



TENNESSEE STATE UNIVERSITY

# AG MASTER PLAN





# TABLE OF CONTENTS:

- Department of Agribusiness and Education . . . . . 4
- Department of Agricultural Sciences and Engineering . . . . . 10
- Department of Environmental Sciences . . . . . 17
- Department of Food and Animal Sciences . . . . . 26
- Department of Human Sciences . . . . . 36
- Cooperative Extension Program . . . . . 53
- TSU Agricultural Research and Extension Center . . . . . 61





## INTRODUCTION

The Tennessee State University College of Agriculture has made tremendous strides in the last decade. In that time, we have grown our agricultural science undergraduate enrollment by six times and graduate enrollment by 10 times. In addition to the growth in enrollment, we've grown our degree offerings in the last decade, adding three new M.S. programs, one Ph.D. degree program, two graduate certificate programs, and several undergraduate degree concentrations.

We are the leading research and outreach entity among the 1890 land-grant institutions. For more than a decade, we have been securing the highest competitive grant funding totals amongst 1890 land-grant institutions from the USDA's National Institute of Food and Agriculture. This past year, faculty from the College of Agriculture accounted for 83% of the grant proposals submitted university-wide at Tennessee State University, securing \$47 million in grant funding in the fiscal year. In fact, on a full-time equivalent basis, the College faculty's output and performance far exceeds the other land-grant institutions in the region. We also quickly built up the largest outreach program among the 1890 institutions; we now have extension agents in 60 of the 95 counties in Tennessee.

Today, there are a number of tremendous challenges facing the agricultural sector in Tennessee, across the country and the globe. We have an aging farm population, decreasing productive agricultural lands, changing consumer food habits, a growing world population, and a rapidly changing climate. We are in the midst of a perfect storm as it relates to the agricultural sector. As the State of Tennessee has an important agricultural industry that features a great many small-to-medium-sized farmers, it is imperative that we push to address these issues with a heightened sense of urgency in fulfilling our mission to support the agriculture sector across the state.

To help resolve or find solutions to these significant challenges, we want to build our capacity both in terms of personnel and with respect to degree offerings. We're pushing hard to grow our enrollment and meet the increased student demand with a robust, diverse body of faculty members and additional, new degree offerings crafted for specificity and focus. We plan to add several new faculty members and support staff to the five academic units and research centers as we continue to grow. To realize this vision, these plans, we urgently need to develop the physical infrastructure to house the faculty and train students. As such, a detailed facilities plan developed by the faculty is presented



A photograph of a sunset over a field. The sun is a bright, glowing orb on the right side of the horizon, casting long, golden rays across the sky and the field. The field is a mix of green and yellow, with some trees and hills in the background. The sky is a gradient of blue and orange.

# DEPARTMENT OF AGRICULTURAL BUSINESS AND EDUCATION



# AGRICULTURAL BUSINESS AND EDUCATION DEPARTMENT

Nearly 18 percent of the nation's economy and 29 percent of American jobs are linked to agriculture. This economic and work-based prominence of agriculture is evident in Tennessee as farming dominates the state's landscape with 77,300 farms covering 10.8 million acres, 41% of land area in the State, ranking it 8th in the US for the number of farms. Operation, inputs, outputs, workforce development, and sustainability are made possible when current and future agricultural leaders learn key business management, economic, leadership, communication, and education skills. The Agricultural Business and Leadership Division at TSU provides these skills to youth and adults in Tennessee through formal and non-formal education, research, and extension.

The activities of the Agricultural Business and Leadership Program are supported in the college by 10 faculty members, 20 graduate level assistantships, and various offices assisting academic engagement, recruitment and retention, research, and extension. Additionally, faculty secure external grants to provide opportunities for students and to conduct research to support development in this area. Our faculty also provide extension training to producers and members of the public in support of the Agricultural Business and Leadership workforce development.

We equip students and stakeholders through technologies for immersive learning (i.e. virtual reality, augmented reality, 360-degree video), our AI/robotics laboratory in the new Agricultural Education building. Our engineering laboratory provides opportunities for current and future professionals and educators to be equipped to teach others skills like welding, coding, and machining. We also have adopted software technologies like digital learning (i.e. Desire2Learn, CogBooks) and course sharing (i.e. Quotly) platforms in support of our Extension programs and our online Masters of Agricultural Business and Leadership degree option.





## Department of Agribusiness and Education

### Future Enrollment Projections

Enrollment Projections						
		Ag Business and Education				
	Future Yr Projections	0	5	10	15	20
<b>Students (Headcount)</b>						
	Number of PhD Students	0	5	7	9	12
	Number of Funded Masters Level Grad Assistants	9	18	30	34	38
	Number of GTAs and GRAs if not included above	4	8	10	12	14
	Number of Undergraduate Majors	43	60	84	119	167
	Number of Post Docs	0	3	4	5	6
	Number of MA and EdS Students not counted above					
<b>Faculty</b>						
	Number of Faculty, Full-time T/TT	1	3	4	5	6
	Number of Instructors/Lecturers, Full-time	0	0	0	0	0
	Number of Adjunct Faculty	1	1	0	0	0
	Number of FTE Faculty	10	13	15	17	19
	Number of Faculty, Emeriti (Productive)	0	2	2	3	3
	Number of Visiting Faculty/Scholars	0	2	3	3	3
	Lab Assistants					
<b>Research and Technical Staff</b>						
	Number of Research Associates, Full-time	0	2	3	4	5
	Number of Research Associates, Part-time	0	1	1	1	1
	Number of Technicians/Lab-Based Research					
	Number of Technicians/Lab-Based Instruction					
	Average Grad Students per Faculty in Research Lab					



# Research and Training Laboratories and Facilities

## Entrepreneurship, Incubation and Commercialization Center for Agribusinesses

### **Mission:**

Create an Entrepreneurship-Incubation/Commercialization Center dedicated to cultivating innovation, providing holistic support to startups, and ensuring the effective commercialization of agribusiness ventures. The center is committed to providing resources, mentorship, and networking opportunities for both emerging startups and established agribusinesses, fostering their growth and contributing to the long-term sustainability of the agribusiness sector.

### **Objectives:**

The Entrepreneurship-Incubation/Commercialization Center for Agribusinesses is dedicated to cultivating innovation within the agribusiness sector, aiming to encourage and support the development of groundbreaking ideas and technologies. This involves providing entrepreneurs with a conducive environment for creativity, research, and development, along with resources to implement cutting-edge solutions in agriculture.

The center itself will be a comprehensive hub featuring offices, labs, and collaborative spaces tuned to meet the specific needs of agribusiness startups, offering training, mentorship, coaching, and direct access to industry experts. Networking events and collaborative opportunities among startups will be actively promoted, with a focus on emphasizing commercialization support through strategic partnerships with industry leaders and investors. The center will further provide extensive technical, legal, and financial support through workshops, seminars, and collaborations aimed at enhancing the skills of agribusiness entrepreneurs and protecting their intellectual property.

A consulting student-run venture will also be established to offer students hands-on opportunities in consulting projects, market research, business plan development, financial modeling, and technology solutions for agribusiness startups. By engaging students in impactful roles, the consulting venture contributes to the success of agribusiness startups while providing valuable experiential learning opportunities for the students involved.

### **Infrastructure (10,000 square feet facility):**

The infrastructure requirements for the Center should be designed to create a conducive environment for innovation, collaboration, and business development. First and foremost, the center needs a physical location that is easily accessible and spacious enough to accommodate offices, labs, collaborative areas, and meeting rooms. This facility serves as the nucleus for all activities, providing an environment that fosters creativity and collaboration.

Within this physical space, dedicated offices are essential for startups, entrepreneurs, and administrative staff. These offices should be well-equipped with amenities and utilities to support



day-to-day operations. Additionally, the presence of labs and research facilities is crucial for agribusiness research and development, demanding modern technology and equipment for innovative projects and experiments. Meeting and conference rooms are indispensable for hosting workshops, seminars, networking events, and collaborative discussions, catering to various group sizes and activities.

Furthermore, a robust technology infrastructure is necessary, encompassing high-speed internet, audiovisual equipment, and collaborative tools for effective communication and research activities. Common areas and lounge spaces play a vital role in promoting informal discussions, networking, and relaxation, contributing to the development of a collaborative and supportive community. Dedicated spaces for the incubation program, commercialization support services, training and capacity-building, networking and community building, and monitoring and evaluation activities are essential components of the center's infrastructure. Lastly, allocating space for a consulting student-run venture enhances the center's capabilities by providing hands-on opportunities for students in consulting projects, market research, and technology solutions tailored to the agribusiness sector, creating a symbiotic relationship between students and startups.

### **Small Farm Center (5,000 square feet facility)**

The Center of Small Farm is a comprehensive facility designed to provide essential resources, knowledge, and support socially disadvantage farmers. The center aims to empower farmers to optimize their profitability, adopt sustainable practices, and navigate the challenges of a rapidly evolving agricultural sector. This facility plan outlines the key components of the center, including building information, square footage allocation, and the activities and users within the facility.

#### ***Mission Statement:***

The mission of the Center of Farm Profitability is to empower farmers and agricultural businesses by providing them with the knowledge, resources, and support necessary to enhance profitability, sustainability, and productivity. Through innovation, education, and collaboration, the Center of Small Farm at Tennessee State University strive to create a thriving farming community that embraces modern practices, adapts to change, and achieves long-term economic success.

The proposed Center of Small Farm will consist of a multi-purpose building complex, strategically designed to accommodate various activities and services. The approximately 5000 square footage complex is proposed and will include the following components:

*Main Administrative/Research/Extension wing:* To accommodate administrative staff, scientists, researchers and students. Facility will mainly consist of a lobby, office rooms, IT facility and conference room. The activities include administrative operations, strategic planning, coordination of services, and consultations with farmers and agricultural businesses. The facility will also accommodate in conducting experiments, data collection, analysis, and development of innovative farming techniques, crop improvement, and technology-driven solutions.

*Resource and Information wing:* The facility will include audio-visual room, meeting rooms, data management room, printing room etc. Offering consultation services on farm management,



marketing strategies, and financial planning. Activities include providing access to a comprehensive collection of agricultural resources, market data, financial tools, crop budgets and industry-specific publications. We will also host seminars, networking events, and collaborative meetings to foster knowledge exchange, partnerships, and industry-wide discussions on farm profitability. The resource and information unit will also assist farmers in accessing funding opportunities and grants that can support their growth, investment in technology, and adoption of sustainable practices.



# DEPARTMENT OF AGRICULTURAL SCIENCES AND ENGINEERING



# AGRICULTURAL SCIENCES AND ENGINEERING DEPARTMENT

Crop Sciences is a broad discipline that focuses on many agricultural and ornamental plant products and is of primary importance to the productivity of agro-ecosystems, especially in the Southeastern US. Economically, agricultural crops contribute about \$2.4 billion to Tennessee's GDP and Tennessee is ranked 5th nationally in total acreage for ornamental nursery crop production.

At Tennessee State University, crop science is an important area within the Department of Agricultural and Environmental Sciences and is served by over 20 faculty members performing research on a number of important agronomic and horticultural species. These faculty also collaborate closely with other institutions and disciplines to focus on not only applied field research but also in basic sciences like physiology, metabolites or nanotechnology.

Technology plays a large role in the work of crop scientists at TSU. DNA sciences and "omics" are complementary to crop science developments for the university. Remote sensing and drone technology are also utilized to help enhance methods of precision agriculture, climate smart farming, and nursery crop productivity. The use and development of practical applications for behavior-modifying chemicals is another TSU-led area focused on enhancing pest management programs.

Climate smart agriculture practices are being studied by crop scientists at TSU to enhance farmer resilience under changing weather patterns. Potential adaptation methods for production of sweet potato, watermelon, cantaloupe and peppers have been engaged under organic systems. The identification of bioenergy crops for biodiesel, ethanol, and electricity production have been studied to identify those that fit Tennessee's environment. There are also joint projects with environmental sciences to see how microbial communities adapt to warming soils. Societal issues such as consumer, grower and producer adaptation to the recent pandemic with techniques to protect employee health have also been recent topics of funded projects.



## Department of Agricultural Sciences and Engineering

### Future Enrollment Projection

Enrollment Projections		2023	2028	2033	2038	2043
		Biotech/Premed				
	Future Yr Projections	0	5	10	15	20
<b>Students (Headcount)</b>						
	Number of PhD Students	28	28	28	28	30
	Number of Funded Masters Level Grad Assistants	11	18	20	22	25
	Number of GTAs and GRAs if not included above	0	0	0	0	0
	Number of Undergraduate Majors	40	80	100	120	150
	Number of Post Docs	10	12	15	20	25
	Number of MA and EdS Students not counted above					
<b>Faculty</b>						
	Number of Faculty, Full-time T/TT	1	2	3	3	3
	Number of Instructors/Lecturers, Full-time	0	0	0	0	0
	Number of Adjunct Faculty	0	0	0	1	2
	Number of FTE Faculty	21	22	22	23	25
	Number of Faculty, Emeriti (Productive)	0	0	0	0	0
	Number of Visiting Faculty/Scholars	0	0	0	0	0
	Lab Assistants					
<b>Research and Technical Staff</b>						
	Number of Research Associates, Full-time	10	12	15	16	20
	Number of Research Associates, Part-time	4	3	3	3	3
	Number of Technicians/Lab-Based Research	4	3	3	3	3
	Number of Technicians/Lab-Based Instruction	0	0	0	0	0
	Average Grad Students per Faculty in Research Lab	1.77	1.92	1.92	1.92	1.96



## **Research and Training Laboratories and Facilities**

### **Plant Science Center (75,000 Sq Ft)**

As we chart the future course of our department, the comprehensive development of our infrastructure is paramount. Our master plan is designed to align our physical resources with the ambitious academic, research and extension goals we have set. The essence of this expansion lies in the creation of a synergistic environment where state-of-the-art facilities and human expertise converge to foster groundbreaking research and innovative education.

Central to our needs are state-of-the-art research labs, the backbone of scientific inquiry and student learning. Accompanying these labs, dedicated office spaces for our research faculty and staff, including postdocs, research associates, and graduate students, are essential. These private workspaces are not only crucial for academic productivity but also foster an environment conducive to intellectual exchange and collaboration.

Equally important are the meeting and conference rooms, which will serve as hubs for academic discussions, seminars, and collaborative projects, facilitating a dynamic exchange of ideas within and beyond the department. The department head's office suite, complete with staff areas, will be the command center for effective leadership and administrative functions, ensuring smooth departmental operations.

Our vision extends to specialized facilities like research greenhouses and support structures, including storage and headhouses, which are vital for plant science and precision agricultural research. Complementing these are growth chambers and cold storage facilities like cold and freezer rooms, indispensable for controlled experiments and preserving biological samples. For field studies, research farmland and plots, along with department-owned vehicles for transportation, are fundamental in providing practical, real-world research experiences.

Furthermore, specialized rooms such as window-less assay rooms for light-sensitive experiments, a gas chromatograph room for chemical analysis, and an insectary for entomological research underscore our commitment to comprehensive and diverse research capabilities.

A shared computing facility equipped with high-performance computers will address the growing need for data-intensive research, spanning from bioinformatics to computational modeling. The importance of a dedicated clean bench room, or tissue culture room, and an on-site autoclave facility at the farm cannot be overstated for maintaining the highest standards of research integrity and biosecurity.

The establishment of a Precision Agriculture/Digital Agriculture Center will place us at the forefront of modern agricultural practices, integrating advanced technology into farming. Additionally, teaching greenhouses dedicated to student learning will ensure hands-on experiences in horticultural practices, enriching our educational offerings.

The proposed Plant Science Center (75,000 Sq ft) stands as the centerpiece of our infrastructural vision, embodying our commitment to excellence in the realm of plant science. This multi-level facility, crowned with a state-of-the-art rooftop greenhouse, is designed to be more than just a building; it represents an integrated hub of knowledge, innovation, and discovery. The Center will

house our advanced research laboratories, faculty and staff offices, and specialized facilities such as the Digital and Remote Sensing Laboratory and the Precision/Digital Agriculture Center, marking it as a cutting-edge epicenter for both theoretical and applied plant science research. Its strategic design encourages not only rigorous scientific inquiry but also fosters an environment of collaboration and learning among students, educators, and researchers. The rooftop greenhouse is a symbol of our dedication to sustainable practices and advanced agricultural research, offering a unique space for urban agriculture studies, experimentation in controlled environments, and hands-on learning experiences. This Center is envisioned to be a beacon within the academic community, attracting top-tier researchers, ambitious students, and collaborative projects from around the nation and the globe, thereby significantly enhancing our department's prestige and impact in the field of plant science.

Each aspect of this plan is a building block in creating an environment of academic excellence and innovation, crucial for advancing the department's mission and enhancing both research capabilities and student learning experiences. Below is a listing of the pieces of our masterplan.

<b>Facility</b>	<b>Description</b>	<b>Total Needed</b>	<b>Lead Person</b>
Research Faculty Offices	Essential for providing a dedicated space where faculty can conduct research planning, data analysis, and academic writing, facilitating uninterrupted intellectual work.	3750 sq. ft. (25 x 120 sq. ft.)	Each Faculty
Research Labs	Critical for conducting experiments, housing specialized equipment, and providing a controlled environment for scientific inquiry and innovation and the training of students and postdoctoral associates.	20,000 sq. ft. (25 x 800sq.ft.)	Each PI
Meeting/Conference Rooms	Necessary for collaborative discussions, seminars, and meetings, fostering an environment of academic exchange and teamwork	1500 sq. ft. (3 x 500 sq. ft.)	Chair and Admin Asst
Department chair's office suite with staff	Central for departmental leadership and administration, enabling effective management, coordination, and support for departmental activities.	1000 sq. ft.	Chair and Admin
Research Staff offices (Postdocs, Res. Assoc, Res Asst; Grad Student)	Provides a professional workspace for research staff and graduate students, essential for focused research work, study, and collaboration.	5000 sq. ft. (50 x 100 sq. ft.)	Chair and PIs
Research Faculty/Staff Supplies Storage Rooms	Crucial for securely storing research equipment, samples, and materials, ensuring organization and easy accessibility for ongoing research.	7500 sq. ft. (25 x 300sq. ft.)	Each Faculty
Smart Greenhouses and support facilities including storage and headhouse for	Vital for controlled plant growth and experiments, facilitating year-round research in plant science, irrespective of external weather conditions.	17,000 sq. ft. 15,000 sq. ft. (30 zones x 500 sq. ft. each) plus 2,000	Each Faculty and Station Superintendent, Teaching faculty



research and teaching		sq. ft. support facility	
Research growth chambers	Necessary for simulating various environmental conditions, crucial for controlled experiments in plant growth and development. They allow for precise control of environmental factors such as temperature, light, humidity, and CO <sub>2</sub> levels, enabling researchers to conduct experiments under exact and repeatable conditions. Growth chambers are crucial for experimental research in agriculture, plant physiology, and environmental studies. They enable researchers to simulate different environmental conditions, study plant responses to stressors, and conduct controlled experiments on crop growth and development. This can lead to important discoveries in plant breeding, genetics, and sustainable agriculture practices. Additionally, they are valuable in teaching students about the scientific method and experimental design in plant science.	5000 sq. ft. (50 chambers, 100 sq. ft. each)	Individual faculty
Cold Rooms	Important for storing samples, chemicals, and biological materials at low temperatures, preserving their integrity for accurate research.	1,000 sq. ft. (10 rooms, 100 sq. ft. each)	Individual faculty
Freezer rooms	Essential for long-term storage of critical research materials at very low temperatures, ensuring their longevity and reliability for future analysis.	1,000 sq. ft. (10 rooms, 100 sq. ft. each)	Chair and faculty
Research farmland/plots	Fundamental for field experiments in agriculture and plant science, providing real-world conditions for applied research.	300 acres	Station Superintendent
Vehicles for research.	Necessary for transporting researchers, equipment, and samples to and from field sites, facilitating off-campus research activities.	10	Associate Deans
Window-less Assay Rooms	Important for experiments requiring controlled light conditions, such as assays sensitive to natural light variations.	900 sq. ft. (3 rooms, 300 sq. ft. each)	Chair and faculty
Gas Chromatograph Room	Essential for housing gas chromatography equipment, used in analyzing chemical compounds, in a controlled environment.	400 sq. ft. (2 rooms, 200 sq.ft. each)	Chair and faculty
Insectary	Critical for studying insect behavior and interactions with plants, important in research areas like pest control, pollination, and disease vector.	1000 sq. ft. (2 facilities, 500 sq. ft. each)	Entomology faculty
Shared Computing Facility (High performance computers)	Vital for data-intensive research, including bioinformatics and computational modeling, requiring high computational power and ultra-high-speed internet for data transfer in collaborative projects.	1500 sq. ft. (3 facilities, 500 sq. ft. each)	Chair and faculty

Dedicated clean bench room (tissue culture room)	Necessary for sterile tissue culture work, a fundamental technique in plant biotechnology and genetic research.	800 sq. ft. (2 rooms, 400 sq. ft. each)	Chair and faculty
Autoclave facility at the farm	Important for sterilizing equipment and materials used in field research, ensuring biosecurity and the integrity of experimental data.	600 sq. ft. (3 facilities, 200 sq. ft. each; one facility per building)	Station superintendent
Precision Agriculture/Digital Agriculture Center	This is a facility equipped with the latest technology and tools for the study and application of precision and digital agriculture. This includes systems and software for data management, satellite imagery, drones, GPS technology, soil and crop sensors, and other advanced agricultural technologies. This center is crucial for a department focused on modern agricultural practices. It allows for the research and teaching of efficient farming techniques that minimize waste and maximize crop yield. The center also provides students and researchers with hands-on experience in using cutting-edge technologies that are transforming the agricultural sector, making them more employable and ready to address contemporary agricultural challenges.	2250 sq. ft.	Precision agriculture group
Teaching Greenhouse(s)	Teaching greenhouses are controlled environment structures designed for the cultivation and study of various plant species. They are equipped with systems to regulate temperature, humidity, light, and irrigation, allowing for year-round growth and experimentation with different horticultural practices. These greenhouses are essential for practical, hands-on teaching in plant science, and horticulture. They provide students with the opportunity to apply classroom knowledge, conduct experiments, and understand plant growth and development in a controlled setting. This hands-on experience is invaluable in preparing students for careers in agriculture, environmental science, and related fields.	4,000 sq. ft. (4 zones, 1000 sq. ft. each)	Chair and teaching faculty
Digital and Remote Sensing Laboratory	Labs equipped with GIS (Geographic Information Systems) and remote sensing technology for mapping and monitoring agricultural landscapes. Facilities for the development and testing of satellite imagery and UAV (Unmanned Aerial Vehicle) technology in agriculture.	1000 sq. ft.	Chair and faculty





TENNESSEE  
STATE UNIVERSITY  
College of Agriculture



# DEPARTMENT OF ENVIRONMENTAL SCIENCES





# ENVIRONMENTAL SCIENCES

## DEPARTMENT

The Natural Resource Management Division in the College of Agriculture is composed of faculty and staff that span a wide range of research areas that include Forestry and Wildlife; Sustainable Energy; and Land, Air, and Water. The primary goals of our faculty are to couple multidisciplinary research to evaluate the impacts that natural and human-induced stressors, such as land-use change, climate change, and forest management, have on terrestrial and aquatic ecosystems. This research provides our stakeholders in Tennessee and the southeastern region with science-based information and solutions to environmental issues.

Our Division is supported by the Department of Agricultural and Environmental Sciences in the College of Agriculture and is fostered via state, federal, and non-profit funding partners such as the Tennessee Wildlife Resources Agency, Tennessee Division of Forestry, United States Forest Service, National Institute of Food and Agriculture, and the Nashville Zoo at Grassmere. We use a variety of cutting-edge, technologies, tools, and resources including Geospatial Information Systems, molecular resources (e.g., microbiome sequencing), and landscape-scale field experiments to evaluate environmental threats throughout the state and southeastern region and provide actional science-based solutions to the issues we are addressing.

The faculty and staff in the Natural Resource Management Division develops collaborative research strategies that rely on the collective expertise of our faculty to tackle emerging environmental issues and stressors that threaten natural resources and environmental resources, develop climate-smart approaches for natural resources management and sustainable agricultural/forestry methods and energy production, and maintain the diverse and sustainable ecosystem services provided by aquatic and terrestrial ecosystems in natural and urban settings within Tennessee and the region.





## Department of Environmental Sciences

### Future Enrollment Projections

FALL 2024 Enrollment Projections		2023	2028	2033	2038	2043
		Environmental Science				
	Future Yr Projections	0	5	10	15	20
<b>Students (Headcount)</b>						
	Number of PhD Students		15	18	20	24
	Number of Funded Masters Level Grad Assistants	24	30	35	38	42
	Number of GTAs and GRAs if not included above		2	4	5	6
	Number of Undergraduate Majors		60	82	96	120
	Number of Post Docs	3	8	10	12	12
	Number of MA and EdS Students not counted above					
<b>Faculty</b>						
	Number of Faculty, Full-time T/TT	1	6	8	8	10
	Number of Instructors/Lecturers, Full-time					
	Number of Adjunct Faculty					
	Number of FTE Faculty	8	15	16	17	18
	Number of Faculty, Emeriti (Productive)					
	Number of Visiting Faculty/Scholars	1	5	8	10	10
	Lab Assistants		1	2	2	2
<b>Research and Technical Staff</b>						
	Number of Research Associates, Full-time	1	5	8	8	10
	Number of Research Associates, Part-time					
	Number of Technicians/Lab-Based Research		2	4	5	6
	Number of Technicians/Lab-Based Instruction		1	1	2	2
	Average Grad Students per Faculty in Research Lab	2.67	2.24	2.38	2.52	2.57

# Research and Training Laboratories and Facilities

## Center for Forestry Research and Education (CFRE)

### Background:

The Center for Forestry Research and Education is a field research laboratory located in Cheatam County Tennessee. The 125-acre center is located approximately 5 miles southeast of Ashland City, TN on the banks of the Cumberland River and 17 miles west of Tennessee State University main Campus. Currently, the property has major limitations to do any forestry related research, however, can be used for limited research in agroforestry, bioenergy crops production and silvopasture management. It can be retro-fitted and developed into a research and education center for developing new tools and technologies for modern forestry practice and environmental stewardship. We envision this center will serve the need for our students, faculty and community members to design applied research projects in forestry and environmental science. We believe this center will significantly contribute to the University's goal to move from R2 to R1 institution. We aimed to expand the center in other regions of the state of Tennessee as the land and resources are available to a sizeable acreage with at least 1,000 acres contiguous forest land. This will allow us to expand our research in areas of applied forestry, urban forestry, forest hydrology and soils, carbon sequestration, wildlife habitat, and ecological services, and other relevant fields.

### Purpose and Goals:

The ultimate goal of the Center for Forestry Research and Education is to provide opportunity to conduct cutting-edge research, train next-generation of forestry professionals through experiential learning, and empower communities, especially disadvantaged communities by community-based extension and applied resource management training through outreach program. The specific goals of the center are:

- a) Establish long-term research site for silvicultural, agroforestry and applied ecological research.
- b) Conduct short-term project-based research.
- c) Establish demonstration sites or arboretum for community engagement. The center will be a resource for forestry-related extension, for example, we will conduct tours, workshops, and other educational activities to better empower and engage local communities.
- d) Use the center for teaching and learning purposes for field technique classes in dendrology, ecology, forest sampling, mensuration, silviculture, urban forestry, timber harvesting and utilization, wildlife management, and soil and water conservation. The Department of Environmental Science within the next year will be pursuing accreditation for an undergraduate degree in Natural Resource and Ecosystem Management (NREM) program through the Society of American Foresters. We are developing new courses for this program and would utilize the forest within the Center for Forestry Research and Education for hands-on learning in field labs could include courses in Dendrology, Silviculture, Watershed Management, Forest Health and Protection, Natural Resource Management, Forest Measurement and Inventory, Tree Physiology, and Urban Forestry.

SAF accreditation places a large emphasis on access to appropriate sites for experiential learning and the development of field skills and transportation to those sites. Likewise,



many of the disciplinary competencies required within an accredited Natural Resources and Ecosystem Management (NREM) program require experiential learning with a focus on field skills to complement theoretical understanding of the material. Every accredited NREM program across the country has institutions that own forests used for research and teaching. Some of these sites are solely composed of the forest with a trail system and parking while others include field stations and/or living and dining accommodations to support field camps (ranging from ~ 3 weeks to an entire semester) where students live on-site and take the majority of their field-based courses or complete their Senior Capstone and where faculty and graduate students conduct research.

**Location:**

Research and Educational Forest: 125 acres Cheatam Country forest and potential expansion on other forests area (approximately 1,000 acres) across the state of Tennessee (in future)

Research Lab: Forestry lab (1,000 sq feet) at new Environmental Science building (pending)

**Space details:**

One Research lab (1000 sq ft) in New Environmental Science Building (pending), covering research in forestry, use of technology in forest monitoring and management.

One Teaching lab (2250 sq ft) in New Environmental Science Building (pending), covering undergraduate courses in Fundamentals of environmental Science, Dendrology and Plant Science.

125 Acre forest and farm land for forestry related research in Cheatam county and potential expansion of research forests across the state of Tennessee (pending).

**Personnel Involved:**

There are three major research area in CFRE at:

1. Forest Measurement Inventory, Modeling, and Use of Technologies (Pokharel, Archer, Akumu, Chang, Sutton)
2. Field Techniques - Dendrology, Silviculture, Watershed Management, Forest Health and Protection, Natural Resource Management, Forest Measurement and Inventory, Tree Physiology, and Urban Forestry (Neumann, Chen, new hire on arboriculture, new hire on small woodlot management, Archer and Pokharel)
3. Forest Soil and Watershed Management (Rakshit, Byl and Li, Pokharel)

## Soil Health Center (SHC)

### Background:

Global agriculture faces a dire and rapidly changing environment (IPCC 2023). As the foundation of healthy ecosystems, soils are of critical significance to global food security and climate change mitigation. The conventional soil conservation approach is however insufficient to tackle exceedingly complex environmental issues; therefore, there is a need for a new and integrated discipline, soil health. Soil health is an emerging research field that assesses how well soil performs all of its functions now and how those functions are being preserved for future use (USDA NRCS, 2024). Maintaining soil health is essential to maximizing profitability along with its long-term sustainability.

The College of Agriculture at Tennessee State University has grown tremendously in the last decade with its diverse quality workforce, different disciplines, and ample infrastructure and facilities. With the advent of the Inflation Reduction Act (IRA) and Farm Bill, the need for training under-represented students is unprecedented. Despite there is still a lack of interest in “dirt”, and we need to integrate research and training programs in soil health which will provide first-hand research experience for our students. The College of Agriculture at TSU is becoming an ideal hatching bed that has been well-prepared for establishing the Soil Health Center (SHC), serving as an interdisciplinary research, education, and academic center in soil science. The center will play an important role in building strong, integrative research and academic programs that directly involve minority students, to provide the research experience and academic training required for a career in soil science research.

### Purpose and Goals

The ultimate goal of the SHC at TSU is to develop nationally recognized research, teaching, and extension programs with a long-term mission of improving soil health and the resilience and sustainability of agricultural production systems and ecosystem services in a rapidly changing environment. Specifically, to address the growing challenges that are wrought with global warming, excessive nutrient input, extreme precipitation, invasive species, diseases, and urbanization, the SHC aims to work on three major areas.

- To enhance undergraduate and graduate education at the interface of the fundamentals of soil science, agricultural science, climate change, environmental monitoring, and interdisciplinary environmental science, policy, and human health. *The objective* is to cultivate a new generation of soil scientists equipped with quality education in soil biogeochemistry and physics, an interdisciplinary knowledge basis, and aspirations to provide sound solutions,
- To conduct foundational research to advance scientific understanding of soil physical and biogeochemical processes and interactions. *The objective* is to improve our knowledge of the physical and biogeochemical interactions and processes within and between the soil and the environment, and
- To assess models, decision support tools, and new management/conservation practices and/or processes. *The objective* is to promote soil-based enhancement of nutrient and water efficiencies, reduced inputs, and a reduction in chemicals of environmental concern, as well as the emerging significance of regenerative agriculture.



**Location:**

Research - Agricultural Biotechnology Building, Farrel-Westbrook Complex, and New Environmental Science Building (pending)

Teaching - Agricultural Biotechnology Building and New Environmental Science Building (pending)

Soil Testing - New Environmental Science Building (pending)

**Space details:**

Two Research labs (each 1000 sq ft) in New Environmental Science Building (pending), covering research fields centered on Soil Health with concentrations in Soil Biogeochemistry, Soil Chemistry, Climate Change, and Integrated Environmental Monitoring (e.g., GIS)

One Teaching lab (2250 sq ft) in New Environmental Science Building (pending), covering undergraduate courses in Fundamentals of Soil Science, Climate Change, and Environmental Analysis.

One Soil Testing lab (1250 sq ft) in New Environmental Science Building (pending)

**Personnel Involved:**

There are three major research directions at SHC:

1. Soil Biogeochemistry
  - Chemistry (Li, Rakshit, de Koff, Thapa, Bhandari)
  - Physics (Soil Physics hire, Behnaz, Byl)
  - Biology (Li, Soil Health hire, Omondi, Taheri, Hui)
2. Soil Management/ Quality (de Koff, Omondi, Archer, Akumu, Bhandari)
3. Forest Soil (Pokharel, Chen, De'Etra).

## **Water Center**

### **Background:**

Water is essential to sustaining life and crop production, and it is vulnerable to changing climates, pollution, and inefficient use for agriculture purposes. The TSU Water Center is dedicated to research and education of the HBCU community in Tennessee and across the nation that will help sustain hydrological systems that are vital to the stability of society, agriculture, and natural systems. We use an interdisciplinary approach to resolve complex problems such as climate variability, agricultural water use, land cover change, and point and non-point pollution. Climate change has emerged as an underlying challenge for water resource sustainability, from flooding to flash droughts and extreme temperatures, all exacerbated by societal and ecological needs.

The TSU Water Center is addressing these issues using a combination of modern and traditional methods. The Water Center provides state-of-the-art facilities and equipment to focus on water-related research studies for monitoring water quality, hydrological research, and water resource management, as well as conducting research on the agricultural water management, irrigation systems engineering, water use efficiency, and precision water management. We provide courses on water management, water sciences, in addition to hands-on activities that provide students with experiential learning opportunities. Students are also encouraged to conduct research with faculty on real-world issues. We use remote monitoring systems, GIS, high tech field and laboratory equipment, and computer systems to solve real-world questions and challenges. We collaborate with State and Federal agencies, such as US Department of Agriculture (USDA), USGS, Tennessee Dept of Health, Tennessee Department of Agriculture (TDA), National Science Foundation (NSF), US Agency for International Development (USAID), and public companies and non-profits to provide funding for maintain resources to address emerging challenges.

### **Purpose**

- Understand emerging hydrological challenges and develop scientifically sound responses that help to manage and sustain water resources for future generations.

### **Goals**

- Educate and research methods that will help us to sustain water resources in Tennessee and the region.

### **Location**

The Water Center is composed of field and lab resources. The TSU Research Farm in Nashville, TN, along the Cumberland River has five 250-foot-deep monitoring wells, drilled in limestone bedrock. There are 4 additional wells with pumps used for irrigation and livestock. The Farm also contains a 40-acre wetland that is home to a wide variety of plants and animals and is considered a biological oasis for organisms in the urban environment of Nashville.

The Water Center consists of two laboratories (approximately 2,000 square feet total) and will be located on the main campus, in the College of Agriculture. Both labs are used for research and for advanced classes in the water sciences. Each of these labs has 1,000 square feet spaces and they are located close to each other.



- 1- Irrigation and agricultural water management research (1,000 square feet)
- 2- Water quality and hydrology (1,000 square feet)

### **Space details**

#### **A. Irrigation and Ag Water Management Lab – (Molaei and others)**

This lab is designed to measure the quantity of water in the soil, air, and plants through the use of precision irrigation sensors and remote sensing imaging sensors for monitoring and measuring crop water use, as well as designing low-cost IOT-based soil and crop sensing tools for the research studies. Additionally, the lab provides space for designing irrigation systems and evaluating the application efficiency of the irrigation system. The lab comprises four distinct stations:

Station 1: Soil and water measurement (200 sq ft)

Station 2: Irrigation systems design (200 sq ft)

Station 3: Precision Irrigation and Water Management (200 sq ft)

Station 4: Computer desk and working stations for up to 6 students and 2 post-docs (400 sq ft)

#### **B. Water quality and hydrology lab – (Byl and others)**

This lab is designed for measuring quality and chemistry of water, biological sample processing, and computer analysis. They include:

- Multi-purpose Islands/benches
- Area around the perimeter of the room for the large equipment with high voltage outlets such as hood, laminar and autoclave and ...
- Bench space for smaller instruments
- Lab space with computer desk for 6 students and 2 post-docs

### **Personnel Involved**

The main faculty involved in the water research center are Dr. Tom Byl and Dr. Behnaz Molaei and other faculty members who are directly and indirectly working in the water and hydrology related field.



# DEPARTMENT OF FOOD AND ANIMAL SCIENCES





# FOOD AND ANIMAL SCIENCES

## DEPARTMENT

The food and animal industries are an important sector of Tennessee's economy. The animal industries represent about one-third of the agricultural cash receipts in Tennessee and nearly half of the agricultural cash receipts nationally. In addition, the food processing industry in Tennessee is significant, with many companies producing a wide range of foods. The Food and Animal Science Focus area in the College of Agriculture is comprised of faculty with diverse expertise in food engineering, food chemistry/biochemistry, food microbiology, human nutrition and sensory analysis, physiology and genetics, animal genomics and immunology, and poultry production including veterinary science. All research areas are supported by the College of Agriculture through public, private and non-profit funding.

The food science program focuses on tracking trends and risk factors, defining the burden, finding new pathogens and drug resistance, novel detection techniques, developing leading edge technologies like sustainable food processing (waterless) systems and novel packaging. In addition, the group also examines analytics in epidemiology, foodomics/microbiome, human health (i.e. food function and relationships between diet and disease), e-sensing techniques integrated with AI and machine learning.

Our animal science research generates novel information in various sub-disciplines that increases our knowledge of fundamental biological processes that affect animal well-being and performance and provides possible pathways to overcoming obstacles and enhance sustainability in food animal production systems. Service is provided through the dissemination of research-based information and conducting educational activities that train agricultural producers in various areas of livestock management. Changing production and market environments are being addressed by investigating alternative animal genetics and management approaches that enhance livestock wellbeing, productivity, and niche market access. The innovations generated by these programs are directly impacting the economy of the state of Tennessee.





## Department of Food and Animal Sciences

### Future Enrollment Projection

FALL 2024 Enrollment Projections						
		Food and Animal Sciences				
	Future Yr Projections	0	5	10	15	20
<b>Students (Headcount)</b>						
	Number of PhD Students	3	15	18	20	25
	Number of Funded Masters Level Grad Assistants	19	25	30	35	35
	Number of GTAs and GRAs if not included above					
	Number of Undergraduate Majors	112	143	182	232	297
	Number of Post Docs	3	6	7	8	10
	Number of MA and EdS Students not counted above					
<b>Faculty</b>						
	Number of Faculty, Full-time T/TT	3	6	8	9	11
	Number of Instructors/Lecturers, Full-time	0	0	0	0	0
	Number of Adjunct Faculty	0	0	0	0	0
	Number of FTE Faculty	12	15	16	18	22
	Number of Faculty, Emeriti (Productive)	0	0	0	0	0
	Number of Visiting Faculty/Scholars	0	1	3	3	4
	Lab Assistants	0	1	2	3	4
<b>Research and Technical Staff</b>						
	Number of Research Associates, Full-time	0	1	2	2	3
	Number of Research Associates, Part-time					
	Number of Technicians/Lab-Based Research	3	4	4	5	6
	Number of Technicians/Lab-Based Instruction	0	2	2	2	2
	Average Grad Students per Faculty in Research Lab	1.83	3.33	3.20	3.44	3.33

# Research and Training Laboratories and Facilities

## General Information of the Department

Tennessee State University (TSU), a Land Grant University, has and will continue to benefit immensely from contributions of the Department of Food and Animal Sciences in meeting the university's tripartite land grant mission of teaching, research, and outreach. Through its mission, the Department of Food and Animal Sciences will feed into the key strategies for economic development of the State of Tennessee, focusing on workforce development efforts on key target clusters in which the state has a clear competitive advantage, food, health, being the top of the list. Another mission for workforce and economic development is the drive to provide a unique programs focusing on a holistic approach to food and the animal sciences issues in Tennessee.

The new academic unit will prioritize academics, research and outreach activities and collaborations that align with the state's priorities. This includes partnerships with industries, government agencies, and research organizations to drive innovation and economic development. In addition, aligning with the State Master Plan's community engagement objectives, the new academic unit will actively engage with local communities through initiatives such as outreach programs, internships, and partnerships that address local needs and contribute to community development

This document provides a master plan of facilities required to fulfil the mission of the Department. It is anticipated that these facilities will also contribute of the mission of the university, the state and the nation by:

1. Supporting the food and animal industries and enhancing partnerships among Tennessee State University, state Department of Agriculture and the food and animal industry.
2. Contributing in work force development in the food and animal sciences through teaching and experiential learning.
3. Supporting graduate programs including the M.S. and Ph.D. degree programs and undergraduate student research experiential learning.
4. Supporting research addressing key need areas of the food and animal industries and the consumer, and source of revenue for the university through indirect costs.
5. Serve as incubation and demonstration centers for the food and the animal industries and other stakeholders, including elementary, high school and college students.

## **1. The Center for Food Product Innovation and Commercialization**

### **Purpose:**

The Center for Product Innovation will offer state-of-the-art facilities for food product research, instruction, and community engagement. Its foremost aim is to establish a robust infrastructure that not only supports the department's teaching and outreach endeavors but also enhances its research capabilities within middle Tennessee. This center will be uniquely designed to give students hands-on experience in a dynamic, operational setting, enabling them to conduct meaningful research and acquire practical skills. The facility is not just an academic hub; it will

also serve as an asset to the food industry. It will offer comprehensive support in process and product development, making it an indispensable resource for established companies exploring new product lines or process innovations, as well as for burgeoning startup food enterprises. This symbiotic relationship with the industry not only fosters real-world learning opportunities for students but also generates essential revenue. This income is vital for the center's sustainability, facilitating the maintenance of existing apparatus and the procurement of new, cutting-edge equipment. Moreover, the center's engagement with industry partners will create a vibrant, collaborative environment. This fosters not just academic growth but also professional networking opportunities, enhancing students' future career prospects. It will act as a bridge between academic theory and industry practice, ensuring that students are well-prepared to meet the evolving demands of the food product sector. This Center needs to be built adjacent to the Food and Animal Science Building.

### **Subunits in Center for Food Product Innovation and commercialization**

- Product Development Lab and Packaging Unit: Creation and refinement of new food products, including recipe formulation, sensory evaluation, nutritional and shelf-life analysis [1000 sf].
- Process Engineering Unit (Wet and Dry space): Specialize in the development and optimization of food processing techniques, ensuring efficiency, safety, and quality in production [2000 sf].
- Food Safety and Quality Control Division: Dedicated to ensuring that all products meet industry standards and regulations for safety and quality, including microbiological testing and shelf-life studies [1000sf].
- Nutritional Research and Analysis Center: Conduct research on the nutritional content of foods, exploring ways to enhance the health benefits of food products [600 sf].
- Consumer Sensory Testing Lab: Where new products will be tested for consumer acceptance, including taste tests, focus groups, and market research [1500 sf].
- Food Business Incubator: Supports startup food companies with resources, mentorship, and facilities to help them grow and commercialize their products [1000 sf].
- Food Technology and Innovation Workshop space: A space equipped with the latest food technology and tools for experimental and prototype development. The space includes laser cutting, 3D printing, Computer-controlled high precision CNC machines, SolidWorks, and AutoCAD software's, ANSYS, high end computing system 64 Gig RAM, 1 terabyte of space [1000 sf].
- Outreach and Extension Services: Will provide education and training to community and industry partners, including workshops, seminars, and consulting services [1000 sf].

**Total square footage: approximately 10,000 sf**

### **Electrical Requirements**



This facility needs to be equipped with filtered compressed air lines and distilled water for the equipment and processing systems. It would require a boiler for steam generation for sterilization and pasteurization processes. There would be allocated electrical power at 600VAC, 480VAC, 230VAC, 208VAC or 120VAC, 3 phase system. A three-phase power supply is a type of polyphase system and is the most common method used by electrical grids worldwide to transfer power. It's widely used in industrial and commercial settings, including food processing plants, due to its efficiency and power capacity. Electrical outlets and connections at varying voltages are provided to the surrounding areas of the pilot facility.

Some safety considerations for equipment's used in food processing:

- Circuit Breakers and Fuses: To protect against overloads.
- Ground Fault Circuit Interrupters (GFCIs): Especially in areas exposed to water typically used in processing.
- Emergency Shutoffs: Easily accessible and well-marked.
- Surge Protection: To safeguard sensitive electronics.

### **Location**

Across from the new food science building

### **Designated Person**

The center will accommodate 1 principal investigator, a lab manager, 2 postdocs, 3 graduate students and 2 high school students.

A director needs to be hired for this facility.

## **2. Dairy Unit w/ AMS and Creamery**

### **Purpose:**

The mission of the Tennessee State University integrated dairy farm and creamery is to serve as an experiential learning center for students, providing them with a hands-on and comprehensive education about the intricacies of the dairy industry. Through a combination of theoretical knowledge and practical engagement, students will gain insights into the entire dairy production process, including animal husbandry, milk production, and sustainable agricultural practices from the dairy product manufacturing in the creamery. Our goal is to equip students with a holistic understanding of the dairy supply chain, and to empower students with the knowledge and skills needed to navigate and contribute to the dynamic and vital field of dairy farming. The farm serves as a living classroom, fostering a deep understanding of the entire dairy supply chain while instilling a commitment to ethical and responsible practices within the next generation of agricultural professionals.

### **Location:**

New farm

### **Space Details:**

30,000 ft<sup>2</sup> facility:

*The Barn*

- At least 100 free stalls for lactating cows
- At least two robotic milk units
- Two 40 x 26 ft bedded pack for maternity
- Calf raising location
- Heifer raising location
- Vet room
- Sick pen
- Bulk tanks for milk storage
- Milk filtration system
- Milk taxi for calves
- TMR Wagon
- Fans
- Misters
- Brushes
- Scale
- Manure scraper/flush system
- Manure separator and storage
- Foot baths
- Feed push-up robot
- Locker rooms
- Bathrooms

*The Creamery*

- Pasteurizer
- Pump
- Bottle filler
- Chiller
- Refrigerators
- Wash vats

### **3. Poultry Research Facility-including poultry processing unit**

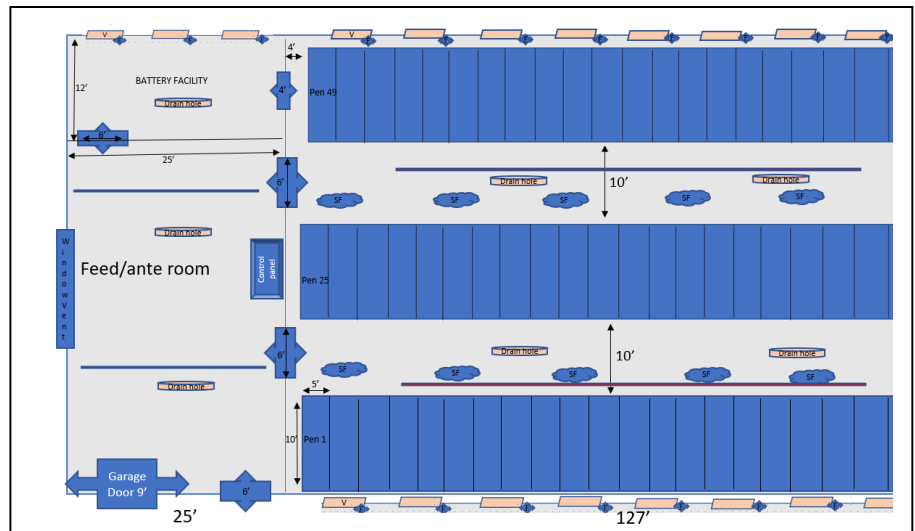
The newly built poultry facility which will be a cutting-edge facility at TSU will support research, education, and industry collaboration in the field of poultry production.

**Location:** The poultry facility will consist of a broiler house, a cage facility for production birds, and then a pilot-scale processing unit, all located in the main campus research farm. The dedicated

team of poultry and animal scientists and faculty members will conduct studies on various aspects of broiler genetics, nutrition, health, and management.

Broiler house: 50'X152'. This broiler house will consist of 72 (5'X10') pens and a feed room anteroom facility. The facility will mimic all the industry standards of modern broiler house and thus provide a controlled environment conducive to conducting experiments (pen trials), collecting accurate data, and analyzing the performance of experimental flocks. The

research outcomes will contribute to the advancement of knowledge in poultry science and the development of sustainable practices in broiler production.

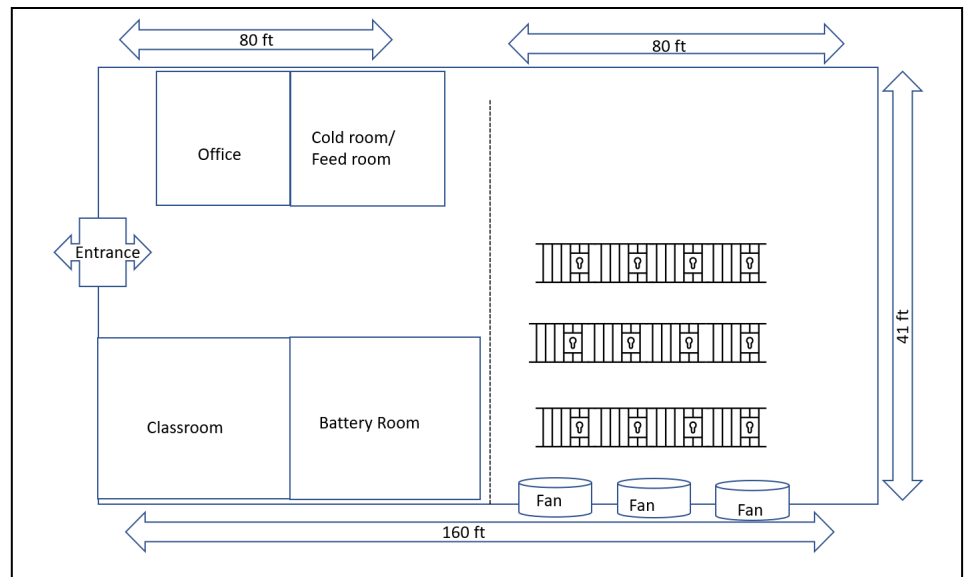


Cage house: 41' X160'

The cage house will consist of multiple compartments as presented in the layout- a cage room (80'X41') for rearing laying hens (~ 300-bird capacity), a battery room, classroom, cold room and an office.

Processing Unit: (50'X75'). The pilot scale processing unit will house the equipment for slaughtering, plucking/feathering, evisceration, washing,

chilling, cutting a portioning. The capacity to process about 300 market-age birds in a day would be ideal for research and demonstration.



In addition to research, the facility will offer invaluable educational opportunities for students. Through hands-on training, students will gain practical experience in poultry production, management, and research techniques. This experiential learning will prepare them for careers in the poultry industry and equip them with the skills necessary to address industry challenges. Overall, this state-of-the-art poultry facility will promote research excellence, student training, industry collaboration, and community engagement benefitting Tennessee and beyond.



#### **4. Livestock Handling Facility-Farm**

Purpose:

The Department of Food and Animal Sciences is proposing to establish an animal handling facility for research, teaching and demonstration for students and livestock producers training. Interest in the animal sciences, especially veterinary medicine, has been increasing in the College of Agriculture. The majority of animal science students aim to join veterinary schools. This facility will be utilized in livestock handling and management training, a requirement for pre-veterinary majors. The facility will also be used in management training of livestock producers. Additionally, the animal handling facility would be used for general management of the research beef cattle and meat goat herds and for research data collection for ruminant livestock research projects in support of graduate student research projects and related investigative activities.

All of the teaching activities, producer training, and research achievements over the last 25 years have been accomplished without the benefit of a basic enclosed teaching or research field lab that could facilitate research work or student teaching under controlled environment. In addition to teaching and research, the Animal Science program at TSU hosts producers from across the state and region for outreach training on a regular basis each year. Tennessee State University is the only 4-yr institution in the state of Tennessee (among six) with an animal science program without an indoor Animal Science lab for student teaching, research activities, or producer training in livestock production.

A basic indoor facility would facilitate all three phases of work conducted in livestock management program (teaching, research, and outreach). The requested facility will include an animal handling and observation laboratory fitted with animal handling equipment, video monitors, surgery and prep areas, office and meeting space, and other features. The proposed animal handling facility would be approximately 60' x 120' in size and located across from the ruminant livestock grazing area and outside of the FEMA-designated flood zone on the Main Campus Research Farm.

#### **5. Meat Processing Unit-Large animals-cattle, goats and sheep**

The Department of Food and Animal Sciences is proposing to establish a red meat processing plant for research, student teaching and the training of livestock producers and plant managers. Meat science is the natural bridge between animal science and food science. Work in the plant would involve the harvest of meat animals and the evaluation of carcass quality and yield attributes, meat quality and the development and testing of new post-harvest meat handling techniques and new meat products. Meat science research includes the assessment of pre-harvest and post-harvest management factors. Students would work with research staff on carcass fabrication. Meat Science is one of the primary animal science specialties.

Graduate students could conduct research in the plant. The facility would provide experiential learning opportunities for pre-vet students because many of the meat plant inspectors hired by the

federal and state governments are veterinarians. There is currently no red meat processing plant at a university in Tennessee, so the proposed plant would be unique in the state. There is growing demand for locally produced and marketed meat products and the state's meat processing capacity is not sufficient to satisfy demand from local livestock producers for such services. Along with supporting research and traditional teaching, the plant would also facilitate training producers interested in learning about carcass evaluation and fabrication, guiding new plant managers and providing continuing education to experienced plant managers. Meat safety, HACCP certification, and other aspects of plant management are important areas of stakeholder training as the meat processing capacity grows in Tennessee.

The proposed animal handling facility would be approximately 9,000 ft<sup>2</sup> in size and located outside of the FEMA-designated flood zone in close proximity to the Poultry Plant. The plant would include areas such as harvest room, processing area, coolers, freezers, office space, locker room area, animal receiving area, offal storage, dry storage, product storage, classroom, research lab, etc. A meat processing plant is a unique facility that requires special design components. Biosecurity includes facility location, special/restricted access, unique building materials, and water use and drainage considerations. Plant location and all structural and operational aspects of the physical plant are subject to federal and state regulations for meat processing facilities.





TENNESSEE  
STATE UNIVERSITY  
College of Agriculture

# DEPARTMENT OF HUMAN SCIENCES





## HUMAN SCIENCES DEPARTMENT

Human Sciences focuses on the holistic well-being and empowerment of individuals and families. As a comprehensive group, our Human Sciences programs impact many areas of functioning within society. Family functioning supports society at large. Likewise, healthy individuals create a more productive society. Human Sciences is an interdisciplinary field that houses Child Development and Family Studies, Consumer Sciences Education, Leadership and Development, Food and Nutritional Sciences, and Food Service Management.

Child Development focuses on modeling active, play-based, age-appropriate learning for children. As gaps in educational attainment have continued to grow, the Department has hosted preschoolers and their educators to model activities. Education about play-based learning is provided to families through take-home materials and an Extension curriculum that covers the lifespan (family studies). The current mental health crisis experienced by individuals of all ages highlights the crucial role of individual development and family cohesion. The physical, educational, and mental health benefits of engaging with the outdoors are immense. Human Sciences faculty have led initiatives to increase comfort levels with nature through play while teaching families to grow their food. Community resources developed by faculty help families face normative and non-normative changes in development and relationships. Additional projects promote higher trust in vaccines and their role in health and disease prevention, particularly in marginalized populations.

Changes in the national population require clothing options that meet changing trends and are responsive to individual needs in an aging society. Human Sciences professionals have been instrumental in designing footwear that addresses foot sores and infections that are particularly problematic for users with diabetes. Food, clothing, and relationships are basic needs of individuals but also areas that require special consideration depending on the individual's age, health, and ability. Meeting those needs enables individuals to continue to develop and contribute to society.



## Department of Human Sciences

### Future Enrollment Projections

FALL 2024 Enrollment Projections						
		FCS				
	Future Yr Projections	0	5	10	15	20
<b>Students (Headcount)</b>						
	Number of PhD Students	0	0	0	0	0
	Number of Funded Masters Level Grad Assistants	0	3	5	8	10
	Number of GTAs and GRAs if not included above	0	2	3	5	6
	Number of Undergraduate Majors	65	97	146	221	330
	Number of Post Docs	0	1	1	2	2
	Number of MA and EdS Students not counted above	0	0	0	0	0
<b>Faculty</b>						
	Number of Faculty, Full-time T/TT (teaching)	5	5	6	6	6
	Number of Instructors/Lecturers, Full-time	1	1	2	2	2
	Number of Adjunct Faculty	5	6	7	8	9
	Number of FTE Faculty (Teaching & Extension)	8	8	9	10	11
	Number of Faculty, Emeriti (Productive)	0	0	0	1	1
	Number of Visiting Faculty/Scholars	0	0	0	1	1
	Lab Assistants	0	1	2	3	4
<b>Research and Technical Staff</b>						
	Number of Research Associates, Full-time	0	1	2	3	4
	Number of Research Associates, Part-time	0	0	0	0	0
	Number of Technicians/Lab-Based Research	0	1	1	1	1
	Number of Technicians/Lab-Based Instruction	0	1	1	1	1
	Average Grad Students per Faculty in Research Lab	0	2	4	6	8

## Research and Training Laboratories and Facilities

The mission of the Department of Human Sciences is to prepare students for leadership roles in the field of Family and Consumer Sciences that empower individuals, strengthen families and enable communities through education, outreach (extension), and discovery (research). The following requests will help the Food and Nutritional Sciences, Food Service Management, and Dietetics concentrations fulfil this mission and meet the department's 2023-2028 strategic goals to:

1. Widen our impact to improve the quality of lives of individuals, families and communities.
2. Increase the number of bachelor and master level FCS professionals working to improve the quality of lives for individuals, families, and communities.
3. Advance diversity, inclusivity, and sense of belonging in the profession of FCS.

Now, through strategic initiatives, we aim to amplify our impact. We will create ripples of positive change, widening our reach, multiplying the number of dedicated FCS professionals, and cultivating a welcoming and diverse profession. Presented alphabetically, the modernization and dynamic facility upgrades are necessary steps on our path to a brighter future, where everyone has the opportunity to thrive.

### 1. Community Kitchen and Engagement Room:

**Purpose:** The Community Kitchen and Engagement space will serve as a food demonstration and dining facility for lab courses, food and nutrition education workshops, and other outreach events conducted by faculty and FCS Extension (i.e., SNAP-ED, FNEP). The facility will include a Demonstration Kitchen for Community Nutrition Education Workshops conducted by students in Foods and Nutritional Sciences. The space will be used for nutritional education and community engagement and have up-to-date audiovisual equipment for presentations.

**Space requirement and location:** Renovation of Humphries Room 118 (~2,000 square feet)

**Lead persons:** Veronica J. Oates & Rita Fleming

#### Equipment needed:

- Convection oven
- Hood and fire suppression
- 24" gas char broiler
- 4-burner hot top
- Under-counter refrigerator
- Split sink for hand-washing and prep
- Seating for 20
- Wired for sound and video capture
- Maple butcher block counter tops (x2)
- Direct access to public hallway



- 24" char grill
- Refrigerated base
- Double fryers
- Pass-through cooler
- 3-bay hot well
- 2-bay soup well
- Double commercial panini sandwich grill
- Beverage cooler
- Ice machine
- Tables and chairs to accommodate 50 to 75 persons
- Large demonstration mirror
- Video camera
- Large monitors
- Hands-free microphone
- Cooking equipment and utensils

**Estimated Cost:** \$350,000

## 2. Experimental Food Lab

**Purpose:** In addition to serving as an active teaching laboratory for students, this space is used for product testing and development, food service/retail recipe development and testing. Sharon Suggs and Matthew Blair have a grant with Bush's Beans and doing consumer taste tests and recipe research on mung beans.

**Space requirement and location:** Room 240 in Humphries (~1500 square feet)

**Lead persons:** Veronica J. Oates & Priscilla Ayine

**Equipment needed:**

- Extensive large and small industrial equipment pieces
- Industrial Ovens and Dryers: Large-scale ovens capable of baking, roasting, and drying food products in bulk.
- Commercial Mixers and Processors: High-capacity mixers for blending, whipping, and emulsifying large quantities of ingredients.
- Extruders and Pasta Machines: For shaping and forming dough into various pasta formats, snacks, and other extruded products.
- Counter dough sheeter
- Bag labeler and sealer
- Piston filler
- Pressure cookers (not for commercial canning) (x3)
- Hoods ventilated to outside
- Electronic balances
- Digital thermometers
- Handheld pH meters
- Thermostatically controlled electric fryers
- Blenders and food processors
- Pots and pans

- Stainless steel sink with counter tops
- Kitchen utensils.
- A 36-inch Viking Professional gas range with convection ovens
- Two smooth top electric ranges with convention ovens
- Two gas ranges with conventional ovens
- Five microwave ovens,
- One three section commercial refrigerator
- One freezer

**Estimated Cost:** \$350,000

### 3. Food Sensory Lab

**Purpose:** A sensory lab will allow for the execution of discrimination, descriptive and affective sensory analysis. Used for both teaching and research to examine the relationship between human perception and instrumental analysis of food, the lab should have a tasting room, individual tasting booths (one of which is handicapped-accessible), a preparation area and access to an observation room equipped with a two-way mirror for group sessions such as focus groups. Sharon Suggs and Matthew Blair have a grant with Bush's Beans and doing consumer taste tests and recipe research on mung beans. The lab allows faculty and students to conduct food sensory experiments with African American consumers.

**Lead persons:** Veronica J. Oates & Sharon Suggs

**Space requirement and location:** At least 100 square meters of space; Renovation of former Locker room on 2<sup>nd</sup> floor of Humphries hall.

- Preparation area: 10-15 square meters
- Waiting area: 5-10 square meters
- Data analysis area: 5 square meters
- Storage: 5-10 square meters
- Office: 5-10 square meters

**Equipment needed:**

- Dedicated computer for the lab
- 4 Sensory Booths
- Laboratory benches adjacent to and flush with sliding pass-through
- Biometric Equipment eye trackers and galvanic skin response sensors
- High-Performance Liquid Chromatography (HPLC)
- Gas Chromatography-Mass Spectrometry (GC-MS)
- Near-Infrared Spectroscopy (NIR)
- Texture Analyzer
- Preparation benches
- Hand and dishwashing facilities
- Conventional range/oven
- Two microwave ovens
- Freezer and refrigerator storage
- Preparation and serving utensils

- Storage for dry ingredients, glassware and trays
- Analytical balance, digital balancer
- Fisher Isotemp Lab oven
- 1 Commercial freezer
- 1 Commercial refrigerator
- Water activity meter (AquaLab)
- TA.XT2i Texture Analyzer
- Konica Color Reader
- Refractometer
- pH meters

**Estimated Cost:** \$350,000

#### **4. Natural Playground Laboratory for the Early Learning Center**

**Purpose:** A natural playground provides advantages and additional benefits to children by encouraging creativity and imagination and promoting physical development. Natural spaces reduce stress, improve well-being, and provide a chance for children to connect to the environment and appreciate nature. Natural playground would be completed with the help of volunteers and parents in addition to paid contractors. Food and nutrition students would plant and grow flowers and vegetables with ELC children and families. Some of the food and vegetables grown could be sold at the department's TigerFresh Farmers Market for the benefit of student activities and cooking classes for the community, and meals and snacks at the ELC.

**Lead persons:** Veronica J. Oates & Margaret Machara

**Space requirement:** Conversion of back playground to accommodate the natural play spaces and a small greenhouse. Dismantling and repurposing of existing playground equipment.

#### **Equipment Needed:**

- Sustainable and eco-friendly materials
- Climbing structures
- Swings
- Slides
- Boulders
- Logs
- Ramps
- Landscaping (native trees, shrubs, vegetation)
- Small greenhouse
- Garden beds
- Benches
- Wooden fencing
- Mulch
- Grading
- Drainage
- Site preparation

**Estimated Cost:** \$70,000



## 5. Nutrition Counseling and Anthropometric Lab

**Purpose:** A nutrition counseling and anthropometric lab provides a practical learning environment for students in dietetics and nutritional science program. The lab allows students to gain hands-on experience completing nutrition focused physical exams, anthropometric measurements, body composition analysis, and dietary assessment techniques. The lab will facilitate research related to nutrition, health and behavior change. For the clients, access to nutrition counseling and education can promote healthier lifestyles and well-being.

**Lead persons:** Latasha Williams & Veronica J. Oates

**Space requirement:** 1000 sq. ft. with areas for client reception and screening, dietary assessment and counseling, body composition assessment; 40-50 square meters for a basic anthropometric lab with limited equipment

### Equipment Needed:

- Sphygmomanometer
- Video recording equipment to record counseling sessions
- Bioimpedance scales
- In-body scale
- Hand-grip Dynamometer
- Computers with electronic health file simulation software
- Blood chemistry kits
- Video equipment for recording and playback of counseling sessions
- Monitors for reception area
- Air Displacement Plethysmography (ADP) system

**Estimated Cost:** \$110,000

## 6. Quantity Food Research and Development Kitchen

**Purpose:** Space is needed for preparing meals for the Early Learning Center (ELC) and quantity food courses. The kitchen provides a tangible platform for hands-on learning experiences. Participants can observe meal planning, food preparation, and portion control, translating theoretical knowledge into practical skills. A commercial kitchen space can be rented by local entrepreneurs that need a commercial kitchen space for food preparation and post-harvest processing.

**Lead persons:** Sharon Suggs & Veronica Oates

**Space requirement:** A minimum 1600-2000 square feet (93-186 square meters). Humphries Room 207 or part of 118.

### Equipment needed:

- Combi oven

- Rotating rack oven
- 4 gallon steam jacket kettle
- 25 gallon steam tilt kettle
- Braising skillet
- Single fryer
- 30 quart mixer
- 3-well hot table
- 3,600 watt microwave
- Blast chillers (x2)
- 4-door cooler, wheeled (x2)
- 2-door freezer, wheeled
- 8x16 walk-in coolers (x2)
- 16x16 walk-in freezer
- 4-burner range with sill oven
- Pot filler spigot behind the tilt skillet
- Commercial dishwashing station
- Large hoods ventilated to outside

**Estimated Cost:** \$300,000

## 7. Teaching Kitchens (A and B) & Dining Room Renovations

**Purpose:** For the existing kitchens on the 2<sup>nd</sup> floor of Humphries are circa 1970s and in dire need of updates to meet the needs of 21<sup>st</sup> century culinary standards. There are ventilation issues that require remediation to ensure the safety of students. Each unit, 5 in each kitchen, will have a stainless steel sink with counter tops, a stove, dishwasher, microwave ovens, and appropriate kitchen utensils that are home grade quality. Refrigerators (one home style and one three section commercial) and a freezer are needed for the food preparation courses. Students will have access to use of electronic balances, digital thermometers, handheld pH meters, thermostatically controlled electric fryers, blenders and food processors. The dining room connected to kitchen A (room 228 Humphries) will be updated to accommodate dining tables and chairs, steam table, and a mobile demonstration table.

**Lead persons:** Veronica J. Oates & Sharon Suggs

### **Equipment needed:**

- 2-36-inch Viking Professional gas ranges with convection ovens
- Double stacked convection oven
- 6-burner ranges with convection ovens (x2)
- 4-burner ranges with still ovens (x2)
- 2-burner induction units (x2)
- Prep tables with sink and drawers (x5)
- Ranges on wheels with quick gas disconnects
- Hand sinks (x3)
- Large capacity ice machine
- Freeze dryer
- Bowl chopper

- Food dehydrator
- Ice cream making machines (x2)
- 2 home style refrigerators
- 1 three section commercial refrigerator
- 2 freezers
- Sandwich prep tables (x2)
- Warmer/Proof boxes (x2)
- Tables and chairs

**Estimated cost:** \$450,000

## **8. TigerFresh Farmers Market**

**Purpose:** The farmers market is an outgrowth of the Food Justice Leadership Academy and provides students opportunities for hands-on community involvement in the food for life movement. The mission of the farmers market is to promote health and wellness through food and nutrition security, food sovereignty, and nutrition education. The primary goal is to provide fresh and diverse produce the TSU campus and surrounding community. Additionally, we want the market to provide a place and space for our community gardeners and small farmers to sell their produce and farm products. Going forward, we would like to increase student involvement, the number of vendors at the market, and the level of engagement with the surrounding community. The market offers students opportunities to learn about entrepreneurship and business development, provides nutrition education to the community and learn about conducting surveys and collecting data.

**Lead persons:** Veronica J. Oates, Rita Fleming, & Brione Lockett

**Space requirement:** Humphries gated parking lot (back section cordoned off) on the days of the market. Space for a hydroponic container farm.

### **Equipment needed:**

- Plots at the TSU community garden for students to plant and grow produce for the market and food demos
- Hot plates
- Portable food demonstration equipment for outdoor cooking demos
- Karaoke machine for playing music and making announcements
- Heavy duty outdoor electrical cords
- Banners and other signage for the parking lot on the days of the market
- Tents for vendors with TigerFresh logo
- Crates for collecting and displaying produce
- Seeds and seedlings for growing in the community garden
- Modular hydroponic container to grow vegetables year-round
- Wrapping or painting of a mural on the container farm unit

**Estimated Cost:** \$178,000



## 9. Apparel Construction Lab

**Function:** This class lab will provide space to instruct students in the specific technical knowledge of constructing garments relative to the requirements of the apparel industry.

**Special Requirements:** Moveable lectern with input/output panel, network computer, touch screen microprocessor control, document camera. Full width whiteboard, video projection unit, smart boards, lockable cubbies for students, tack board near door entry, secure cabinets to store digital equipment.

**Furniture:** student computer workstations with ergonomics chairs. Consider workstations to accommodate 4 students each will provision from multiple monitors, keyboards and mouse. All stations are to configure to a share printers. Stations to be equipped with wire management systems to power and data plug and play. Instructors table and upholstered chair.

**Loose Equipment:** Computers, printers, scanners, industrial sewing machines, sergers

**Special Electrical:** Provide for power outlets adequate for flexible room layout with moveable stations.

**Net Assignable Square Feet:** 1,500

An Apparel Construction Lab requires a range of equipment to enable students to learn how to construct and alter clothing. Here are some essential pieces of equipment that should be included in such a lab:

1. Sewing machines: Industrial sewing machines are essential for an Apparel Construction Lab. They are designed to handle heavy-duty fabrics and can stitch faster than domestic machines. The lab should have a range of machines to cover different types of stitching, such as straight stitch, zigzag stitch, and overlock stitch.
2. Serger machines: These machines are perfect for finishing seams and edges of fabric. They trim the seam allowance and encase the raw edges, leaving a clean finish.
3. Irons and ironing boards: Pressing is a crucial part of garment construction, and the lab should have a range of irons and ironing boards to enable students to press their work.
4. Cutting tables and cutting tools: The lab should have large cutting tables with a smooth surface and a height suitable for standing and cutting fabric. Cutting tools include scissors, rotary cutters, and cutting mats.
5. Dress forms: Dress forms are essential for fitting and draping garments. They come in different sizes and shapes, and the lab should have a range of forms to accommodate different body types.
6. Measuring tools: Measuring tools include rulers, tape measures, and French curves. These tools help students take accurate measurements and create patterns.
7. Notions: Notions are small items such as buttons, zippers, and thread. The lab should have a range of notions to enable students to finish their garments.
8. pattern-making software, embroidery machines, and fabric dyeing equipment.

## 10. Apparel Lab Pep/Stock Room

**Function:** This space will be used to store and prep materials used in apparel construction and design labs. It will also store a wide variety of sewing supplies, materials, equipment and student projects.

**Special Requirements:** Heavy duty adjustable steel shelving of varying depth, other built in equipment to be coordinated with the University during design.

**Net Assignable Square Feet:** 400

An Apparel Lab Pep/Stock Room requires a variety of equipment to function efficiently. Below are some essential equipment that can be used in an Apparel Lab Pep/Stock Room:

1. Shelving Units: These are used to store and organize the different apparel items such as fabric rolls, finished garments, and supplies.
2. Rolling Racks: They are used to transport and store the finished garments and fabric rolls.
3. Sewing Machines: They are essential for any Apparel Lab Pep/Stock Room. The sewing machines could be industrial or domestic, depending on the size and scope of the operations.
4. Cutting Tables and Mats: These are used to cut fabrics and patterns for garment production.
5. Ironing Boards and Presses: They are used to press and iron the finished garments.
6. Storage Bins: They are used to store and organize smaller items such as thread, needles, and buttons.
7. Computer and Printer: They are used to manage inventory and print labels for the finished garments.
8. Labeling Machine: This machine is used to print and attach labels to the finished garments.
9. Measuring Tapes and Other Measuring Tools: These are used to ensure accurate measurements of the apparel items.
10. Packaging Supplies: These include packing tapes, boxes, and bags used to pack and ship the finished garments.

Having these equipment in an Apparel Lab Pep/Stock Room ensures that the production process is efficient and effective.

## 11. Laundering Lab

**Function:** This research lab will provide space for textile and garment testing of colorfastness, laundering conditions, care instructions, labeling requirements, and perspiration testing.

**Special Requirements:** Flat table for laptop, Whiteboard, lockable cubbies, emergency eyewash unit as required, hand washing station (double sinks) with hot and cold running water, cabinets near sink.

**Furniture:** Testing tables and ergonomic chairs

**Loose Equipment:** Drying rack, perspiration testing equipment, clothes washer, clothes dryer

**Special Electrical:** Provide power for equipment. Electrical service to the space should be a part of the facilities emergency power supply.

**Net Assignable Square Feet:** 1,500

To set up a laundering lab for textiles testing. Here are some of the essential items require:

1. Washing Machines: need a range of washing machines that can simulate different types of washing cycles to test the durability of various fabrics.
2. Dryers: need dryers that can simulate different types of drying cycles to test the durability of various fabrics.
3. Fabric Swatches: need a range of fabric swatches to test the laundering durability of different types of textiles.
4. Detergent: need a variety of detergents to test the effectiveness of different detergents on different types of fabrics.
5. pH Meter: need a pH meter to test the pH level of detergents and other chemicals used in the laundering process.
6. Stain Removers: need a range of stain removers to test the effectiveness of different stain removers on different types of fabrics.
7. Water Hardness Test Kit: need a water hardness test kit to test the hardness of water used in the laundering process.
8. Scale: need a scale to weigh fabrics before and after laundering to determine the amount of fabric loss during the laundering process.
9. Irons: need irons to test the durability of fabrics after ironing.
10. Fabric Testing Equipment: need a range of fabric testing equipment to evaluate the quality of fabrics after laundering, such as tensile strength testers, abrasion testers, and pilling testers.

These are just some of the essential items needed to set up a laundering lab for textile testing.

## **12. Textile Dark Room Lab**

**Function:** This research lab will be used for textile and garment color analysis.

**Special Requirements:** Perimeter bench counter depth 30in minimum along the wall with peg boards above. Double sink with hot and cold water. Cabinets for product placement.

**Furniture:** Flat tables with ergonomic chairs

**Loose Equipment:** Datacolor spectrophotometer, Gretag Macbeth type light box

**Net Assignable Square Feet:** 500

A textile darkroom lab is a specialized workspace designed for creating and developing photographic prints on fabric. This process requires a controlled environment that is free from light, dust and other contaminants. In order to set up a textile darkroom lab, program will need the following items:



1. **Darkroom space:** This space should be a room that can be completely darkened, ideally without any windows or other sources of light. The space should also have access to running water, electricity and ventilation.
2. **Darkroom lights:** special darkroom lights, such as red safelights, to provide the necessary illumination for working in the darkroom. These lights emit a low level of red light that does not affect the light-sensitive emulsion on your photographic paper.
3. **Developing trays:** Developing trays are used to hold the chemicals needed for processing your photographic prints. You will need at least three trays for developing, stop bath and fixing.
4. **Tongs:** Tongs are used to handle your prints safely while they are being processed in the chemical baths.
5. **Chemicals:** Chemicals such as developer, stop bath and fixer, as well as a hypo clearing agent and a washing aid.
6. **Photographic paper:** Photographic paper that is specifically designed for printing on fabric. This paper has a light-sensitive emulsion that reacts to the chemicals used in the developing process.
7. **Fabric:** Fabric to print your photographic images onto. This can be any type of fabric that can be submerged in the chemical baths and is suitable for the type of ink you are using.
8. **Ink:** Ink that is specifically designed for printing onto fabric. This ink is heat-set to ensure that it bonds well with the fabric and does not wash out.
9. **Equipment:** An enlarger, timer, thermometer, measuring cups and a scale to accurately measure the chemicals needed for processing your prints.

### **13. Textiles Conditioning Lab**

**Function:** This research lab will be used for physical texting of textiles and garments.

**Special Requirements:** Whiteboard, projector capabilities of receiving computer-generated images and access to video. Lockable cubbies, emergency eyewash unit, hand washing station, fume hood, electrical outlets.

**Furniture:** Ergonomic chairs, Flat tables

**Loose Equipment:** specification to be coordinated with the university's design.

**Net Assignable Square Feet:** 860

A textile testing lab requires various items to conduct accurate and reliable tests. Here are some of the essential items needed for a textile testing lab:

1. **Testing equipment:** A textile testing lab needs various types of equipment to carry out different types of tests, such as abrasion testers, tensile testing machines, color measurement devices, and moisture meters.
2. **Consumables:** The lab requires various consumables such as chemicals, reagents, and solvents for the preparation of samples and carrying out tests.

3. Safety equipment: Safety equipment such as gloves, goggles, lab coats, and respirators is necessary to ensure the safety of lab personnel and prevent any accidents.
4. Reference materials: Reference materials such as standard fabrics, dyes, and fibers are necessary to ensure that the lab's testing results are accurate and consistent.
5. Software: Specialized software is required to analyze and interpret test results and manage data.
6. Calibration equipment: Calibration equipment such as weights, temperature sensors, and pressure gauges are needed to ensure that the testing equipment is functioning correctly.
7. Quality control equipment: Quality control equipment such as spectrometers, pH meters, and thermometers help to ensure that the lab's testing results are accurate and consistent.

#### **14. Textile Laboratory Prep/Stock Room**

**Function:** For the function of storing and prepping textile materials in a textile lab, it is important to have a space that is organized, clean, and easily accessible. The space should ideally be divided into two sections - one for storage of the textile materials and the other for prepping them.

**Special Requirements:** The shelves should be sturdy and adjustable, so that they can be easily modified to accommodate different types of materials. Additionally, it is important to have cabinets with drawers for storing smaller textile materials.

**Furniture:** chairs and stools available in the prepping section for the staff and students to sit on while they work. Additionally, a few rolling carts can be useful for transporting the textile materials from the storage to the prepping section.

**Net Assignable Square Feet:** 500

#### **Community Resource Center (CRC)**

Space:

1. The space requested for the Community Resource Center is the area on the first floor of Humphries Building, formerly occupied by Nursing.
2. In addition, renovations need to be completed to make Room 118, formerly a student event space for the Department of Human Sciences usable.
3. Land Space for a natural playground.

Personnel:

1. The CRC will require a director or at a minimum someone with 50% time devoted to the center to organize events and materials, as well as recruit participants.
2. The CRC will also require a devoted administrative assistant to facilitate purchasing, paperwork, etc.
3. Student workers to help with resources and events.

### Vision:

This center will serve the needs of TSU students, families and businesses in the North Nashville area. Students will be able to come to the center to use academic resources such as books, journals, and project materials. Students and families will have access to written materials and workshops that promote well-being. Area businesses that also serve individuals and families will have access to information, kits of materials, and trainings that assist their mission. Natural Playground will be a model area where events and trainings for area childcare workers and families.

### Potential Stakeholders:

1. TSU students
2. Families served by the ELC
3. Individuals and Families in the North Nashville Area
4. Community nonprofits
5. Area childcare centers
6. Researchers
7. Extension Specialists/Agents
8. Academic Faculty/Classes

### Potential Topics:

1. Study skills
2. Relationships/Communication
3. Mental Health
4. Individual development
5. Parenting
6. Nutrition
7. Healthy living
8. Outdoor activities

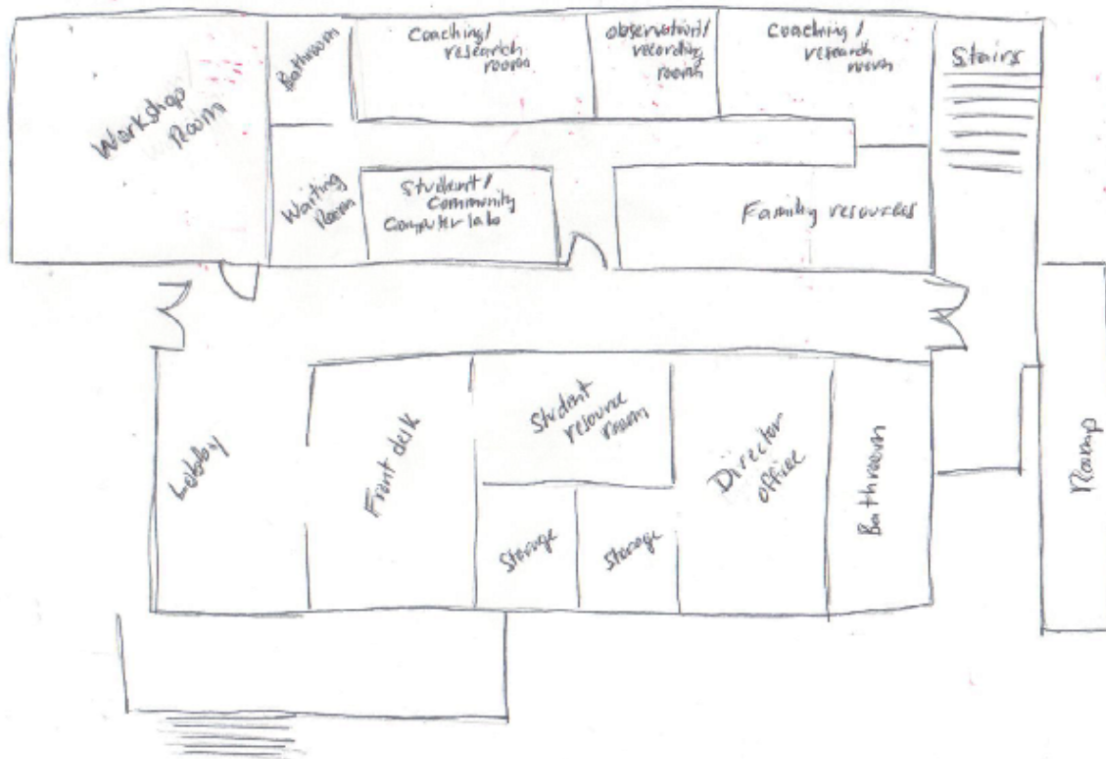
### Potential Activities/Resources:

1. Brochures and Factsheets
2. Materials for class projects
3. Materials for family interaction
4. Reference books and journals
5. Teaching/Learning kits that can be checked out
6. Workshops, classes, or trainings
7. Potential for observed individual or family coaching
8. Potential for recorded family or group interactions for research



Space Utilization (layout below):

1. The front area with the administrative assistant serves as a welcome to the CRC and holds many available resources.
2. Student Resource room for educational and project materials.
3. Storage space and room for the director
4. Classroom for educational workshops
5. Coaching, Education and Research rooms with observation/recording room between.
6. Student/Community Computer Lab
7. Large meeting space (118, not shown in picture) for student and community events
8. Outdoor space (not pictured) for natural playground



Needs:

1. All rooms need to be structurally functional
2. Furniture needs for areas
3. Recording/Observation equipment
4. Presentation screens, projectors, computers
5. Computers for room where students and community can access the internet for classes or community skill development
6. Some materials to supplement natural elements of the playground (such as covered structures, storage, fencing, etc.)
7. Office supplies and printing material for activities and resources





TENNESSEE  
STATE UNIVERSITY  
College of Agriculture

# COOPERATIVE EXTENSION PROGRAM



# Cooperative Extension Program

## Tennessee New Farmer Academy Centers

Envisioned as a catalyst for transformative agricultural leadership, the Tennessee New Farmer Academy stands at the forefront of empowering individuals to embark on a rewarding journey in agriculture. Established at Tennessee State University in the spring of 2014, the Academy has evolved into a pivotal institution offering a seven-month certification program tailored for those aspiring to become agricultural entrepreneurs. Ideal candidates encompass a diverse spectrum, ranging from individuals entirely new to agriculture, those seeking a transition from fields like military service or the private sector, to those exploring post-retirement opportunities.

Currently thriving in four strategic locations across Tennessee - Memphis, Nashville, Pikeville, and Wartburg - the Tennessee New Farmer Academy has proudly witnessed the graduation of approximately 658 new and beginning farmers since its inception. It has become a testament to the success of its mission, which focuses on imparting crucial concepts, providing essential information, and facilitating hands-on experiences necessary for building robust, viable, and successful agricultural businesses.

In a significant development, the Tennessee New Farmer Academy was included in the Tennessee Department of Agriculture's Tennessee Agriculture Enhancement Program (TAEP) beginning farmer option in 2021. This inclusion enables new and beginning farmers with less than 5 years of experience, who may not meet minimum requirements, to apply for cost-share assistance. The beginning farmer option, focusing on Application A, allows producers to qualify for up to 50% cost share in various programs.

The success of the Tennessee TSU New Farmer Academy is further evident in its ability to secure approximately \$250,000 in grant funds since 2014, supporting outreach and educational initiatives. Celebrating its 10th year in 2024, the NFA continues to make a significant impact on Tennessee Agriculture, with numerous successful graduates contributing to the sector.

Looking towards the future, the Tennessee New Farmer Academy harbors a bold long-term vision: the establishment of three New Farmer Academy Centers strategically dispersed across the state. Each of these centers will serve as comprehensive hubs for agricultural education and innovation, featuring an Agriculture Education multi-purpose building and a minimum of 100 acres of dedicated farmland.

### **1. Agriculture Educational building Facilities:**

Each TSU Tennessee New Farmer Academy Training Center will feature an expansive educational building, covering an impressive 250,000 square feet (500x500 ft). These facilities will serve as the core infrastructure for comprehensive agricultural education, combining modern amenities with practical spaces tailored to meet the diverse needs of participants.



- **Teaching Classroom:** The heart of the educational building will be a state-of-the-art teaching classroom equipped with advanced audiovisual technology. This space is designed to accommodate up to 100 students, providing an ideal environment for interactive lectures, workshops, and collaborative learning experiences. The classroom will be flexible to adapt to various teaching methodologies, ensuring an engaging and dynamic educational atmosphere.
  - **Staff Offices:** Two dedicated staff offices within the building will serve as functional workspaces for instructors, administrative staff, and program coordinators. These offices are strategically positioned to facilitate efficient communication and coordination among the educational team, ensuring smooth operation of the program.
  - **Breakroom:** Recognizing the importance of creating a communal space for relaxation and social interaction, each educational building will include a comfortable breakroom. This area will provide participants and staff with a welcoming environment to unwind, fostering camaraderie and a sense of community among those involved in the program.
  - **Necessary Facilities:** The educational building will incorporate essential facilities, including restrooms and other amenities, to cater to the daily needs of participants and staff. Ensuring accessibility and convenience, these facilities will be designed with a focus on user comfort and efficiency.
  - **Multi-Functional Spaces:** Beyond the teaching classroom, the educational building will feature multi-functional spaces adaptable for workshops, seminars, and additional educational activities. These flexible areas can be configured to accommodate hands-on demonstrations, guest lectures, and group discussions, enhancing the versatility of the educational environment.
  - **Technology Integration:** Leveraging the latest in educational technology, the building will be equipped with modern audiovisual systems, interactive displays, and connectivity solutions. This integration ensures that participants have access to cutting-edge tools, enhancing the overall learning experience and preparing them for the technological demands of modern agriculture.
  - **Sustainable Design:** Emphasizing sustainability, the educational building will incorporate eco-friendly materials, energy-efficient systems, and innovative design principles. This commitment aligns with the Academy's vision for responsible and environmentally conscious agricultural practices, extending to the infrastructure that supports its educational mission.
2. **Farmland with Irrigation and Greenhouses:** The expansive farmland accompanying each center will be a living laboratory for aspiring agricultural entrepreneurs. Spanning at least 100 acres, the land will be equipped with cutting-edge irrigation systems to ensure optimal crop management and yield. Greenhouses will provide a controlled environment for experimentation with diverse crops, fostering innovation and sustainability. The combination of practical, hands-on experience in the fields and the utilization of modern

agricultural technologies will prepare graduates to navigate the complexities of real-world farming.

3. **Farm Equipment Storage and Repair Facilities:** As an integral component of each TSU Tennessee New Farmer Academy Training Center, dedicated farm equipment storage and repair sheds will play a crucial role in supporting the practical aspects of agricultural education. These facilities, spanning an impressive 10,000 square feet (100x100 ft.), will serve as hubs for the maintenance, storage, and upkeep of essential farming equipment.
4. **Community Engagement and Outreach:** Each New Farmer Academy Center will actively engage with the local community, fostering a sense of shared responsibility and collaboration. Outreach programs, workshops, and farmer's markets will connect new farmers with residents, creating a symbiotic relationship that contributes to the economic and social fabric of the region. By intertwining the centers with the communities, they serve, the Academy aims to create not just skilled farmers but advocates for sustainable and community-centric agriculture.

In embracing this visionary mission, the Tennessee New Farmer Academy aspires to redefine the landscape of agricultural education. The New Farmer Academy Centers will not only produce skilled agricultural entrepreneurs but will be epicenters of innovation, sustainability, and community development. With a commitment to knowledge, hands-on experience, and community engagement, these centers are poised to shape the future of Tennessee's agriculture, fostering a new generation of leaders who will propel the industry into a vibrant and prosperous era.

## **Community Nutrition Education Center in West Tennessee**

Significant disparities in access to healthy food and nutrition education. This contributes to higher rates of chronic diseases like obesity, diabetes, and heart disease. Establishing a community nutrition education center at Tennessee State University (TSU) with extension agents, dietitians, and administrative offices would address these challenges by:

- Providing accessible, culturally relevant nutrition education: TSU's historically Black college and university status positions it to connect effectively with diverse communities in West Tennessee. Extension agents and dietitians can tailor programs to address specific needs and preferences.
- Increasing food security: The center can offer hands-on workshops on budgeting, grocery shopping, and cooking healthy meals on a limited income and house a food pantry and soup kitchen. This empowers families to make informed food choices and stretch their resources further via SNAP-ED/ FNEP agents, program assistants, and students matriculating in food and nutritional sciences and dietetics.
- Building healthy communities: By promoting healthy eating habits and physical activity, the center can contribute to overall well-being and reduce healthcare costs. This creates a ripple effect, improving the quality of life for individuals and communities.
- Promoting healthy pregnancies and deliveries: Establishing doula and breastfeeding training and certification programs at the center can help combat health disparity in infant and maternal mortality experienced by African Americans in Tennessee. The maternity mortality ratio (MMR) in Tennessee was 58.5 deaths per 100,000 live births in 2020. That is a 51% increase from 2017-2019. According to the 2022 Tennessee Maternal Mortality Review Report, Black women are three times more likely to die from pregnancy-related causes than white women in Tennessee.
- Leveraging TSU's expertise: TSU's faculty and staff in the Department of Family and Consumer Sciences have extensive knowledge and experience in nutrition education, family resource management, and outreach. This expertise can be channeled to develop effective programs and resources for the center.
- Developing community resources: The center can provide workshops on family resource management home ownership, consumer education, estate planning, investing, and entrepreneurship skills.
- Improving patient advocacy and navigation of healthcare: Health education specialists and agents have expertise in providing workshops on self-advocacy and patient provider communication skill-building to making choices for Medicare/Medicaid, health insurance, caring for family members, and end-of-life care decisions. provider communication.
- Providing a site for experiential learning: Students majoring in Family and Consumer Sciences require internships and field work related to their concentration in child development, family studies, fashion merchandising and product development, nutritional sciences, and food service management. Classes and workshops will be offered to the community such as sewing, child rearing, conflict management, etc.



- Providing quality child care services: TSU's Early Learning Center has provided convenient, dependable and professional services for children in Nashville for over 50 years. We will provide these services to families in West Tennessee.

Community Nutrition Education Center (CNEC) in West Tennessee provides a unique opportunity to make a significant impact on underserved communities. Here are our ideas for maximizing the potential of the 10,000 square feet space:

Proposed Programming and Activities:

- Community Kitchen:
  - Host cooking classes focused on healthy and budget-friendly meals, featuring local ingredients.
  - Offer community meals and food pantries, addressing food insecurity and promoting social interaction.
  - Organize cooking demonstrations and workshops for specific groups like diabetics, senior citizens, or families with young children.
- Doula and Lactation Consultant Training and Certification Programs:
  - Facilitate exams and evaluations required for certification.
  - Provide job placement assistance for graduates.
  - Develop a network of consultants and mentorship program.
  - Offer the training and certification to TSU students.
- Early Learning Center:
  - Create a nurturing and educational space for young children, focusing on healthy habits and food education.
  - Offer parent-child cooking classes, nutrition workshops, and story time sessions.
  - Partner with child care providers to offer on-site nutrition education and cooking activities.
- Tailoring/Sewing Room:
  - Host sewing classes and workshops for all ages, promoting creativity and practical skills.
  - Offer clothing alterations and repair services, generating income and supporting financial well-being.
  - Organize textile recycling programs and upcycling workshops, promoting sustainability.
- Family Resource Center:
  - Connect families to social services, healthcare providers, and educational resources.
  - Offer parenting workshops, financial literacy programs, and mental health support groups.
  - Partner with local businesses to offer employment opportunities and career development resources.
- Meeting Space:
  - Facilitate workshops and presentations on nutrition, health, child development, financial literacy, and other relevant topics.
  - Host community events like movie nights, game nights, book clubs, and support groups.

- Partner with local organizations to offer programs like ESL classes, job training, or legal aid clinics.

#### Role as Program Leader and Director of Community Outreach

Rita Fleming's leadership will be crucial in establishing and running the center. As Program Leader for Family and Consumer Sciences and Director of Community Outreach and Engagement, she will:

- Develop and implement a strategic plan: This plan will outline the center's goals, target audiences, program offerings, funding strategies, and evaluation methods.
- Build partnerships: Collaborate with local organizations, healthcare providers, and community leaders to ensure the center's services reach those who need them most.
- Recruit and manage staff: Hire qualified extension agents and dietitians who are passionate about community outreach and nutrition education.
- Develop and deliver educational programs: Create engaging workshops, cooking demonstrations, and other activities that meet the diverse needs of West Tennessee residents.
- Secure funding: Identify and pursue grants, contracts, and other funding opportunities to support the center's operations and program development.
- Evaluate and adapt: Regularly assess the center's impact and make adjustments as needed to ensure its effectiveness.
- Promote the center's services: Raise awareness about the center through outreach activities and media campaigns.

#### Role as Department Chair of Human Sciences

As the Chair, Veronica J. Oates' goal is to make the Center sustainable and relevant to the community. The vision is to focus on the specific needs of the community, build strong partnerships, and constantly strive for improvement. To do this, she will:

- Project operational costs, income sources, and potential funding opportunities.
- Ensure equitable access by offering sliding scales and scholarships for those in need.
- Create opportunities for community members to volunteer their time and skills.
- Provide training and professional development opportunities to empower a team to continuously learn and grow, adapting to changing community needs.
- Foster a collaborative and inclusive work environment by encouraging teamwork, communication, and mutual respect among staff and faculty.
- Evaluate and track impact of the center by assessing the effectiveness and reach of programs.
- Project operational costs, income sources, and potential funding opportunities.
- Regularly assess the center's impact and adjust programming to ensure its effectiveness.

- Positions Needed:
- An TSU extension agent and specialist in family and consumer sciences resource management will provide workshops on home ownership, resource management, estate planning, investing, and entrepreneurship.
- A health education agent and specialist will provide workshops on self-advocacy and patient navigation through Medicare/Medicaid, health insurance and patient provider communication.
- SNAP-ED/FNEP agents and specialists will provide nutrition education programs and cooking demonstrations.
- A consumer education specialist will help in building community resiliency and social capital by holding workshops on entrepreneurship and home ownership.
- A community/program organizer will coordinate scheduling of the programs and workshops at the facility.
- An experienced doula and childbirth educator will help develop curricula and build the doula program. They will deliver the training and TSU Center for Learning will issue the certificates.
- A director will manage the Early Learning Center and two qualified childcare teachers will provide quality instruction to pre-kindergarten children.





TENNESSEE  
STATE UNIVERSITY  
College of Agriculture



# TSU AGRICULTURAL RESEARCH AND EXTENSION CENTER

## Research

### Proposal for Establishing a State-of-art University Farm at Tennessee State University Agricultural Research and Education Center

#### Agricultural Research and Education Center, Nashville

Tennessee State University (TSU) in Nashville has a unique opportunity to establish a state-of-the-art University Farm that will serve as a hub for education, research, and extension/outreach in the agricultural domain. TSU has a rich history in agriculture, and to further enhance its commitment to academic excellence, research, and community outreach, we propose the establishment of the University Farm. This proposal outlines the creation of a comprehensive facility with dedicated units for small ruminants, poultry, horticulture, equine, dairy, beef, and swine. The farm will contribute to the academic and research pursuits of the College of Agriculture and provide a platform for Cooperative Extension to test and demonstrate innovative farming practices. With a central focus on climate change, sustainable agriculture, and conservation of natural resources, the proposed University Farm will demonstrate agricultural excellence in downtown Nashville.

#### Objectives:

1. **Education:** Create a dynamic learning environment for K-12 to higher education students within the College of Agriculture, promoting hands-on experiences and practical skills development.
2. **Research:** Facilitate cutting-edge research in agriculture, with a specific emphasis on sustainable practices, climate change mitigation, and natural resources conservation.
3. **Extension/Outreach:** Serve as a demonstration site for Cooperative Extension to disseminate knowledge and new farming practices to the broader community, ensuring the adoption of innovative methods.

#### Working Units:

The University Farm will consist of the following working units:

1. **Small Ruminants is dedicated** to the breeding and research of sheep and goats, focusing on meat and wool production.
2. **Poultry:** It features facilities for poultry farming, egg production, and animal health and welfare research.
3. **Horticulture is a unit that focuses** on cultivating vegetables, fruits, and specialty crops, incorporating sustainable and climate-smart practices.
4. **Equine:** Catering to the study and breeding of horses, integrating equine science into the academic curriculum.
5. **Dairy:** Comprising facilities for milk production, cheese making, and dairy research, with a commitment to sustainable and ethical practices.
6. **Beef:** Dedicated to the breeding and research of cattle for beef production, emphasizing best practices in animal husbandry and meat production.
7. **Swine:** Focused on the sustainable pork production, with research initiatives in swine waste management and climate-friendly practices.

#### Research Areas:



1. **Sustainable Agriculture:** Investigate and implement environmentally friendly farming practices, emphasizing reducing carbon footprint and promoting biodiversity.
2. **Natural Resources Conservation:** Research and demonstrate soil conservation techniques, water management, and land stewardship.
3. **Climate Change Mitigation:** Explore ways to mitigate the impact of climate change on agriculture, emphasizing resilient and adaptive farming methods.

#### **Infrastructure and Resources:**

1. **Livestock Facilities:** Construct state-of-the-art barns, sheds, and pens tailored to the specific needs of each working unit.
2. **Crop Fields:** Establish extensive fields for cultivating feed crops for livestock and research on various vegetable and specialty crops.
3. **Research Laboratories:** Develop cutting-edge laboratories equipped for molecular biology, genetics, and climate science research.
4. **Classrooms and Auditoriums:** Build dedicated spaces for lectures, workshops, and conferences, promoting collaboration and knowledge-sharing.
5. **Extension Center:** Establish a center for Cooperative Extension activities, including workshops, training sessions, and outreach programs.

#### **Conclusion:**

Establishing a University Farm at Tennessee State University will enhance the academic and research capabilities of the College of Agriculture and serve as a vital resource for the broader agricultural community. By embracing a multidisciplinary approach and focusing on sustainability and climate change, TSU can position itself as an agricultural education and innovation leader. This proposal seeks the necessary support and commitment to turn this vision into a reality, contributing to the future of agriculture and environmental stewardship.

## **Agricultural Research and Education Center, McMinnville**

### **Otis L. Floyd Nursery Research Center**

The Tennessee State University Otis L. Floyd Nursery Research Center (NRC) is located in the heart of Tennessee's nursery industry, about 80 miles southeast of Nashville in McMinnville, Tennessee.

#### **Mission:**

Our mission is to provide leadership in strengthening and expansion of our nursery industry through innovative research and extension programs in entomology, genetics, horticulture, pathology, chemical ecology, sustainability, nursery extension, and related sciences. We also produce nursery Extension publications that address topics in nursery production, insect control, disease control, and weed control.

#### **Current Building Infrastructure**

The NRC is an 86-acre farm with a 20,000 square foot main building and several accessory units. The main building houses 7 scientist offices, 10 program labs, 8 staff offices, 1 large (100 people) and 1 small (12 people) meeting spaces and parking for 50 vehicles. The center also has 6 external storage units (10 x 30 ft), an equipment maintenance building (100 x 60 ft) and a pesticide mixing/storage facility (40 x 40 ft), a soil mixing facility, and auxiliary office space for 2 people.

#### **Building Upgrades and Expansion**

Most urgently, an engineering survey in 2022 determined the boilers for the main building and greenhouse have exceeded their lifespan at 28 years old and need immediate replacement. The estimated cost for this replacement is \$1.2 million. In order to grow the research capacity at the Center a new wing needs to be added to the facility. We would like to expand science operations by providing 6 additional scientist offices, 8 additional staff spaces, 8 lab spaces, and supply storage areas. These lab spaces will include a climate-controlled space to house the NRC entomology, pathology and herbarium collections, a clean room for shared large equipment and equipment storage, and a BSL-2/quarantine lab for handling sensitive materials. The new spaces will permit the full utilization of current and new research areas by removing the need to use some lab space as office areas, as currently required. Additionally, the additional laboratory and staff capacity will permit the addition of new program areas to include plant physiology, economics/marketing, an additional USDA/ARS position and a diagnostic facility. An additional 30 parking spaces will be added to the lot. An agriculture engineering fabrication facility will also be added for the precision agriculture position. Interior finishes in the current building are original to the building (28 years) and need to be replaced.

#### **Current Field, Greenhouses & Container Pads**

The property currently has approximately 50 acres of usable field space, a controlled environment greenhouse space with 6 bays (36 x 24 ft), 2 container areas (60x70 ft), (40 x 30 ft), 13 polyhouses and 9 small stand-alone greenhouses (12x20 ft). We also have 3 soil storage/potting pads (20 x 30 ft)



### **Field, Greenhouse & Container Pad Renovation & Expansion**

There are several acres of field space with old experimental trees that need to be cleared and removed before the land can be used for new production research. The existing greenhouses need to have all external Lexan replaced, and the polyhouses need to have shadecloth replaced. Four additional controlled environment greenhouse will be needed for new faculty, as well as seven additional polyhouses and an 9 additional small stand-alone greenhouses for experimental use. We would also like to acquire an additional 25 acres of production land nearby for field experiments.