

# North Carolina Agricultural and Technical State University and North Carolina State University Combined Research and Extension Plan of Work 2022-2026

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## I. Plan Overview

### 1. Executive Summary

This Plan of Work includes research and extension programs at North Carolina State University (NC State) and North Carolina A&T State University (N.C. A&T). These programs and activities are designed to discover and develop new knowledge and technology that allow North Carolinians to lead prosperous, healthy lives. This plan represents the combined research and extension programs that largely emanate from the College of Agriculture and Life Sciences (CALs) at NC State and the College of Agriculture and Environmental Sciences (CAES) at N.C. A&T. The North Carolina Agricultural Research Service is the research arm headquartered in the CALs, while research at N.C. A&T's CAES is conducted through the Agricultural Research Program (ARP). Together, they devote their resources to supporting the research operation represented in this Plan of Work. At both institutions, the research effort serves interests in agriculture, environmental and biological or life sciences. In addition, the research program provides the scientific base for academic and extension programs delivered by the two colleges. Extension efforts at both CAES and CALs are driven by the needs of North Carolina's people and carried out in all 100 counties and the Eastern Band of Cherokee Indians by North Carolina Cooperative Extension, a partnership of the two institutions with county, state and federal governments. The partnership is administered through NC State Extension on NC State's campus in Raleigh and Cooperative Extension at N.C. A&T in Greensboro.

#### Research and Extension at N.C. A&T

N.C. A&T encourages innovative and interdisciplinary research necessary to advance agricultural technology, solve the problem of food insecurity and save the environment. CAES conducts research on the university farm, at the Center for Environmental Farming Systems in Goldsboro (CEFS); at the Center of Excellence in Post-Harvest Technologies (CEPHT) in Kannapolis; and on campus in laboratories where investigations include agricultural economics, animal science, soil science, plant science, human nutrition, food science and bioenergy. CAES Extension utilizes variety of instruments to assess the needs, make value choices or set priorities on what educational programs Cooperative Extension needs to focus on. County and state extension centers identify, collect and analyze information pertinent to the economic, social and environmental situation. Data collected are used to determine what priority issues are within the scope of the organization's mission. Issues or problems are examined to determine new potential impact or benefit to the clientele and Extension's ability to address the issue or problem compared to other agencies or organizations. State Extension specialists determine if available research and the knowledge base is adequate to address the problem or issue. Thus, CAES engages in cutting-edge research and promotes the application of inter- and trans-disciplinary integrative approaches that include the outreach of Extension to increase critical mass and impact. To move forward with this aim, we are focusing on four integrative clusters (priorities): (1) plant and animal agricultural systems; (2) food safety, nutrition and health; (3) youth, family and community well-being; and (4) environmental and natural resources.

Specifically, Research and Extension at NCA&T will continue to open doors and make an impact in the following ways:

Improving Plant and Animal Agricultural Systems: Within this area, we will work to address cross-cutting and emerging areas that include big data, genomic sciences, the microbiome, and environmentally controlled agriculture (hoop houses and high and low tunnels, for example), animal and plant health and production. With the addition of an animal science specialist, Extension will expand its work with livestock producers, placing special emphasis on limited resources, small-scale minority farmers. Researchers will study alternative raising practices and feed to reduce the use of antibiotics in cattle, pigs and poultry. Researchers at NCA&T will study the efficiency of different feeding sources to improve animal productivity and gut health. In plant systems, the focus will be in sustainable agriculture, alternative and high value crop production (like hemp, mushroom), season extension, climate change adaptation, value added agriculture, digital agriculture, soil health, eco-friendly way to control the pest in fruits, vegetables, and cash crops, agro economics. CAES'

staffing and plans of work have expanded relative to small farm production and technology. The construction of CAES farm pavilion is completed, this on-farm facility will focus on sustainable agriculture and local and community food systems, housing its applied research and demonstration programs' staff and providing space for meetings, forums and conferences. The pavilion will house offices, wet/dry prep labs, high-tech instructional/training classrooms, meeting and conference rooms, and an indoor multipurpose room to facilitate the college's continued delivery of high-quality programming initiatives and activities to its students and the community.

**Enhancing Food Safety, Nutrition and Health:** With in this area both research and extension will work to address the issue of human health and food safety. The research will focus on whole grain cereals, human health and human nutrition, probiotics strains, food allergy, food production process, bioactive compounds of food, post-harvest technology and food security. With the rise in the obesity rate in North Carolina from previous decades, much work is needed to improve community health and wellness. Cooperative Extension and researchers at NCA&T will work together in a concerted effort to increase information and resources for African-American families and children in rural communities who are often poor and disproportionately affected by high obesity rates and other health-related problems, such as high blood pressure and diabetes. This will be done through research that uses a community-based participatory approach as well as a diabetes prevention curriculum to teach individuals how healthy eating, physical activity, behavior changes and weight loss can help reduce their risk of developing type 2 diabetes. Extension mascots Nate & Kate will promote MyPlate concepts for children in grades K-3. MyPlate illustrates the five food groups that are building blocks for a healthy diet using a familiar image-a place setting for a meal. The MyPlate model is a key component of the Speedway to Healthy classroom activities and exhibits.

The newly constructed student and community farm will focus on sustainable agriculture and urban, local and community food systems, production, and processing, which will serve education, research, extension, and community outreach activities. It will also provide a venue for teaching and experiential learning activities that complement North Carolina NCA&T's degree programs. As part of CAES outreach effort targeting food desert residents, a substantial plot of land at the university farm will be set aside for nearby residents of NCA&T to allow them to raise vegetables for their use. This will be overseen by Extension staff and students to learn and apply the best growing practices. This program will be expanded out to assist local communities interested in establishing community gardens.

Additional research in this area will focus on the coronavirus disease COVID-19) caused by SARS-CoV-2 and poses a critical health issue to the processes and products of agriculture. Consequently, it is an issue of significance importance to the agricultural industry. Some of the research to be conducted by CAES researchers will address the spread and transmission of the virus. Researchers will be examining ways to reduce surface contamination of workspace surfaces in production facilities and laboratories. One approach will be to develop non-chemical means of disinfecting surfaces using applications derived from hemp and mushroom. Other efforts involve developing workspace use and food safety protocols that maximize the use of workspaces while minimizing time needed for cleaning and preparing surface spaces for production work.

**Enriching Youth, Family and Community Well-Being:** CAES researchers and Extension staff are dedicated to working with NC's minority population, socially disadvantaged and disabled growers, elderly population, youth, and children to improve their lifestyle. Researchers will continue to identify the challenges that the elderly population face while aging in place. Also, other research areas include healthy eating habits and childhood obesity. Understanding the relationship between credit scores, debt and interest rates is crucial to the economic well-being of families and individuals. Extension will expand its financial resource management programming to ensure that those who are the most financially vulnerable are well equipped to make sound financial decisions for themselves and their families. 4-H remains an integral role of Cooperative Extension. Increasing interest in and knowledge of science, technology, engineering, and math (STEM) is key for youth to be competitive in today's job market. Furthermore, leadership and presentation skills are important for both personal and professional success. Therefore, 4-H programming will focus on areas such as STEM (science, technology, engineering, and math), leadership development, and agriscience. Innovation Station, the cutting-edge mobile learning experience, will continue traveling to counties throughout North Carolina, providing introductory and advanced STEM (science, technology, engineering and math) curricula for children in grades K-12. Extension will offer summer camp experiences to provide opportunities for first-generation 4-H youth to learn about being leaders in their clubs and communities.

**Environmental and Natural Resources:** In this area we will work to protect the natural environment, provide a solution for waste management and conventional energy. CAES researchers will investigate an advanced biological system to

produce alternative energy, treat agricultural and industrial waste, and protect and improve water quality. Extension will continue to support small scale producers and landowners in their effort to develop woodlot management plans while also integrating techniques and practices such as silvopasture production and riparian buffers.

## Research and Extension at NC State

At NC State, CALS follows a strategic plan focused on people, partnerships and programs. The plan is built upon five core themes: Enhancing the production, quality, accessibility and profitability of food, plant, animal and bioenergy products for North Carolina, the nation and the world; Ensuring environmental stewardship and sustainability of air, land, soil and water resources; Creating a food supply that is safe, secure, healthy, affordable and of high quality; Improving human health and well-being for individuals, families and communities; and Preparing students and stakeholders for leadership and success in the global workforce. Research and Extension programs at NC State collaborate to achieve solutions in each of these areas. The North Carolina Agricultural Research Service remains the principal state agency for research in agriculture, life sciences, forestry and family and consumer sciences. Research projects involve not only CALS but also the NC State colleges of Sciences, Natural Resources, Design, Engineering and Veterinary Medicine. Faculty positions are key to meeting these goals, and we have hired about 75 new faculty members through the university's Chancellor's Faculty Excellence Program, through an unprecedented investment by the provost's office and through a college effort to fill other priority positions.

NCARS conducts research at facilities on and off the NC State University campus. On-campus facilities include Biological Resources Facility, the Bioinformatics Research Center, the Cellular & Molecular Imaging Facility, the Center for Electron Microscopy, NSF Center for Integrated Pest Management, Center for Plant Breeding & Applied Genomics, Food Rheology Lab, Genomic Sciences Laboratory, Herbarium, Horticultural Substrates Lab, Insect Museum, Nuclear Magnetic Resonance Facility, Phytotron controlled environment facility, Plant Disease and Insect Clinic, Plant Transformation Lab, Food Processing Pilot Plants, Structural Biochemistry Resources and Spatial Information Research Laboratory. Off-campus facilities include field laboratories supporting extensive animal and crop research capability as well as agricultural and municipal waste management research; regional research and extension centers with resident faculty members in both western and eastern North Carolina; and 18 agricultural research stations strategically located throughout the state, including the Center for Environmental Farming Systems, which specializes in sustainable agriculture research and extension.

The knowledge and technology developed through NCARS research and research from other institutions are made available to North Carolina citizens through North Carolina Cooperative Extension, a strategic partnership of CALS, CAES and county, state and federal governments. NC State Extension is CALS' outreach component. As the largest extension program at the university, it works collaboratively to provide educational opportunities that help people put research-based knowledge and technology to work to foster economic prosperity, environmental stewardship and an improved quality of life. To address ever-changing needs, Extension's statewide long-range plan changes as needs and circumstances dictate. To achieve the plan's objectives, NC State extension specialists and researchers work hand-in-hand with field faculty serving in all 100 North Carolina counties and on the Cherokee Reservation to deliver research-based agricultural, food and nutrition, and youth development programs for all North Carolinians. Our world-leading faculty and exceptional field faculty and staff provide high-tech, high-touch expertise to serve the unique needs of diverse clients. Our extensive partnerships with agriculture, business, industry, education and government create a unique culture of collaboration that increases productivity and fuels economic development. Our trusted research-based programs and technical assistance provide solutions and empower clients to make better-informed decisions. Our leadership in experiential education equips clients to effectively transfer knowledge and skills into practical application.

Meanwhile, CALS is continuing to strengthen relationships with agricultural commodity groups, biosciences industries and other stakeholders. Thanks to these partnerships, CALS is pursuing three game-changing initiatives that integrate research and extension for the benefit of consumers, farmers, agribusinesses and others involved in the food supply chain:

The North Carolina Plant Sciences Initiative is based on an interdisciplinary systems approach to solving complex problems facing agriculture and science. Through the initiative, the university is building a new world-class facility on Centennial Campus. Construction has begun and is expected to be complete in 2021. There, teams of scientists in plant-

related disciplines -- plant and microbial biology, plant pathology, biochemistry and horticultural, soil, and crop sciences – will work side-by-side with animal and poultry scientists, chemists, engineers, mathematicians, physicists, statisticians and economists to address key challenges related to food, fiber and fuel.

The North Carolina Food Processing and Manufacturing Initiative is designed to diversify and add value to agricultural businesses through food processing. Its goals are to capture added value from North Carolina's agricultural commodities through the development of innovative food products and processing technologies; to foster the growth of food manufacturing entrepreneurial endeavors; to proactively target site selection opportunities within the food manufacturing supply chain; and to provide regulatory training and outreach to the food processing/manufacturing sector.

The Food Animal Initiative. CALS has partnered with the College of Veterinary Medicine to lead this new initiative related to food animal industries, which contribute 60%+ of the state's agricultural production. As the initiative grows, it will enlist the support of other partners at NC State, other land-grant institutions, government agencies and industry. Investigations into the production health of swine, cattle and poultry are underway, including work to address porcine reproductive syndrome virus in sows and antibiotic use guidelines to mitigate resistance in microbes and ensure food safety.

In addition to these initiatives, CALS research and extension work will focus on four priorities for 2020-2025:

**Improving Plant and Animal Agricultural Systems:** Complex challenges demand complex solutions. A rapidly growing population. Less farmland. Climate and water shifts. Emerging crop diseases and pests. Antibiotic resistance in microbes and the need to ensure food safety. These are just some of the challenges facing agriculture today. We bring the brightest minds in academia, government and industry together to drive innovation that increases yields, creates new varieties, extends growing seasons, enhances agricultural and environmental sustainability and produces new and improved technology. Through its research and extension programs, CALS is solving challenges related to the productivity and profitability of both large- and small-scale farms, to the safety and nutritional value of the food supply and to the wise stewardship of natural resources. In plant systems, researchers and extension specialists are developing and disseminating knowledge and technology to improve plant production and protection to enhance farming, landscaping and gardening. Our research and extension programs in animal systems are focused on developing and disseminating knowledge and methods for animal breeding, reproduction, nutrition, genetics and genomics, physiology, environmental stress, product quality, and health and well-being.

**Protecting Environmental and Natural Resources:** CALS' research and extension efforts proactively and comprehensively promote environmental stewardship and protect the natural environment through conservation and sustainable agriculture and timber production. These efforts also aim to tackle the critical issues impacting the quality of our soil, water and air. CALS also provides scientific solutions for animal waste management, wastewater treatment, nutrient management, septic systems, wetland management, soil properties, and fishery and pond management. Programs support the expansion of production systems for biofuels and biobased products including non-petroleum-based fuels, forest biomaterials, power sources and chemicals. In collaboration with the NC State College of Natural Resources, Extension Forestry enables North Carolinians to make informed decisions concerning the management, enhancement, and enjoyment of their forest and other natural resources through sound, research-based information and education.

**Enriching Youth, Family and Community Well-Being:** Our youth are the future of our state and we are doing our part to provide them with the skills they need for success. NC State Extension continues to provide opportunities for youth to participate in 4-H clubs, camps, school enrichment, afterschool and special interest programs. Our 4-H programs increase opportunities for youth to develop life skills, grow confidence, independence, resilience, and STEM skills through fun hands-on learning in safe, healthy, and enriching environments. Our programs also address critical challenges affecting consumer and family well-being. Other focus areas include parenting, child care, family relationships, financial management, aging, healthy homes, and disaster readiness, response, and recovery. At the community level, Extension works with individuals, community groups and local governments on leadership skills, workforce development, entrepreneurship, civic engagement, volunteerism, community planning, and disaster preparedness.

**Enhancing Food Safety, Nutrition and Health:** Efforts to keep American's healthy and free from foodborne illness necessitate a focus on preventing food safety problems rather than taking a reactionary approach. Research and extension efforts protect the safety of food stages along the entire supply chain, from production to consumption. To meet the growing need for healthy food, we are developing and producing new food products that promote health and prevent disease. At the same time, CALS provides nutrition education programming to ensure that individuals, families and

communities have the knowledge they need to make informed choices about food and healthy lifestyles.

## 2. FTE Estimates

Year	1862 Extension	1890 Extension	1862 Research	1890 Research
2022	740.0	91.7	395.0	105.0
2023	740.0	91.7	395.0	105.0
2024	740.0	91.7	395.0	105.0
2025	740.0	91.7	395.0	120.0
2026	740.0	91.7	395.0	120.0

## II. Merit / Peer Review Process

At NC State a thorough scientific and merit review of each proposed HATCH project is conducted at the departmental level before submission to the North Carolina Agricultural Research Service (NCARS). This departmental review consists of an informal review (PI's responsibility) and a formal review (Department Head's responsibility). HATCH projects must be aligned with one of the critical issues from the Plan of Work. Next, research projects undergo a budgetary review and are submitted to USDA/NIFA for approval. The merit of Smith Lever Extension programs developed by Extension Specialists is determined by the Department Heads, Extension Director, and State Program Leaders. Program merit is guided by emerging needs identified through needs assessments Extension agents, state/local advisory councils, governmental officials, advisers, commodity group representatives, volunteers and other clients. At the state level, extension leadership and specialists identify broad areas and scope for Extension to focus its work. At the local level district directors, county directors, and field faculty review local needs to develop county level plans of work and individual plans of action. At the local level, District and County directors assess the merit of Extension programming.

Evans-Allen projects are supported through the Office of Agricultural Research (OAR) in N.C. A&T State University's College of Agriculture and Environmental Sciences (CAES). The research director in conjunction with the leadership team, faculty and staff determines the need, priority, and scientific feasibility of proposed Evans-Allen projects and the development and implementation procedure for project documentation, merit review, and selection. This process assures that research proposals are scientifically sound, relevant to society's food and agricultural needs, and no duplication of efforts undertaken elsewhere. Prior to proposal development, alignment of the research topic with the needs of the state and the direction of the four program initiatives of CAES is determined. Upon agreement by the department chair, the associate dean for research, the research director, and the principal investigator, a proposal on the topic for submission through the Evans-Allen program is prepared. A merit review process is conducted that includes a review by an external panel comprised of individuals from both within and outside the University who are knowledgeable of or familiar with the area of research. Proposals are then reviewed by the associate dean for research, who determines if additional review and substantive revision is necessary. Upon acceptance by the associate dean for research and research director, proposals are transmitted to NIFA/USDA for approval. Upon NIFA approval, proposals are submitted to the OAR for budgetary review. State program leaders, specialists, regional extension directors and selected county faculty provide internal, merit review of extension program based on statewide needs, and stakeholder input. They collectively, develop extension programs; which provide the broad areas and scope for extension to focus its work. Program specialists develop specific objectives, program descriptions, measure of progress, impact indicators, cost-benefit analysis, and volunteer involvement/value for each objective. County Extension Centers select objectives that most fit local needs. They plan, implement and evaluate educational programs to address objectives outlined in the state plan of work.

## III. Stakeholder Input

### 1. Actions to Seek

NC State College of Agriculture and Life Sciences is committed to seeking, receiving and using input from all stakeholder groups, including under-represented groups and the general public. NC State makes a concerted effort to involve and inform college partners and other stakeholders in planning efforts. The college is fortunate to work closely with a large number of North Carolina commodity organizations, biotechnology companies, service organizations and societies,

agricultural advocacy groups and others to encourage their input and support. NC State Extension routinely reaches out to stakeholder groups including residents, governmental officials, advisory leaders, commodity group representatives, volunteers and other clients. County extension personnel interact daily with stakeholders in such a way that input is effectively gathered and communicated to administration and faculty. An Advisory Leadership System is functional in each of North Carolina's 100 counties and the Eastern Band of the Cherokee Indians. The Advisory Council represents geographic, cultural and economic diversity within the communities we serve. This council provides the voice of the groups they represent. Extension county staff serve on local boards and committees to encourage stakeholder involvement in Extension activities. Local extension staff attend community meetings and events and as members of the communities they serve, engage stakeholders and actively seek input.

The CAES Advisory Board meets three times a year and provides advice and counsel on matters related to the College's strategic direction, priorities, and external relations, as well as advice on staying relevant and addressing the needs of its stakeholders. The Board is comprised of industry/commodity group leaders, alumni, students, partner agencies and small farmers. It provides eyes and ears into the communities served by N.C. A&T and provides a forum for CAES to hear from constituents and communicates information relating to research and outreach. The Strategic Planning Council (SPC) is the advisory leadership group for Cooperative Extension at N.C. A&T and is the voice for NC residents that lack the financial resources, educational background or other social factors, which limit their involvement in the decision-making process. Council members help Extension reach more clientele, ensure the relevancy of programs, and interpret the value of Extension to stakeholders. The SPC meets three times per year, one of which is a joint meeting with NC State's State Advisory Council. The Strategic Planning Council members also attend other special meetings to provide organizational review and input. Two members who serve on both councils facilitate networking and collaboration between both councils. With these organized groups emphasizing and providing significant stakeholder input into program direction, a planned and proactive process is operational that assures that programs are reviewed and overall needs assessed on a continuous basis, but no less than once every two years, with greater frequency encouraged.

## **2. Methods to Identify**

NC State is committed to identifying and giving stakeholders the opportunity to provide feedback and ensure that local programs meet local needs and priorities. Stakeholders are identified through commodity groups, community partners, the Advisory Leadership System, volunteers, staff participation and attendance at community events, other clients, public outreach efforts, and the needs assessment process. Stakeholders are also identified through outreach efforts using mass media, social media, and the Extension website. The Advisory Leadership System, functional in each of North Carolina's 100 counties and among the Eastern Band of the Cherokee is also used to identify groups and individuals from whom to collect input. The Advisory Council represents geographic, cultural and economic diversity within the communities we serve. The system provides a means to engage a comprehensive stakeholder group. This system is monitored administratively to assure that a diverse group of stakeholders are engaged.

The College of Agriculture and Environmental Sciences (CAES) works with its College and departmental advisory boards to identify stakeholders. These boards are comprised of industry, commodity and organizational groups, as well as small farmers and alumni, who help the College, identify stakeholders and assist with obtaining input into CAES' strategic direction and priorities. The Strategic Planning Council organizes community forums, focus groups, listening sessions and a grassroots leadership conference, which helps to identify the stakeholder to collect the input. The input from diverse groups of stakeholders are gathered via mail surveys, electronic/web surveys, focus groups.

## **3. Methods to Collect**

One source of stakeholder input comes from direct interactions between NC State research scientists and county-based extension personnel with producers, industry and other agribusiness representatives. NC State maintains close ties with state agricultural industry associations. The association boards identify high-priority research areas. NC State Extension conducts a formal needs assessment which includes collection of stakeholder input. Extension uses mailed surveys, electronic/web surveys, one-on-one interviews, and focus groups to collect stakeholder input for the needs assessment and subsequent program prioritization process. Stakeholder input is also collected from advisory leadership councils located in each county. Strategic planning efforts in extension and for the entire college benefit from concentrated efforts by college leadership to engage stakeholders through listening sessions, focus groups, and state-wide conferences and workshops. Many of the departments within the College of Agriculture and Life Sciences have formal advisory groups with stakeholder members that meet on a regular basis providing input and direction for research and extension programs.

The Strategic Planning Council at Cooperative Extension at N.C.A&T organizes grassroots leadership conferences each year to collect input from the stakeholder from all three regions of NC (Mountains, Piedmont and Coastal Plains). Also, to ensure appropriate, inclusive and adequate stakeholder input, Cooperative Extension implements environmental scans in each county and on the Eastern Band of Cherokee Indian reservation. The scans provide a wide range of needs, issues, trends and emerging issues. They are submitted and stored in a central database. In addition, state specialists (at N.C. A&T and North Carolina State University) review and compile trend data relative to their area of expertise. Trend data are shared with county staff on alternate years or more often depending on the severity of the issue. Extension also conducts series of listening sessions, focus groups, and statewide conferences and workshops to get the feedback from stakeholders. In addition, CAES uses mail surveys, electronic/web surveys, focus groups, and community forums to collect stakeholder inputs for the needs assessment and program prioritization process.

#### **4. How Considered**

Stakeholder input is used to set program priorities, identify emerging issues, redirect extension programs, redirect research priorities, set staffing priorities and direct budget priorities. Because research and extension activities are directed toward the development and implementation of new knowledge and technology, faculty members are constantly relating industry and consumer needs to the discovery process. Stakeholder input is used in determining research and extension directions and gaining program support and advocacy for research and extension initiatives. For example, the commodity association boards provide information on high-priority research areas to be used in requests for proposals, and boards then decide which proposals to fund. This type of stakeholder input has a direct effect on research activities and subsequent extension programming. Our environmental scanning process identifies key issues of concern and needs of the community and allows us to translate these needs into science-based programs and services. Citizens, commodity association members and representatives, county commissioners, state legislators, and many other leaders and policy makers identify these emerging issues, program needs and priorities which inform program direction, budgets, staffing, and plans of action. This is a huge ongoing function that is ingrained in program planning and implementation for both Research and Extension. It is our intent to involve and serve the citizens of this state in the most effective ways possible to enhance the quality of their lives and economic well-being.

### **IV. Critical Issues**

#### **1 Improving Plant and Animal Agricultural Systems**

##### **Description:**

There is a critical need to increase agricultural food, fiber, and fuel productivity and to increase the profitability of farms and agribusinesses while providing safe, nutritious food for a growing population and being good stewards of our natural resources. Plant systems address plant production, protection, the development of new plant varieties and plant products, organic farming, landscaping, gardening, and discovering and disseminating solutions to production issues including weeds, pests and diseases. Animal systems focus on developing and disseminating knowledge and methods for animal breeding, reproduction, nutrition, genetics and genomics, physiology, environmental stress, product quality, health, wellbeing and biosecurity.

**Term:** Long

##### **Science Emphasis Areas**

Bioeconomy, Bioenergy, and Bioproducts  
Family & Consumer Sciences  
Food Safety  
Sustainable Agricultural Production Systems

#### **2 Protecting Environmental and Natural Resources**

##### **Description:**

There is a critical need to proactively and comprehensively promote environmental stewardship and to protect the natural environment through conservation and sustainable agriculture and timber production and to subsequently address the critical issues impacting the quality of our soil, water, and air. Our work includes providing scientific solutions for animal waste management, wastewater treatment, nutrient management, septic systems, wetland management, soil properties, and fishery and pond management. Programs support the expansion of production systems for biofuels and bio-based products including non-petroleum-based fuels, power sources, and chemicals. We also provide support for forestry, wood products and tourism.

**Term:** Long

**Science Emphasis Areas**

Agroclimate Science  
Bioeconomy, Bioenergy, and Bioproducts  
Environmental Systems  
Family & Consumer Sciences

**3 Enhancing Food Safety, Nutrition and Health**

**Description:**

There is a critical need to ensure we have a safe and nutritious food supply. Our efforts help protect the safety of the food supply through research and extension efforts focused on all levels along the food supply chain, from production to consumption. To meet the growing need for healthy food, our work includes development and production of new food products that promote health and prevent disease. There is also a critical need to ensure that individuals, families, and communities have the knowledge to make choices about selecting nutritious food and living healthy lifestyles that reduce their risk of chronic disease and that they have access to safe, high-quality food at reasonable prices.

**Term:** Long

**Science Emphasis Areas**

Family & Consumer Sciences  
Food Safety  
Human Nutrition

**4 Enriching Youth, Family & Community Well-Being**

**Description:**

There is a critical need for youth to develop skills necessary for future success. Our work provides opportunities for youth to participate in 4-H clubs, camps, school enrichment, afterschool and special interest programs. There is also a critical need to address the challenges affecting consumer and family well-being. Our research and outreach focus on areas such as parenting, child care, family relationships, financial management, aging, healthy homes, and disaster readiness, response, and recovery. Critical issues facing communities include economic, social and environmental resiliency. Our programs focus on leadership, workforce development, entrepreneurship, civic engagement, volunteerism, community planning, and disaster preparedness.

**Term:** Long

**Science Emphasis Areas**

Environmental Systems  
Family & Consumer Sciences  
Food Safety  
Human Nutrition  
Sustainable Agricultural Production Systems  
Youth Development