

2017 South Carolina State University and Clemson University Combined Research and Extension Plan of Work

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I. Plan Overview

1. Brief Summary about Plan Of Work

The Plan of Work reflects Research and Extension activities planned by Clemson University and South Carolina State University to benefit agribusiness, communities and citizens of South Carolina from 2016 through 2020. South Carolina has programs in NIFA's primary target areas: Global Food Security and Hunger, Food Safety, Climate Change, Sustainable Energy and Childhood Obesity. South Carolina is reporting on five other state program areas: Sustainable Agriculture Production for (non-food) Horticultural Crops, Agribusiness and Community Development, Sustainable Animal Production Systems, Natural Resource Management and 4-H Youth Development and Families.

The working relationship between Research and Extension is based on the discovery and delivery of new knowledge through science-based relevant research leading to discoveries specific to South Carolina's needs that are delivered through Extension programs in the planned programs. The major focus areas include advancing the competitiveness of the agriculture and forestry industry, enhancing the economic potential of rural communities, safeguarding the food supply, preserving natural resources and preparing young people to become productive citizens. There is continued emphasis on evaluating all Research and Extension activities and providing quality performance information to stakeholders.

The 2015 Flood Disaster had a dramatic and devastating impact on South Carolina agriculture. Major crops impacted included cotton, peanuts, soybeans, grain sorghum, vegetable crops and wheat. Corn harvest had been nearly completed when the flooding occurred and was impacted the least. Conservative estimates of direct crop losses are estimated at over \$336 million. It is not yet known to what extent the losses will be covered by crop insurance.

Clemson Extension began efforts to assess crop damages within two days of the flood event and those efforts continue today. Through the use of a Flood Damage Assessment Report, farmers were asked to report their losses through South Carolina Emergency Management Division. Over 400 farms responded from across the state. Along with the Damage Assessments, Clemson Extension partnered with the South Carolina Department of Agriculture, South Carolina Farm Bureau, USDA Farm Service Agency, USDA Natural Resources Conservation Service, RMA Crop Insurance, Small Business Administration, FEMA, the Governor's Office, and numerous industry and agricultural lending groups to host 11 farmer meetings to discuss issues such as crop insurance, flooding effects, legislative actions, disaster recovery, agricultural funding options, harvesting options, and farm financing options for 2016. The meetings were attended by over 880 participants. Further meetings are scheduled. Twenty Extension Agents, Crop Specialists, and Agricultural Economists participated directly in the programs through planning, presentations, and assessments.

Clemson continues to establish its Advanced Plant Technology program at the Pee Dee Research and Education Center in Florence. This research will provide a bridge to 21st century agriculture using traditional plant breeding and molecular genetics to develop new crops and crop-based products. The goal of the program is to foster continued development of the agricultural economy in the Pee Dee Region and throughout South Carolina. Specific objectives are to increase the per acre value of crops; improve drought, insect and disease resistance, improve crop yields, and introduce new crops and crop-based products that can expand the market for South Carolina farm products; and attract private agribusiness investment in research, development and application of new technologies and the creation of new crop

varieties. Scientists will focus on developing improved varieties of the state's major crops such as corn and soybeans; improving the biofuel production capacities of crops, which include sorghum and switchgrass; and developing new crop varieties that are not currently economically feasible in the state but offer a viable market potential for South Carolina producers.

New technologies involving the use of Intelligent River Motestack data collection platform are being applied for multi-scale instrumentation of agricultural and forestry systems in Clemson's Hunnicutt Creek Watershed and the agricultural activities in the Calhoun field laboratory, Edisto Research Center, and Baruch Institute. Research will be initiated related to the intermediate biomass densifying processes that can link the research areas of biomass production and biomass conversion. This research will also determine how the choice of feedstock and its management will affect the densifying processes for biomass, the quality of the biomass pellet produced and its use as a solid fuel or liquid fuel.

Clemson research projects are looking to improve the conversion of agricultural crops specifically switchgrass to soluble carbohydrates that can be subsequently converted to biofuels or biofuel precursor; to build a platform of production information about feedstocks that can be grown sustainably to use in South Carolina's future bioenergy industry; and to investigate and develop sustainable technologies to convert biomass resources into chemicals, energy, materials and other value added products.

New research for Clemson will focus on the development, analysis and application of next-generation materials, hardware, software, and network systems required to implement Intelligent Farm technology. The Intelligent Farm represents an emerging sustainable agriculture informatics tool that will transform the way we monitor and manage from small family farms to large industrial farms. The Intelligent Farm will collect unprecedented amounts of data on agricultural and meteorological events, aggregate data into functional databases and transform the data into information to be used for site-specific management of water, nutrients, herbicides and pesticides within individual fields.

Studies at Clemson University will be underway to examine hydrologic, biogeochemical and forest productivity processes along a hydroperiod and salinity gradient in the Hobcaw Barony on the upper coast of South Carolina. The study would not only provide critical information regarding ecosystem processes in a region sensitive to climate change, but also establish a foundation for an environmental sensor network using technological innovation.

Research is underway on remote data collection and data management on forests, tied to the new Intelligent River technology. The Intelligent River™ project is changing the science of river management using cyber infrastructure and remote data gathering. Data, including temperature, turbidity and dissolved oxygen, are collected in a database that can be viewed via the Internet. The data collected for forests will be valuable for landowners. The application of this technology to forest production has been requested by landowners in the state. Techniques to enhance forest growth and quality are critical to growers in the state.

New research in Global Food Security and Hunger will be underway in the following areas: the development of Intelligent Agri-tronic Devices (IAD) and methodology for site-specific management of crop inputs (irrigation, nutrients, pesticides, etc.) for cattle production to enhance farm profits and environmental sustainability of South Carolina's agriculture, the reduction to costs while providing a robust mechanism to manage weeds in agronomic crops in South Carolina, and the improvement to 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. New research will look to mitigate yield and quality degradation in peanut production from biotic and abiotic stresses and sustainably grow the crop and utilize the information gained from the dynamics of the plant metabolites to predict the mechanism of glyphosate resistance in Palmer amaranth, and for the restoration of the sites invaded by exotic plant species. 1890 Research has a new study that investigates alternative sources of vegetable oil from non-edible plant seeds for biodiesel production. Oils extracted from acceptable samples will be compared the the yield, chemical and physical characteristics of the soybean oil as a standard. More in-depth characterization and testing are required. The research is seeking alternative oil sources based on

non-food, non-staple and local or transplantable plant seed sources.

The future look of Clemson Research will change shape at the start of next fiscal year as we move from individual projects to group 'umbrella' projects per the request from Dr. Sonny Ramaswamy during his last visit to the University. This will result in a decrease in the overall number of projects and will facilitate more collaboration and innovation between researchers.

Clemson Extension and 1890 Extension will continue to support growers and producers in the implementation of systems that are economically sustainable, safe and environmentally sound. We will continue efforts to support local and state agribusiness communities and to build the leadership capacity of the citizens of the state. Clemson will continue agribusiness programs to provide budget analyses, marketing strategies and production technology information to start-up agribusinesses, emerging farmers and established farmers.

Training on safe food handling practices will be the focus of the Food Safety program. Canning coaches continue to deliver reliable, science-based food preservation and canning information into communities across the state. Partnerships developed through agents in 4-H youth development and nutrition and health programs will strengthen our capacity in addressing the issue of food literacy, understanding food systems and impacting childhood obesity. In addition, Clemson and South Carolina State will continue to collaborate on volunteer training in 4-H. For the next report cycle, there will be three research projects in 1890 Research on Childhood Obesity. Two of the obesity projects have been reported on in previous POW Accomplishments and Results. However, one new Childhood Obesity project will be added to focus on food derived AGEs (Advanced Glycation End-products) in relation to obesity and breast cancer.

South Carolina's citizens and PSA's stakeholders have direct input into decisions of the Extension System through statewide planning efforts and the needs identification process. We will be aggressively monitoring and training about potential threats to plant and animal agriculture. Multiple animal programs targeting youth will continue. The South Carolina Legislature passed Regulation R.61-43, Standards for the Permitting of Agricultural Animal Facilities in 1996. According to Sections 100.190 and 200.190 of the regulations, growers of all permitted animal confinement facilities in South Carolina are required to attend a training provided by Clemson University. We will continue to certify producers to improve their marketing potential. We are continuing work with producers to adopt herd health and cost management strategies.

Home and Garden Information Center (HGIC) video content is targeted at South Carolina citizens to educate them about how to properly use and care for different plant material in the landscape. This information can be accessed at any time of the day from anywhere around the world. Videos will continue to be made available on YouTube, iTunesU and the HGIC website (<http://www.clemson.edu/extension/hgic/>). Extension will continue to conduct field trials. Evaluation programs will be provided to growers with comprehensive and updated information on performance so that they can make informed decisions. Activities that foster sustainable agricultural practices and policies will be promoted and encouraged.

Wetland and watershed management seeks to improve water quality, wetland and aquatic wildlife habitat. Increased knowledge about our wetland ecosystems, mankind's impact on water quality and what we can do to ensure proper water quality are important topics included in this program. Additionally, such a program increases the public's understanding and awareness of natural resource management, and builds a network of natural resource ambassadors.

South Carolina has an abundance of wildlife resources that enhance the quality of life, provide families with outdoor recreational opportunities, and drive our economy by providing needed revenue to the state economy and local communities. For example, wildlife and wildlife-related activities contributed more than \$1.5 billion dollars annually to the state's economy. In addition, revenue generated from wildlife recreation (e.g. hunting) in rural communities generates an estimated \$6 million a year to individual counties. Because the Palmetto State is among the fastest growing in the nation, this growth has put unprecedented pressure on wildlife and the habitats that support them. Since most of the land base in the

state is privately owned, private landowners have a tremendous opportunity to impact wildlife conservation in South Carolina. Land managers throughout the nation agree that next to motorized trail traffic, horse traffic is the most difficult to manage for prevention of damage to forest ecosystems. The most fundamental management problems related to horse traffic are those of controlling erosion and prevention of stream sedimentation and fecal contamination of surface waters. This program will explore innovative techniques to deliver educational programs on wildlife, water conservation and management on private lands, and explore and develop synergistic solutions and techniques that overcome wetland and urban wildlife challenges to the benefit of people and wildlife in South Carolina.

Clemson and South Carolina State will report work formally labeled CLED to the program topic of Agribusiness and Community Development. The major goals of the program are to foster the development of local and regional food systems, promote entrepreneurial and agribusiness development, and enhance community resiliency and economic capacity. Community Development encompasses leadership, team building and consensus development activities for adults. The program offers community leadership development training, facilitation of strategic planning for economic development, public issues education, and serves as a collaborative agency with other leadership program sponsors. Board training for public officials and nonprofit organizations are offered at the community and state-wide level. The South Carolina Community Development Collaborative is a partnership of community, municipal and government organizations partnering to leverage their knowledge and resources to promote a holistic approach to sustainable community development. Within the collaborative, organizations identify opportunities for partnership, funding and learning to increase individual organization and member capacity in assisting communities. Through the sharing of assets, the members serve as a "resource bank" to meet community needs.

South Carolina has identified the following national outcomes and indicators to report against in the FY16 reporting cycle:

Planned Program: Global Food Security and Hunger

Outcome #1, Indicators 1, 3, 4 and 5

Outcome #2, Indicators 1,2,3,4, 5, 6, 11, and 12

Outcome #3, Indicators 1 and 4

Planned Program: Food Safety

Outcome #3, Indicators 2, 3, 5, 6, and 7

Outcome #4, Indicators 2 and 4

Planned Program: Climate Change

Outcome #1, Indicators 1,3, and 4

Outcome #2, Indicators 1 and 5

Planned Program: Sustainable Energy

Outcome #4, Indicators 1 and 3

Outcome #5, Indicator 1

Planned Program: Childhood Obesity

Outcome #1, Indicators 1,2,3 and 4

Outcome #2, Indicators 1, 2 and 3

Outcome #3, Indicator 1

Addressing quality of life opportunities for the citizens in South Carolina with a special emphasis on limited-resource communities is of particular interest to the 1890 Research and Extension Program. The term limited-resource focuses on minorities and socially disadvantaged individuals who lack education, knowledge to resources, equipment or money to invest in various resources. The limited-resource farmer makes less than \$10,000 a year in farm income. Underrepresented and underserved populations in the

state will continue to be a source of stakeholder input. There will continue to be a focus on providing educational programs to improve the well-being of the family structure within limited resource communities; to promote change in the lives of youth and to strengthen family values through youth development programming. Leadership programming will be provided to assist limited resource communities with leadership development education programs and tie leadership development to community economic development initiatives within communities. Programs will be designed to alert, inform and educate high school students in the fundamental concepts of financial planning.

The 1890 Research and Extension Program has several priority goals to accomplish during the next five year cycle of the Plan of Work. The priority goals include reconstruction of the Camp Harry Daniels Facility, developing a demonstration farm at Camp Harry Daniels, conducting economic development activities in small towns and rural communities, securing land and constructing cluster centers in target counties across the State, expanding the Mobile Technology Center Outreach, increasing the involvement of faculty and the number of inter-disciplinary research projects, expanding internal and external collaborations and partnerships to build the land-grant capacity, expanding support to target groups including, but not limited to veterans, and launching campus/community health initiatives to address health disparities. 1890 plans to increase their external funding to support programmatic and operational initiatives.

1890 Extension will take its programs and services to the people as the Mobile Technology Unit travels to remote areas of the state providing wireless computer Internet access to individuals at various facilities within a 100 yard radius. 4-H and Youth Development and Families, Community Leadership and Economic Development and Food Safety will continue to be a priority focus as well as Global Food and Hunger, Childhood Obesity and Sustainable Animal Production Systems.

There is a new organizational structure in place at Clemson University that unifies the Vice President for Public Service and Agriculture and Dean of the Clemson Agriculture, Forestry, and Life Sciences position as one person. Clemson Extension has just approved a new strategic plan which affects some of the program groupings on an internal level - such as agribusiness and community leadership and economic development. South Carolina State University and Clemson University will continue to coordinate their Research and Extension programming efforts to the extent that the topical areas, particularly of research, are related. An ongoing relationship between the county Extension offices of both institutions will continue to grow.

Multi-state research activities will continue to be emphasized as Extension specialists and researchers participate in establishing multi-state projects with their colleagues in other states in the region and across the country. Clemson's multistate activities include the Southern Region Fruit Consortium, a collaboration between North Carolina State University, Clemson University and institutions in Georgia, Virginia, Tennessee, and Arkansas. The Regional Forestry Position is a liaison of the southern land-grant universities and the USDA Forest Service - Southern Region. The Regional Forestry Specialist is working with Clemson on a Regional Wood Utilization Summit with Clemson Academic Program Director, Dr. Pat Layton. This Summit will involve Extension Wood Utilization and other specialists on a regional initiative to develop an educational toolkit for local educators. The Regional Peach Initiative is a partnership between South Carolina and Georgia. The Orchard Floor Management program was listed as a co-recipient of an SCRI grant coordinated by Virginia Tech to determine the impact ground cover manipulation can have on winegrape vigor. New initiatives will include tobacco, apple and strawberry work with the University of Georgia and N.C. State. Research and Extension faculty will continue to be encouraged and supported in their efforts to obtain outside funding to leverage their federal and state funding base.

Estimated Number of Professional FTEs/SYs total in the State.

Year	Extension		Research	
	1862	1890	1862	1890
2017	135.0	41.0	82.0	13.0
2018	135.0	41.0	86.0	13.0
2019	135.0	41.0	90.0	13.0
2020	135.0	41.0	94.0	13.0
2021	131.0	41.0	98.0	13.0

II. Merit Review Process

1. The Merit Review Process that will be Employed during the 5-Year POW Cycle

- 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 Advancement Council (formerly known as the State Extension Advisory Council) is responsible for reviewing and commenting 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. Each Council member has the opportunity to give input about programs. There are Extension volunteers, producers, a community center program coordinator, public school educators and business owners.

There are internal university review panels at both Clemson and South Carolina State. Programs are reviewed by State Extension Program Team Leaders and by

administration, at each institution. Both panels review projects and programs at their institutions based on organizational capacity, relevance and impact. An annual joint review is expected for the next reporting year.

The Internal University Panel, periodically, reviews South Carolina's Plan of Work. 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. The Research and Program Development Committee is kept abreast of new national priority areas and the realignments of research and Extension activities at both institutions. The program review activities of the committee will complement the scientific peer review process established at both institutions.

In addition, all research projects go through a review process as outlined under Hatch or Evans-Allen regulations. This serves as the Expert Peer Review process, as each project is sent for external review and comments and suggestions are examined and incorporated into the new project, as appropriate.

III. Evaluation of Multis & Joint Activities

1. How will the planned programs address the critical issues of strategic importance, including those identified by the stakeholders?

Multi-state research programs are the result of extended collaboration and consultation between faculty members in the respective states. The decision to move forward with a regional program is based on the appropriateness of the program to address critical issues, the ability of faculty to develop, implement and evaluate the program and on the potential for the program to be effective meeting the identified needs of the citizens and industries in the state.

Extension programs will be those that address critical needs as identified by local stakeholders. In addition, relevant nationally identified issues will be addressed. Examples of criteria used are:

- Does the program address major societal problems, needs, or opportunities that are well-defined and documented?
- Does the program have an identified evidenced base?
- Can Extension impact be measured and reported?
- Does the program fit within the strategic goals of Public Service and Agriculture?
- Can effective marketing and public awareness methods be implemented?
- Does the program attract financial and other resources and is it supported by systematic fund development?
- Can skills and expertise of paid and volunteer staff be used?
- What partnerships can be established?
- Does the program have an appropriate delivery system in place for effective implementation?
- Does the program identify internal and external resources and expertise?

- Delivery methods can be implemented through interactions, distance education, electronic methods, printed materials, media, etc.

2. How will the planned programs address the needs of under-served and under-represented populations of the State(s)?

According to the Darla Moore School of Business at the University of South Carolina, the population of South Carolina increased by 15.4 percent between 1990 and 2000 and by another 7.4 percent between 2000 and 2005; 11.6 percent of that increase has been attributed to immigration, primarily from Mexico and Latin America. Most work in the construction industry, with another proportion in agriculture, in addition to processing factories. Latino population has increased considerably faster in South Carolina and the Southeast than for the United States as a whole.

Research and Extension programs and activities address issues which impact all segments of the population, to include global food security and hunger, sustainable energy, youth and family issues, nutrition, food safety, water and natural resources and issues relating to plants and animals. Underserved and underrepresented populations will be used to identify areas of need. Stakeholder input is particularly critical in identifying programs that have a broad reach in terms of numbers and economic groups, especially limited-resource persons, which can be served. Results in the form of knowledge and its application will be transferred through the resources of Extension in the various states. Activities in community and economic development, nutrition and 4-H are particularly beneficial to underserved and underrepresented populations.

3. How will the planned programs describe the expected outcomes and impacts?

The Clemson Extension program teams will use logic models to link outcomes and inputs. A description of the situation, including goals, objectives, inputs (identifying target audiences), and outcomes will be used in program planning. Impact will be assessed through established indicators for all projects. The Clemson University Management Information System (CUMIS) is a web-based reporting system that provides data relative to numbers of programs conducted, number of persons completing programs, knowledge gain, economic gains through generation of additional income on savings, adoption of practices as a result of participation, and contacts made for the Cooperative Extension Service. CUMIS collects publications and media data. We will report the number of publications submitted and those published. CUMIS collects additional data for specifically defined indicators written by program teams. Individuals with Extension appointments report their activities each month in the system. In addition, narrative summaries will be used. The Public Service and Agriculture division at Clemson has identified a database to help quantify economic impacts for both Research and Extension.

The planned and potential impact of each research project and program are outlined in the initial design phase. Outcomes and impacts are key discussion areas as decisions are made to initiate, continue or terminate programs. There is increased emphasis on identifying specific goals, which can be evaluated at the conclusion of the activities. Typically, outcomes and impacts are presented in terms of new knowledge and new applications of current knowledge.

The descriptions of the outcomes may include descriptions of the products, processes and procedures that are anticipated and may reflect the number of individuals, communities and industries that are anticipated to benefit.

1890 Research and Extension Program utilizes an in-house reporting mechanism reflective of the USDA Plan of Work System to collect, monitor and evaluate data of researchers and agents. The staff utilizes the system to input data on knowledge gained, workshops conducted and attendees completing workshops, number of persons participating and completing programs, knowledge gained, direct/indirect contacts of adults and youth, publications, patent

applications, business plans, number who adopted practices, as well as other pertinent information to address the state defined outputs. Within the past year, 1890 has been collaborating with officials at Clemson University to obtain and mirror a data collection system similar to CUMIS. Also, many of the Extension agents utilize the software Survey Monkey to conduct evaluations and tally results of asked questions. The data assists in preparing the qualitative outcomes and impacts of the designated priority goals. Extension will add adoption of recommended practices and economic gains through additional income or savings to its evaluation mechanism.

4. How will the planned programs result in improved program effectiveness and/or

The programs in the Plan of Work are designed for periodic evaluation to ensure that they meet the specified goals and established targets. Periodic evaluations will occur during an informal review session to complement the annual written progress reports helps to refine the approach and the deliverables, while the program is still in progress. A comparison of the initial goals, inputs and the actual outcomes of concluding programs is used in the design of new programs. Assessments are conducted and reports are sent for internal reviewers to examine impacts of Extension programs based on program team metrics. Annual research reports are reviewed for established metrics such as publications, numbers of technical contributions, disclosures, patents, joint Extension efforts, and funds generated. The collective comments of the panel are sent to the individual scientist or to the appropriate program team members.

IV. Stakeholder Input

1. Actions taken to seek stakeholder input that encourages 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 of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey specifically with non-traditional groups

Brief explanation.

Stakeholder input remains key to successful Extension programs. Clemson and South Carolina State have a long history and tradition of seeking stakeholder input into the Plan of Work process. The process of seeking stakeholder input included 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.

Stakeholder input is sought via meetings with people representing all counties in the state to identify issues and set priorities for agricultural Research and Extension. Stakeholders are identified and

invited to attend a meeting. Stakeholders included those internal to the Cooperative Extension and 1890 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 boards members, commodity group representatives, community leaders, human service providers, business/industry representatives and collaborators (S.C. Farm Bureau, Chamber of Commerce, USDA Farm Service Agencies, etc).

2(A). A brief statement of the process that will be 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.

People who are already involved in Research and Extension programs or receive services as well as people who may not be involved, but may have similar interests or are addressing similar concerns are identified and contacted.

2(B). A brief statement of the process that will be 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 advisory meetings are attended by county advisory committee members and other key stakeholders. A Nominal Group Technique (NGT) is used to garner stakeholder input for the Plan of Work process. NGT is a process that allows a group of individuals to generate a large number of ideas in a relatively short period of time. NGT is helpful in identifying problems, exploring solutions and establishing priorities.

Several steps are involved in conducting the NGT. First, each of the counties in South Carolina was asked to conduct a NGT. Second, instructions were provided to all county

offices/county directors of the steps involved in conducting the NGT. Third, to ensure diversity, emphasis was placed on obtaining a cross section of people that represent the local community. Fourth, a set of rules and procedures was established for the smooth operation of NGT. Fifth, a series of questions were identified to which stakeholders were to respond.

Annual meetings around the state are open to the general public and conducted to gain input on stakeholder interests, concerns and needs. A survey instrument will be used to collect stakeholder input and issue identification for Extension. Participants are asked to evaluate the effectiveness of Extension programs, identify major concerns in the county and recommend topics they feel Extension can adequately address. They also give program ideas. In addition, each county compiles data from the stakeholder meetings and makes adjustments in program design and implementation.

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.

State Program Team Leaders identify the major programs for the new federal Plan of Work using the identified list of issues. The programs are defined using the logic model. The State Plan of Work, which includes specific initiatives and projects, is developed based on the identified programs. The process is used to identify emerging issues and to redirect Extension programs. Programs are developed, expanded or eliminated based on their quality and/or effectiveness. In addition, the priorities identified are considered when hiring staff and when establishing action plans.

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	Agribusiness and Community 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

2. Brief summary about Planned Program

The program will support the development of niche markets for beef, dairy and poultry producers, allow farmers in the state to diversify their operations, and make local products available to the citizens of the state. Research and Extension will develop and implement animal production systems that are economically sustainable and environmentally sound, provide training that will increase herd management skills, assist producers in making informed business decisions, and increase profitability for producers.

South Carolina has a large number of livestock producers and the forage-fed base has the potential to expand the markets for their products. Emphasis continues on forage based livestock production. Clemson research in this area will be expanded with improved facilities and increased funding. Research will also continue in such areas as biodiversity of Insects of Medical and Veterinary Importance, surveillance of infectious causes of bovine abortion, stillbirth and neonatal death in SC, enhancing the competitiveness and value of U.S. Beef, and prevalence of rota virus, corona virus, cryptosporidium and e. coli (f-5) in SC dairy and beef calves two months of age or younger.

Clemson research will continue to focus on management systems to optimize calf and heifer performance through increased understanding of feeding strategies, management systems, wellbeing, productivity and environmental impact for productivity and profitability. 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 researchers are working to identify the prevalence of four microorganisms, which play a significant role in calf illness and production loss in beef and dairy operations. And research will continue to find sustainable solutions toward the control and management of two major hive pests by better understanding the biology and mechanisms of resistance in honey bees.

1890 research will continue on preventing the effects of noise induced hearing loss and high blood pressure among South Carolina farmers and agricultural workers. The project will educate farmers and agriculture workers (minority and majority populations) on the implications of excessive noise levels over a period of time could potentially bring about complications of ischemic heart disease and high blood pressure.

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. Additionally, LPH scientists participate 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. New LPH research intends to encompass aspects of surveillance and/or diagnosis of diseases/problems affecting production animals through the monitoring of certain parameters and development of tools important for the diagnosis, prevention, and management of such diseases. Clemson Livestock Poultry Health Veterinary Diagnostic Center receives many submissions each year from various species of animals which offer a readily available source of enteric and other bacterial isolates for antimicrobial susceptibility testing (AST).

3. Program existence : Mature (More than five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
301	Reproductive Performance of Animals	20%	20%	37%	0%
302	Nutrient Utilization in Animals	20%	20%	0%	0%
303	Genetic Improvement of Animals	15%	15%	0%	0%
307	Animal Management Systems	20%	20%	18%	0%
308	Improved Animal Products (Before Harvest)	15%	15%	18%	0%
311	Animal Diseases	0%	0%	9%	0%
315	Animal Welfare/Well-Being and Protection	10%	10%	18%	0%
723	Hazards to Human Health and Safety	0%	0%	0%	50%
724	Healthy Lifestyle	0%	0%	0%	50%
	Total	100%	100%	100%	100%

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Production and income from beef cattle has been increasing since 2002. In addition, cash receipts for the sale of milk by dairy farmers amounted to \$56.3 million during 2010. Continuing momentum in the agribusiness components requires a solid research base and a knowledgeable agent base. Forage-fed beef is a component of this growth. Research is expanding and there are expectations that the percentage share of the market will increase beyond what is currently estimated to be 10%.

In South Carolina, Clemson University is the sole source for providing training and testing as required by law for all livestock and poultry producers to receive their waste permits. The Confined Animal Manure Management Training Program (CAMM) is an educational program that is required by state law for all livestock and poultry producers as a condition of their waste permit. All new producers must attend the program within one year of beginning operation. All swine producers and all large dairy and poultry producers are required to be certified animal manure managers. Producers are required to pass a comprehensive exam on manure management to obtain certification. All animal waste permit holders are required to obtain 10 hours of recertification credit every five years. Clemson Extension provides seminars, field days, and conference presentations to provide the required continuing education.

Public concern over the management of animal manure has become a major environmental issue in South

Carolina centered on water quality (surface and groundwater) and gaseous emissions including odors. There is less tolerance for odors yet more potential for surrounding neighbors to be impacted by odors because of the location of operations in communities. Social problems have created an ever-increasing hostility between animal producers and surrounding neighbors. In addition, animals have not been efficient users of nutrients supplied in their diets. Therefore, significant plant nutrients are found in animal manures. The nutrients, particularly nitrogen, phosphorus, and potassium, are needed for crop inputs for crops like corn and soybean. Surveys indicate that nearly one half of all animal manure applied to land is not credited as a nutrient source. Animal manure nutrients can be applied at excessive rates if better management practices are not adopted. The excessive rates of application can lead to both surface and groundwater pollution.

There is concern for the small-scale livestock producers in South Carolina not being able to receive premiums for their cattle. Many producers lack the proper facilities needed to administer the animal health products required for premium prices. Seminars, workshops as well as equipment needs will be addressed to assist the limited-resource farmer.

Farming unlike any business enterprise poses a lot of risk to all producers. Therefore, managing the risks is a priority for the 1890 Extension Small Farm Program at South Carolina State University. Needs through legal risk management projects and activities will continue to be addressed. Conferences, workshops, trainings and risk management education tools will proceed to provide farmers and landowners successful management of their farming enterprises.

Clemson will be making a major investment to upgrade its dairy research facilities and will be making the facilities, along with poultry, beef, and swine research facilities, available to faculty with grant support to complement ongoing Hatch funded research.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

The Animal Production program promotes an alternative livestock enterprise, assists farmers in improving their niche market and provides access to pure breed bulls. The breeding, production and marketing of beef and dairy cattle, other small ruminants and their products is a major component of South Carolina's agricultural economy. When competing with larger growers in other states, producers having even small competitive advantages in any of the three mentioned areas can be helpful.

It is assumed there is a market demand for forage-fed beef, improved nutritional value in milk and producers need every advantage and the latest knowledge to remain competitive in their businesses. It is also assumed that disease resistance in poultry flocks is an area of critical importance and of great interest to the poultry industry in South Carolina and in neighboring states. It is assumed that animal facility

operators and those involved in animal waste management are interested in cost-effective technologies and practices to reduce the environmental impact of animal production. In general, issues related to animal health are a major area of concern in the state. Educational programs can provide producers with information that they can use to increase herd management skills, make informed business decisions, increase profitability for growers, and lead to production and economic efficiency.

South Carolina has research projects underway, each of which has the potential to resolve issues which are negatively impacting producers. Information derived from research into animal production and health and management practices will in turn be disseminated as appropriate by Cooperative Extension as well 1890 Extension. Some of the research in animal genetics will be fed back into other research efforts for a longer term impact. Research continues on options for effectively managing animal waste. Research goals for individual projects are tied to input from state commodity boards, producers and cooperative extension. Results from research into forage-fed beef and dairy cattle will have applications for producers in South Carolina.

2. Ultimate goal(s) of this Program

The program will support the development of niche markets for beef, dairy and poultry producers, allow farmers in the state to diversify their operations and make local products available to the citizens of the state, develop and implement animal production systems that are economically sustainable and environmentally sound, provide training that will increase herd management skills, assist producers in making informed business decisions, increase profitability for growers, and design and implement a stochastic simulation module for herd-based disease spread.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	11.0	8.0	6.5	1.0
2018	11.0	8.0	7.0	1.0
2019	11.0	8.0	7.5	1.0
2020	11.0	8.0	8.0	1.0
2021	11.0	8.0	8.5	1.0

V(F). Planned Program (Activity)

1. Activity for the Program

In Extension, programs planned for the new year are the Bull Test program, the Master Cattleman educational series, the Grass Masters program, an Advanced Grass Master / Grazing School, and a forage/beef field day and workshop. A grant 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. Further meetings are planned to

develop economic strategies for dairymen in SC. The Confined Animal Manure Management Team will offering trainings and recertifications across the state this year.

The 1890 Small Farm Assistance and Outreach Program will continue to improve management operation by gaining knowledge and increasing skills in production, marketing and enterprise risk management tools. They will become efficient in livestock production management through better decision making and minimizing their overall production costs.

Clemson Researchers are working to identify the prevalence of four microorganisms, which play a significant role in calf illness and production loss in beef and dairy operations. In addition, research is being conducted to assess bull semen quality and fertility, sperm cell composition, and hormonal response to the toxin found in tall fescue Kentucky 31; as well as optimize calf and heifer and dairy cow performance through increased understanding of feeding strategies, management systems, well-being, productivity and environmental impact for productivity and profitability. Finally, 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 1890 Researcher will seek to determine the percentage of farmers and agricultural workers in rural South Carolina who are directly affected by the phenomenon and the ones who take proactive measures to protect their hearing from noise exposure. Data will be collected to measure the levels of noise exposure to compare with OSHA noise standards. Blood pressure levels will be measured and surveys distributed to assess the use of hearing protection devices.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Public Service Announcement ● Newsletters ● TV Media Programs ● Web sites other than eXtension

3. Description of targeted audience

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

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Disclosures
- Licenses
- Number of people completing educational workshops.
- Number of educational workshops conducted.

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Number of people reporting increased knowledge and indicating adoption of animal production practices.
2	Number increased percentage of forage fed beef production in the State and Region
3	Increased income due to producers and growers improved production efficiency of confined animal systems.

Outcome # 1

1. Outcome Target

Number of people reporting increased knowledge and indicating adoption of animal production practices.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1890 Extension
- 1890 Research

Outcome # 2

1. Outcome Target

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

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 307 - Animal Management Systems
- 302 - Nutrient Utilization in Animals

4. Associated Institute Type(s)

- 1890 Extension

Outcome # 3

1. Outcome Target

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

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals
- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Each research project, and its respective program, sets a series of goals and objectives to be accomplished. The situation is presented at the time the research begins and changes are reported during the conduct of the research and at its conclusion. An internal review committee meets with researchers and teams of researchers on research projects and research programs within the planned program areas. The intent of the research effort is identified, as are the anticipated outputs and outcomes. Measures would include new knowledge developed, disclosures, patent applications, patent awards, license agreements, publications and other selected measures, as appropriate.

Extension will use CUMIS evaluations/reporting, pre and post evaluations, data comparisons, measures of participation and knowledge gained. Research bulletins will be prepared for publication and distribution.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Sustainable Agriculture Production for (non-food) Horticultural Crops

2. Brief summary about Planned Program

Clemson researchers will continue initiatives to investigate diseases of ornamental plants and trees caused by Phytophthora spp., to develop a cost-effective, efficient, and environmentally sustainable water treatment systems, to investigate chestnut reestablishment in orchard and forest settings and to examine and provide solutions for some of the most recalcitrant pathology problems in golf course bermudagrass greens at this time. New research will address management strategies for anticipated decreasing availability and quality of water for irrigation used by the green industry; an additional project will mine natural genetic variation in maize for genes and genetic elements controlling stalk strength.

For Extension, the program will focus on developing and implementing practices that are economically sustainable and environmentally sound. Objectives include improving profitability and reducing negative environmental impacts of horticultural (non-food) systems, increasing efficiency of production, and increasing the supply and dissemination of information and knowledge about IPM strategies that are available to growers.

3. Program existence : Mature (More than five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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%	18%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	10%	0%	18%	0%
202	Plant Genetic Resources	10%	0%	0%	0%
204	Plant Product Quality and Utility (Preharvest)	10%	0%	0%	0%
205	Plant Management Systems	15%	0%	9%	0%
211	Insects, Mites, and Other Arthropods Affecting Plants	10%	0%	18%	0%
212	Diseases and Nematodes Affecting Plants	10%	0%	37%	0%
215	Biological Control of Pests Affecting Plants	10%	0%	0%	0%
216	Integrated Pest Management Systems	15%	0%	0%	0%
601	Economics of Agricultural Production and Farm Management	10%	0%	0%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Situation and Scope)**1. Situation and priorities**

There is an information need among South Carolina residents related to the improvement of environmentally sound horticultural practices. Through consumer education in environmental horticulture this program can significantly enhance Extension's ability for education and outreach and increase service hours toward direct enhancement of the horticultural practices of individuals. Consumers and horticultural professionals will be trained on environmentally sound horticultural practices (i.e. plant identification, selection, culture, pest identification, and integrated pest management) to improve their neighborhoods in a socially acceptable manner that does not contaminate the environment with excess fertilizer, inappropriate pesticides, or harmful exotic plants. Researchers will assist Extension with efforts in this area.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Educational programs will provide consumers with information so that they can make informed decisions to improve profitability and reduce the negative environmental impacts of horticultural systems. The educational activities will minimize off-farm inputs for low income producers and maximize on-farm resources. Training workshops can provide consumers adequate record keeping techniques.

The ornamental plant and turf grass producers in South Carolina contribute to the state's agricultural economy. Ornamental plant producers benefit from research on plant production, transportation, and new greenhouse technologies.

South Carolina has a warm, humid climate and ornamental plant and turf grass producers and consumers, particularly homeowners and golf course operators, will benefit from sound, science-based information to control insect and plant diseases.

2. Ultimate goal(s) of this Program

The goals of this program include:

1. To assist ornamental plant and turf grass industries in South Carolina in becoming profitable and highly productive.
2. To increase effective management of insects and diseases that impacts these industries.
3. To help simplify farm record keeping which encourages participants to maintain farm records on a continuous basis and improve financial management.
4. To educate farmers on ways to implement production systems that require the application of low off-farm input and provide opportunities for farmers to grow crops that satisfy consumer demand within environmentally safe conditions.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	15.0	0.0	8.0	0.0
2018	15.0	0.0	8.5	0.0
2019	15.0	0.0	9.0	0.0
2020	15.0	0.0	9.5	0.0
2021	15.0	0.0	10.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Home and Garden Information Center (HGIC) video content is targeted at South Carolina citizens to educate them about how to properly use and care for different plant material in the landscape. This information can be accessed at any time of the day from anywhere around the world. Videos will continue to be made available on YouTube, iTunesU and the HGIC website. Extension will continue to conduct field trials. Evaluation programs will be provided to growers with comprehensive and updated information on performance so that they can make informed decisions. Activities that foster sustainable agricultural practices and policies will be promoted and encouraged.

The development of recombinant DNA and transgenic technologies has provided excellent opportunities for plant trait modification through genetic engineering. The activity in this Clemson research will lead to better understanding of molecular mechanisms controlling plant response to abiotic stress, therefore facilitating development of novel strategies for genetic improvement of various crop species.

Clemson researchers are working to find solutions for some of the most recalcitrant pathology problems in golf course bermudagrass greens at this time. These problems include diseases such as spring dead spot, Rhizoctonia leaf and sheath spot or blight, and nematode infestations. Additional research is looking to develop a cost-effective, efficient, and environmentally sustainable water treatment system. This model system will facilitate implementation of effective treatment technologies beyond those chemically-based systems currently in use, providing the tools necessary for more efficient and sustainable water use and management practices by the green industry.

Furthermore, Clemson research projects are investigating 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 investigating chestnut reestablishment in orchard and forest settings with special consideration of the current and historical knowledge of the species and its interaction with other pests and pathogens.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Public Service Announcement ● Newsletters ● TV Media Programs ● Web sites other than eXtension

3. Description of targeted audience

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

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
 - Number of patents submitted
 - Number of peer reviewed publications
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Disclosures
 - Licenses
 - Number of people completing horticultural educational workshops
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

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

Outcome # 1

1. Outcome Target

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

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 205 - Plant Management Systems
- 216 - Integrated Pest Management Systems
- 211 - Insects, Mites, and Other Arthropods Affecting Plants

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Each research project, and its respective program, sets a series of objectives to be accomplished. The situation is presented at the time the research begins and changes are reported during the conduct of the research and at its conclusion. An internal review committee meets with researchers and teams of researchers on research projects and research programs within the planned program areas. The intent of the research effort is identified, as are the anticipated outputs and outcomes. Measures would include new knowledge developed, disclosures, patent applications, patent awards, license agreements, publications and other selected measures, as appropriate.

Pre/post evaluations will be administered for Extension. Data comparisons and measures of participant numbers and reported knowledge gained will be used.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Natural Resource Management

2. Brief summary about Planned Program

The Natural Resource Management program includes water resources, environmental conservation for wildlife, and sustainable forest management programs.

Water Resources

In water resources, Clemson will continue focusing on the development, analysis, and application of next-generation materials, hardware, software, and network systems required to fill fundamental technology gaps to enable rural connectivity to and applications support of the Intelligent River™ Research Enterprise.

New research will look at the increasing likelihood of conflicts between the conservation needs and the demands of water users, particularly during periods of drought. This research seeks to identify potential areas of conflict before they become critical, and to assist in conservation planning that seeks to address and mitigate those conflicts.

Extension program components seek to educate agricultural producers to increase acceptance of Best Management Practices (BMPs) that protect and improve water quality; educate homeowners to increase acceptance of BMPs that prevent water pollution from the homestead; educate the public on how their land-use practices impact the quality and quantity of water in urban streams; develop and deliver educational programming on stream restoration and water quality protection; develop participation in water quality volunteer groups; design, demonstrate and promote the installation of riparian buffers and other environmentally appropriate plantings to protect water quality; and promote environmentally sound natural resource recreation and tourism opportunities in South Carolina.

Land managers throughout the nation agree that next to motorized trail traffic, horse traffic is the most difficult to manage for prevention of damage to forest ecosystems. The most fundamental management problems are those of controlling erosion and prevention of stream sedimentation and fecal contamination of surface waters.

An 1890 researcher will continue to investigate the environmental remediation of using sensor technology and contaminant transport modeling. Research will focus attention on characterizing, remediating, managing and monitoring the Edisto River mercury contaminated water and sediments in place and assessing the processes that govern ecological and human health risks. The research is supported by advanced science and technology such as sensor technology and fate and contaminant transport modeling. Effective modeling requires actual water quality data for calibration and validation. The research will help to fill knowledge gaps for integration of field sensor monitoring and numerical modeling experiments.

Wildlife Conservation

Aquatic and terrestrial invasive and nuisance plant and animal species, including several state-listed and federally listed illegal species, are significant in South Carolina. All invasive and nuisance species have adverse economic and environmental effects on production agriculture and natural resource interests with increased dependency on irrigation and environmental effects on fish and wildlife, particularly waterfowl populations. Extension is also charged with training and offering Continuing Certification Units to the 389

(2004) Licensed Aquatic Pesticide Applicators in South Carolina and with educational programs and most up-to date control recommendations to private landowners and managers. Through joint programming between Clemson Extension and SC DNR, the state has twice avoided major infestations of giant salvinia, cited as "the worst weed in the world" and continues work on Phragmites and water hyacinth control.

Sustainable Forest Management

Sustainable forest management activities encourage landowners to develop management plans by providing them with alternative silvicultural systems and methods that are suitable for their individual objectives. Alternative systems include uneven-age management, mixed pine/hardwood management and natural regeneration systems. Activities will also educate landowners on forestry BMPs that can be applied to their lands. Information will also be provided on urban forest issues and education urban dwellers who may own family forests.

Climate Change

Research will extend our scope of study by focusing more 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. New research will 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; an additional new project will provide a platform of understanding how agriculture and forestry fit into the broader decision-making taking place within the Savannah River Basin.

3. Program existence : Mature (More than five years)

4. Program duration : Medium Term (One to five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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%	18%	0%
112	Watershed Protection and Management	30%	0%	9%	0%
122	Management and Control of Forest and Range Fires	10%	0%	0%	0%
123	Management and Sustainability of Forest Resources	10%	0%	36%	0%
124	Urban Forestry	5%	0%	0%	0%
131	Alternative Uses of Land	5%	0%	9%	0%
133	Pollution Prevention and Mitigation	10%	0%	9%	0%
134	Outdoor Recreation	5%	0%	0%	0%
135	Aquatic and Terrestrial Wildlife	5%	0%	9%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	10%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Situation and Scope)**1. Situation and priorities**

Changes in land-use patterns are impacting the state's resources in unplanned ways, such as the changes in water quality and quantity. Future wise use of the state's natural resources will require public education of the impacts that current and future land uses have on natural resources.

The availability of adequate, good quality water supplies for South Carolina's population and the production of agricultural and other products is a critical mid to long term issue. The impact of periodic droughts and the growing need for water in urban areas, particularly Atlanta, Georgia and Charlotte, North Carolina is of importance to the citizens of South Carolina.

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. Forest landowners in South Carolina are seeking ways to diversify land use and management in an effort to provide additional income from natural resources on their land. We must find ways to create and maintain ecologically significant habitats (including waterways and forests) in and around urban areas as traditional wildlife habitats are lost. Across the country, there is a growing awareness of the need for a proactive management strategy for urban wildlife involving all of the stakeholders. From corridor preservation to city parks and area subdivisions to backyard naturescaping, proactive urban wildlife management is needed to accomplish natural resource conservation objectives successfully. By developing a pool of well-trained volunteers, we can radically increase service hours toward direct enhancement of our natural resources.

Invasive species, both plant and animal, cause significant economic, health and human safety concerns in South Carolina. Unfortunately there is a lack of knowledge of how to effectively address and minimize problems with nuisance species. Aquatic and semi-aquatic wildlife (beaver, muskrat, otter) and select waterfowl (particularly Canada Geese) are a particular concern and can have significant impacts on water quality and consequently human health (E. coli and other bacteria outbreaks from waste).

Human/deer conflicts in South Carolina have increased significantly, causing an estimated \$53 million worth of agricultural damage annually in the state, as well as human health and safety concerns in suburban and urban landscapes. 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.

Forests cover two-thirds of the total land area in South Carolina and they are essential for our state's economy, environment, and quality of life. Timber, with a delivered value of about \$800 million, is South Carolina's most valued crop. South Carolina's forestry industry generates \$17 billion annually to the state's economy, employing over 90,624 individuals. Forest products are number one in manufacturing in SC. SC exports over \$1.3 billion in timber and timber products a year. Many landowners fail to manage their forestland because they object to clear cutting or other conventional intensive practices that focus primarily on timber production.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

The availability of adequate, good quality water supplies for South Carolina's population and the production of agricultural and other products is a critical mid to long term issue. The impact of periodic droughts and the growing need for water in urban areas, particularly Atlanta, Georgia and Charlotte, North Carolina are of importance to the citizens of South Carolina. A focus on improving and evaluating watershed models will assist policy makers in developing strategies for economically viable land use to coexist with good water quality.

Educational programs that teach proactive management strategies can be used to successfully conserve natural resources, reduce negative impacts on water, and to minimize problems associated with invasive and nuisance species. In addition, the private sector is providing services for resolving nuisance species problems and these individuals, e.g. Nuisance Wildlife Control Operators, (NWCOs) require training to provide services to reduce conflicts and problems with nuisance species in the most effective, legal and humane manner.

Teaching forestry best management practices can improve forest productivity and promote natural

resource conservation.

Researchers need to remain current on potential disease and pest threats to South Carolina's forests. Remote sensing technologies will improve forest production and profitability.

2. Ultimate goal(s) of this Program

The program also promotes sustainable management of forest resources and understanding of natural forest systems through proactive leadership, continuing education, educational training on public issues affecting forestry, and research. In addition, this program will develop models which will provide a scientific basis for decisions on long term water quality issues in South Carolina and to teach Best Management Practices (BMP's) of natural resources at all levels of land ownership to minimize the negative environmental impacts on water. This program also aims to provide landowners and natural resource managers with the tools, information and economic incentives to maintain and enhance lands for wildlife and to provide services and solutions to mediate and resolve human-wildlife conflicts as they occur.

This program should be able to provide an accurate data base on the potential disease and pest threats which can be accessed by Extension and transferred as needed to South Carolina timber growers, state forestry agencies and homeowners.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	18.0	0.0	17.0	1.0
2018	18.0	0.0	17.5	1.0
2019	18.0	0.0	18.0	1.0
2020	18.0	0.0	18.5	1.0
2021	13.0	0.0	19.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

A Clemson research project will provide an overview of South Carolina's sustainable forest resources. It focuses on all forest resources (wildlife, timber, recreation, water, aesthetics, etc.) and specifically addresses long-term timber supply related to the state's future use and development of these resources. Other research also being continued are projects to evaluate the contribution of bacterial contaminants and sediments to streams that result from recreational trails and trail user types, to understand the cellular and molecular mechanisms that govern virulence of the food-borne pathogen, Entamoeba histolytica, and to study 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.

In addition, the Natural Resource Management Program will focus on the following:

1. Educate agriculture producers and homeowners to increase acceptance of BMPs that protect and improve water quality.
2. Deliver educational programming on stream restoration, water quality and sustainable forestry protection and develop participation in volunteer groups, and train county volunteers to deliver WQ programming.
3. Design and educate audiences about the installation of riparian buffers and other environmentally appropriate plantings to protect water quality.
4. Promote environmentally sound natural resource recreation and tourism opportunities in South Carolina.
5. Conduct field research focused on toxicity of metals and pesticides and on TMDL watershed modeling.
6. Establish an environmental radiochemistry lab.
7. Conduct a literature investigation on groundwater radionuclides in the Edisto River.
8. Collect real-time field measured data using GPS and EMP-2 Nippon Mercury Analyzers.
9. Develop and conduct training programs to teach sustainable forestry principles.
10. Utilize and expand demonstrations of longleaf pine restoration, even and uneven-age management, pine straw production, and alternative management systems in SC.
11. Provide natural resource professionals with programming on longleaf pine ecology, management technology, and hardwood management.
12. Write and produce news articles and radio programs and other forms of mass media on sustainable forest and water principles.
13. Inform landowners of the economic and environmental benefits of using BMPs in all forest management operations.
14. Work with the forestry community to support and promote appropriate training and outreach programs related to sustainable forest management.
15. Use trained master landowners to promote forest management among their peers.
16. Utilize and expand existing demonstrations of hardwood (bottomland and upland) management to provide an understanding of even age and uneven age management systems.
17. Utilize the TOP Logger and other logger education programs to train loggers on sustainable forestry and alternative silvicultural systems.
18. Promote the use of prescribed fire.
19. Educate public officials and urban communities about the benefits of urban forests and the diverse issues and concerns involved in attracting and/or managing existing urban/suburban wildlife.
20. Develop methods of control and educate professionals and family forest landowners on these to eliminate or control invasive pests of forests and enhance forest health.
21. Develop and deliver educational programs (including web-based) and products on wildlife conservation and management on private lands.
22. Assist civic and community/governmental leaders to plan for urban wildlife greenspaces which include waterways and impoundments and educate each about the importance of urban wildlife and its priority on the urban/suburban agenda nationwide.
23. Continue to provide training to public and private sector natural resource professionals (NWCOs) on best management practices for nuisance wildlife management.
24. Conduct Pond Clinics and programs to educate landowners/managers.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Public Service Announcement ● Newsletters ● TV Media Programs ● Web sites other than eXtension

3. Description of targeted 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.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Disclosures
- Licenses
- Number of people completing educational workshops.
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

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 Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Extension
- 1890 Research

Outcome # 2

1. Outcome Target

Number of people applying wildlife habitat improvement practices.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife
- 131 - Alternative Uses of Land

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 3

1. Outcome Target

Number of acres affected by sustainable forestry practices.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 122 - Management and Control of Forest and Range Fires
- 123 - Management and Sustainability of Forest Resources
- 124 - Urban Forestry

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Each research project and its respective program, sets a series of goals and objectives to be accomplished. The situation is presented at the time the research begins and changes are reported during the conduct of the research and at its conclusion. An internal review committee meets with researchers and teams of researchers on research projects and research programs within the planned program areas. The intent of the research effort is identified, as are the anticipated outputs and outcomes. Measures would include new knowledge developed, disclosures, patent applications, patent awards, license agreements, publications and other selected measures, as appropriate.

Extension will measure using pre/post evaluations, data comparisons, measures of participation and knowledge gained. The overall BMP compliance level will be determined as established by SC Forestry Commission monitoring.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Food Safety

2. Brief summary about Planned Program

The Food Safety Program will feature the Serving Safe Food Curriculum from ServSafe. Agents certified as ServSafe Food Protection Managers will teach proper cleaning and sanitizing, safe handling of food, correct temperatures, proper personal hygiene, as well as other aspects of food safety. Agents will assist entrepreneurs and food businesses with food safety issues, teach food service managers via train-the-trainer programs and assist managers in training their employees. In addition, volunteers are being trained as canning coaches to help multiply the ability of agents to get reliable, science-based food preservation and canning information into communities across the state.

Clemson research will continue investigating food safety implications related to organic vs. conventional systems for egg laying, on-farm composting, natural antimicrobials, antimicrobial packaging and modified atmosphere packaging; as well as the study and development of bioactive compounds from peach by-products, specifically the skin and stone. New research seeks to address 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.

Under Food Safety, 1890 Research has two projects. The United States (US) and European Union (EU) are in negotiations to create the US-EU Transatlantic Trade and Investment Partnership, also known as TTIP. The agreement would remove tariffs and nontariff barriers to trade, harmonize food safety regulations and sanitary and phytosanitary restrictions. TTIP is expected to have significant impact on global agricultural trade and SC farm exports. The goal is to evaluate the potential impact of the TTIP on food safety and South Carolina agricultural production, export and trade. Another research project will focus on ozone treatment as an alternative for conventional fumigation to manage stored insect products. The focus will be on conventional fumigation to manage stored insect products. The study looks at lethal ozone concentration for different life stages of selected laboratory-reared species to get a dose-time-mortality response relationship.

3. Program existence : Intermediate (One to five years)

4. Program duration : Medium Term (One to five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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%	14%	0%
503	Quality Maintenance in Storing and Marketing Food Products	5%	20%	14%	5%
703	Nutrition Education and Behavior	0%	30%	0%	35%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	45%	20%	29%	20%
723	Hazards to Human Health and Safety	40%	10%	43%	20%
724	Healthy Lifestyle	5%	20%	0%	20%
	Total	100%	100%	100%	100%

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

According to public health and food safety experts, 76 million illnesses in this country can be traced to food-borne bacteria each year. Moreover, the Food and Drug Administration estimates that two to three percent of all food-borne illnesses lead to secondary long-term illnesses. Food Marketing Institute research shows that consumers know food safety is important and know they personally should observe sound food-handling practices. However, it also shows either they do not fully comprehend some of the most important messages or they fail to use food safety measures. For example, 85% of consumers understand the importance of washing hands vigorously when handling food, but only 65% always do so.

The need to constantly communicate food safety messages is underlined by continued changes in food safety recommendations for both consumers and the food service industry. There is a need to increase food safety through improved processing and packaging, screening vegetables for pesticides and developing new diagnostic procedures for animal pathogens. Travel and tourism and the related retail food service industry is South Carolina's largest economic driver. Training retail managers and employees in safe food handling practices is key to maintaining a healthy tourism experience and to repeat visitors.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Food handlers can reduce the incidences of foodborne illnesses as a result of using practices learned through training about proper food handling practices.

Food safety can be increased through improved processing and packaging, screening vegetables for pesticides and developing new diagnostic procedures for animal pathogens.

Delivery of food safety information via volunteers and train-the-trainer efforts is an important extender of resources.

Training retail managers and employees in safe food handling practices can help SC maintain a healthy tourism experience.

Research into films, antimicrobials and nanotechnology applications will produce results that will enhance food safety in South Carolina, as will the ability to screen for pesticides on vegetables and detect animal pathogens.

2. Ultimate goal(s) of this Program

The overall goal is to improve the quality and safety of food for citizens of South Carolina.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	5.0	3.5	3.5	2.0
2018	5.0	3.5	4.0	2.0
2019	5.0	3.5	4.5	1.0
2020	5.0	3.5	5.0	1.0
2021	5.0	3.5	5.5	1.0

V(F). Planned Program (Activity)

1. Activity for the Program

Research will be conducted to develop a rapid, sensitive, specific, and cost-effective bioassay for detection of viable Mycobacterium avium subspecies paratuberculosis (Map) in milk and fecal samples. Additionally, research will aid in the development of bioactive compounds from peach by-products, specifically the skin and stone; as well as take a pro-active approach to prevent risks of the combination of pathogenic biofilm-forming bacteria in causing respiratory disease in a susceptible population. Finally, research addresses the food safety implications related to organic vs. conventional systems for egg laying, on-farm

composting, natural antimicrobials, antimicrobial packaging and modified atmosphere packaging. In general, the main goal of the 1890 Research is to assess the susceptibility and biological responses of selected external feeders of grain to ozone gas. Determine the biological and reproductive responses of adult insects surviving sub-lethal dosages of ozone gas. A training course will be delivered. The ozone generator will be commissioned and a post-doctoral researcher will be hired to the team. Safe handling of food will be taught to handlers in the food service industry and the general public. Commercial food processors will be targeted in an effort to improve commercial food processing efficiencies and effectiveness/develop new markets/improve commercial handling, processing, preservation and packaging to provide safe and high quality foods. Attention will be given to providing consumers with scientifically based, reasonable nutrition and food safety information via the media. Food-borne illnesses will be defined and conditions discussed that encourage bacteria growth. Most common food-borne pathogens, additives, preservatives and basic kitchen safety techniques will be taught. The following activities will be conducted:

- Participants will develop skills in procuring of food for good health;
- Participants will demonstrate skills in preparing food; emphasizing healthy preparation techniques;
- Participants will increase knowledge and skills for the safe handling of food;
- Managers and supervisors will be certified to train food handlers in safe food handling techniques;
- Food handlers will practice safe food handling techniques;
- Volunteer food handlers at temporary events will increase their knowledge in safe food handling;
- Regulatory compliance will be promoted;
- Specialists will assist entrepreneurs in the development of new food businesses;
- Public understanding of technology, with an emphasis upon food biotechnology will increase;
- Media outlets will utilize Extension food safety and nutrition resources.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Public Service Announcement ● Billboards ● Newsletters ● TV Media Programs ● Web sites other than eXtension

3. Description of targeted 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.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Licenses
- Disclosures
- Number of people completing educational workshops.

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

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 Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Extension
- 1890 Extension

Outcome # 2

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
- 723 - Hazards to Human Health and Safety
- 703 - Nutrition Education and Behavior

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 3

1. Outcome Target

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

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
- 503 - Quality Maintenance in Storing and Marketing Food Products
- 502 - New and Improved Food Products

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 4

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

The goal is for county faculty to be supported entirely through county monies, generated funds, gifts and/or grants and contracts and for new food safety and nutrition county faculty to be added through that same means.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Each research project and its respective program, sets a series of objectives to be accomplished. The situation is presented at the time the research begins and changes are reported during the conduct of the research and at its conclusion. An internal review committee meets with researchers and teams of researchers on research projects and research programs within the planned program areas. The intent of the research effort is identified, as are the anticipated outputs and outcomes. Measures would include new knowledge developed, disclosures, patent applications, patent awards, license agreements, publications and other selected measures, as appropriate.

CUMIS evaluations/reporting; other methods as funding is secured to support them. Standardized tests for food safety trainings.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Agribusiness and Community Development

2. Brief summary about Planned Program

Clemson and South Carolina State will report work formally labeled CLED to the program topic of Agribusiness and Community Development. The major goals of this program are to foster the development of local and regional food systems, promote entrepreneurial and agribusiness development, and enhance community resiliency and economic capacity. The program provides entrepreneurial training and support with an emphasis on agribusiness and natural resources, industry cluster development and economic impact analysis. The program also promotes community enhancement that is linked to community image, sustainable economic development, and improved quality of life.

The Clemson Institute for Economic and Community Development provides educational, policy formation, and service functions, such as strategic planning and grant support as a collaborative and facilitative entity to extension educators, citizens, and others. The Institute offers community leadership development training, facilitation of strategic planning for economic development, public issues education, and serves as a collaborative agency with other leadership program sponsors.

The Adult Leadership and Community Development Program provides communities with leadership training, financial management, business development, family and consumer education capacity that creates opportunities for continuous and sustained growth. With a focus on resource building, education and training, leadership, strategic and sustainability planning, the 1890 Extension Program assists socially disadvantaged and economically depressed communities in building their potential to enhance their own resource development capacity from the inside out. Some of the activities involved under the program include technology education workshops and classes and community outreach (fairs and expos).

A skilled workforce has been identified as one of the key elements in attracting new investment that leads to better paying sustainable jobs. In cooperation with the South Carolina Commission of Employment Security and local Workforce Investment Boards, the needs for different workforce skills will be documented and matched to characteristics of the local workforce. The Brownsfields Redevelopment program serves to remediate abandoned, idle or underused industrial or commercial property where expansion or redevelopment is complicated by real or perceived environmental contamination.

The CD Certificate Program is designed in partnership with Benedict College School of Community Development and the South Carolina Association of Community Development Corporations Incorporated to provide practitioners in local communities with the knowledge, skills and abilities to successfully design, develop and establish successful economic and community development initiatives in their local communities. The program is designed to provide practitioners competencies in the following areas: community needs assessment and asset mapping, leadership models and roles, building effective partnerships, developing effective advancement programs, building effective political relationships, establishing effective public/media/community relations, and designing and developing effective community development projects.

Clemson research will be shifting to a new emphasis on research and development of agribusiness and agricultural information technology. A beta system has been developed and provides for query based reports of economic impacts of research specific to crop type, soil type, and user-defined geographic region; this research will continue to grow in the years to come. New research is looking to create awareness and interest at the middle and high school levels for careers in the agricultural sciences, and to prepare students for success in college, leading to a sustainable supply of well-educated agricultural

scientists.

Under the Agribusiness and Community Development Program, 1890 Research has five projects. One looks at the dynamic linkages among capital investment, export, agribusiness, education, business, climate and quality of life variables and economic development of South Carolina. Another focuses on data envelopment analysis (DEA)-Based integrated logistics network system designed to improve supply chain efficiency in South Carolina, while another researcher explores can U. S. export credit programs enhance exporting opportunities and increase income for small agribusinesses and small farmers in South Carolina. Research will investigate accelerating the usage of digital communication technologies by small agribusiness firms in South Carolina as well as focus on reduction of transient related power blackouts to lessen the crops and livestock losses by U. S. farms and the spoilage of refrigerated agricultural products.

3. Program existence : Mature (More than five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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	25%	25%	0%	20%
609	Economic Theory and Methods	10%	10%	20%	10%
610	Domestic Policy Analysis	15%	10%	0%	20%
801	Individual and Family Resource Management	15%	20%	0%	10%
802	Human Development and Family Well-Being	15%	10%	0%	15%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	20%	15%	40%	20%
806	Youth Development	0%	10%	20%	5%
903	Communication, Education, and Information Delivery	0%	0%	20%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

The Agribusiness and Community Development program fosters the development of local and regional food systems, promotes entrepreneurial and agribusiness development, and enhance community resiliency and economic capacity. It addresses the need for increased leadership training and development in South Carolina's rural, suburban, city, and transitional areas to help these areas identify

resources and strategies to assist in their economic growth and development. Transitional areas include counties and communities at the fringes of metropolitan sprawl or changing neighborhoods. The target areas often lack progressive leadership that looks beyond local political boundaries. Projects such as the Palmetto Leadership program and Public Issues Education are designed to assist leaders with local planning to find new revenue sources in rural counties that have a low tax base and relatively few income producing resources. Extension educational programs foster teamwork, planning and regionalism to address effectively the locale's economic and quality of life concerns. The community development program provides a facilitated and constructive forum where conflicting interests and policies can be addressed through the action plans of established and emerging leaders. The programs also help create the next generation of informed leaders.

The Adult Leadership and Community Development Program provides individuals and communities with technology to enhance personal and professional development, leadership training, financial management, small business development and family and consumer education. The goal is to be a major community advocate and support programs in the State that provide individuals and communities with personal and professional development.

There is a need to support communities with research efforts and provide data which will assist in 1890 youth programs, eliminate drugs and other illicit activities and strengthen economic development in communities where needed.

Policy issues and concerns of low and moderate income residents as they relate to the distribution of local public services will be reviewed and analyzed. The distribution of service delivery, role performance and officials' perceptions will be collected.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Assumptions for the Agribusiness and Community Development program include:

- * The development of targeted industry strategies, community leadership development and overall strategies for economic development can spark entrepreneurial innovation and attract jobs;
- * Training programs can help build leadership skills of local citizens;
- * Trained leaders can promote informed change that produces community-friendly public policies;
- * A properly trained population can enhance workforce preparedness and promote economic development in communities;
- * Engaging communities through collaborative efforts and partnership increases buy-in, and significantly increases the potential for program and community success;
- * The power to change communities rests within the communities;
- * Communities are best able to define what success looks like;

- * Growers of food and non-food crops need alternative crop options and new production systems to remain competitive in markets;
- * Growers having access to agribusiness and agriculture information technology stand a better chance at incorporation into their operations.

2. Ultimate goal(s) of this Program

The goals of the program are to strengthen the economic competitiveness of rural areas, improve the business climate, create economic opportunities and improve the quality of life for rural residents. The program will foster the development of local and regional food systems, promote entrepreneurial and agribusiness development, and enhance community resiliency and economic capacity. The program will provide training for citizens to enhance leadership, communication, team building and strategic planning efforts. It will also provide communities with tools to develop a vision for transformation to a future state of increased livability, prosperity and sustainability. The program will provide individuals and communities with access to technology to enhance personal and professional development, financial management, small business development and family and consumer education. In addition, growers of food and non-food crops will be able to maintain a competitive edge in regional and international markets.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	10.0	7.0	7.0	5.0
2018	10.0	7.0	7.5	5.0
2019	10.0	7.0	8.0	3.0
2020	10.0	7.0	8.5	3.0
2021	10.0	7.0	9.0	3.0

V(F). Planned Program (Activity)

1. Activity for the Program

New Clemson research will involve an assessment of economic impacts of agricultural research by measuring the impacts of the Experiment Station in terms of job creation/preservation, increased crop quality, increased crop yield, increased efficiency in use of fertilizers, pesticides, and irrigation, and increased water and other environmental qualities and providing an objective information source for assessing resource needs at the research and education centers to maximize their impacts.

The following activities will be either initiated or continued:

1. Conduct leadership programs and workshops in counties or municipalities, teaching facilitation skills and best practices of conflict resolution to be used in public meetings and public forums. Offer leadership, board training and organizational capacity building and promote participation in task forces/committees that have programmed outcomes and that formulate action plans and policies.
2. Coordinate with other state organizations and regional NGOs to promote community food system development, trainings, workshops, etc.
3. Conduct community assessments and work with communities on land use planning issues;
4. Develop entrepreneurship training curricula necessary to meet the needs of the local community.

5. Engage citizens in community promotion projects annually;
6. Conduct market assessments, economic impact analysis and business retention programs for rural/urban communities;
7. Develop a quantitative systems dynamics model for local food systems.;
8. 1890 will address issues associated with youth through an empowerment/citizenship program;
9. Increase statewide collaborations by continuing to share information with potential partners and engaging them in community projects;
10. Provide leadership in cultural and environmental stewardship;
11. Convene practitioners and researchers in an interactive environment that results in innovative, sustainable solutions;
12. Foster research, collaborations, capacity building and leadership for sustainable community and economic development;
13. Projections will be made for labor needs by occupational category under current situations and for proposed projects (The estimates will be linked to process-based models and tied to industry targeting recommendations. The information generated will be critical in assisting local organizations with training responsibilities to develop a local workforce capable of competing in the knowledge-based economy. Other possible areas of work include evaluating and working to strengthen linkages between rural and urban-based clusters in terms of backward and forward linkages.);
14. Develop business plans;
15. Researchers will be working to develop procedures for evaluating the economic feasibility of agribusiness value added based economic development options, and to develop economic models to estimate regional impacts, particularly on income distribution of the use of the value added agribusiness model. Assistance with policy development for small communities is considered a valuable tool for local program planners and policy makers to strengthen their respective regional economies, most of which will be predominantly rural.
16. There will be a distinct shift in focus to a new emphasis on research and development of agribusiness and agriculture information technology. The economics of alternative crops and the economics of new production systems will be a major focus of this effort.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Public Service Announcement ● Billboards ● Newsletters ● TV Media Programs ● Web sites other than eXtension

3. Description of targeted 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.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
 - Number of patents submitted
 - Number of peer reviewed publications
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Number of publications and business plans.
 - Total number of people completing educational workshops.
 - Number of business owners increased knowledge.
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

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 agribusiness and community promotion projects

Outcome # 1

1. Outcome Target

Total number of people reporting increased knowledge in community improvement and development as a result of participation in CLED activities.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 608 - Community Resource Planning and Development
- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities
- 806 - Youth Development

4. Associated Institute Type(s)

- 1890 Extension
- 1890 Research

Outcome # 2

1. Outcome Target

Number of participants engaged in agribusiness and community promotion projects

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

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

Description

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Each research project and its respective program, sets a series of objectives to be accomplished. The situation is presented at the time the research begins and changes are reported during the conduct of the research and at its conclusion. An internal review committee meets with researchers and teams of researchers on research projects and research programs within the planned program areas. The intent of the research effort is identified, as are the anticipated outputs and outcomes. Measures would include new knowledge developed, disclosures, patent applications, patent awards, license agreements, publications and other selected measures, as appropriate.

Extension will measure using pre/post evaluations, data comparisons, measures of participation and knowledge gained.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

4-H Youth Development and Families

2. Brief summary about Planned Program

The 4-H and Youth Development Program in South Carolina is a community based experiential educational program dedicated to the overall positive development of the youth of South Carolina. The 4-H Program seeks to provide a community environment that supports the development of the positive assets of youth and development of life skills so that youth may become competent, caring and contributing adult members of society. In order to accomplish this goal, the SC 4-H Program utilizes an experiential subject matter oriented program that supports the current state school curriculum in primarily afterschool, out-of-school club units, camps and short-term special interest programs. Local adult and teen volunteer leaders will be recruited and trained to provide land-grant based subject matter curriculum and educational experiences.

Research will be explored on the quality of assessment, curriculum and interaction between early childhood educators and children in Orangeburg, Calhoun, Bamberg, Barnwell and Allendale early childhood program. The structural characteristics of the early childhood programs will be recorded. Data will be collected from 10 center-based early childhood private/non-profit programs.

Research will increase African-American males' exposure to mathematical related careers, to provide exposure, awareness and importance of mathematics to African-American males. The project plans to increase mathematic proficiency and develop a support system through tutoring and mentoring of a cohort of sixth through eighth grade black males.

In addition, research will continue assessing the degree of developmentally appropriate assessment, curriculum and best strategies utilized by community-based child care center-based programs. The project will explore the quality of assessment, curriculum and interaction between early childhood educators and children in the Orangeburg Cluster early childhood programs.

3. Program existence : Mature (More than five years)

4. Program duration : Medium Term (One to five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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	0%	10%	4%	20%
802	Human Development and Family Well-Being	15%	20%	15%	25%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	10%	20%	10%	25%
806	Youth Development	75%	50%	71%	30%
	Total	100%	100%	100%	100%

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

While many students are making solid progress in school, too many others are performing below minimum standards of the basic academic skills. Large percentages of students are still placed in special education, even though many of them are recognized as disabled only in academic learning, but not in other areas of life. In 2015, the average math, reading, and science scores of eighth-grade public school students in South Carolina was below the national average. One of our priorities is to coordinate and promote the parallel utilization of 4-H curriculum with the state approved public school curriculum. Single parent families have increased. More and more parents of young children are working. Poverty has declined dramatically over the years, but has not changed much for young children since, especially for the growing numbers of children in families headed by single mothers. Increasingly, parents must divide their time between children and employers. In 2000, 7.1% of all children did not live with their natural parents. Approximately 4.9% of all children lived with relatives and 1.6% lived with non-relatives. Another one of our priorities is to enhance family well-being for all families through parent and youth involvement in 4-H.

In addition, volunteers will be equipped for leadership roles, will train youth with new knowledge and skills and will make positive impacts in their communities. An effective volunteer management system for 4-H Youth Development will be established and sustained. County programs will provide a wide variety of experiential educational opportunities and curricula through a number of different delivery modes such as clubs, short term interest programs, camps, etc., dependent upon their personnel and budgets. Emphasis will be on volunteer-led educational programming that provides productive youth-adult partnerships. Statewide curriculum training for volunteers, staff and youth will be provided for replication at the club and county levels. Programs designed to meet the needs of limited-resource audiences will be provided. Money management skills will be taught and community partnerships will be created and strengthened.

Action research is primarily practitioner driven. It is a method for teachers to examine outcomes for students. It is a method of trying out ideas in practice as a means of increasing knowledge about and/or improving curriculum, teaching and learning. Also, it is important to discover the dynamics of relationships identified through online instructional features that are important for the creation of a successful educational program for meeting diverse needs of adult learners.

1890 Research will explore the quality of assessment, curriculum and interaction between early

childhood educators and children in early childhood programs. The structural characteristics of the early childhood programs will be recorded. Overall, the research will assess the degree of developmentally appropriate assessment, curriculum and best strategies utilized by community-based child care centered programs.

2. Scope of the Program

- In-State Extension
- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Due to a rapidly changing, complex American society and a media-reinforced "me" culture, youth need experience and training to become contributing, effective members of their communities. The 4-H program provides opportunities for youth to serve as partners in planning, implementing and evaluating the overall program as partners in the program, not merely recipients. Strong families provide children with a sense of belonging and the security of being loved and nurtured. Children from families without this strength and security often are at risk. 4-H seeks to support the family unit and strengthen the individual child, building upon the assets that are present. Far fewer youth, including 4-H members, now live on farms or require knowledge of crops and animal husbandry practices to survive. But learning about living things is just as critical today because society as a whole has lost touch with agriculture and food production. Although our society expresses a desire for open space and abundant natural resources, citizens lack a working knowledge of natural resources and an understanding of their role in environmental stewardship. 4-H seeks to create an awareness and appreciation of the natural environment and an understanding of individual and personal responsibility of every citizen to maintain the natural resources.

Youth face the challenge of balancing and making healthy decisions with the desire to feel part of a group. 4-H provides a variety of programs, events and activities designed to increase the ability of youth to make wise decisions. Living successfully in the information age requires that youth be knowledgeable and skilled in communicating their ideas and beliefs. This includes the ability to speak with poise and confidence in the public arena, effectively and efficiently communicate utilizing computer technology and through standard written formats. 4-H programs provide opportunities for youth to become proficient in many communications modes. Youth learn about the environment, other subject matter, and develop important life skills through experiential learning programs that use outdoor settings and/or residential environments. Trained adult volunteers are critical in providing a multiplying effect of limited Extension 4-H professional staff. To maximize the efforts of 4-H staff to reach a large and diverse youth audience, 4-H volunteers are utilized to lead 4-H clubs and county 4-H events and activities.

The research may result in an opportunity for decisions to be made as to whether differentiated levels of technical assistance is needed to raise child care centers in counties to a higher level of quality or whether a new curricular approach needs to be designed to meet such needs for the centers because of their unique characteristics and child nurturing needs.

2. Ultimate goal(s) of this Program

The overall goal for the SC 4-H Program is the development of communities of young people in South Carolina who are learning leadership, citizenship and life skills. The 4-H Program seeks to achieve this goal by creating healthy experimentally educational environments in the local community, which supports the positive development of young people ages 5 to 19.

Youth ages 5 to 19 will develop life skills and the corresponding competency, coping and contributory

skills within the content areas of Leadership, Personal Development and Citizenship, Communication and Expressive Arts, Science, Technology and Engineering, Nutrition, Fitness & Safety Education, Food and Nutrition through EFNEP for Children and Youth, Plants and Animals, Natural Resources and Shooting Sports, and youth camping opportunities.

The SC 4-H Youth Development program will recruit, train and manage a system of local adult and teen volunteer leadership who will work with youth ages 5-19. Trained SC 4-H Volunteers and staff will provide land grant based subject matter curriculum and educational experiences so that youth might develop specific life skills, and will provide documentation to excel at a level of educational advancement in the field of action research. Efforts will be made to provide a successful educational program for meeting diverse needs of adult learners.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	22.0	11.5	0.0	2.0
2018	22.0	11.5	0.0	1.0
2019	22.0	11.5	0.0	1.0
2020	22.0	11.5	0.0	1.0
2021	22.0	11.5	0.0	1.0

V(F). Planned Program (Activity)

1. Activity for the Program

County programs will provide a wide variety of experiential educational opportunities and curricula through a number of different delivery modes such as clubs, short-term interest programs, camps, etc. dependent upon their personnel and budgets. Emphasis will be on volunteer led educational programming that provides productive youth/adult partnerships. In addition, statewide curriculum training for volunteers, staff and youth will be provided for replication at the club and county levels. The 4-H youth development educational program is committed to assisting youth and adults in acquiring knowledge, life skill and attitudes that will enable them to become self-directing, contributing and productive members of society. Youth are provided skills needed to become well-rounded students. For example, lessons will cover leadership, conflict resolution, stress, financial management, gardening, social skills and diversity. In regard to youth and family development, basic computer skills will be taught, nutrition information given and opportunities for volunteering are a few activities provided for adults.

A committee that includes university departments, 4-H agents and industry is continuing to develop curriculum for the Stimulator activity which will include robotics, GSP/GIS, Aerospace, ATVs, biofuel programming, the power of wind and global food web. Extension will continue to use the two 4-H Science Trailers throughout the state to reach additional youth in the area of science and technology. Each county is challenged to established new clubs to explore various aspects of science. These youth will attend the Clemson Student Investigators program.

In regard to research, comprehensive systems of curriculum, assessment and program evaluation guided by sound early childhood practices, effective early learning standards and program standards and a set of core principles and values will be constructed. The implementation of a planned, challenging, engaging and comprehensive curriculum will promote outcomes for all young children. An assessment of young children's strengths, progress and needs will be conducted. The research will help improve the educational and developmental interventions of programs.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations ● Other 1 (mentoring) 	<ul style="list-style-type: none"> ● Public Service Announcement ● Billboards ● Newsletters ● TV Media Programs ● Web sites other than eXtension

3. Description of targeted 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

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Number of people participating in educational workshops conducted
- 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.
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

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 Target

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

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1890 Extension

Outcome # 2

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Extension
- 1890 Extension

Outcome # 3

1. Outcome Target

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

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 801 - Individual and Family Resource Management

- 806 - Youth Development
- 802 - Human Development and Family Well-Being

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 4

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development
- 802 - Human Development and Family Well-Being

4. Associated Institute Type(s)

- 1862 Extension
- 1890 Extension

Outcome # 5

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Extension
- 1890 Extension

Outcome # 6

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 7

1. Outcome Target

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

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development
- 802 - Human Development and Family Well-Being

4. Associated Institute Type(s)

- 1862 Extension
- 1890 Extension

Outcome # 8

1. Outcome Target

Number of youth increased knowledge in financial management.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities
- 802 - Human Development and Family Well-Being
- 801 - Individual and Family Resource Management

- 806 - Youth Development

4. Associated Institute Type(s)

- 1890 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

The majority of the Clemson Extension 4-H agents and specialists have been newly hired, as a result of faculty retirements and past budgetary constraints. New faculty, unfamiliar with the Extension or 4-H history and philosophy, come with no ideas or different ideas, which quickly can become new practice or interpretation of policy. A newly formed mentoring team and process is in place. Orientation of county, university and national faculty is an ongoing need or unexpected changes can quickly derail good long term planning efforts. 4-H must develop new outreach approaches for public contact with both potential and current participants. A more volunteer oriented base with greater reliance on new communication channels must be envisioned and enacted.

4-H is no longer the only afterschool youth program for our youth. Afterschool programs are growing dramatically across the state. Along with additional partners, in the field, is a shift in the philosophy of community youth development. Collaboration at the community level for youth development requires a new orientation to many of the present staff and new competencies to facilitate joint programming.

A significant number of youth are becoming home schooled in South Carolina and evidence of their participation has become noticeable in 4-H recognition programs. As this trend continues, 4-H must address new attitudes about education in the state and develop new approaches for attracting equal participation from all educational sectors of society.

Latinos are not yet the major minority in certain areas of the state, but fast becoming one. This group is becoming a new audience with new needs and demands. Sensitivity to their culture and expectations is largely lacking, currently. The need for Spanish curriculum and Spanish speaking staff is growing.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

The SC 4-H Program needs an ongoing systematic evaluation of its delivery system and the resultant impacts on youth, families and communities. Toward this goal SC 4-H proposes to establish a

4-H evaluation committee that will determine types and plans for implementing appropriate evaluations or impact studies over the next five years. The CUMIS system will provide one mechanism for collection of some of the evaluation data. Face-to-face interviews, pre and post-test will continue to be conducted.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Nutrition and Childhood Obesity

2. Brief summary about Planned Program

In South Carolina, over sixty percent of all adults are now either overweight or obese. South Carolina is the 8th fattest state in the nation. Nutrition education programs will focus on the topic of preventing childhood obesity and chronic diseases. Children learn eating behaviors from adults and peers. There are relatively few studies examining the role of the family in shaping and supporting behaviors leading to weight gain, loss or maintenance. This program intends to present an approach to integrate research, teaching and outreach to address the multifaceted public health problem.

EFNEP is a federally funded nutrition education program for children, youth and families with limited resources and is administratively supported by the Clemson and South Carolina State University Extension Services. EFNEP helps persons develop the knowledge, skills, attitudes, and behavior needed to improve their diet. Families learn to make informed choices about low-cost, nutritious foods; to better manage family finances; and to become more self-sufficient. Families and youth are taught individually or in small groups by Clemson EFNEP nutrition educators. Paraprofessional instructors are trained in basic nutrition and food-related topics by Extension nutrition specialists from both institutions. Many EFNEP nutrition educators are hired from the community in which they work. EFNEP currently is located in fifteen counties in South Carolina.

Establishment of nutrition Extension Service activity within limited-resource communities to promote lifestyle behaviors may prevent the development of chronic diseases. Clemson Extension agents and 1890 Extension agents seek partnerships in program planning and implementation.

Researchers are working to reduce excess fat deposition in meat producing animals. This is tied to the ongoing research in the animal program.

1890 Research is focusing on the issue of obesity and its many causes. Obesity is among the top five preventable causes of many common cancers. There is a strong link between obesity, type-2 diabetes, metabolic syndrome and cancer-related mortality. The factor that links diabetes, obesity and metabolic syndrome with cancer is believed to be hyperinsulinemia. Research will be conducted to develop the relationship theory. Another study will be conducted on reclaiming a healthy heritage. The research will focus on prevention and/or management of utilizing an intergenerational approach to make children aware of the value of knowing how to produce and prepare locally grown foods. The project will address the obesity epidemic impacting young children. Also, research will be conducted on food derived AGEs (Advanced Glycation End-products) in relation to obesity and breast cancer. The primary goal of the study is to investigate the extent of carbohydrate and fat derived AGEs, measuring amounts of carboxymethyllysine (CML) and carboxyethyllysine (CEL) from obese (BMI>30) and breast cancer-noncancerous tissue samples from similar age groups and known BMI values.

3. Program existence : Intermediate (One to five years)

4. Program duration : Medium Term (One to five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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	0%	0%	60%	0%
701	Nutrient Composition of Food	5%	10%	20%	10%
702	Requirements and Function of Nutrients and Other Food Components	5%	10%	20%	10%
703	Nutrition Education and Behavior	40%	30%	0%	40%
723	Hazards to Human Health and Safety	5%	30%	0%	10%
724	Healthy Lifestyle	45%	20%	0%	30%
	Total	100%	100%	100%	100%

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Childhood obesity is a serious health issue, with the prevalence reaching epidemic proportions and more than doubling in the last three decades, with even higher rates among subpopulations of minority and economically disadvantaged children and adolescents. Over 60% of adults are now either overweight or obese. Obesity rates are increasing in children, with an estimated 34% of all school-aged children and 25% of low income children being obese. Prevention of the development of obesity is essential and prevention should start with children. Children have the lowest prevalence of obesity, but the habits that lead to obesity are developed early in life.

The economic impact of obesity and associated chronic diseases has been estimated to be approximately \$1 billion in South Carolina alone and \$147 billion nationwide. Obesity in children and adolescents has been associated with several chronic disease states including: diabetes, asthma, sleep apnea, and gall bladder disease. Several studies document that the prevalence of type II diabetes is increasing among children and adolescents. Children who are overweight are at increased risk of becoming overweight or obese adults. Nationally, the prevalence of adult obesity increased 75% between 1991 and 2000 (from 22.9% to 30.5%). Adult obesity is an important risk factor for several chronic disease conditions. Approximately 14% of the South Carolina population is low income and at higher risk for food insecurity obesity. The causes of obesity are complex and include genetics, lack of physical activity and high-fat, energy-dense foods, which are readily accessible, inexpensive, heavily advertised, and palatable. Furthermore, individuals who are overweight may not eat more than normal weight individuals but, instead, may have a positive energy balance due to low energy output.

2. Scope of the Program

- In-State Extension
- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Increased physical activity and healthy eating can contribute to the reduction of obesity. A critical step in developing successful interventions to increase physical activity and healthy eating for the prevention and control of obesity among children involves understanding how families influence the weight-regulating behaviors of their children.

The reduction of fat in the diet will contribute to a reduction in childhood and obesity in the general population.

2. Ultimate goal(s) of this Program

The goal is to reduce the prevalence of overweightness, obesity and the associated health risks and promote healthy lifestyles of children in South Carolina. A multi-faceted approach will be used, focusing on the development and promotion of lifelong healthy eating and physical activity behaviors for children, youth, and families and on working with partners to change the nutrition and fitness environment. In addition, research will produce options which can reduce consumption of fatty acids in ruminant animal products.

Another goal of the program is to determine the efficacy and cost-effectiveness of the proposed interventions through randomized trials, enable continued refining of our understanding of relationships, and develop empirical evidence for improving and adapting interventions to family environmental contexts. Thus, increasing the probability of success of future obesity prevention and control interventions with children.

There will be four primary objectives for research in childhood obesity:

1. Explore associations between family domain factors and child physical activity and eating behaviors;
2. Develop and refine measures of family domain factors associated with child physical activity and eating behaviors;
3. Delineate the strength and direction (causal linkages) of the relationships between family domain factors with the greatest potential for change through community based interventions;
4. Pilot test an intervention targeted towards family factors that relate child physical activity and eating behaviors.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
		1862	1890	1862

2017	21.0	5.0	0.0	3.0
2018	21.0	5.0	0.0	2.0
2019	21.0	5.0	0.0	2.0
2020	21.0	5.0	0.0	2.0
2021	21.0	5.0	0.0	2.0

V(F). Planned Program (Activity)

1. Activity for the Program

Associations will be explored between family domain factors, child physical activity and eating behaviors. Measures of family domain factors associated with child physical activity and eating behaviors will be developed and refined. This program will delineate the strength and direction of the relationships between family domain factors with the greatest potential for change through community based interventions. A pilot test will be conducted of an intervention targeted towards family factors that mediate child physical activity and eating behaviors.

Educational and nutritional workshops will be conducted with youth and families of general and limited resources to improve their health and well-being. Health assessments on participants and their families will be conducted. Daily recreational activities will be incorporated into summer and after-school programs. Pilot studies will be conducted. Research will attempt to identify the modified DNA residues, interpret formation of compounds. Carryout growth assays with other inhibition methods. A summer nutritional camp will be implemented. A self-esteem curriculum will be designed. Food choice surveys will be designed and checked for reliability.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Public Service Announcement ● Billboards ● Newsletters ● TV Media Programs ● Web sites other than eXtension

3. Description of targeted audience

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

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Number of children and youth reached in healthy eating programs.
- Number of youth completing educational workshops.
- Number of youth gained knowledge in nutrition and fitness.

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

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.
3	Number participants reporting increase knowledge in safe food handling and nutrition.

Outcome # 1

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 502 - New and Improved Food Products
- 703 - Nutrition Education and Behavior
- 701 - Nutrient Composition of Food
- 724 - Healthy Lifestyle
- 723 - Hazards to Human Health and Safety

4. Associated Institute Type(s)

- 1862 Extension
- 1890 Extension
- 1890 Research

Outcome # 2

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 723 - Hazards to Human Health and Safety
- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

4. Associated Institute Type(s)

- 1862 Extension
- 1890 Extension

Outcome # 3

1. Outcome Target

Number participants reporting increase knowledge in safe food handling and nutrition.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 724 - Healthy Lifestyle
- 723 - Hazards to Human Health and Safety
- 702 - Requirements and Function of Nutrients and Other Food Components
- 703 - Nutrition Education and Behavior

4. Associated Institute Type(s)

- 1890 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

Changes in public policy directed toward obesity, nutrition and fitness, and food safety issues will impact availability of funding for community-based translational research and outreach in food safety and nutrition and may necessitate additional activities in any one area. For instance, South Carolina has required every school to implement a program in nutrition and fitness.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

A 4-H evaluation committee determines types and plans for implementing appropriate evaluations or impact studies for programs. The CUMIS system provides one mechanism for collection of some of the evaluation data. Extension will also measure using pre/post evaluations, data comparisons, measures of participation and knowledge gained.

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Climate Change

2. Brief summary about Planned Program

Research will continue to examine loblolly and longleaf pine management and address the effects of severity and frequency of prescribed burns on the production and exports of pollutants and nutrients in forested watersheds.

3. Program existence : Intermediate (One to five years)

4. Program duration : Medium Term (One to five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : No

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
132	Weather and Climate	0%	0%	50%	0%
205	Plant Management Systems	0%	0%	50%	0%
	Total	0%	0%	100%	0%

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

The Southeastern states will begin to experience the effects on climate change in their coastal regions, sea level rise, for example, increasing water salinity inland and converting freshwater wetlands into salt marsh. Also, increases in temperature and frequent rainstorms and hurricanes, due to climate changes, will alter biogeochemical processes in soils. Natural communities of species in coastal regions will also be impacted by climate change.

The changing climate is reducing the number of cold days traditionally needed for peach tree production. New varieties which can tolerate shorter cold exposure are needed to support the SC peach industry.

Priorities will include determining the sources and inputs of halogenated organics to SC coastal ecosystems and identifying "hotspots" and major mechanisms of greenhouse gas and pollutants.

It will also be important to determine if natural communities of species are bound together by strong ecological interactions or if species respond individually to changes in the environment.

The research seeks to integrate readily available hydrology analysis systems with accumulated, in-situ and real-time remotely sensed precipitation data to predict the likelihood that roads, bridges, underpasses, etc. in rural areas are flooded during severe rain events. The U. S. Weather Service NEXRad integrated precipitation products as an input to a GIS compatible hydrology model will be used.

2. Scope of the Program

- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

There is now a consensus that global temperatures will likely change more in the next century than they have typically changed over recent geologic history. Agencies in the Southeastern US need to understand the effects of population growth and climate change on greenhouse gas emissions, carbon cycling and natural communities of species in coastal regions.

When natural disasters occur, an efficient disaster relief supply chain plays a critical role in quickly distributing relief supplies to the affected area for rapid recovery. A simulation model for disaster response is the foundation on which new policies and tactics can be developed and evaluated. In order to develop useful analytics for a disaster relief supply chain, simulation can be an excellent tool for understanding the impact of disasters, disaster-response operations and the consequences of alternative policies.

2. Ultimate goal(s) of this Program

The goals of this program include to:

- 1) Provide research based information to federal, state and local agencies about the impacts of sea level rise on biogeochemical processes and the challenges of balancing population growth with water resource needs and environmental quality goals;
- 2) Develop an understanding of the latitudinal responses of interacting species in coastal regions to climate change;
- 3) Develop more efficient uses of water;
- 4) Examine new plant varieties suited to the changing climate;
- 5) Develop a hierarchical facility-location model for quickly distributing disaster relief supplies;
- 6) Preposition decision of relief supplies and inventory replenishment policies will be modeled and analyzed in the simulation model;

7) A case study will be employed using the developed Arena simulation model.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	0.0	0.0	5.0	0.0
2018	0.0	0.0	5.5	0.0
2019	0.0	0.0	6.0	0.0
2020	0.0	0.0	6.5	0.0
2021	0.0	0.0	7.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

The forest floor detritus layer is the major source of terrestrial nutrients to aquatic ecosystems, affecting many environmental processes in soil and water. New Clemson 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 our 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.

In southern USA, especially in the Gulf and Atlantic Coastal Plains, loblolly and longleaf pine are two major species under widespread management on both public and private lands. Managers are constantly making choices to favor one species over the other, and this decision will have a long-lasting impact on southern forests, especially considering ongoing climate change due to global warming. The new Clemson project is designed to quantify the growth differences and differential disturbance responses between loblolly and longleaf pine. Results from the project will help land managers to make better informed decision, which should result in a forest condition that is better adapted to, or better equipped to mitigate, future climate change.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Group Discussion ● One-on-One Intervention 	<ul style="list-style-type: none"> ● Public Service Announcement ● Web sites other than eXtension

3. Description of targeted audience

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

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Disclosures
- Licenses

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

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.

Outcome # 1

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 132 - Weather and Climate

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

{NO DATA ENTERED}

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Each research project, and its respective program, sets a series of objectives to be accomplished. The situation is presented at the time the research begins and changes are reported during the conduction of the research and at its conclusion. An internal review committee meets with researchers and teams of researchers on research projects and research programs within the planned program areas. The intent of the research effort is identified, as are the anticipated outputs and outcomes. Measures would include new knowledge developed, disclosures, patent applications, patent awards, license agreements, publications and other selected measures, as appropriate.

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Sustainable Energy

2. Brief summary about Planned Program

Ongoing Clemson research continues to improve the conversion of agricultural crops specifically switchgrass to soluble carbohydrates that can be subsequently converted to biofuels or biofuel precursor. Clemson Research and Extension are working together to build a platform of production information about feedstocks that can be grown sustainably to use in South Carolina's future bioenergy industry as well as investigate and develop sustainable technologies to convert biomass resources into chemicals, energy, materials and other value added products.

3. Program existence : Intermediate (One to five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds :Yes

6. Expending other than formula funds or state-matching funds : No

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	75%	0%	0%	0%
402	Engineering Systems and Equipment	0%	0%	50%	0%
511	New and Improved Non-Food Products and Processes	25%	0%	50%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Developing alternative sources for the production of biofuels is a national priority. In South Carolina crops that could serve as a source for biofuel could mean new crops and income for South Carolina farmers. Priorities include identifying alternative sources, optimizing the state's ability to successfully produce the crops and expanding the science and engineering for bio-based industries and an economy with a bio-based component.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Assumptions for the sustainable energy program include:

- 1) The effects of climate change impacts all crops in drought cycles, to include energy crops;
- 2) New non-food crops are needed to diversify the potential sources of fuels from plants;
- 3) Once new crops are identified, the best practices must be developed through research and disseminated through extension;
- 4) Educational workshops will provide information to help the producer make informed decisions to improve profitability of energy crops.

2. Ultimate goal(s) of this Program

The ultimate goal of the program is to capitalize on new crops for energy production to include sorghum and switchgrass, and to identify other potential energy crops which can be successfully grown in South Carolina and provide profits to farmers. Non plant energy sources such as the Black Soldier Fly and algae will also be considered to create a diversified mix of energy production in South Carolina.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	4.0	0.0	2.0	0.0
2018	4.0	0.0	2.5	0.0
2019	4.0	0.0	3.0	0.0
2020	4.0	0.0	3.5	0.0
2021	4.0	0.0	4.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Switchgrass research is underway to evaluate the efficiency of various bacteria to convert switchgrass to biofuels and bioproducts. Current Clemson research attempts to mimic natural degradation process by allowing the bacteria and fungi to work together to convert switchgrass to soluble sugars. The overall goal is to improve the conversion of agricultural crops specifically switchgrass to soluble

carbohydrates that can be subsequently converted to biofuels or biofuel precursor. Additional projects aim to build a platform of production information about feedstocks that can be grown sustainably to use in South Carolina's future bioenergy industry; as well as investigate and develop sustainable technologies to convert biomass resources into chemicals, energy, materials and other value added products.

A ramp up of crop development speed is essential given the competitiveness from world markets for existing crop commodities, the enormous market potential of bioenergy and other co-products, and the threat of climate change on shifting living (e.g. emerging pests and weeds) and non-living (e.g. floods and droughts) factors affecting crop yield. In short, the application of new technologies such as the analysis of huge DNA sequence datasets described in new research may very well be essential to maintaining and improving the profitability of the US/SC agricultural industry now and in an uncertain future where the Farmer's Almanac may not be predictive of future climate.

Extension will conduct educational programs and demonstration projects to help the producer make informed decisions to improve profitability of energy crops.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Public Service Announcement ● Billboards ● Newsletters ● TV Media Programs ● Web sites other than eXtension

3. Description of targeted audience

All consumers in the state will benefit from research and education programs related to lower cost energy options.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Disclosures
- License agreements
- Number of people completing educational workshops

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

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

Outcome # 1

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources
- 402 - Engineering Systems and Equipment
- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1862 Extension
- 1890 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Each research project and its respective program, sets a series of objectives to be accomplished. The situation is presented at the time the research begins and changes are reported during the conduction of the research and at its conclusion. An internal review committee meets with researchers and teams of researchers on research projects and research programs within the planned program areas. The intent of the research effort is identified, as are the anticipated outputs and outcomes. Measures would include new knowledge developed, disclosures, patent applications, patent awards, license agreements, publications and other selected measures, as appropriate.

Extension will measure using pre/post evaluations, data comparisons, measures of participation and knowledge gained

V(A). Planned Program (Summary)

Program # 10

1. Name of the Planned Program

Global Food Security and Hunger

2. Brief summary about Planned Program

Extension will conduct educational programs to develop and implement agricultural production systems that are economically sustainable and environmentally sound. Objectives include improving profitability and reducing negative environmental impacts of agronomic and horticultural cropping systems, increasing efficiency of production, and increasing the supply and dissemination of information and knowledge about integrated pest management strategies and systems that are available to growers. Extension is charged with training and offering Continuing Certification Units to the 389 (2004) Licensed Aquatic Pesticide Applicators in South Carolina and with educational programs and the most up-to date control recommendations to private landowners and managers.

Many research projects will continue in the area of Global Food Security and Hunger. Additionally, new research will be underway 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; assess the impact of both single and multiple gene Bt traits on the development of corn earworm larvae; and 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. New 1890 research will be conducted investigating alternative source of vegetable oil from non-edible plant seeds for biodiesel 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.

3. Program existence : Intermediate (One to five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : No

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	0%	10%	10%	10%
204	Plant Product Quality and Utility (Preharvest)	10%	25%	18%	15%
205	Plant Management Systems	15%	25%	23%	20%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	0%	13%	0%
212	Diseases and Nematodes Affecting Plants	20%	0%	3%	0%
213	Weeds Affecting Plants	10%	0%	7%	10%
216	Integrated Pest Management Systems	10%	0%	20%	15%
601	Economics of Agricultural Production and Farm Management	30%	40%	3%	10%
701	Nutrient Composition of Food	5%	0%	3%	20%
	Total	100%	100%	100%	100%

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

South Carolina growers produced a soybean crop valued at \$101,700,000, a corn crop valued at \$145,860,000, and a wheat crop valued at \$76,140,000. Clemson University conducts Official Variety Trials of all major crops in multiple locations across the state. The information generated from these trials is used by growers to select the varieties that perform best in their region of the state. Over the past twelve years, peanut production in South Carolina has increased from 8,000 acres to approximately 100,000 acres. There will be continued effort to teach growers how to identify the optimal time to harvest peanuts. Improved production practices are a continued emphasis.

There is also an information need among South Carolina residents related to the improvement of environmentally sound horticultural practices. Through consumer education in environmental horticulture and by developing a pool of well-trained volunteers, this program can significantly enhance Extension's ability for education and outreach and increase service hours toward direct enhancement of the horticultural practices of individuals.

In addition, many youth have little understanding of food systems from farm to table. Educational programs will be conducted to help youth shape basic decision-making about food and cultures.

As South Carolina faces major concerns of emerging disease outbreaks, invasive plant species introduction, exotic plant pest and disease introduction, food safety, and other agroterrorism issues, the roles of state/county emergency officers and first responders are rapidly expanding. Research is being focused on field crops which have experienced substantial production increases in the state to include, wheat, peanuts and sorghum.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Producers need every advantage and the latest knowledge to remain competitive in their businesses. Educational programs can provide growers with information that they can use to make informed business decisions, increase profitability, and lead to production and economic efficiency. Information derived from research into agronomic production will, in turn, be disseminated as appropriate by Cooperative Extension as well 1890 Extension. Through consumer education in environmental horticulture and by developing a pool of well-trained volunteers, this program can significantly enhance Extension's ability for education and outreach and increase service hours toward direct enhancement of the horticultural practices of individuals. In addition, educational programs can help youth gain knowledge and make more informed decisions. New varieties and practices developed through research in South Carolina can find applications in other states and in other nations.

2. Ultimate goal(s) of this Program

The program will allow farmers in the state to diversify their operations and make local products available to the citizens of the state, develop and implement agronomic production systems that are economically sustainable and environmentally sound, provide training that will assist growers in making informed business decisions, and increase profitability for growers. The program will encourage growers to adopt new agronomic and horticultural production practices. The program will help to simplify farm record keeping, which encourages participants to maintain farm records on a continuous basis and improve financial management; educate farmers on ways to implement production systems that require the application of low off-farm input and provide opportunities for farmers to grow crops that satisfy consumer demand within environmentally safe conditions.

There will be a focus on the development of new processes to enhance food security on the local, state, national and global levels as well as evaluate the impact on farmers' profitability and employment opportunities. A combination of new varieties, new methodologies for plant and animal management, refined integrated pest management approaches and new innovations through genomics will assist in dealing with world hunger issues.

South Carolina's contribution to the body of agricultural knowledge through research will lead to increased production of quality foods and youth will become more literate about food and food systems.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890

2017	30.0	8.0	33.0	1.0
2018	30.0	8.0	33.5	1.0
2019	30.0	8.0	34.0	1.0
2020	30.0	8.0	34.5	1.0
2021	30.0	8.0	35.0	1.0

V(F). Planned Program (Activity)

1. Activity for the Program

Current Clemson research looks at watermelon rootstock effect on disease resistance and yield. On-going research also seeks to identify the effect of plant nutrients on the regulation of nodule number in *Medicago truncatula* and the effect of nodule number on plant nutrient values. Current proposed research is developing sensors, controls and instrumentation technologies for sitespecific application of pesticide, nutrients and water for precision agriculture and to demonstrate use, benefits and effectiveness of such technologies in the southeastern United States. Research also examines a variety of reduced-risk chemical, cultural, and biological methods to improve management of vegetable diseases. Current research will determine whether grain sorghum can be used to reduce Columbia lance nematode population densities.

An understanding of arthropod species diversity is fundamental to essentially all efforts to control pests and to take advantage of benefits that arthropods provide. To promote such understanding, research proposes to restore, maintain, and enhance the state's principal species reference collection of Arthropoda specimens, the Clemson University Arthropod Collection (CUAC).

Clemson researchers are developing and refining strategies for managing insect pests of cotton and soybeans, including research into electronic monitoring and detection methods for insects and/or population indices, research on thrips control, and research into monitoring and/or management of resistance development, treatment thresholds, and overall fit of Bt technologies for bollworm.

A current Clemson study is looking at spatial ecology of key pests of field crops (cotton, soybean, corn, wheat) and their natural enemies, and developing environmentally friendly management practices. In soybeans in South Carolina, existing species, such as corn earworm, velvetbean caterpillar, soybean looper, and stink bugs, provide challenges for producers annually. Another study will be looking to develop and refine strategies for managing insect pests of soybean, particularly invasive species that will include the bean plataspid (also known as the "kudzu bug"), *Megacopta cribraria*, and potentially the brown marmorated stink bug, *Halyomorpha halys*.

Clemson researchers are looking to evaluate the influence of rootstocks on temperate-zone fruit tree characteristics grown under varying environments using sustainable management systems, to develop improved rootstocks for temperate-zone fruit trees using state-of-the-art genomic tools in breeding programs, to accelerate adoption of new rootstocks (a) by improving propagation techniques and (b) by acquiring new rootstocks from worldwide sources, and to better understand the impacts of biotic and abiotic stresses on scion/rootstock combinations in temperate-zone fruit trees.

The 1890 researcher will investigate alternative sources of vegetable oil from non-edible plant seeds for biodiesel production. Sample seeds of selected plants will be procured and oils extracted using an oil extraction machine. Chemical and physical characteristics of the acceptable samples will be measured or determined.

Educational workshops will be conducted and focused on programs and activities related to integrated crop management, integrated pest management, water resources, risk management, and marketing. Grow your own vegetable gardens workshops will be conducted. Field trials will be conducted and sound agriculture practices and policies will be promoted. Volunteers will be trained to assist in

program delivery.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Public Service Announcement ● Billboards ● Newsletters ● TV Media Programs ● Web sites other than eXtension

3. Description of targeted 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.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Disclosures
 - Licenses
 - Number of people completing educational workshops
 - New Variety Releases
 - Number of youth participating in 4-H food systems programs
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

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 Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 601 - Economics of Agricultural Production and Farm Management
- 204 - Plant Product Quality and Utility (Preharvest)
- 701 - Nutrient Composition of Food
- 213 - Weeds Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 216 - Integrated Pest Management Systems
- 205 - Plant Management Systems
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

4. Associated Institute Type(s)

- 1890 Extension

Outcome # 2

1. Outcome Target

Number of youth gaining knowledge of food systems

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 701 - Nutrient Composition of Food

4. Associated Institute Type(s)

- 1862 Extension
- 1890 Extension
- 1890 Research

Outcome # 3

1. Outcome Target

Number of producers indicating adoption of recommended agronomic crop production practices

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 213 - Weeds Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 204 - Plant Product Quality and Utility (Preharvest)
- 216 - Integrated Pest Management Systems
- 601 - Economics of Agricultural Production and Farm Management
- 205 - Plant Management Systems
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 4

1. Outcome Target

Number of Master Gardeners applying skills learned and reporting activities.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 213 - Weeds Affecting Plants
- 701 - Nutrient Composition of Food
- 216 - Integrated Pest Management Systems
- 205 - Plant Management Systems

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

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

Description

During the last few years, there has been a rapid rise in public interest in vegetable gardens for food. Many urban communities have looked to community gardening as a low cost option to grow food for themselves and others.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Each research project and its respective program, sets a series of objectives to be accomplished. The situation is presented at the time the research begins and changes are reported during the conduct of the research and at its conclusion. An internal review committee meets with researchers and teams of researchers on research projects and research programs within the planned program areas. The intent of the research effort is identified, as are the anticipated outputs and outcomes.

Measures would include new knowledge developed, disclosures, patent applications, patent awards, license agreements, publications and other selected measures, as appropriate. Extension will measure using pre/post evaluations, data comparisons, and measures of participation and knowledge gained.