South Carolina (Clemson University, South Carolina State University Combined)

Plan of Work for 2023-2027

Status: Final (Approved 9/28/2022)

Executive Summary Overview

The primary industry in SC is agriculture, with 25,000 farms across 4.7 million acres that contributes over $46 billion to the state's annual economy and provides over 247,000 jobs. Forestry is also an important economic driver in SC, contributing over $21.2 billion annually. With such diverse natural resources across the state, tourism is also a major economic force, accounting for expenditures of $24.4 billion in 2019. The 5.1 million people living in SC are crucial to maintaining the quality of life and conservation of the natural beauty in SC, particularly youth, since they are our future stewards of the state. The livelihood and quality of life for SC residents is what drives the programming and research focuses for Clemson University and South Carolina State University (SC State).

The Plan of Work reflects Research and Extension activities to benefit agribusiness, communities, and citizens of SC. Focus areas include advancing the competitiveness of the agriculture and forestry, economic development, safeguarding the food supply, preserving natural resources, and preparing the younger generations to become productive citizens.

AGRISYSTEMS PRODUCTIVITY AND PROFITABILITY

Clemson Research

1. The Advanced Plant Technology program uses traditional plant breeding and molecular genetics to develop new crops and crop-based products.

2. Use of Intelligent Agritronic Devices (IAD) and methodology for site-specific management of crop inputs (irrigation, nutrients, pesticides, etc.)

SC State Research

1. Controlled environment agriculture - an intensive form of hydroponically based agriculture where plants grow within a controlled environment to optimize horticultural practices.

2. Urban agriculture - Production beyond home consumption or educational purposes; Distribution and marketing of food and other products within the cores of metropolitan areas and at their edges such as community, school, backyard, and rooftop gardens.

3. Organic agriculture - Making healthy foods, soils, plants, and environments a priority; Crop productivity through biological fertilizer inputs; Management practices such as cover cropping and crop rotation.

4. Smart Farms - a means of incorporating information and communication technologies into agriculture to collect data about soil and plants that will be beneficial in helping to prevent diseases and make agriculture efficient and sustainable.

5. Hoop houses will be utilized to assist farmers in the day-to-day activities of agriculture.

6. Artificial Intelligence (AI) utilizing machines, such as drones, to conduct repetitive learning and discovery through data. AI based advanced ag-drone system for local farmers will be explored.

7. An innovative industrial hemp production investigation as a viable new emerging crop for small and minority farmers will be explored.

Clemson Extension

1. Increase the adoption of practices that reduce nuisance and environmental impacts through education in the areas of control of odors and vectors, protection of water quality, nutrient management, citing of facilities, and alternative waste handling practices with an emphasis on confined animal production facilities.

2. Emerging tools and practices to increase crop production, decrease operating costs, and reduce environmental impacts for specific farm conditions to ensure farm profitability and environmental sustainability.

SC State Extension

1. Equip all socially disadvantaged farmers with sound management practices through educational activities and projects.

2. Implement the Small Farm Program within the six basic SC State Extension Regional areas that will explore animal production systems, vegetable production systems, sustainable agriculture production, Integrated Pest Management (IPM) practices, and risk management education and natural resource development.

AGRIBUSINESS AND COMMUNITY DEVELOPMENT

Clemson Research

1. Development, analysis and application of next-generation materials, hardware, software, and network systems required to implement new technology for emerging sustainable agriculture. Collect and analyze data on agricultural and meteorological events to be used for site-specific management of water, nutrients, herbicides, and pesticides within individual fields.

2. Examine hydrologic, biogeochemical and forest productivity processes along a hydroperiod and salinity gradient in the upper coast of SC. It will also establish a foundation for an environmental sensor network using technological innovation.

SC State Research

1. Develop financial literacy training programs and counseling services for farmers to improve farm performance.

2. Improve profitability and sustainability through food hub network for small farmers in South Carolina.

Clemson and SC State Extension

1. Provide educational programs directed at teaching management skills that ensure long-term profitability and sustainability for the farm business such as business planning, creative problem solving, assessing alternate enterprise combinations and technologies for profitability while managing market and financial risks and maintaining the integrity of the environment.

2. Programs will focus on providing educational opportunities that address current issues and industry trends in agriculture in the high schools and middle schools across the state to prepare a future labor force in agriculture.

3. Programs will continue to be offered to communities to assist farmers and other agriculturalists to remain on the cutting edge of technology and business skills.

ENVIRONMENTAL AND NATURAL RESOURCES CONSERVATION

Clemson Research

1. Remote data collection and data management on forests. Climatic data (temperature, turbidity, dissolved oxygen) are collected in a database that can be viewed via the internet.

2. Research continues in the areas of silviculture, harvesting operations, forest management, and forest health. Techniques to enhance forest growth and quality are critical to growers in the state.

SC State Research

1. Atmospheric water generators form modified postconsumer plastics.

2. Climatic impacts and predictability of soil erosivity and precipitation over the southeastern US.

Clemson Extension

1. Educational programming to address the impacts of land use, and to promote Best Management Practices (BMP's) at all levels of land ownership (private and public).

2. Equine traffic in SC, which is estimated at 750,000 horses across the state, poses a fundamental management problem of erosion control the prevention of stream sedimentation and fecal contamination of surface waters. Increased knowledge about wetland ecosystems, mankind's impact on water quality and what can be done to ensure proper water quality.

3. Wildlife and wildlife-related activities contribute more than $1.5 billion dollars annually to the state's economy. There are 12.9 million acres of forests in SC and forestry an economic impact of $21 billion annually. We will provide programming in these areas to sustain forests and waterways.

4. Water impoundments, ponds and managed wetlands also impact the quality of life in SC and provide habitat for wildlife and recreational opportunities for residents. Programs aimed at providing landowners and natural resource managers with the tools, information, and economic incentives to maintain and enhance lands for wildlife and forestry are paramount.

5. The environmental horticulture (or "green") industry complex includes production firms (nursery, greenhouse, and sod producers), horticultural service firms (landscape, lawn, and tree care professionals), urban foresters and arborists, private and public grounds workers, landscape pest management professionals, and retail garden centers. We will address the economic, environmental, and social aspects of environmental horticulture to help clientele increase their knowledge and adoption of practices in various areas of.

FOOD SAFETY, SECURITY, AND NUTRITION

Clemson Research

1. Research on the effectiveness of rendering and post-process storage conditions to destroy and/or prevent the growth of animal disease pathogens. Thorough understanding of bacterial transfer from surfaces and rapid detection methods for bacterial contamination are crucially needed in all aspects of food safety research and quality control.

2. Improvements in packaging help improve food safety but also food quality in terms of improving shelf life that reduces food waste. Antimicrobial food packaging could help extend shelf life and provide an extra level of assurance for companies regarding the quality of their products meeting code date requirements.

3. Research on the loss during distribution and retail sale of fresh produce. The proposed work will include fresh produce which could impact the local, rural grower in assisting them in getting their products through the distribution cycle to market without serious loss of quality and overall shelf life.

4. Livestock forage production to enhance farm profits and environmental sustainability of agriculture.

5. Reduction of costs to manage weeds in agronomic crops.

6. Improvement to irrigation water management in SC using real-time soil and weather inputs to automate irrigation scheduling of a center pivot equipped with variable-rate irrigation (VRI) technology.

7. Peanut production - Mitigate yield and quality degradation from biotic and abiotic stresses; Improve production sustainably; Determine the mechanism of glyphosate resistance in Palmer amaranth; Restore sites invaded by exotic plant species.

SC State Research

1. Investigate nutrition as a key prophylaxis against chronic inflammation and other co-morbidities in South Carolina families.

2. Analysis of phytochemicals isolated from sweet potatoes grown on South Carolina farms and antibacterial effects of sweet potatoes phenolic extracts on foodborne pathogens.

Clemson Extension

1. Continue to offer FSMA certifications on the following: FSMA Preventive Controls for Human Food; FSMA Preventive Controls for Animal Food; FSMA Produce Safety Rule and FSMA Foreign Supplier Verification Programs.

2. Retail food safety is critical for the state of SC. Travel and tourism and the related retail food service industry are SC's largest economic drivers. Training retail managers and employees in safe food handling practices are key to maintaining a healthy tourism experience and to repeat visitors.

Clemson and SC State Extension

1. We are well-positioned to foster a culture of health leveraging partnerships with public health sciences researchers and health delivery systems to improve health, wellness, and nutrition.

2. SC State will conduct FSMA Outreach and Education Training to underserved socially disadvantaged vegetable producers across the six regions.

YOUTH AND FAMILY DEVELOPMENT

Clemson Research does not participate in this critical issue.

Clemson and SC State Extension

1. The SC 4-H Youth Development program will work to empower youth to become healthy, productive, and contributing members of society.

2. Ag Innovation Scholars Program will address a critical workforce need by expanding educational opportunities to students interested in pursuing and completing a baccalaureate degree in food, agriculture, natural resources, and human sciences.

3. The Helping Youth Pursue Excellence (HYPE) Program will increase the postsecondary completion rate of students in underserved communities.

MULTISTATE EXTENSION ACTIVITIES

Clemson University Multi-State Programs

1. Southern Region Fruit Consortium: Collaboration between North Carolina State University, Clemson University and institutions in Georgia, Virginia, Tennessee, and Arkansas.

2. Tobacco, apple and strawberry research with the University of Georgia and NC State.

3. The Regional Peach Initiative: Partnership between SC and Georgia.

4. The Orchard Floor Management: Determine the impact ground cover manipulation has on wine grape vigor.

5. Regional Apple Initiative: Partnership between SC, Georgia, and North Carolina.

Merit and Scientific Peer Review Processes

Extension (Clemson and SC State): The South Carolina State Extension Advancement Council provides input at a state level for both Clemson Extension and SC State Extension programs. At Clemson University, each county also has a local county advisory board that reviews programs and makes suggestions for improvements. The Clemson Extension County Advisory Boards meet to review program history and provide input for future programming needs. Clemson also launched Land-Grant Press (LGP)

by Clemson Extension, which is a peer-reviewed system for all Clemson Extension publications. Each article submitted is assigned 2 internal reviewers and 1 external reviewer for accuracy and readability of the article. Reviewers are considered experts in their field and they have the option to accept the article, accept it with revisions, or reject the article. Once the article is deemed acceptable for publication, a final review is conducted by the Managing Editor and a Contributing Editor. This peer-review process ensures that all publications generated by Clemson Extension are up--to-date, factual, and accurate. SC State University has advisory boards by county regions to review their programs and recommend improvements. Programs are also reviewed by the Extension Program Team leaders and administration. Projects and programs are reviewed based on organizational capacity, relevance and impact. In 2018 a survey was administered to external stakeholders to receive feedback on the strengths and weaknesses of Clemson Extension programming.

Research (Clemson and SC State): For Clemson University Experiment Station, an internal review panel meets to review all research outputs and outcomes in preparing to initiate new research projects. The review panel consists of the Experiment Station Director, the Department Chair of the principal investigator, the Research and Education Center (REC) Director, 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 proposals submitted for new projects in addition to (1) internal and (2) external reviewers' comments 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. A project termination discussion is held at the conclusion of the project to discuss the project and determine the next steps for a new project. In addition, all research projects go through a review process as outlined under Hatch regulations. This serves as the Expert Peer Review process, as each project is sent for external review, comments and suggestions, which are examined and incorporated into the new project, as appropriate.

SC State does their reviews quarterly. A project termination meeting is held at the conclusion of the project to discuss the project and determine the next steps for a new project. In addition, all research projects go through a review process as outlined under Hatch or Evans- Allen regulations. This serves as the Expert Peer Review process, as each project is sent for external review and comments and suggestions are examined and incorporated into the new project, as appropriate.

Stakeholder input: Action Taken to Seek Stakeholder Input

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 (i.e. under-served groups such as those in rural areas that have limited access to community resources)

Targeted invitation to selected individuals from the general public (solicited feedback regarding the STEM program)

Survey of traditional stakeholder groups

Survey of traditional stakeholder individuals

Survey specifically with non-traditional groups.

Stakeholder input: Methods to Identify Individuals and Groups

Advisory Committees

Internal focus groups

External focus groups

Open listening sessions

Needs assessments

Surveys

Stakeholder input: Methods for Collecting Stakeholder Input

Meeting with traditional stakeholder groups. (i.e. Cattleman's Association, County Forest Landowners Associations, County Advisory Boards, County Administrators)

Survey of traditional stakeholder groups

Meeting with traditional stakeholder individuals

Survey of traditional stakeholder individuals

Meeting with general public (open meeting advertised to all)

Meeting specifically with non-traditional groups (i.e. under-served groups such as those in rural areas that have limited access to community resources)

Survey specifically with non-traditional groups

Meeting specifically with non-traditional individuals

Meeting with invited selected individuals from the general public (solicited feedback regarding the STEM program)

Stakeholder input: A Statement of How the Input Will Be Considered

Budget planning and allocation process

Identification of emerging issues to be addressed

Redirect Extension programs

Redirect Research programs

Consideration of needs in staff hiring process

Action plans

Setting of priorities for planning cycle

Internal plans of work for Extension program teams

Critical Issues

Agribusiness and Community Development

Initiated on: Nov 26, 2019
State: South Carolina

Term Length: Long-term (>5 years)

Clemson and SC State Extension & Research will help develop local and regional food systems, promote agribusiness development, and enhance community resiliency and economic capacity. Clemson and SC State will provide training and support with an emphasis on agribusiness and natural resources, industry cluster development and economic impact analysis as well as community enhancement that is linked to community image, sustainable economic development, and improved quality of life. Clemson and SC State Extension will also provide agricultural educational opportunities in grades K-12 that address current issues and industry trends to increase the agriculture workforce.

Science Emphasis Area

Education and Multicultural Alliances, Sustainable Agricultural Production Systems

Agrisystems Productivity and Profitability

Initiated on: Nov 26, 2019
State: South Carolina

Term Length: Long-term (>5 years)

Clemson Extension & Research (CER) as well as SC State will help develop niche markets for livestock producers, diversify farming operations, and make local products available. CER and SC State will develop and implement sustainable and environmentally sound animal production systems, and provide training for increases in animal health, profitability, and productivity. Researchers will also investigate production, management and diseases of agronomic crops and ornamental plants.

Science Emphasis Area

Bioeconomy, Bioenergy, and Bioproducts, Environmental Systems, Sustainable Agricultural Production Systems

Environmental and Natural Resources Conservation

Initiated on: Nov 26, 2019
State: South Carolina

Term Length: Long-term (>5 years)

Clemson and SC State Extension and Research will focus on expanding and enhancing forestry and the forest industry, balancing the demands of water supply and water quality, and wildlife conservation. Research will examine loblolly and longleaf pine management and the effects of severity and frequency of prescribed burns on the production and exports of pollutants and nutrients in forested watersheds.

SC State research will focus on removal and/or stabilization of non-radioactive Uranium and heavy metals, toxic trace elements of cotton seeds and reusing post-consumed (PSCs) for solvent extraction of resins and other reprocessing. Clemson and SC State Extension will focus on landowner education to increase management practices and land stewardship. Work will also focus on environmental horticultural education and efforts to reduce the impact of animal agriculture on the environment.

Science Emphasis Area

Agroclimate Science, Environmental Systems

Family and Youth Development
Initiated on: Nov 26, 2019
State: South Carolina

Term Length: Long-term (>5 years)

Clemson and SC State Extension will provide families at all income levels with educational information that improves human relationships and helps them manage their resources more effectively. Creating caring families and communities through collaborative efforts is a must if we are to meet the challenges of today and beyond. Youth development is a concern and Clemson and SC State Extension will help mentor youth in order to become healthy, productive and contributing members of society. Providing a safe environment to learn and grow as individuals is critical for the success of mentoring youth in today's society. Research at SC State will focus on the effects of horticulture therapy on at-risk youth living in rural communities.

Science Emphasis Area

Education and Multicultural Alliances, Environmental Systems, Family & Consumer Sciences, Human Nutrition, Youth Development

Food Safety, Security and Nutrition
Initiated on: Nov 26, 2019
State: South Carolina

Term Length: Long-term (>5 years)

Clemson Research will investigate food safety implications related to organic vs. conventional systems for egg laying, on-farm composting, natural antimicrobials, antimicrobial and modified atmosphere packaging, and the study and development of bioactive compounds from peach by-products. Clemson and SC State Extension will communicate changes in food safety recommendations for consumers and the food service industry as identified by Clemson and SC State Researchers and other agencies. Clemson Research will also work to increase food safety through improved processing and packaging, and developing new diagnostic procedures for animal pathogens. Clemson Extension and SC State will focus on reducing adult and childhood obesity, improving the health and nutrition of residents and provide a more sustainable and secure food supply.

Science Emphasis Area

Family & Consumer Sciences, Food Safety, Human Nutrition, Youth Development