

Tennessee (Tennessee State University, University of Tennessee Knoxville Combined)

Plan of Work for 2023-2027

Status: Final (Approved 9/27/2022)

Executive Summary Overview

Tennessee's two land-grant institutions comprise the Tennessee Agricultural Research and Extension System. They work independently and collaboratively to conduct Research and Extension programs in all 95 counties and to serve the state's 6.9 million people. The University of Tennessee is based in Knoxville and serves as the state's 1862 institution. It includes the University of Tennessee Extension (UT Extension) and the Tennessee Agricultural Experiment Station (UT AgResearch). Based in Nashville, Tennessee State University (TSU) is the state's 1890 institution; it includes the TSU Cooperative Extension Program and the TSU Institute for Food, Agriculture and Environmental Research. This Plan of Work represents the combined efforts of UT Extension, UT AgResearch, TSU Cooperative Extension Program, and the TSU Institute for Food, Agriculture and Environmental Research.

Agriculture is integral to Tennessee's economy and culture. Almost one of every eight to nine dollars generated in the state is associated with agriculture or an industry that generates products from a natural resource - more than \$79.3 billion annually. The state's agricultural and related exports totaled \$2.2 billion in 2021, up \$325 million or 17% when compared to 2020. Tennessee experienced increases in all major commodity categories in 2021. Farm receipts totaled \$3.6 billion, with approximately 65.5% of this value coming from crops and 34.5% from animals and animal products. In addition to the economic successes of Tennessee agriculture, 339,400 Tennesseans are directly employed by agricultural or natural resource industries, making effective research and Extension programs critical. Tennessee's land-grant institutions conduct research and provide Extension outreach in five key areas to address critical issues affecting the state: supporting food, fiber, and energy systems; enhancing biodiversity and environmental quality; enriching our economy; developing our workforce; and strengthening our health. Research projects provide new knowledge to help stakeholders address issues that affect them. Extension activities share that knowledge with stakeholders ultimately to result in a change in action or condition.

Extension will continue to provide programs to address the ongoing needs citizens and agriculture producers across the state. Health issues continue to be top concerns for residents. Extension will strengthen health programming by offering the Health and Nutrition programs and provide resources for improving dietary and physical activity for limited-resource Tennesseans. Extension Livestock and Forage programs strengthen our Extension and research for the state's livestock producers, researchers and Extension personnel will jointly implement research and outreach in hay schools, late gestation nutrition, marketing, forage testing, and stockpiled forages. Tennessee Extension has developed

programs to strengthen and provide value-added opportunities for producers. The UT Center for Farm Management was established in the Dept. of Agriculture and Resource Economics in 2022. The Center facilitates Extension, Teaching, and Research programs on farm financial management. The Center will focus on meeting the needs of Tennessee producers and enhancing long-term profitability and sustainability of agriculture enterprises. Through the Crops Production Systems Extensions provide demonstration and translational research projects that benefits producers. The crop variety trials for corn grain, silage, and soybeans as well as producer education programs for corn, soybeans, cotton, wheat, and tobacco production are key areas. The Consumer Economics program helps families increase savings, decrease debt, and financially plan. The On my Own and 4-H Workforce Development programs are designed for youth and adults that provide needed skills, trainings, and experiences to participants. Workforce development programs will continue to be of top priority for Extension.

Extension continues develop programs to encourage and provide youth development opportunities. The Next Chapter program is a collaborative effort between the Office of Admissions and Tennessee 4-H. In creating this program, we want to create an early discussion around what skills are necessary for students to be successful in both their secondary and postsecondary plans. 4-H continues programing on honing STEM and Citizenship/Leadership skills.

TSU Extension has appointed Program Leaders in family and consumer sciences, 4-H youth development, and agriculture and natural resources to provide linkage with program areas between UT and TSU Extension. These appointees also serve on the TSU Extension Programming Council to coordinate integrated and interdisciplinary programming efforts.

UT AgResearch conducts research within its eight academic departments and seven physical centers, and at ten AgResearch and Education Centers (REC) located throughout the state. These units help drive planned research programs and facilitate faculty research projects. In addition to “A Decade of Excellence: Ten-Year Strategic Plan for UTIA, 2018-2028,” AgResearch operates under the guidance of its “2021-2024 AgResearch Strategic Action Plan” with the objectives to balance a portfolio of integrated, inter-disciplinary programs, cultivate teams to approach complex problems, advance concepts with structured support, and to ensure R&D capacity with targeted investment. As we approach normal operations after the COVID-19 pandemic, AgResearch faculty and staff will accelerate their impactful work on behalf of the state of Tennessee.

AgResearch is emphasizing programmatic themes to establish integrated programs that contribute solutions to complex problems. The UT One Health Initiative is working to preserve and promote human, animal, plant, and environmental health to advance economic growth, and conserve biodiversity at local, national, and global scales. Scholars from across AgResearch are contributing to studies that define the factors threatening human and animal health, and the health of our environment. The emerging Digital Agriculture program draws on the skills of researchers to create a transdisciplinary path to carbon-smart agriculture and benefits from ongoing investment to build capacity in Precision Livestock Farming (PLF). The program incorporates both plant and animal management projects that ultimately will contribute information to refine strategies that offer carbon reductions over today’s agriculture systems. AgResearch is realigning the capabilities at two of its ten REC to facilitate PLF initiative. The Little River Animal and Environmental Unit plans to have milking robots in operation by late fall 2022, and the Middle Tennessee REC is retooling to support precision beef and poultry

production research. Also, expanded activity in Controlled Environment Agriculture will respond to concerns of food security and nutrition.

The transformational Agricultural Genomics and Synthetic Biology program will advance animal and plant-based productivity. Although early in its development, the initiative already engages faculty to advance state-of-the-art science to design crops that are resilient to climate change. Finally, the BioEconomy Advancement initiative is an established interdisciplinary program focused on sustainable fuels, chemicals, and materials. Additional investment is expanding research capabilities in sustainable aviation fuels to contribute to the aggressive Grand Challenge goals announced by the White House.

Through the Institute of Agricultural and Environmental Research, the goal of agriculture research at TSU is to create and communicate new knowledge in the agricultural and environmental sciences, especially as it relates to the challenges faced by disadvantaged groups. Utilizing faculty in the Dept. of Agricultural and Environmental Sciences and the Dept. of Human Sciences, our research addresses Tennessee's critical issues through focus groups in the plant, animal, food, and human sciences. These faculty-led groups facilitate the identification of research priorities of importance to stakeholder groups and the pursuit of collaborative approaches to address the priorities in our critical issues. To ensure we remain relevant to the needs of our stakeholders, a college-wide advisory committee is being formed to ensure that new and existing programs address the needs of agriculture in America. This committee includes leaders from national and regional commercial entities, state, and local government representatives, plus state and regional stakeholder organizations. Additional efforts to shape the future of agricultural research and Extension at TSU include a new Futuristic Agricultural College Committee to provide a vision that will respond to the grand challenges of the agricultural sector by utilizing the technological advances. We believe that technological advances, profitable business opportunities, and policy changes will help solve climate change, declining rural population, increasing labor costs, and lack of nutritional security to many disadvantaged and minority populations.

Despite the challenges imposed by COVID, TSU IAgER will continue to expand research capabilities in the critical issue areas through the addition of new faculty in biotechnology, food science, precision agriculture, and agricultural economics. We are moving forward to the construction phase of a new Food Science and Technology Building that will support our expanding expertise in food technology and safety. The Agricultural Research and Extension Center associated with the TSU main campus was heavily damaged by a tornado in the spring of 2020. Although field operations have resumed, all greenhouse, shadehouse, and indoor activities at the facility are just partially resuming. The timeline for rebuilding dictates that research in these facilities will be significantly delayed for at least another year.

Merit and Scientific Peer Review Processes

Tennessee Extension programs funded by Smith-Lever or NARETPA Section 1444 and 1445 require a merit review process. A panel of Extension administrators, program leaders and scholars from four states reviewed and approved the Tennessee Extension merit review criteria. Criteria includes assessing needs, delivery methods, implementation steps, evaluation, ensuring diversity and defined outcomes. UT and TSU coordinate merit review processes. State Extension specialists propose planned programs. All proposed programs are reviewed and approved by a review team of UT and TSU Extension administrators and specialists.

UT AgResearch will utilize the process that has been in place since it has proven to be both efficient and effective. Hatch regular and Hatch/Multi-state research projects undergo a review process for merit and scientific soundness, and to ensure alignment with established research priorities. The review process for Hatch regular research projects begins informally with discussions between the project director, colleagues, the department head, and, if applicable, AgResearch and Education Center administrators (if field work is required for the project). A review panel of three scientists then evaluates the proposal for clarity, technical relevance, and scientific merit. The project director makes any necessary revisions and submits the proposal to the department head for review. If approved, the Dean/Director of AgResearch then conducts a final evaluation and endorses the proposal for submission to NIFA.

Hatch/Multi-state projects go through a comparatively more extensive review at the regional level, so the internal review process is abbreviated. The faculty member officially joins a multi-state project after consulting with colleagues and, if applicable, the AgResearch and Education Center administrators. The project director then submits a proposal reflecting the UT component directly to the Associate Dean/Associate Director of AgResearch for review and comment. Once the review is complete and any necessary changes are made, the researcher submits the project to NIFA.

As per NIFA recommendations, each proposed TSU research program is peer-reviewed for relevancy and practicality. The review is performed by subject-specific faculty focus groups and the college administration. The Associate Dean for Research facilitates additional reviews by external subject matter experts in the 1890 and 1862 Land-grant system. Faculty proposals within the Critical Issues are evaluated for relevance, scientific soundness, and appropriateness of planned outcomes. Following evaluation and recommended modification, only those proposed programs that successfully meet all criteria are developed into executable outcome objectives.

The TSU College of Agriculture continues to provide dedicated time and monetary support for focus group members to hold off-campus retreats to discuss, evaluate, and plan program objectives without the distractions of campus life. Also, the Associate Deans of the college continue to hold regularly scheduled group and individual meetings with faculty members to review research priorities, Extension work plans, and progress in these areas. These meetings facilitate an almost continual avenue for monitoring of progress and problem resolution. The above described procedures contribute significantly to ensuring that projects under the Critical Issues are executed efficiently and with maximum benefit to stakeholders.

Stakeholder input: Action Taken to Seek Stakeholder Input

UT and TSU Extension pursued multiple data collections for this Plan of Work. All 95 counties have local Extension advisory groups that provide ongoing stakeholder input. The UT-TSU Extension State Advisory Council reviews and updates plans bi-annually. Extensive strategic plan activities also informed this plan. Employees, community members and state agency leaders participated in surveys, listening sessions and focus groups to identify critical issues affecting their communities and how Extension could address these concerns. Based on this input, the State Extension Advisory Council identified plan priorities. New state action agendas were created to address priorities. Plans are reviewed annually to determine progress and make changes.

UT AgResearch continues to seek stakeholder feedback through several means. The UT Commission on Agriculture holds public meetings twice per year to provide feedback to UT leadership. Three UTIA

Regional Advisory Councils meet twice per year to discuss agricultural and natural resources issues, UTIA program priorities, and how UTIA, including UT AgResearch and UT Extension, may respond to these issues. Successful partnerships with commodity and industry groups, the Tennessee Farm Bureau, and several departments within the Tennessee state government are beneficial to the advancement of common research interests. Advocacy/advisory groups serve the UT AgResearch academic departments and the ten AgResearch and Education Centers at the invitation of the department head and Center director, respectively, to provide stakeholder feedback and to guide future research priorities. Faculty help drive the UT AgResearch agenda by remaining abreast of emerging research and actively engaging with the scientific community, program leaders with state and federal funding agencies, the public, and agricultural and natural resources commodity and industry groups.

Additionally, the UT System is completing a survey that went statewide regarding public input into the grand challenges facing Tennessee. This was a UT System effort, but UT Extension and UT AgResearch assisted in sharing the survey across Tennessee and the results will certainly add to the information we use to determine directions for our work.

Through the development of relationships with the leadership and members of stakeholder-related organizations, TSU research obtains valuable stakeholder input concerning research priorities. To ensure our faculty and programs remain relevant to the needs of our stakeholders, a college-wide advisory committee is being formed to propose and guide new initiatives, and make certain current initiatives address the needs of agriculture in America. This committee includes leaders representing national and regional commercial entities, state and local government representatives, plus state and regional stakeholder organizations. Additional efforts to shape the future of agricultural research and Extension at TSU include the establishment of a Futuristic Agricultural College Committee.

TSU research and Extension places a very strong emphasis on our faculty to partner with the industry, trade, commodity, or professional organizations associated with their respective program areas. In addition to interacting with industry, trade, commodity and professional organizations, faculty are encouraged to assume leadership roles in the organizations. Examples of associations in which our faculty have enhanced roles of engagement are the: Entomological Society of America, American Phytopathology Society, American Society of Agronomy, Southern Nursery Association, Tennessee Soybean Board, Tennessee Cattlemen's Association, Amaranth Institute, Tennessee Organic Growers Association, Tennessee Nursery and Landscape Association, SE Branch-Entomological Society of America, International Plant Propagator's Society, Tennessee Goat Producers Association, and the Tennessee Urban Forestry Council.

In addition to private groups, TSU faculty regularly engage public agencies to provide guidance and feedback about our programs. Agencies include USDA/NIFA, USDA/APHIS, USDA/ARS, USDA/FSA, USDA/FS, USDA/NRCS, USDA/ERS, USDA RMA, Tennessee Department of Agriculture, Tennessee Department of Forestry, Tennessee Plant Material Advisory Committee, Tennessee Wildlife Resources Agency, and the Tennessee Department of Environment and Conservation. A number of different programs maintain an active presence on social media and utilize feedback gained from those sources in their programs.

Stakeholder input: Methods to Identify Individuals and Groups

UT and TSU Extension will employ their extensive, statewide network of advisory groups for stakeholder input. The State Extension Advisory Council provides input and direction for statewide initiatives. Tennessee Extension Agents will continue to place special emphasis on involving youth and other underrepresented groups in needs assessment activities. All of Tennessee's 95 counties have a County Agricultural Committee of seven local stakeholders, nominated by the County Mayor and approved by majority vote of the County Commission. Every County Agriculture Committee meets four times annually, and their duties include input into hiring decisions, local funding, and local programming.

UT AgResearch implements several methods to identify stakeholders for input. The UT Commission on Agriculture includes representatives from commodity and industry groups, the state government, and the community. It holds public meetings twice per year to provide feedback to UT leadership on research, extension, and education issues. Three UTIA Regional Advisory Councils are comprised of the UT Senior Vice President for Agriculture and Deans, representatives from Tennessee agricultural and natural resources commodity groups, and clientele served by UTIA programs. UTIA personnel nominate the commodity group and clientele members. Each of the three Regional Advisory Groups elects a chair to guide meetings. In addition, UT AgResearch administrators and faculty are actively engaged with agricultural and natural resources commodity and industry groups. As new priorities arise, these groups seek out one another to discuss common research needs and opportunities for partnership. Advocacy/advisory groups for the UT AgResearch academic departments and the AgResearch and Education Centers identify additional stakeholders based on the individuals' and groups' relevant background, expertise, and community connections. UT AgResearch faculty regularly interact with their peers at professional meetings and through joint project ventures. UT AgResearch administrators encourage faculty to meet with program leaders at state and national funding agencies to discuss research priorities. Additionally, faculty have opportunities to meet with the public during AgResearch and Education Center field day events.

To date, TSU research has employed a strategy to identify stakeholders in a manner that will provide the most useful and accurate feedback possible about stakeholder concerns. Groups that serve the stakeholders (community-based groups) or groups that represent stakeholders (industry and trade associations) are a primary source of input. Examples of groups are listed in the previous section, "Actions to Seek Stakeholder Input". Individual stakeholders are utilized where there are no associated groups representing the program area, or when an opportunity for face-to-face interaction (i.e., at an association meeting, field site visit, or community event) is presented. In these cases, individuals involved the program outputs are identified and queried for input.

In addition to this strategy, as previously discussed, TSU College of Agriculture is creating an Advisory Board of individuals representing decision-makers from industry, government, and commodity groups. This board will provide invaluable coordinated, stakeholder-based input and programmatic direction to our research and Extension programs.

Stakeholder input: Methods for Collecting Stakeholder Input

Tennessee Extension (UT/TSU) Agents and Specialists are trained in needs assessment strategies and how to select individuals for Advisory Committees. Community leaders selected for Advisory Committees are chosen to represent the diversities (i.e., gender, age, racial/ethnic, socio-economic,

political, educational, etc.) of the county or area served. The UT Commission on Agriculture conducts public meetings twice per year (specific to UT Extension). Extension Agents recruit individuals who have participated in past and current Extension programs; and they recruit individuals who have not used Extension to serve on local advisory committees and participate in open listening sessions. Extension Agents also conduct surveys on planned program areas.

UT AgResearch collects input through regular contact with stakeholders. The UT Commission on Agriculture and the UTIA Regional Advisory Councils meet twice per year. The UT Senior Vice President for Agriculture responds to any issues raised, and, as appropriate, may delegate action to the Deans/Directors of UT AgResearch and UT Extension. UT AgResearch administrators meet with external stakeholders throughout the year. They have face-to-face meetings with the academic department heads and virtual meetings with the AgResearch and Education Center directors monthly; collectively they meet once per year. The academic departments and AgResearch and Education Centers meet with their advocacy/advisory groups annually and share stakeholder feedback with AgResearch administrators and faculty as appropriate. Faculty attend professional meetings and read scientific journals and popular press articles throughout the year. Departments hold monthly faculty meetings where individuals can share their insights with peers and their department head.

TSU research collects input from stakeholders by interactions with commodity groups via survey instruments or face-to-face discussions. Survey instruments are a useful tool to assess information from broader groups of stakeholders. The face-to-face discussions are often held with individual stakeholders, community group representatives or trade association representatives, or with individual stakeholders in a group setting. These interactions allow for questions and answers to direct and stimulate discussion of areas important to stakeholders. Many research programs regularly employ surveys of stakeholders to solicit feedback on important issues; surveys for feedback on individual topics are also used following informational talks at educational programs, field days, etc. While some stakeholders prefer the anonymity and brevity of a survey instrument (often resulting in increased level of input gained), it does not always allow for discussion of previously unrecognized areas of concern. The increased acceptance of social media presents opportunities for stakeholder input.

Many programs maintain an active presence on social media; these platforms serve as a source of information on stakeholder needs and concerns. Research presentations to non-academic stakeholders solicit feedback via evaluations; information gained is incorporated into program focus areas.

Also, as previously discussed, TSU College of Agriculture is creating an Advisory Board of individuals representing decision-makers from industry, government, and commodity groups. This board will provide invaluable coordinated, stakeholder-based input and programmatic direction to our research and Extension programs.

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

Created from stakeholder input, the State Extension Strategic Plan identifies emerging issues, redirects Extension programs, builds state action agendas, and sets program priorities. Stakeholder input and performance measures at local, regional, and statewide level monitor and adjust deployment of the strategic plan. As part of this process, the opinions from many Tennesseans, including decision-makers, clientele, partners, and volunteers were considered. More than 120 stakeholders and 490 UT Extension employees participated in the regional and campus listening sessions. The planning effort also included

an online survey component. UT Extension will address the increasing urbanization and a loss of farmland in the state are concerns for residents. Our Nursery, Fruit and Vegetable Production Programs will place greater emphasis on plant, pest, and soil diagnostic services. The Center for Profitable Agriculture will continue to conduct educational programs on the state's Agritourism industry and value-added programs. Health issues continue to be top concerns for residents. Extension strengthened health programming by offering the CDC Diabetes Prevention Program. To strengthen our Extension and research for the state's beef cattle producers, researchers and Extension personnel will jointly implement research and outreach in hay schools, late gestation nutrition, marketing, forage testing, and stockpiled forages.

Stakeholder input is an active part of setting UT AgResearch budget priorities and redirecting allocations as critical needs emerge, are addressed, and wane. Stakeholder input directly impacts hiring patterns, faculty equipment budgets, scientific communication efforts, forward-looking action plans, and grant-writing directions.

TSU Extension will continue to use extensive stakeholder input to determine what extension faculty positions and extension agent positions are needed for the state of Tennessee. TSU Extension will also continue to partner with UT Extension, county extension offices and extension advisory councils to determine staffing needs, emerging issues and determine priority areas for Tennessee.

Based on a needs assessment, TSU Extension implemented a program called, "Tennessee New Farmer Academy" for farmers, ranchers and returning veterans, to address the need of shortage of production farmers due to aging farm population. We have also expanded the locations to each region of the state. TSU Extension small and minority farms outreach program have been supporting minority and small farmers in Tennessee. It offers several two-day outreach conferences across the state to serve small, minority and women farmers.

As previously stated, TSU research utilizes stakeholder input during the planning and execution of research programs. Information gained through this process did not result in any major changes in research direction or research scope this past year. Rather, it provided information on additional facets for research exploration. For example, discussions with nursery growers and regulatory agencies have led to a major emphasis being placed on education and research in an emerging disease affecting our nursery industry, a yet-to-be named syndrome impacting growers of some of our leading woody ornamentals. Continued concerns over consumer health and food safety issues drives our emphasis in these areas of research. These new, or additional information changes, are examples of stakeholder-inspired modifications we encounter most frequently.

Critical Issues

Agronomic Crop Systems

Initiated on: Nov 12, 2018

State: Tennessee

Term Length: Long-term (>5 years)

Row crops are valued at close to \$1 billion and are grown on 3 million acres across Tennessee each year. Producers are challenged with high production costs, relatively low profit margins, plant diseases, weather, and international competition. Our work in agronomic crop systems will seek to increase yield

and improve profitability for Tennessee row crop producers by assisting them to learn and adopt research-based recommendations, developing and testing technology that will protect crops from pests and disease, providing data in support of new genetics, improving the sustainability of agricultural production, and by developing and selecting improved crop varieties and production systems.

Science Emphasis Area

Developing Our Workforce

Initiated on: Nov 26, 2019

State: Tennessee

Term Length: Long-term (>5 years)

A key component for thriving communities is a strong workforce in rural and urban areas. Tennessee's programs for youth and adults provide the skills, experience, and confidence necessary to move into a competitive workforce and solve present and upcoming challenges. Through outreach and engagement, we also educate youth to better understand the vital role that agriculture and animal industries play in people's lives and the career opportunities these industries provide.

Science Emphasis Area

Education and Multicultural Alliances, Family & Consumer Sciences, Food Safety, Sustainable Agricultural Production Systems, Youth Development

Enhancing Biodiversity and Environmental Quality

Initiated on: Nov 26, 2019

State: Tennessee

Term Length: Long-term (>5 years)

Safeguarding and enhancing the natural resource environment has become increasingly complex within environmental, social, resource and personal contexts. Through collaboration among researchers, industry, producers, environmental groups, and government, we are helping preserve a diverse and resilient environment for future generations.

Science Emphasis Area

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

Enriching Our Economy

Initiated on: Nov 26, 2019

State: Tennessee

Term Length: Long-term (>5 years)

Helping farms and agriculture businesses become more profitable and individuals become financially secure boosts the local, state, and national economies. Our programs strive to strengthen the economic viability of all facets of agribusiness, and improve the financial literacy of Tennesseans and beyond so they may build and protect wealth for themselves and future generations.

Science Emphasis Area

Family & Consumer Sciences, Food Safety, Sustainable Agricultural Production Systems, Youth Development

Strengthening Our Health

Initiated on: Nov 26, 2019

State: Tennessee

Term Length: Long-term (>5 years)

Making healthy choices is important for humans, animals, and even our planet. As a leader in nutrition, animal welfare, and environmental education, we are working to understand how food, physical activity, and social connections affect overall health (i.e. One Health). From food safety to disease prevention and maintenance to the state of our environment, these efforts will help Americans and the rest of the world lead healthier lives for generations to come.

Science Emphasis Area

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

Supporting Food, Fiber, and Energy Systems

Initiated on: Nov 26, 2019

State: Tennessee

Term Length: Long-term (>5 years)

Safe, sustainable agricultural systems that are socially, economically, and environmentally responsible are key to enhancing the lives of Tennesseans and supporting a growing global population. We are exploring ways to deliver discoveries using a systems approach to agriculture productivity that will provide customizable solutions for producers.

Science Emphasis Area

Agroclimate Science, Bioeconomy, Bioenergy, and Bioproducts, Environmental Systems, Family & Consumer Sciences, Food Safety, Human Nutrition, Sustainable Agricultural Production Systems