventing the effects of noise induced hearing loss and high blood pressure among South Carolina farmers and agricultural workers; as well as looked at the dynamic linkages among capital investment, exports, agribusiness, education and quality of life variables in South Carolina.

The 1890 Extension Program provided life-long learning opportunities that helped rural and urban participants improve their quality of living. The Small Farm Program offers four major outreach projects to all farmers in South Carolina with more emphasis on small scale landowners, limited resources, socially disadvantage farmers and ranchers. The Small Farm Program is implemented in five 1890 Extension Cluster Areas and surrounding counties across the state. The four outreach projects are Animal Production System, Vegetable Production System, Sustainable Agriculture Production (IPM) Practices and Risk Management Education. One of the underlining objectives of the outreach is to equip all farmers 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/cluster rural economic development. The number of acres affected by the Integrated Crop Management (ICM) was 21,950. Four hundred sixty six farmers were educated on the importance of soil/nutrient management through soil testing. Over one hundred forty three producers reported increased dollar returns per acre or reduced costs per acre.

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. The program helps depressed communities build the potential to enhance their own resource development capacity from the inside out. Activities were offered in community education and community outreach. The Community Education Catalog was distributed across the state, which outlined various courses offered by 1890 Extension personnel. Several SMART (Strategies in Math and Reading using Technology) Academy summer camps were held. Exhibition booths at county fairs and expos were conducted in Columbia and Charleston, SC. Approximately 2,560 individuals were reached through the program.

In regard to 4-H and Youth Development, the 1890 Extension Program concentrated on 4 specific planned programs, which included healthy lifestyles, citizenship, food safety and nutrition and SET (science, engineering and technology). Over 6,150 people were reached through the delivery of 4-H and Youth Development services. Approximately 1,141 youth decided to make healthy food choices after participation in the healthy lifestyles and food safety/nutrition program. In comparison to last year, there was an increase in the number of adults participating in the workshops. There was an increased graduation rate of both youth and adults. Over 283 youth reported adopting recommended hand washing practices, which was up from last year of 44.

Over 8,800 participants gained knowledge from the offered programs and services of 1890 Extension. Two hundred forty six outreach activities were offered by the 1890 Program. Approximately 1,443 educational workshops were conducted by Extension. Eight thousand five hundred and fifteen participants completed the educational workshops.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	150.0	41.0	22.4	13.0
Actual	135.0	41.0	78.6	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, which is composed of Extension volunteers, producers, a community center program coordinator, public school educators and business owners, has the opportunity to give input about programs.

There are internal university review panels at both Clemson and South Carolina State. The programs are reviewed by State Extension Program Team Leaders and by administration, at each institution. Both panels review projects and programs at their institutions based on organizational capacity, relevance and impact. The internal university panels are asked to review annually South Carolina's Plan of Work. The Research and Program Development Committee is kept abreast of national program areas and the realignments of research and extension activities at both institutions. The program review activities of the committee complements 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. The review panel consists of the Experiment Station Director, the Associate Dean for Research and Graduate Studies, the Department Chair of the PI, a member of media services, and other subject matter experts as needed. The panel is appointed by the Experiment Station Director in consultation with other administration, faculty and staff. The panel reviews all pre-proposals submitted for new projects to ascertain the merit of the project and to assure that it fits the overall goals and objectives of the Experiment Station and the College. The panel also reviews the full proposals along with external reviewers' comments and the final proposal before submission to Washington, D.C. This panel also reviews the outcomes and outputs from each project when annual and final reports are submitted. A project termination meeting is held at the conclusion of the project to discuss the project and determine the next steps for a new project.

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, comments and suggestions, which 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 State 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 Advancement Council members and the Extension system. In general, respondents felt Extension was a valuable service and a great use of public funds. When respondents reported dissatisfaction, there were two major issues mentioned. 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 clientele wanted more affordable and better publicized training sessions.

Brief Explanation of what you learned from your Stakeholders

A hiring plan was developed and new agents, program assistants and specialists are being hired to serve programs and counties. A new marketing plan is being developed. The plan is to train those in the system on how to better publicize Extension programs, how to effectively market Extension's value to those who do not directly benefit from Extension's programs and to continually strive to improve Extension programs among those whom we serve.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
5835172	1851203	4507197	2271843

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	5083451	1851203	4734444	2271843
Actual Matching	5083451	1851203	4793669	2271843
Actual All Other	0	0	6943080	0
Total Actual Expended	10166902	3702406	16471193	4543686

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	4060496	0	0	0

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Sustainable Animal Production Systems
2	Sustainable Agriculture Production for (non-food) Horticultural Crops
3	Natural Resource Management
4	Food Safety
5	Community, Leadership, and Economic Development
6	4-H Youth Development and Families
7	Nutrition and Childhood Obesity
8	Climate Change
9	Sustainable Energy
10	Global Food Security and Hunger

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%	20%	37%	20%
302	Nutrient Utilization in Animals	20%	20%	0%	20%
303	Genetic Improvement of Animals	20%	15%	0%	15%
307	Animal Management Systems	10%	20%	18%	20%
308	Improved Animal Products (Before Harvest)	20%	15%	18%	15%
311	Animal Diseases	0%	0%	9%	0%
315	Animal Welfare/Well-Being and Protection	20%	10%	18%	10%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	10.0	8.0	2.8	1.0
Actual Paid	13.0	8.0	6.4	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
559946	323284	430602	351530
1862 Matching	1890 Matching	1862 Matching	1890 Matching
559946	323284	387489	351530
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	241741	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

In Extension, activities conducted included educational programs such as Master Cattleman, Grass Masters, small flock poultry workshops, small ruminant management, field days, Backyard Poultry and Backyard Swine Processing, Pasture Ecology Schools, beekeeping short course, Beef Quality Assurance certification trainings, biosecurity programs, meat goat workshops, dairy goat workshops, horse and disease concerns and quality milk initiative surveys. A grant has been received to develop, demonstrate and distribute mobile applications as tools for cattle operations. We will continue to work with producers in developing cost management strategies for rations, budgets and other input costs.

South Carolina Regulation R.61-43 provides requirements for confined animal facilities and the utilization of animal manure from those facilities. Under this regulation, managers of confined animal facilities must obtain a manure management certification through Clemson University and maintain that certification. Fifty-three trainings were held around the state for 1,187 producers who received certification or recertification. 100% of the participants reported knowledge gained.

This year Clemson research discovered multiple new species of biting flies in various parts of the world, including the United States, Colombia, Portugal, Turkey, and Vietnam. Other research verified that PRRSV infection alters the miRNA expression profile in pig body fluids and established via microarray data that miRNA expression in serum is altered compared to pre- and post-infection.

Continuing Clemson research is working to identify the prevalence of four microorganisms, which play a significant role in calf illness and production loss in beef and dairy operations. 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. Additional research is looking to measure and improve beef quality, safety and value by assessing impacts of animal health, animal care, and processing management/production strategies, as well as optimize calf and heifer and dairy cow performance.

New Clemson research aims to find sustainable solutions toward the control and management of two major hive pests by looking at hygienic behavior and the genes that may underlie that behavior and breeding bees with resistance characteristics.

The recently funded 1890 research project focused on preventing the effects of noise induced hearing loss and high blood pressure among South Carolina farmers and agricultural workers. The major goal of the project is to educate farmers and agriculture workers (minority and majority populations) in South Carolina of the implications of excessive noise levels over a period of time could potentially bring about complications of ischemic heart disease and high blood pressure. A poster presentation of the research

project was prepared for the Professional Agricultural Workers Conference (PAWC).

The 1890 livestock producers continued to improve their operation management by gaining improved knowledge and increasing their skills in production, marketing skills and enterprise risk management tools. Despite the adverse climatic and environmental conditions, high feed costs and poor market prices, the producers managed to hold onto their operations. As a result, they became efficient in livestock production management through better production decision making by minimizing their overall production cost. Therefore, the small farmers and producers limited the amount of purchased inputs as much as possible to maintain profitability and minimize any harmful environmental impact.

2. Brief description of the target audience

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

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	9815	10560	128	70

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

Patent Applications Submitted

Year: 2015

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	3	14	17

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Disclosures

Year	Actual
2015	1

Output #2

Output Measure

- Licenses

Year	Actual
2015	0

Output #3

Output Measure

- Number of people completing educational workshops.

Year	Actual
2015	9728

Output #4

Output Measure

- Number of educational workshops conducted.

Year	Actual
2015	429

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 and indicating adoption of animal production practices.
3	Number increased percentage of forage fed beef production in the State and Region
4	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 and indicating adoption of animal production practices.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1462

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Small scale swine production has generated much interest for producers in the Orangeburg Cluster. The success of the local swine industry is a benefit to the local farming community. This is due in part to some herd health issues in the large scale commercial herds, lower feed costs and higher prices for BBQ sized hogs. Many of the farmers who have recently entered into swine production had experience in the industry years ago, but do not have the resources needed to be successful, such as access to the latest general production information.

What has been done

The local Extension Agent conducted one on one sessions with farmers. After making farm visits, the agent contacted the State Veterinarian. Issues relating to various conditions of small scale swine production were addressed. For instance, it was determined that the losses of young piglets were due to improper housing during cold weather. Therefore, herd health issues, alternative feed sources and further development of direct marketing were addressed. An improved housing plan was developed and the timing of breeding was adjusted.

Results

From the counseling, knowledge was gained. One producer started out with two bred sows. With education, he has increased his herd to eight breeding sows, two boars and sixty piglets. With feeding costs, the farmer reported he purchased 700 bushels of corn from local farmers, with corn priced at \$3.92 per bushel, which equals \$2,744. \$500 was spent at the local feed mill, which gave \$3,244 back into the local economy. He plans to sell 9,000 lbs. of live weight BBQ sized hogs at \$0.66/lbs. for a total of \$5,940. With feed costs subtracted, the farmer will gross \$3,244.

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)
315	Animal Welfare/Well-Being and Protection

Outcome #3

1. Outcome Measures

Number increased percentage of forage fed beef production in the State and Region

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	13

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Livestock producers in the Greenwood Cluster were interested in identifying and eliminating poor performing livestock from their herds. Poor performing animals do not gain weight at the rate of average and above average performers. Since weight is a major factor in determining value, producers are paid less for lighter weight animals at marketing time.

What has been done

A workshop was held to discuss sustainable livestock production, marketing and identifying and correcting weaknesses in the livestock herd.

Results

Thirty (30) producers attended the workshop. One producer, with assistance from the Cluster County Agent, utilized the portable livestock scale system to weigh his calves. Four animals were discovered to be below the average weaning weight by an average of 86 pounds. Based on current market prices at the time, the 4 animals would cause a loss of \$692 or \$173 dollars per head. The mothers of the animals were replaced with animals that would produce offspring with above average performance.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	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

Agents and specialists have reported conducting 308 programs reaching 8,646 people. Other programs included Master Cattleman, Grass Masters, small flock poultry workshops, small ruminant management, field days, Backyard Poultry and Backyard Swine Processing, Pasture Ecology Schools, beekeeping short course, Beef Quality Assurance certification trainings,

biosecurity programs, meat goat workshops, dairy goat workshops, horse and disease concerns, and quality milk initiative surveys.

Results

Over 93% of the participants reported knowledge gained. Producers reported improved breeding, health and reproduction methods, and implemented recommended grazing management systems. Programs 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.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection

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. Because of the education and implementation of the adopted animal management practices, the swine producers were able to make a profit from their investment. Also, one farmer was selected to participate in the "Small Farmer Agricultural Leadership Institute", in order to utilize his leadership skills to further advance agriculture.

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%	10%	0%
204	Plant Product Quality and Utility (Preharvest)	20%	0%	10%	0%
205	Plant Management Systems	20%	0%	20%	0%
211	Insects, Mites, and Other Arthropods Affecting Plants	15%	0%	40%	0%
212	Pathogens and Nematodes Affecting Plants	10%	0%	0%	0%
215	Biological Control of Pests Affecting Plants	15%	0%	0%	0%
216	Integrated Pest Management Systems	20%	0%	20%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	20.0	0.0	4.9	0.0
Actual Paid	15.0	0.0	7.7	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
569380	0	597924	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
569380	0	405634	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	325015	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Clemson Extension Agents taught courses on 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. Home and Garden Information Center (HGIC) website recorded 3,566,476 hits last year. HGIC developed and mailed 413 fact sheets. Extension horticultural programs were conducted such as pesticide applicators recertification, turf management, pesticide recordkeeping, managing insects and diseases on plants and trees, spreader calibration, fertilizer applications for nurseries and landscapes, and fire ant management.

This year in research the SC84-319 Southern Pea was reviewed by the Clemson University Variety Release Committee and approved for release with the cultivar name 'Ogle'. In addition, wheat breeding lines were tested and are ready for release and official variety trials were conducted for corn, cotton, soybean, sorghum, wheat, oat, barley, and southern pea. Other research developed a degree-day model for the lecanium scales allow landscape care professionals to accurately time the application of insecticides, effectively eliminating 1-3 applications on each population.

Within Sustainable Agriculture Production for non-food Horticulture Crops, Clemson University researchers are continuing to develop research-based Best Management Practices for South Carolina turfgrasses. Continuing research is looking to develop a cost-effective, efficient, and environmentally sustainable water treatment system that will facilitate implementation of effective treatment technologies beyond those chemically-based systems currently in use. Additional research will explore the efficient use of water to propagate floriculture crops through the implementation of a dynamic mist control system.

Additional research is looking 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. As well as examine and provide solutions for some of the most recalcitrant pathology problems in golf course bermudagrass greens at this time.

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?

The Home and Garden Information Center Coordinator serves as an expert to answer horticulture questions received from South Carolina residents. The agent also offers two online classes through the eXtension Moodle platform.

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	6905	10532	0	0

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

Patent Applications Submitted

Year: 2015
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	2	14	16

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Disclosures

Year	Actual
2015	3

Output #2

Output Measure

- Licenses

Year	Actual
2015	0

Output #3

Output Measure

- Number of people completing horticultural educational workshops

Year	Actual
2015	6905

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants gaining knowledge and applying skills learned in environmental horticulture education.

Outcome #1

1. Outcome Measures

Number of participants gaining knowledge and applying skills learned in environmental horticulture education.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	6224

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 271 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 were affected. Assistance was offered to nurseries and floriculture producers.

Results

Due to improved knowledge of tree management, pest management, and fertility management particularly in old orchards undergoing renovation, growers have saved or gained in better quality and yields \$47,500. There were 15 joint educational efforts with industry, state or federal agencies and/or trade associations.

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	Pathogens and Nematodes Affecting Plants
215	Biological Control of Pests Affecting Plants

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Competing Public priorities

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Over 271 programs were conducted reaching 6,905 people. Of those participating in programs 90% 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%	15%	0%
112	Watershed Protection and Management	35%	0%	31%	0%
122	Management and Control of Forest and Range Fires	10%	0%	0%	0%
123	Management and Sustainability of Forest Resources	10%	0%	30%	0%
131	Alternative Uses of Land	5%	0%	0%	0%
133	Pollution Prevention and Mitigation	10%	0%	8%	0%
134	Outdoor Recreation	5%	0%	0%	0%
135	Aquatic and Terrestrial Wildlife	5%	0%	8%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	8%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	21.0	1.0	4.5	1.0
Actual Paid	13.0	0.0	16.8	0.0
Actual Volunteer	15.0	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
527212	0	382980	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
527212	0	666497	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	2032868	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Agents and specialists conducted fire assessments, and presented workshops on prescribed fire burning, timber taxation, wildlife and pond management, hunting and land liability, forest landowner association meetings, Carolina Clear workshops and worked with individual families. A Master Pond Manager Course was held. Master Naturalist volunteers provided over 19,800 hours of service. This statewide corps of volunteers provide education, outreach and service dedicated to the beneficial management of natural resources in South Carolina. Clemson University and the South Carolina Department of Health and Environmental Control implemented the Certified Erosion Prevention and Sediment Control Inspector (CEPSCI) program. Water Resources Agents partnered with the Enoree River Educational Board to work with septic pumping contractors to identify potential failing septic systems and high risk communities. A Stormwater Pond Problem Solving Clinic and Stormwater Pond Management Conference were conducted. The billboard campaign for the Stormwater Education Consortium encouraged smart landscaping for water stewardship, reached 0.5 million residents in four different locations across the Tri-County. The ACSEC's demonstration sites recorded more than 70,000 visitors, providing a hands-on opportunity for residents to see and learn about best management practices for their yard. In addition, 4H2O Exploring Watershed summer camps were conducted targeting youth and adults. A Carolina Schoolyards Curriculum Writing Workshop was conducted to teach South Carolina educators how their schoolyards can become environmentally friendly. They installed a rain garden at a Carolina Yards demonstration site. As part of the workshop, teachers began writing curriculum for the Carolina Schoolyards program.

Clemson University research has shown the importance of the development of regional networks that can support data sharing and collaboration, in order to adequately inform coastal climate change adaptation policy at multiple scales. Additional research is trying to better understand the fate and toxicity of emerging materials, specifically nanomaterials and pharmaceuticals; identify potential areas of conflict between 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; and on how climate change related disturbances, such as hurricanes, sea level rise, salinity intrusion, and drought, insect break out, fire and management, etc affect the coastal forests, and how coastal forests react to these disturbances.

Research this year also had a positive effect on developing 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.

2. Brief description of the target audience

The target audience includes farm and forest landowners, Extension agents, and administrators, natural resource professionals, land management agency personnel and 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?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	19866	3849	0	0

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

Patent Applications Submitted

Year: 2015

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	0	26	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Disclosures

Year	Actual
2015	0

Output #2

Output Measure

- Licenses

Year	Actual
2015	0

Output #3

Output Measure

- Number of people completing educational workshops.

Year	Actual
2015	19866

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of people gaining knowledge and using practices to improve water quality and quantity.
2	Number of people applying wildlife habitat improvement practices.
3	Number of acres affected by sustainable forestry practices.

Outcome #1

1. Outcome Measures

Number of people gaining knowledge and using practices to improve water quality and quantity.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	18698

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Natural Resources Management Program promotes the use of Best Management Practices of 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

Agents partnered with the Enoree River Educational Board and worked with septic pumping contractors to identify potential failing septic systems and high risk communities. Clemson and the South Carolina Department of Health and Environmental Control have partnered to develop and implement the Certified Erosion Prevention and Sediment Control Inspector (CEPSCI) program. A Stormwater Pond Problem Solving Clinic and Stormwater Pond Management Conference were conducted. Children ages 9-14 participated in a camp and learned about watersheds, water quality, aquatic ecosystems, and wildlife through a variety of lessons and activities.

Results

After data collection on the Enoree River, all stations showed water quality improvement. With a mean annual wage for construction site inspectors in South Carolina of \$44,940, the CEPSCI program supported salaries and wages of \$50,400,000. The Stormwater Consortium's billboard campaign encouraged smart landscaping for water stewardship and reached 0.5 million residents in four different locations across the Tri-County Area. The Stormwater Consortium demonstration's sites recorded more than 70,000 visitors, providing a hands-on opportunity for residents to see and learn about best management practices for their yard.

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

Outcome #2

1. Outcome Measures

Number of people applying wildlife habitat improvement practices.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1063

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Over three-fourths of the wildlife habitat in South Carolina is owned by private landowners, primarily forest and farm owners; consequently there is an information need related to managing wildlife on these lands in order to create and maintain ecologically significant habitats in and around urban areas as traditional wildlife habitats are lost. Wildlife and human conflicts are a major issue in South Carolina and will continue to pose significant economic and human health risks as the state becomes more developed. An educated clientele is important in trying to find a balance between sustainable natural resource management and development in the state.

What has been done

Agents gave a presentation on the Impact of SC Wildlife on park and recreation areas at the annual conference the South Carolina Park and Recreation Association and demonstrated water quality and wildlife habitat restoration projects during the Water n Wildlife Day at Keowee Toxaway State Park. Agents and specialists taught nuisance wildlife class, invasive species at Wildlife Action Adventure camp for youth, aquatic invertebrates and other duck forages for Horry Georgetown Technical College Waterfowl management class and labs, Feral Hog Reduction workshop at the Waccamaw National Wildlife Refuge, Coyote Control Workshop, Feral Swine Reduction Workshop, Beneficial Insects Class, and delivered the Master Wildlifer program. They

gave a report and demonstration of wild hog trapping techniques at the annual meeting of The Wildlife Society. Agents participated in an Invasive Species Curriculum development meeting with Santee Cooper. A 75 feet of wetland carpet was installed to demonstrate the use of select vegetation at the water edge rather than turf. The benefits of this best management practice include reduced erosion, bank stabilization, protect water quality, add aesthetic value, deter nuisance waterfowl, and attract desirable wildlife.

Results

Of the youth and adults participating in the wildlife educational programs, almost 99% reported a gain in knowledge and 85% reported using practices learned.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
135	Aquatic and Terrestrial Wildlife

Outcome #3

1. Outcome Measures

Number of acres affected by sustainable forestry practices.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	500000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Forestry and forest products manufacturing are one of the largest economic drivers of South Carolina's economy, adding \$17 billion annually to the State's economy.

What has been done

Extension agents developed and delivered 28 educational programs in the areas of Sustainable Forest Management and Natural Resources, reaching 942 people. Agents conducted fire assessments, and presented workshops on prescribed fire burning, timber taxation, pond management, hunting and land liability, forest landowner association meetings, and worked with individual families. Volunteers such as Master Naturalists were trained and they contributed over 19,857 hours of service.

Results

Almost 96% of those participating in programs gained knowledge. Total acres affected were about 500,000. Volunteer service hours represented \$408,274 of program support.

4. Associated Knowledge Areas

KA Code	Knowledge Area
122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Competing Public priorities

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Over 892 programs were conducted reaching 19,866 people. Of those participating in programs, 94% reported that they gained knowledge.

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%	17%	0%
503	Quality Maintenance in Storing and Marketing Food Products	5%	20%	17%	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%	33%	20%
723	Hazards to Human Health and Safety	40%	10%	33%	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: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	3.5	1.9	1.0
Actual Paid	5.0	3.5	3.1	2.0
Actual Volunteer	5.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
128453	191462	188232	443038
1862 Matching	1890 Matching	1862 Matching	1890 Matching
128453	191462	116618	443038
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	289304	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Safe handling of food was taught to handlers in the food service industry and the general public. Commercial food processors were targeted in an effort to improve commercial food processing efficiencies and effectiveness 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.

Current Clemson research topics include the food safety implications related to organic vs. conventional systems for egg laying, on-farm composting, natural antimicrobials, antimicrobial packaging and modified atmosphere packaging. Other research is developing a rapid, sensitive, specific, and cost-effective bioassay for detection of viable *Mycobacterium avium* subspecies *paratuberculosis* (Map) in milk and fecal samples. More research is a pro-active approach to prevent risks of the combination of pathogenic biofilm-forming bacteria in causing respiratory disease in a susceptible population.

1890 Research investigates conventional fumigation to manage stored insect products. The study looks at lethal ozone concentration for different life stages of selected species; establish optimal lethal ozone concentration for different life stages of selected laboratory-reared species to get a dose-time-mortality response relationship; evaluate susceptibility of field collected strains to ozone and determine biological and reproductive responses of adult insects surviving sub-lethal dosages of ozone gas. Stored-product insect colonies were continuously maintained. An ozone generator is being fabricated and manufactured. Insect master colonies that provide life stages of cigarette beetle, drug store beetle and merchant grain beetle were established and maintained on a regular basis. The adult beetles were exposed to ozone concentration for one hour at different temperatures. The data was collected and analyzed.

As a new 1890 Research project, the study will evaluate the potential impact of the Transatlantic Trade and Investment Partnership (TTIP) on food safety, South Carolina agricultural production, exports and trade. The effects of the United States and European Union (US-EU) harmonized food safety regulatory standards on the State of South Carolina competitiveness in farm exports and trade will be evaluated. A comparison with the South East Region will be provided. The design of the farm survey questions were completed and printed. The instrument is ready to be administered to the survey respondents and farmers in South Carolina. The South Carolina representative farm models were updated. Exports models are being developed.

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?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1791	322	0	0

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

Patent Applications Submitted

Year: 2015
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	1	11	12

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Licenses

Year	Actual
2015	0

Output #2

Output Measure

- Disclosures

Year	Actual
2015	2

Output #3

Output Measure

- Number of people completing educational workshops.

Year	Actual
2015	1791

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 applying practices learned.
2	Number of managers/supervisors/food handlers completing educational program and receiving a course certificate
3	Number of new or improved food products entering the market as a result of adopting recommended practices
4	Number of people reached through media outlets that utilize Extension food safety resources.

Outcome #1

1. Outcome Measures

Number of participants reporting increased knowledge in safe food handling and applying practices learned.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1762

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

Agents and specialists conducted 133 programs in the area of food safety and food preservation education. Agents and volunteers taught food dehydration class, preserving and storing fruits and vegetables, and jam and jelly workshops. Canning displays were set up at the Farmers Market. Media programs (articles published in newspapers, other external publications, information delivered through radio, television, and social media) reached over 800,000 people with topics of Food Safety, Nutrition, and Health.

Results

Of the adults participating in the educational programs, 98% reported a gain in 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
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety
724	Healthy Lifestyle

Outcome #2

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	0

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 36 ServSafe® food safety training for managers, supervisors, and other food handlers. A total of 206 food-service employees representing 140 food establishments participated.

Results

The approximate economic value of the trainings could be as high as \$10,500,000 by preventing outbreaks.

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

Outcome #3

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
2015	15

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

Workshops included Food Safety Workshop for Food Entrepreneurs, Food2Market. Specialists conducted tests including 58 nutrition facts panels, 6 water activity, 78 pH tests, several nutrient analysis, and viscosity analyses.

Results

Fifteen new or improved food products entered the market as a result of adopting Extension recommendations. Over \$13,543 was secured for product testing.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Number of people reached through media outlets that utilize Extension food safety resources.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

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 1,791 persons who completed Food Safety programs, 98% reported a gain in 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%	20%	0%	20%
609	Economic Theory and Methods	10%	10%	33%	10%
610	Domestic Policy Analysis	15%	10%	0%	10%
801	Individual and Family Resource Management	15%	15%	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%	50%	15%
806	Youth Development	15%	10%	0%	10%
903	Communication, Education, and Information Delivery	0%	10%	17%	10%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	13.0	7.0	2.8	3.0
Actual Paid	7.0	6.0	6.5	6.0
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
330288	394429	574806	824376
1862 Matching	1890 Matching	1862 Matching	1890 Matching
330288	394429	379643	824376
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	239159	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Current research has developed a beta system that provides for query based reports of economic impacts of research specific to crop type, soil type, and user-defined geographic region. Additional research is responsible for maintaining and enhancing the effectiveness and functionality of NIMSS and access and utilization of the NIMSS database.

The Catawba Fresh Market allows customers to shop 24 hours a day from their computers. Once placed online, orders are processed by local growers and then delivered to pre-determined customer pick-up sites. The market is made possible through a partnership between Clemson Extension, the Catawba Farm and Food Coalition and Eat Smart Move More York County. Currently, the site has 42 active farmers selling items such as meat, eggs, produce, breads and other value-added products.

(www.catawbafreshmarket.com). In 2015 Clemson Extension and the Catawba Farm and Food Coalition launched the Catawba Region Food Systems Agency Roundtable to encourage collaboration, networking and professional development of members of food and farming related organizations. This Roundtable occurs monthly and provides a venue for information sharing and a platform to provide a comprehensive approach to assist new and beginning farmers.

The Clemson Institute for Economic Development is working with the winner of the business plan contest (conducted last year), and the city of North Charleston, to implement her plan to educate and provide a retail food market and urban agriculture farm for the Chicora Cherokee neighborhood in North Charleston. This neighborhood is considered a food desert. Residents did not have healthy food available in their vicinity. With the new plan in place residents in the Chicora Cherokee neighborhood now have healthy food alternatives within their vicinity, as well as readily available healthy food education.

Agents distributed 10,000 copies of the Pee Dee Food and Farm Guide. The guide features information on agritourism farms, farmers markets, roadside stands, pick your own farms, specialty crop producers, specialty product businesses, all of whom place special emphasis on supplying products derived from local sources.

The 1890 Research Program has five new studies going on in community, leadership and economic development. The first study investigates the dynamic linkages among capital investment, export, agribusiness, education, business climate and quality of life variables and economic development in South Carolina. The research project will identify the factors that influence economic development variables such as employment, per capita income and poverty and use the results to recommend appropriate strategies needed by policymakers for economic development in South Carolina.

Another investigation is a Data Envelopment Analysis (DEA)-based integrated logistics network system designed to improve supply chain efficiency in South Carolina. The research is important for strategic decisions that significantly affect the overall performance of supply chain management activities. To date, the researcher has completed a mathematical formulation for disaster relief supply chain problems. A spreadsheet model for disaster relief supply chain network has been developed. A new cross efficiency

method in DEA was developed for finding the most efficient decision making unit(s).

Research is being conducted address the problem of how jobs can be created to stimulate economic development and growth by establishing international markets and using the U.S. export credit programs to mitigate non-payment risk associated with such markets. Its relevancy is how the current U.S.

unemployment rate can be reduced further and how the U.S. labor participation rate can be boosted. To date, the survey questionnaires have been formulated and given to the 1890 Extension personnel for dissemination in the various counties.

An investigation on accelerating the usage of digital communication technologies by small agribusiness firms in South Carolina is taking place. The research plans to (1) take stock of current levels of digital technology used among small agribusinesses in South Carolina, (2) identify factors related to the adoption and usage of digital media platforms for business promotion by small agri-based businesses and develop programs and services that provide assistance to businesses in digital content creation and dissemination. Articles related to small business use of digital mediums for marketing activities were categorized and summarized to gather a comprehensive understanding of current research related to digital technology initiatives in a small business setting. A preliminary survey instrument was designed to gauge the level of digital technology usage. The researcher(s) have identified a place to house the Digital Media Resource Lab and digital resource center. All appropriate permissions have been taken to utilize the space.

A study focusing on the reduction of transient instability related power blackouts to lessen the crops and livestock losses by U.S. farms and the spoilage of refrigerated agricultural products is underway. The ultimate goal of the project is to establish a proposed implementation technique as a very powerful tool that can play an important role in the secured operation of power systems by reducing power blackouts due to transient instability. A mini power system research lab has been set up.

The 1890 Adult Leadership and Community Development Program provides communities with leadership training, financial management, business and job development, family and consumer education and child development capacity that creates opportunities for continuous and sustained growth. The program assists communities in building the potential to enhance their own resource development capacity from the inside out. A Community Education Catalog was disseminated throughout the Cluster counties identifying programs and activities to be held in specific areas. Summer camps were held and exhibition booths at fairs and expos were conducted.

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?

eXtension was not used in this program.

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	4849	8371	36	0

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

Year: 2015
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	0	4	4

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Publications, business plans and housing grants.

Year	Actual
2015	2

Output #2

Output Measure

- Total number of people completing educational workshops.

Year	Actual
2015	4849

Output #3

Output Measure

- Number of board members trained.

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

2015 76

Output #4

Output Measure

- Number of homes rehabilitated.

Year	Actual
2015	0

Output #5

Output Measure

- Number of business owners increased knowledge.

Year	Actual
2015	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Total number of people reporting increased knowledge in community improvement and development as a result of participation in CLED activities.
2	Number of participants engaged in community promotion projects

Outcome #1

1. Outcome Measures

Total number of people reporting increased knowledge in community improvement and development 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
2015	7109

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

South Carolina citizens requested outreach services which would improve their quality of living as well as their respective communities. The Community Education Catalog was created to serve as a vehicle in informing the community about the 1890 Extension Program, its cluster offices and the various programs available.

What has been done

The 1890 Extension Community Education Catalogs were distributed statewide to the Cluster counties by the Extension staff..

Results

As a result of preparing and distributing the catalogs, ninety-five percent of them were disseminated into the communities. Program participation increased.

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 Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	3740

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

Clemson continues to provide guidance and training support to Farmers Markets Advisory Boards. The Charleston Economic Community Development program has teamed up with a produce company to develop low-cost strategies to get GAP certification for small farm crop operations. This opens up markets that might not otherwise be available to the farmers. It also improves the management capabilities of participants.

Results

This year, 9 farms are getting either certified, re-certified, or preparing for future certification. The Charleston ECD program has been training entrepreneurs involved in agriculture and creative business to execute their businesses successfully. This year, 20 students have successfully graduated from the ten week program. In addition, Community Pride, Inc., an organization sponsored by Clemson Extension Service and managed by Charleston Extension Agent sponsored four major cleanups. Approximately 182 groups participated in the program accounting for 2,109 individual volunteers. An estimated 58,471 pounds or 29 tons of litter was removed from 364 miles of state maintained roadsides. Volunteers donated 4,842 hours of time to make their communities more aesthetically pleasing. Based on the estimated dollar value of volunteer time at \$20.56 per hour, this provided a savings of \$99,551 to the local tax payers. Over 594 people that completed a leadership project collaborated on a task or concern.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
609	Economic Theory and Methods
610	Domestic Policy Analysis
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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Public Policy changes
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

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. Of the 3,740 persons participating in programs, 76% reported a gain in knowledge.

Ninety-five percent of the Community Education Catalogs were distributed.

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%	20%
802	Human Development and Family Well-Being	15%	20%	0%	25%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	30%	20%	0%	25%
806	Youth Development	50%	50%	0%	30%
Total		100%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	23.0	11.5	0.0	0.0
Actual Paid	26.0	11.5	0.0	2.0
Actual Volunteer	78.0	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
803537	460114	0	355237
1862 Matching	1890 Matching	1862 Matching	1890 Matching
803537	460114	0	355237
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 Agents and volunteers reached youth and family members through educational programs on agriculture, science and technology, natural resources, food safety and nutrition, and leadership skills. In STEM programs, youth used critical thinking and problem-solving skills. Four youth represented SC at the 2015 National 4-H Conference in Washington, DC. Youth participated in the SC Jr. Beef Round Up, Breed Classes, Cloverbud Beef Cattle Knowledge College, Poultry Showmanship Clinic. 4H Agents provided 4H Embryology Curriculum and Brooder Equipment for students at schools that was used in classrooms as science school enrichment. Agents partnered with Master Gardeners, businesses and other agencies to sponsor an Ag Day for Kids at the Pee Dee Research and Education Center. 4-H teams from South Carolina participated in national 4-H livestock judging contest and national 4-H Public Speaking Contest. A South Carolina team won the National Horse Bowl competition. 4-H Community Gardening efforts alone have impacted youth and families through active participation and community outreach. Youth learned about composting, rainwater harvesting, and watershed pollutants. Youth learned about their communities and were contributing members in them. Youth led and participated in citizenship and service projects. Youth used math skills, critical thinking, and creativity, which are valuable life skills. Over 3,021 adult volunteers contributed 18,126 hours of service. 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. 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. Agents reached youth and adults during in school and after school programs, day camps, summer camps, community centers, Head Start, churches, and libraries. In addition, agents used various media, including social media outlets to publicize nutrition information.

The 1890 Extension Program provided area constituents services in the areas of agriculture/natural resources, healthy lifestyles, citizenship, leadership skills, basic life skills, character education, food safety and nutrition, science engineering and technology (SET) and financial management. Forty-eight articulation agreements with external sources were established in the 4-H and Youth Development Program. Over 600 youth participated in the National 4-H Youth Science Day Project. Youth participated in workshops on Character Education, Career Preparation, Entrepreneurship, Food and Nutrition, and organized Recreation/Healthy Lifestyles Projects. Additional science projects were undertaken as well as participation in Junk Drawer Robotics. Program participants took part in college tours and experienced youth day activities at South Carolina State University. Students had an exciting as well as educational experience in the Strategies in Math and Reading using Technology (SMART) Academies, which were held in two locations of the state.

In 1890 Research, the "We Can Too: Challenging and Encouraging African American Males to be Successful in Mathematics" project was recently funded. However, the researcher has announced the project to the community and identified project staff. Data collection routines were established. With another research project, the researcher focused on assessing the degree of developmentally appropriate assessment, curriculum and best strategies utilized by community-based child care center-based programs. Thirty individual pieces of observational data on interaction, curriculum, teaching strategies and supervision with the appropriate sub-scales of the Early Childhood Environmental Rating Scale (ECERS) was collected. Staff training was provided for implementing the Teachstone's Class Observation System and the ECERS.

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?

eXtension was not used in this program.

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3096	1604	64992	81907

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

Patent Applications Submitted

Year: 2015
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	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
2015	65067

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
2015	3021

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 who gain knowledge in natural resources and shooting sports.
7	Number of youth who develop and improve communication skills through speaking and debating.
8	Number of youth increased knowledge in financial management.

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	3021

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 trained over 3,021 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 18,126 hours of volunteer service, which represents a \$372,670 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
802	Human Development and Family Well-Being
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
2015	9216

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 4-H youth participated in leadership training, 4-H Ambassador training, 4-H State Congress, county teen councils, Character Critters, Manners Matter, Jr. Leadership programs, and club officer training to help them serve more effectively in their leadership roles at the club, county, regional, or state levels. Ambassadors represent 4-H to the public and are involved in writing and speaking to the media. 1890 Extension held 126 workshops. There was an increase in the # of MOUs by 20%.

Results

Four youth represented South Carolina at the 2015 National 4-H Conference in Washington, DC. The students engaged in developing and presenting ideas about important issues that affect the entire country. Gains have been reported in knowledge of civic engagement, improvement in self-esteem, new skills demonstrated, and improved connections to the community. 1890 Extension increased 9% of youth reached compared to last year. Of the 126 workshops, 1682 persons gained knowledge (85%). Thirty-two percent intended to adopt Citizenship practices.

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
2015	1460

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

Some 1,460 youth participated in service projects. Youth volunteers gave approximately 8760 service hours. 4H Service projects are arranged through the schools, churches, businesses and other organizations. Youth baked and packaged cookies, then delivered them to an area nursing home. They served at local soup kitchens, donated food to Harvest Hope Food Bank. Students at the Alfred Rush Academy Alternative School prepared Chemo Care Kits to donate to the local hospital. Youth prepared 195 Hero Packs for Army National Guard Youth with deployed family members. Youth participated in a Pet Appreciation Day, baked dog treats and sewed pet toys while promoting their clubs. Youth also participated in National Congress service projects.

Results

The service hours that were contributed were valued at more than \$180,105. 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

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 Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	12954

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 535 Plant and Animal 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 and vegetable gardens.

Results

The youth were able to experience gardening, from soil and seed and from the market 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, the 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 in the youth and teaches them responsibility.

4. Associated Knowledge Areas

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

3b. Quantitative Outcome

Year	Actual
2015	13390

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, and technology.

What has been done

Agents conducted a Robotics Training for teachers. They developed a Curriculum Writing Workshop with 16 science educators from across a 3-county area and assisted teachers in writing 100 lesson plans for youth grades K-8 focusing on STEM and how it integrates with their school gardens. A STEAM Camp was conducted in partnership with USC Salkehatchie. Youth built a Soap Box Racer during workshops and then were allowed to race their cars at the 4H Soap Box Race. Rocket building workshops were conducted during an after school program for military youth. A GPS Training was conducted to help youth prepare for engineering contest. Balloon cars demonstrated the Laws of Motion for a local Hispanic club. Citizen scientists were recruited to participate in the field expedition with EarthWatch Institute.

Results

Youth learned through the study of forensics, techniques to extract DNA. Through the soapbox racer workshops they experimented with acceleration, kinetic energy, aerodynamics, inertia and friction. Through the robotics program they demonstrated the use of math, critical thinking,

problem solving, and creativity, which are valuable life skills. After the 1890 Program trainings, 72% of the participants gained knowledge, while 82% indicated an increase 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 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
2015	4110

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 208 programs were conducted reaching over 4,116 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 of 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 #7

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 Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	727

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Youth need opportunities to develop assets such as 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

Fifty-two programs were conducted reaching 756 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

Outcome #8

1. Outcome Measures

Number of youth increased knowledge in financial management.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	29

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

At-risk youth lack awareness of the significance of sound money management and resource planning development. In the Hampton Cluster, 34.6% of people live in households with incomes below the poverty level. Research indicates that 58% of the youth population learn what they know about money management from their parents. Therefore, leading to rising numbers of personal bankruptcies, credit delinquencies and inadequate savings. There is a significant need for effective financial management instruction.

What has been done

The 1890 Extension coordinated a Finance Management Project to address the financial concerns of youth. Workshops with activities were held to address money management, entrepreneurship, economics, savings and investments.

Results

The evaluations conducted at the completion of the projects indicated 100% of the participants increased their knowledge. Twenty-five percent of the groups reported their intent to adapt to utilizing the entrepreneurship principles.

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

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: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	10.0	4.0	0.0	5.0
Actual Paid	21.0	4.0	0.0	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
682180	158630	0	297662
1862 Matching	1890 Matching	1862 Matching	1890 Matching
682180	158630	0	297662
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 4,427 educational programs were conducted reaching approximately 37,813 people. Agents organized and taught boot camps and workshops for school cafeteria supervisors and state staff from across South Carolina. Agents taught MyPlate, Dietary Guidelines, Healthy Lifestyles, Cooking healthy-Eating Smart, Fit Family Challenge, Cooking Day Camp, and Kids in the Kitchen. They organized Health Fairs. 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. In addition, agents used various media, including social media outlets to publicize nutrition information.

The research study dealing with reclaiming a healthy heritage increased consumption of nutritional foods, developed two nutritional newsletters for stakeholders, planted three vegetables gardens and prepared nutritional foods. The foods prepared and grown included tomatoes, collards and sweet potatoes. Students planted, picked and prepared the foods from the garden. Nutritional recipes were prepared and consumed during snack and lunch times. Another investigation is taking place dealing with the reduction of cancer risks caused by obesity and metabolic syndrome. Training has been done in mammalian cell culture techniques and the aseptic method. An enzyme-linked assay to evaluate and semi quantitate apoptotic activity in cells was introduced and is being optimized for conditions for regular assaying of apoptotic 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

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	7659	2350	30154	9

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

Patent Applications Submitted

Year: 2015
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	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
2015	10519

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 Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	9093

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Overweightness and obesity have reached epidemic proportion in the United States. Both cut across all ages, economic levels, and racial and ethnic group and both are key factors for chronic diseases, such as heart disease, diabetes, arthritis, high blood pressure, stroke and some types of cancer. The primary causes of these conditions may be related to poor diet and lack of physical activity.

What has been done

Agents taught MyPlate, Dietary Guidelines, Healthy Lifestyles, Fit Family Challenge, Cooking Day Camp, and Kids in the Kitchen. They organized Health Fairs. Agents reached youth and adults during in school and after school programs, healthy lifestyles day camps, summer camps, Head Start, churches, and libraries.

Results

Of the 9093 people participating in programs, 88% reported a gain in knowledge.

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

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	10141

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The prevalence of overweight 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 sixty percent 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. The S.C. Obesity Burden Report found 64 percent of middle school students and 76 percent of high school students did not attend physical education classes each week and less than 25 percent consumed the recommended daily servings for fruit and vegetables.

What has been done

A summer online course for teachers explores fun and creative ways to teach nutrition and physical activity to South Carolina students. The Nutrition and Obesity Prevention Education program, or NOPE, includes both self-paced modules as well as live webinars. In addition, Culinary Partners and the Clemson University Expanded Food and Nutrition Education Program (EFNEP) team offered eight boot camps and training for 288 school cafeteria, supervisors and state staff from across South Carolina. A five-day, hands-on training focusing on the fundamentals of scratch cooking, new knife skills and basic nutrition education were planned during the late summer. The Boot Camp trainings were hosted at Greenville and Horry-Georgetown Technical Colleges, RD Anderson Applied Technology Center and Hannah-Pamplico Middle School.

Results

Culinary Partners work with partner school districts to assess food service program strengths and weaknesses. Opportunities are available to develop recommendations for action that each district can pursue to increase quality and efficiency the school food service delivery. The boot camp has

provided the staff with opportunities to cook with fresh, whole ingredients, and wide range of spices to improve the quality of meals they serve. 90% of the participants in the Culinary Boot Camp reported they increased their nutrition knowledge about MyPlate, Dietary Guidelines and six basic nutrients.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
723	Hazards to Human Health and Safety
724	Healthy Lifestyle

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Public Policy changes
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Of the 37,813 persons participating in extension educational programs, 85% reported gaining knowledge in nutrition and obesity. In addition, Expanded Food and Nutrition Education Programs were conducted for 699 limited resource adults to improve nutrition practices, food safety, and food resource management practices such as planning meals, comparing prices, and using grocery lists. More than 79% 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 that 81% of the youth reported eating a variety of foods; 63% increased their ability to select low-cost, nutritious foods; and 36% improved practices in food preparation and safety.

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
111	Conservation and Efficient Use of Water	0%	0%	34%	0%
132	Weather and Climate	0%	0%	33%	0%
205	Plant Management Systems	0%	0%	33%	0%
	Total	0%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.0	1.0
Actual Paid	0.0	0.0	4.5	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
0	0	53782	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	74681	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	664526	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Patent-pending remote sensing technology is being used in select South Carolina waters to collect valuable data for gauging the impact of climate change. Sensors will measure water flow rates and provide water resource managers with real-time information for GIS/hydrology flood warnings to activate first responders in rural areas. In addition the sensors can detect pollution events for more effective water quality management.

Current Clemson University research addresses the effects of severity and frequency of prescribed burns on the production and exports of pollutants and nutrients in forested watersheds. The knowledge gained from combined laboratory and field studies will increase understanding of fundamental physical and chemical processes controlling the formation and movement of pollutants and nutrients in forest ecosystems, and the roles of organic matter in pollutants transformation and transport in actively managed forests.

2. Brief description of the target audience

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

3. How was eXtension used?

Filler text

V(E). Planned Program (Outputs)

1. Standard output measures

2015	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: 2015

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	0	8	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Disclosures

Year	Actual
2015	0

Output #2

Output Measure

- Licenses

Year	Actual
2015	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.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

{No Data Entered}

What has been done

{No Data Entered}

Results

{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate

Outcome #2

1. Outcome Measures

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

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate

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

Filler text

Key Items of Evaluation

Filler text

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%
402	Engineering Systems and Equipment	0%	0%	50%	0%
511	New and Improved Non-Food Products and Processes	0%	0%	50%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	2.4	1.0
Actual Paid	4.0	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	1.8	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
151748	0	249809	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
151748	0	51784	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	420018	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Current Clemson research is looking to improve the conversion of agricultural crops, specifically switchgrass to soluble carbohydrates that can be subsequently converted to biofuels or biofuel precursor. Further research is building a platform of production information about feedstocks that can be grown sustainably to use in South Carolina's future bioenergy industry. More research is looking to investigate and develop sustainable technologies to convert biomass resources into chemicals, energy, materials and other value added products. Extension agents are collaborating with researchers through the SC Bioenergy Summit. They are educating the public about the production of switchgrass and how it supports local agriculture.

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.

3. How was eXtension used?

eXtension was not used in this program.

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2584	890	0	0

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

Patent Applications Submitted

Year: 2015

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Disclosures

Year	Actual
2015	0

Output #2

Output Measure

- License agreements

Year	Actual
2015	0

Output #3

Output Measure

- Number of people completing educational workshops

Year	Actual
2015	71

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of people reporting knowledge gained in sustainable energy and land management and diversification strategies.

Outcome #1

1. Outcome Measures

Number of people reporting knowledge gained in sustainable energy and land management and diversification strategies.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	2437

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

Workshops were conducted on the topics of prescribed fire burning, timber harvesting, forest herbicides, timber taxation, 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

Of the 2584 people attending programs, 94% 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
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Over 94% of the people participating in Extension educational programs gained knowledge. The total acres affected were about 500,000.

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%	14%	0%
204	Plant Product Quality and Utility (Preharvest)	10%	25%	17%	0%
205	Plant Management Systems	15%	25%	24%	0%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	0%	7%	0%
212	Pathogens and Nematodes Affecting Plants	25%	0%	10%	0%
213	Weeds Affecting Plants	10%	0%	4%	0%
216	Integrated Pest Management Systems	20%	0%	7%	0%
601	Economics of Agricultural Production and Farm Management	5%	40%	17%	0%
701	Nutrient Composition of Food	5%	0%	0%	0%
	Total	100%	100%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	34.0	8.0	4.9	2.0
Actual Paid	31.0	8.0	31.7	0.0
Actual Volunteer	300.0	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
1330707	323284	2256309	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1330707	323284	2711323	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	2730449	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Clemson University has a large number of current global food research studies underway. Some examples are research to develop and refine strategies for managing insect pests of soybeans, research to prevent replanting mistakes by the tree fruit industry by identifying rootstocks that are more productive and thus more profitable than existing rootstocks, research to develop an efficient and affordable sensor-based irrigation scheduling technique for cotton to account for field variability in the southeastern Coastal Plain soils, and research to integrate chemical and cultural practices to manage troublesome weeds in agronomic crops in South Carolina.

Additional research is looking 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. More research is aiming 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.

This past year investigators developed a new smartphone application, MyIPM, to promote Integrated Disease Management for sustained peach and strawberry production in the southern United States. Another project began the process to design, build and evaluate a Black Soldier Fly (BSF) composting system for bioconversion of food and farm waste into compost, animal feed, and oil for biodiesel fuel production. Expansion of the system could potentially convert over 200,000 lbs of solid food waste annually from campus dining halls that would normally be deposited in landfills into 4-5 tons of animal feed, 4,000 gallons of petro-diesel, and 17 tons of compost for crop production.

The Agricultural Service Laboratory provides a variety of analytical agricultural testing. The Laboratory is a member and certified as a participant of the Agriculture Laboratory Proficiency Program for Soil, Plant, and Water Analysis Laboratories which provides quarterly exchanges of plant, soil, and water samples. In the year 2015, the Ag Service Lab analyzed 49,401 samples, including 2067 plant tissue, 713 feed and forage, 1604 animal waste, 690 irrigation water, and 67 compost samples.

Agronomic educational programs and activities were conducted that focused on integrated crop management, integrated pest management, water resources, risk management, and marketing. Field trials were conducted and demonstrated. An Unmanned Aerial Vehicle (UAV) has been purchased for use in field research and problem identification. The UAV is a battery powered four rotor quad copter equipped with a mounted camera which can take high resolution pictures from heights up to 400 ft. and can be used in numerous ways such as scouting row crops for insect, disease, nutrient deficiency, and irrigation issues.

Extension horticultural programs included workshops on pesticide applicators recertification, turf management, pesticide recordkeeping, managing insects and diseases on plants and trees, spreader calibration, fertilizer applications for nurseries and landscapes, and fire ant management. Extension conducted fruit growers meetings and broccoli field days. Participants learned about cultivars, spacing, and management techniques that help them become more profitable. Other sessions included the Small Sustainable Farms and Backyards Class, managing ecological pests in organic production, vegetable disease training, vegetable production meetings, on-farm trial peach cultivars, sprayer calibration school, and Certified Crop Advisor training.

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, producers, master gardeners, and growers.

3. How was eXtension used?

The Home and Garden Information Center Director responded to questions received from across the nation as an Ask an Expert on eXtension.org.

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	19472	18197	44	38

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

Patent Applications Submitted

Year: 2015
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	0	28	28

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Disclosures

Year	Actual
2015	2

Output #2

Output Measure

- Licenses

Year	Actual
2015	1

Output #3

Output Measure

- Number of people completing educational workshops

Year	Actual
2015	19499

Output #4

Output Measure

- New Variety Releases

Year	Actual
2015	0

Output #5

Output Measure

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

Year	Actual
2015	1625

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of people reporting increased knowledge in agronomic practices that are environmentally sensitive and economically efficient.
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 applying skills learned and reporting activities.

Outcome #1

1. Outcome Measures

Number of people reporting increased knowledge in agronomic practices that are environmentally sensitive and economically efficient.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of youth gaining knowledge of food systems

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	3000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Good food practices learned early on in life can mean the difference between healthy and unhealthy lifestyles for the consumer. Youth need to understand what the food systems means to them and how it affects their health.

What has been done

Extension agents taught educational programs on the global food web and food deserts. Youth participated in Jr. Master Gardening programs. They were able to experience gardening, from soil and seed and from the market to the table through gardening projects.

Results

4-H Community Gardening efforts alone have impacted some 3000 youth and families through active participation and community outreach. Youth learned recordkeeping, purchasing, storing, and planting knowledge and skills. Youth gained knowledge about where the food that they eat originates and about how the food system directly affects them and their communities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
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
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	10484

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

Farm Enterprise Productivity Analysis training sessions were conducted to identify and evaluate the opportunities for and feasibility of potential activities for South Carolinas primary agricultural commodities. Pesticide applicators recertification, turf management, pesticide recordkeeping, managing insects and diseases on plants and trees, spreader calibration, fertilizer applications for nurseries and landscapes, and fire ant management workshops were conducted. Extension conducted fruit growers meetings and broccoli field days. Participants learned about cultivars, spacing, and management techniques that help them become more profitable. Other sessions included the Small Sustainable Farms and Backyards Class, managing ecological pests in organic production, vegetable disease training, vegetable production meetings, on-farm trial peach cultivars, sprayer calibration school, and Certified Crop Advisor training.

Results

The Extension Agronomic Crop Production programs impact the management and production on over 1,055,097 acres in South Carolina each year. 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. The economic impact of selected Extension Horticulture Programs was \$2,836,000. Extension Commercial Vegetable Production was \$235,000, Commercial Fruit Production was \$960,000, Commercial Ornamental Production was \$500,000, and the Clemson Small Farm Projects \$105,000. The Small Farm Projects between SC State University and Clemson resulted in \$36,000 in savings due to improved fertility and pest management with some reporting a 50% increase in sales volume and a 25% increase in profit margin. Due to improved knowledge of tree management, pest management, and fertility management particularly in old orchards undergoing renovation, growers have saved or gained in better quality and yields \$47,500.

4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens 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 applying skills learned and reporting activities.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	3064

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 77,120 people received information from Master Gardeners through telephone calls, office visits, workshops, and activities. These volunteers conducted plant problem clinics, Ask-A-Master Gardener events, recycling days, community gardening support, speakers bureau, and information booths local farmers markets. The Master Gardener Facebook page served over 6000 viewers.

Results

Master Gardeners contributed over 69,892 hours of service at a value of \$1,436,980 in program support. A Junior Master Gardener program was implemented.

4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
701	Nutrient Composition of Food

V(H). Planned Program (External Factors)

External factors which affected outcomes

- 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 3,064 persons participating in Master Gardener educational programs, 92% 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)	
2214	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 with climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
13522	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)	
15	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.