EMILY HOUSE
Executive Director

BILL LEE
Governor

STATE OF TENNESSEE
HIGHER EDUCATION COMMISSION
STUDENT ASSISTANCE CORPORATION
312 ROSA L. PARKS AVENUE, 9TH FLOOR
NASHVILLE, TENNESSEE 37243
(615) 741-3605

TO: Lori Bruce, Provost
Tennessee Technological University

FROM: Julie A. Roberts, Chief Academic Officer
Tennessee Higher Education Commission

Digitally signed by Julie A. Roberts
Date: 2022.08.12 10:21:50 -05'00'

SUBJECT: Tennessee Technological University
Expedited Letter of Notification: Environmental Agriscience Technology, Master of Science

DATE: August 12, 2022

Thank you for the revised submission of the Expedited Letter of Notification (ELON) for the Environmental Agriscience Technology, Master of Science (MS) program. Per *THEC Policy A1.6 – Expedited Academic Programs: Approval Process,* the ELON is evaluated on the following criteria: alignment with workforce, economic, or other state needs while still assuring quality, student demand, uniqueness, and institutional capacity to deliver the proposed program.

After reviewing the ELON, I approve University's plan to develop the Expedited New Academic Program Proposal (ENAPP) for the Environmental Agriscience Technology, MS. It is understood the proposed program will be developed in accordance with the mission of TTU and will meet the Master Plan for Tennessee Postsecondary Education degree completion and workforce development objectives.

Please be advised that the Expedited Letter of Notification will be posted on the THEC website for public disclosure.

Attachment

cc: Emily House, THEC, Executive Director
Philip Oldham, TTU, President
Sharon Huo, TTU, Associate Provost
Darron Smith, TTU, Dean, College of Agriculture and Human Ecology
Bruce Greene, TTU, Director, School of Agriculture
Ryan Korstange, THEC, Director of Academic Affairs

Tennessee Higher Education Commission
Expedited Letter of Notification Evaluation
August 12, 2022

The evaluation of the Expedited Letter of Notification (ELON) is in accordance with the *THEC Policy A1.6 Expedited Academic Programs: Approval Process*. The evaluation is conducted by interested parties and THEC staff. The ELON is posted on the THEC website for a 10-day period of comment by interested parties.

Institution: Tennessee Technological University	**ELON Submission Date**: January 31, 2022 **Revised ELON Submission:** June 4, 2022 **Revised ELON Submission:** August 8, 2022
Academic Program, Degree Designation: Environmental Agriscience Technology Master of Science (MS)	
Proposed CIP Code: 01.0308 (Agroecology and Sustainable Agriculture)	
Proposed Implementation Date: Spring 2024	
Time Period Posted on Website for Public Comment: February 1-11, 2022	
Program Liaison: Dr. Bruce Greene, Director School of Agriculture (bgreene@tntech.edu)	

Criteria	Comments
Letter of support from President/Chancellor	▪ A letter of support from President Oldham, dated January 27, 2022, highlights the programs uniqueness amongst TN institutions, the massive need for sustainable agriculture, and the proposed programs fidelity to three goals of the US Farm bill.
Implementation timeline	▪ The proposal targets implementation for Spring 2024. ***Please correct the implementation date on the internal cover form.***
Background narrative	▪ The program proposal comes out of conversations dating to 2018 amongst faculty in the College of Agriculture and Human Ecology. Early research into existing program offerings noted the lack of a master's program in sustainable agriculture in Tennessee. ▪ The proposed program is designed to serve both current undergraduates and industry professionals, and will develop graduates who are flexible, innovative, and able to use advancing technological resources to solve the latest real-world problems in agriculture. ▪ The program will be multi-disciplinary, incorporating faculty with expertise in animal science, horticulture, soil science, geospatial technology, engineering, and agribusiness. ▪ The proposed 33-credit program has a thesis and non-thesis option. o The thesis option includes the 12 credits of field core classes, a 15-credit concentration, and a six-credit thesis. o The non-thesis option includes the 12-credit field core, an 18-credit concentration, and a three-credit research project. ▪ Twenty-four credits (the field core and 12 credits of the concentration) will be offered as online or hybrid courses, the remainder will be in person.

Justification for consideration of expedited policy	▪ The proposed program is unique and will train highly skilled workers in agriculture who will be integral to Tennessee's transition from conventional to smart agricultural systems. ▪ Agriculture is a critical sector in Tennessee, occupying 40 percent of the states acreage, and supports nearly 70,000 farming operations. ▪ The Boyd Center reported that in 2015 (the most recent county data) the agricultural industry had a $1.7 billion-dollar economic impact in the upper Cumberland region, providing 8,800 jobs. In 2019 the Boyd Center identified a $81 billion-dollar statewide economic impact from agriculture and identified the creation of 342,000 jobs in agriculture. ▪ A seven percent increase nationally in jobs for Agricultural and Food Scientists is projected for 2016-2026. This growth is related to increased need for 1) crop producing in food and raw materials, 2) sustainable crop production techniques, and 3) innovation in agriculture related field.
Existing programs of study at the institution	▪ The proposed program is not emerging from an existing minor, certificate, or other academic program.
Community and industry partnerships	▪ Letters of support, are provided from: o Tony Womack, Deputy Commissioner, TN Department of Agriculture o Scott Bohanon, Education and Training Specialist, Tennessee Farmers' Cooperative o Dale Barnett, Executive Director, Tennessee Poultry Association o Wendell Stockton, Director of Food Safety & Sustainability, Generation Farms
Accreditation	▪ The proposed program is not considering programmatic accreditation, as there are currently no accrediting bodies for Agroecology and Sustainable Agriculture at the graduate level. Accreditors like ASABE accredit some overlapping fields at the undergraduate level.
Administrative structure	▪ The proposed program will be housed under the College of Agriculture and Human Ecology, in the School of Agriculture. ▪ A current faculty member will be appointed as graduate coordinator and will be provided with release time in order to oversee the program.
Enrollment and graduation projections	▪ The proposed program expects to enroll 4 full-time and 3 part-time students for each of the first two years, and 5 full-time and 4 part-time students for the following three years. Three graduates are expected in the second year of the program, increasing to 7 graduates in the fifth year. Enrollment and graduation projections are reflected in the following table.

	Projected Enrollments and Graduates Program enrollment is limited by the amount of faculty effort that can be devoted to teaching and mentoring students in the program. Currently the eight-program faculty devote 30 percent of their FTE to research. Capping program enrollment at eight new students each year will allow for program quality and student satisfaction in light of current staffing.
Alignment with State Master Plan and institutional mission profile	▪ The proposed program meets the Tennessee Higher Education Master Plan's call for academic programs of distinction that meet economic development, workforce, and research needs. Specifically addressing the need for programs providing training in emerging technologies. The proposed program aligns with Goals 1-2 of the 2018 TTU strategic plan, Tech Tomorrow, by serving as an incubator for collaborative research and providing students with relevant experiential learning opportunities. ▪ The proposed program also aligns with TTU's Rural Reimagined initiative, by training students with cutting edge agricultural technologies and skills who will contribute to the transition from conventional to advanced farming.
Student interest	▪ Student interest was determined through a survey distributed both to students currently enrolled in TTU's School of Agriculture and to Alumni. Roughly 30 percent of the 128 alumni respondents expressed high interest in the proposed program, with nearly 22 percent indicating that they would enroll immediately. ▪ Eighty-five percent of alumni surveyed indicated a preference for part-time attendance. ▪ Twenty-one percent of the 75 current College of Agriculture students who responded to the survey expressed high interest in the proposed program, and another 65 percent expressed moderate interest. Sixty-three percent of current students indicated interest in full-time enrollment.
Existing programs offered at public and private Tennessee universities	▪ There are not any institutions in Tennessee that currently offer a master's degree program in Sustainable Agriculture and Technology. ▪ Ten master's programs are offered in Tennessee in Agriculture. ▪ Agricultural Science, MS at Tennessee State University o Horse Science, MS at Middle Tennessee State University o Agriculture and Natural Resources, MSANR at UT Martin, ▪ Seven Master of Science programs at UT Knoxville (Agricultural Leadership, Education and Communication; Agricultural and

Year	Academic Year	Projected Total Full Time Enrollment	Projected Total Part Time Enrollment	Projected Total Enrollment	Projected Attrition	Projected Graduates
1	2024	4	3	7	2	0
2	2025	7	5	12	2	3
3	2026	8	8	16	2	4
4	2027	9	10	19	2	7
5	2028	9	10	19	2	7

	Resource Economics; Animal Science; Food Science; Plant Sciences; Entomology & Plant Pathology; and Environmental & Soil Sciences). The proposed program integrates agricultural disciplines that are siloed in existing programs, training students to understand the ecology of agricultural systems using cutting edge technology.
Articulation and transfer	▪ Not applicable.
Public comments	▪ No public comments were received.

Tennessee Tech Internal Cover Form for Letters of Notification

Please refer to the TTU Office of the Provost website for New Programs and Program Modifications before developing a proposal. https://www.tntech.edu/provost/new-programs.

Name of New Academic Program and Degree Designation:

MS Degree in Environmental Agriscience Technology

Proposed Implementation Date: Fall, 2023

Information Contact: Billy Bruce Greene / 931-372-3019
Printed Name *Telephone*

APPROVED: Billy Greene / December 13, 2021
Department Chairperson's Signature *Date*

APPROVED: Darron Smith / 12/13/2021
College Dean's Signature *Date*

APPROVED: [signature] / 1/26/2022
Provost's Signature *Date*

Tennessee Tech Board of Trustees Approval: N/A
Date

Office of the President

TENNESSEE TECH

January 27, 2022

Emily House
Executive Director
Tennessee Higher Education Commission
312 Rosa Parks Ave, 9th Floor
Nashville, TN 37243

Dear Executive Director House:

In accordance with THEC policy A 1.6 Expedited Academic Programs: Approval Process, Tennessee Tech University (TTU) submits an expedited letter of notification (ELON) for a new program in the School of Agriculture in the College of Agriculture & Human Ecology. This proposed Master of Science in Environmental Agri-science Technology program will combine concepts of sustainability in agricultural practices through technological advances in plant and animal production systems. Goals of the program are to develop cultural practices and technological advances that will improve agricultural sustainability through basic and applied research; develop a graduate program that will prepare students for successful careers in the sustainable production of agricultural products; and disseminate the results of findings to stakeholders in agriculture production, equipment and product sales, and processing enterprises.

Responsible stewardship of the world's natural resources from the standpoint of agricultural production, and many American consumers, demand that producers use more sustainable and environmentally friendly farming/production practices. Meeting this demand will require the use of cutting-edge technology to meet the demands of a continuously growing population. Tennessee Tech faculty decided to broaden the scope of the proposed Master of Science degree to include the adoption of 21st century Agri-science technology linked with sustainable agriculture and environmental systems. There is no Master of Science degree program being offered in Tennessee that focused solely on technological practices related to sustainable

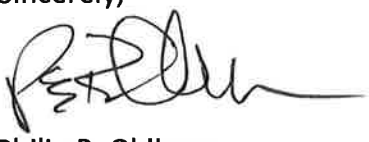
agriculture and the environmental and social practices that form the foundation of a successful, sustainable food and fiber production model.

One of the three original goals of the United States Farm Bill is to "protect and sustain the country's vital natural resources" and one of the seven goals of the United States Department of Agriculture (USDA) Strategic Farm Plan (FY 2018-2022) is to 'Strengthen the Stewardship of Private Lands Through Technology and Research'. The National Institute of Food and Agriculture (NIFA) grants program has placed emphasis on the need for scientific advancement in six priority areas, one of them being, "Agricultural Systems and Technology." All remaining five priority areas are directly or indirectly related to sustainability of animal and plant production and economics. Emphasis has been placed on the holistic approach of addressing production and economic issues as a complete set rather than on an individual basis, which is what this Master of Science degree in "Environmental Agri-science Technology" proposes to do. The degree is designed to develop and apply advances in technology to solving agricultural resources and production problems

I recommend the approval of this new program that has the potential to partially fulfil the mission of Tennessee Tech and the School of Agriculture by serving stakeholders in rural communities in Tennessee through more efficient and sustainable agricultural production practices and education of students to better prepare them for successful careers in agriculturally related businesses.

Please consider this letter a formal request for the expedited approval process.

Sincerely,



Philip B. Oldham
President

Expedited Letter of Notification for MS in Environmental Agriscience Technology

Overview

INSTITUTION:	**Tennessee Technological University, School of Agriculture**
TITLE OF PROGRAM:	**Master of Science in Environmental Agriscience Technology**
CIP CODE:	**01.0308**
CIP CODE TITLE:	**Agroecology and Sustainable Agriculture**

Academic Program Liaison (APL) name and contact information

ACADEMIC PROGRAM LIAISON:	**Dr. Jim Baier** **Interim Director, School of Agriculture** **College of Agriculture and Human Ecology** **931-372-3019** **jbaier@tntech.edu**
PROPOSED DATES FOR EXTERNAL SITE VISIT:	**SPRING 2023**
ESTIMATED DATE OF SUBMISSION OF EXTERNAL REVIEW REPORT TO THEC:	**SPRING 2023**
ESTIMATED DATE OF INSTITUTION'S RESPONSE TO EXTERNAL REVIEW:	**SPRING 2023**
ESTIMATED TIMELINE FOR PROPOSED PROGRAM THAT WILL SEEK PROGRAMATIC ACCREDITATION:	**NA, No accrediting organization**
PROPOSED DATE OF INSTITUTIONAL GOVERNING BOARD'S MEETING TO CONSIDER THE PROPOSED ACADEMIC PROGRAM:	**JUNE 2023**
PROPOSED DATE OF TENNESSEE HIGHER EDUCATION COMMISSION MEETING TO CONSIDER THE PROPOSED ACADEMIC PROGRAM:	**JULY 2023**
PROPOSED IMPLEMENTATION DATE:	**SPRING, 2024**

Background and Overview

Background narrative

In 2018 TN Tech faculty in the College of Agriculture and Human Ecology began investigating the need for a new Master of Science program in **Environmental Agriscience Technology**. We began this process in response to increasing inquiries for a degree program tailored to young professionals, those currently in the workforce, and undergraduate students interested in continuing their education in agriculture. We quickly determined that there is no M.S. degree program currently offered in Tennessee focusing solely on technological practices related to sustainable agriculture and the cadre of environmental and social practices that form the foundation of a successful, sustainable food and fiber production model. After further research and multiple conversations with industry leaders, TN Tech faculty decided to broaden the scope of the proposed MS degree to include the adoption of 21st century agriscience technology linked with sustainable agriculture and environmental systems.

In recent years, there has been increased emphasis globally in development of sustainable production practices through research, adopting new technologies, and improving production practices to more efficiently produce food and fiber to meet the needs of an ever-changing population. More specifically, consumers are exhibiting an increased interest to connect with and better understand how their food was produced, processed, and marketed. Generally speaking 21st century consumers demand that producers use more environmentally friendly farming/production practices, which is also in the best interest of the producer, so the environment can sustain production levels necessary to feed a growing population. Incorporating the use of cutting-edge technology and applied research enhances a producer's ability to grow food and fiber more sustainably while maximizing profits.

The M.S. Degree in Environmental Agriscience Technology will serve both current undergraduates and professionals already in the field as well as those seeking to advance their current positions. By embracing three broad goals outlined by the Sustainable Agriculture Research & Education (SARE) Program, the TN Tech School of Agriculture seeks to provide our graduate students with keys to the future of Agriculture. These goals, known as the *Three Pillars of Sustainability* include:

- Profit over the long term;
- Stewardship of our nation's land, air and water; and
- Quality of life for farmers, ranchers and their communities.

This degree will focus on developing graduates who are flexible, innovative, and able to solve real world problems using the latest technological advances. Graduates must be adept at applying integrative analytical skills, incorporating technology into their research programs, and being capable of working in diverse groups. This will be achieved through a multi-disciplinary approach within the School of Agriculture utilizing faculty with expertise in animal science, horticulture, soil science, geospatial technology, engineering, and agribusiness. The following program and student outcomes will serve as the road map for course development and implementation, research, and outreach:

Program Outcomes: Develop scientists and educators who are able to……

- Identify, analyze, and evaluate agri-environmental policies used to keep farmland in production as well as integrate farming priorities into the urban and rural interface;

- Recognize, interpret, and research agricultural/horticultural practices at the farm-level, including agroecological management principles and practices used to reduce environmental degradation;
- Investigate and utilize various technological advances for developing new and/or enhanced sustainable practices in food and fiber production; and analyze agricultural and natural resource data;
- Design, implement, and evaluate effective and impactful field experiments that address multiple agroecological issues; and
- Properly infer and draw conclusions about biophysical as well as socioeconomic aspects of agricultural sustainability.

Student Learning Outcomes:

- Understand and apply the breadth and depth of knowledge associated with their discipline
- Design, conduct, analyze, and interpret research on important problems in the respective disciplines of sustainable agriculture
- Communicate effectively to a diverse group of people using appropriate traditional and emerging technological media
- Make an original contribution to their discipline

Thesis Option

Major Field Core (courses required of all students in program)	**12**
Concentration, including electives or out of unit courses	**15**
Research & Thesis	**6**
TOTAL:	**33**

Non-thesis Option

Major Field Core (courses required of all students in program)	**12**
Concentration, including electives or out of unit courses	**18**
Research Project	**3**
TOTAL:	**33**

Twelve credit hours of coursework in the *major field core* will be online or hybrid. The other major field courses will be taught on the Tech campus and at the plant science research facility in Cookeville.

Twelve credit hours of coursework in the *concentration* will be online or hybrid. The remaining course options will be offered on the Tech campus.

Justification for consideration of expedited policy

The purpose of the expedited approval process is to rapidly implement new academic programs to aid in workforce development to address current state needs while ensuring that the program quality, uniqueness, and institutional capacity exists. To this end, we are proposing a novel MS degree in the field of Agroecology and Sustainable Agriculture CIP Code 01.0308. This program will be unique as no other graduate programs for this discipline exist in the state of Tennessee (see Existing programs offered at public and private Tennessee universities section below). We expect this degree to train highly skilled workers in the agricultural field that will be integral to the states' transition from conventional agricultural systems to the new smart systems that are being implemented globally. The importance of this sector within the state is highlighted by the THEC Academic Supply and Occupational Demand Report which points out that agriculture occupies 40% of the state acreage and accounts for the state's 69,500 farming operations. Additionally, the annual University of Tennessee Boyd Center for Business and Economic Development reports that in 2015 (most recent county data) the estimated economic impact of agriculture in an 8-county region in the Upper Cumberland Region was $1.7 billion dollars and the agriculture industry provided over 8,800 jobs in this region. In 2019 the Boyd Center reported that the statewide estimated economic impact of agriculture was $81 billion dollars and the agriculture industry created over 342,000 jobs. Furthermore, the THEC Academic Supply and Occupational Demand Report highlights the academic programs offered by the University of Tennessee but their programs do not include a program focused on Agroecology and Sustainable Agriculture CIP Code 01.0308. As the importance of the agricultural sector will continue to increase based on a growing global population demanding a diversified range of agricultural products, there will be a need to produce these products in a more efficient and sustainable manner with reduced environmental impacts. Our proposed MS degree will produce the needed graduates required to transition the state's agricultural systems to more efficient, sustainable, environmentally friendly systems.

The Center for Agroecology & Sustainable Food Systems, a part of the University of California system, reported, "A food and farming system that exploits neither people nor resources and lasts indefinitely has come to be called sustainable agriculture". While this concept is familiar and even supported in many American agricultural universities, it hasn't always been so. For decades, issues such as soil erosion, exploitative working conditions, pest resistance to pesticides, and small farm viability were brushed aside as the price of progress in the industrialized agri-food system (Allen & Brown, 2012).

Currently, there is a movement across the United States to produce food using sustainable practices and improving stewardship of our natural resources, all the while meeting the requirements of an ever-growing population that is demanding to know where and how their food was produced.

In March of 2014, the Coalition for a Sustainable Agriculture Workforce (CSAW) reported the need to double the global food supply to satisfy the needs for a growing population which has led life sciences and agricultural companies to increase their numbers of scientists and employees. According to the CSAW Executive Summary, "we must prepare scientists to bring new and revolutionary approaches to agroecosystem management". Additionally, the executive summary states that if current trends continue, the agricultural workforce will lack the highly trained agronomists, soil scientists, plant breeders, and weed scientists necessary to make the technical advances essential to meet future production and sustainability challenges (CSAW, 2018).

Lastly, the government projects a 7% growth in jobs for Agricultural and Food Scientists for the period 2016 to 2026 nationally. This growth is attributed primarily to a projected need in the future for 1) crop production in food and raw materials, 2) sustainable crop production techniques to preserve environmental resources, and 3) innovation and techniques in the field of agriculture and related fields.

This new M.S. Degree in Environmental Agriscience Technology will meet current industry and consumer needs while preparing future producers to meet the challenge of providing food and fiber for an ever-growing world population. Additionally, these graduates will be required to meet these needs with limited and/or declining natural resources (soil, water, organic matter, etc.), necessitating the implementation of new technologies and production practices to continue to provide food and fiber for a growing world. With the addition of two new faculty in 2021, our administration and faculty believe it is time to move forward with the M.S. Degree in Environmental Agriscience Technology.

Tennessee's Upper Cumberland Region is one of the most geographically diverse areas in the southeastern United States, and is centrally located between three of the state's four major metropolitan areas (Knoxville, Nashville and Chattanooga). Although the fourteen counties comprising the Upper Cumberland (Cannon, Clay, Cumberland, DeKalb, Fentress, Jackson, Macon, Overton, Pickett, Putnam, Smith, Van Buren, Warren and White) boast five community colleges, three Tennessee Technology Centers and Tennessee Technological University, there is still a cry for a stronger focus on STEM (Science, Technology, Engineering, Mathematics) disciplines, skilled trades, and technical training. Agricultural sciences have long been considered part of the STEM disciplines.

Existing programs of study at the institution

The proposed program is not emerging from an existing minor, certificate, or other academic program.

Community and industry partnerships

Letters are attached to the end of the document:

- Tony Womack, Deputy Commissioner, TN Department of Agriculture
- Scott Bohanon, Education and Training Specialist, Tennessee Farmers' Cooperative
- Dale Barnett, Executive Director, Tennessee Poultry Association
- Wendell Stockton, Director of Food Safety & Sustainability, Generation Farms

Accreditation

There are currently no accrediting bodies for CIP CODE 01.0308 Agroecology and Sustainable Agriculture**.** Several entities, such as ASABE, accredit some of the subdisciplines represented in the program but only at the undergraduate level.

Administrative Structure

The proposed MS in Environmental Agriscience Technology will be housed in the School of Agriculture within the College of Agriculture and Human Ecology. The administrative structure within the college is as follows: The Dean of Agriculture and Human Ecology administers activities within the college while

the Director of the School of Agriculture administers activities within the school. To aid in administration of the MS degree, the School of Agriculture Director will appoint an existing faculty member as Graduate Coordinator and allow release time from teaching to compensate for those responsibilities.

Enrollment and Graduation Projections

The school of Agriculture currently has eight faculty with an average research obligation of approximately 30%. While we expect additional faculty to be hired that can contribute to the program, in the beginning, we expect initial student numbers to be limited by faculty effort at a maximum of 7-8 students. It is projected that the attrition rate will be 2 students based on an expected 80% annual retention rate. The majority of full-time students are expected to enroll in the thesis option and conduct research projects that require extensive faculty research effort. The majority of part-time students are expected to consist of non-traditional students that are already employed and seeking to improve their career status by earning a graduate degree. Thus, the part time students are expected to choose the non-thesis degree, requiring more academic advisement but less faculty research. Duration of part-time degrees are expected to be 3 years. The projected annual graduation rate starting at the conclusion of year 5 is 7, and expected to continue at that rate until faculty effort toward research increases.

Table 1 - Projected Enrollments and Graduates

Projected Enrollments and Graduates						
Year	**Academic Year**	**Projected Total Full Time Enrollment**	**Projected Total Part Time Enrollment**	**Projected Total Enrollment**	**Projected Attrition**	**Projected Graduates**
1	2024	4	3	7	2	0
2	2025	7	5	12	2	3
3	2026	8	8	16	2	4
4	2027	9	10	19	2	7
5	2028	9	10	19	2	7

Institutional Alignment and Demand

Alignment with State Master Plan and institutional mission profile

Tech Tomorrow Strategic Plan

From the beginning (1915), TN Tech (then Tennessee Polytechnic Institute) included agriculture in its curriculum. The first catalog for the fledging college noted a Department of Agriculture. Since the early 1920's, the School has evolved and now offers students both classroom and laboratory settings along with 340 acres of deeded farm land near the main campus and, a 1,200-acre farm near Livingston, TN. The undergraduate student body has continued to grow enjoying an average of 320 students. According to previous alumni studies and a recent feasibility study (as reported in this document), our graduates have consistently noted interest in the development of a graduate program in Agriculture.

According to the Tennessee Department of Agriculture, farming and forestry not only preserve a time-honored way of life, but also fuel the state's economy. According to the United States Department of Agriculture, agricultural production generates more than $3.5 billion annually in farm cash receipts in Tennessee (USDA, 2017). Agriculture touches the lives of Tennesseans everyday through the food we eat, the fuel we pump, the clothes we wear, the wood products we use, and the land we enjoy. Employment and entrepreneurial opportunities in agriculture are projected to continue to grow, especially in specialized areas.

Professional careers requiring advanced degrees under the Career Cluster Guide (Tennessee Department of Labor) include: Environmental Sciences, Forestry and Related Sciences, Natural Resources Conservation, Management and Policy, and Veterinarian Sciences. Additional areas benefitting from advanced degrees include: Agricultural Education, Agribusiness, Soil and Agronomy Sciences, Animal Sciences, Turfgrass Management and Agricultural Engineering.

In 2018, TN Tech launched a new strategic plan – Tech Tomorrow – guided by a set of core principles: Academic excellence, community engagement, meaningful innovation, student success, supportive environment and value creation. From this foundation, the strategic plan is guided by four strategic goals: 1. Education for life, 2. Innovation in all we do, 3. Exceptional stewardship, and 4. Engagement for impact.

The M.S. degree in Environmental Agriscience Technology directly addresses two of the strategic four goals developed from the TTU Strategic Plan.

Goal 1: Education for life – Tactic Ai. Evaluate and transform programs, courses, and opportunities to incorporate experiential learning that permeates the educational process – cumulatively and systematically developing students' career and societal readiness.

Goal 2: Innovation in all we do – Tactic Ai. Develop and implement distinct technologically focused programs.

This proposal provides obvious connections between Goals 1 and 2 and the M.S. degree in Environmental Agriscience Technology. Implementation of a graduate program not only will require faculty to stretch themselves to create and maintain a state-of-the-art curriculum, but will also serve as an catalyst for collaborative cross-disciplinary research within the School and College. Additionally, it will provide students with a cadre of experiential learning opportunities with field and laboratory research using the latest technology in global positioning systems, plant genetics, engineering and soil conservation.

Additional alignment with the Tennessee Tech mission can be found within the school's Rural Reimagined initiative. This project seeks to contribute university effort to solve rural stakeholder problems through increased faculty engagement and university funding. We expect our MS program to align heavily with this initiative, as we seek to train students with cutting edge agricultural technologies and by equipping skilled agricultural graduates who will be able to return to their communities and contribute to the state's transition from conventional farming to more advanced smart farming systems.

Tennessee Higher Education Master Plan

As stated in the Tennessee Higher Education Master Plan 2015-2025, "the state continues to acknowledge the critical need for academic programs of distinction at the graduate and professional level to fully address Tennessee's economic development, workforce, and research needs" (TN Higher Educ. Master Plan, 2018). Additionally, as stated in the 2020 updated master plan, we must commit as a state and as a higher education enterprise to working collectively, cooperatively, and intentionally to best serve the needs of students, their families, and Tennessee's economy (TN Higher Educ. Master Plan, 2020).

The Tennessee Higher Education in the New Economy 2020 update indicates that "emerging technologies" have partially necessitated the need for institutions of higher education to meet the fast-changing needs for new and innovative programs. The proposed MS degree in Environmental Agriscience Technology directly addresses this need as it deals with the preparation of students to solve historical and current problems with current and state-of-art technologies.

Recently, Tennessee Tech School of Agriculture received over $2,000,000 in grant funds to develop a poultry program to provide students for career opportunities in a large and continually-growing area of agriculture in the state of Tennessee. A faculty position in poultry science and a new poultry facility, which includes lab and abattoir capabilities for learning and research purposes, is essentially complete. This proposed program, Master of Science in Environmental Agriscience Technology degree, will be an integral component of the poultry program. Development of this Master's program and future studies related to poultry science will promote partnerships between Tennessee Tech and the poultry industry through local companies like Cobb-Vantress, Aviagen, Tyson and Perdue. These partnerships will help to create a pathway for future students from undergraduate or graduate programs to a career in the poultry industry.

Research conducted in this program will focus on the use of technologies to address the issues of environmental impact, production efficiency, and long-term sustainability of agricultural enterprises. This will be achieved through a multidisciplinary approach that combines knowledge from the fields of animal science, horticulture, soil science, geospatial technology, engineering, and agribusiness. Additionally, the development of a new Agricultural Technology and Innovation Center will facilitate expertise in emerging technologies and practices like application of spatial technologies, vertical farming, or regenerative agriculture to improve efficiency of current production practices using existing resources to meet increased demand.

As Tennessee transitions from traditional agriculture to new smart systems, there is a need for skilled graduates who are able to facilitate adoption of practices and emerging technologies to improve environmental stewardship and increase economic output within the agriculture industry. This Master's program will equip both conventional students who choose to continue their education, and returning students who have spent time in the agriculture industry and desire to aid in bringing agriculture in Tennessee into the 21st century. Currently, industry representatives in agriculture seek to hire graduates with both theoretical and technological expertise in areas related to precision agriculture, sustainable production and smart farming. For example, companies that serve producers like DeltAg, Land O'Lakes, John Deere and Pioneer Seeds. As agriculture is a major contributor to the economy of Tennessee with

an estimated $81 billion and over 342,000 jobs (University of Tennessee Boyd Center for Business), this program is a necessary addition to meet the needs of Tennessee's future economy.

One of the goals of the Tennessee Higher Education Master Plan is completion of stacked credentials. The degree will not only enhance the initiative to complete BS degrees among our students, it will provide an opportunity to move seamlessly from the BS into the MS degree. A number of senior level courses in concentrations within the Agriculture and Animal Science degrees in the School of Agriculture will allow students to obtain undergraduate- and graduate-level credit in their chosen concentration and in the MS program.

Student interest

In a recent study, current students in the School of Agriculture as well as alumni of the School were surveyed to determine their interest in a new MS degree program Environmental Agriscience Technology.

Of the 680 alumni surveyed, 128 responded for a 18.2% response rate. Approximately 30% of alumni respondents signaled high interest in the start-up of this program offering; almost 22% of TTU alumni desiring to enroll in the program immediately if the program commenced in the Fall. Eighty-five percent of alumni indicated interest in part-time program attendance. Fifty-three percent of employed alumni respondents expressed at least some employer benefits and/or support if enrolled in the proposed program, with 11% revealing a requirement or encouragement by employers for a degree in sustainable agriculture.

Of the 320 undergraduate students surveyed, 75 responded for a 23.44% response rate. Twenty-one percent of current undergraduate respondents were very interested in the program, and 65% moderately interested. A majority of the undergraduate students estimated enrolling in the program within 2-4 years of the program commencement. Sixty-three percent of undergraduate participants indicated they would attend full time.

Survey results and anecdotal evidence indicate the likelihood that the number of interested graduates from the School of Agriculture will be sufficient to sustain the graduate program. A conservative estimate of enrollment numbers is reported in Table 1 to allow sufficient time to build the program in subsequent years and the total enrollment is expected to increase.

Existing programs offered at public and private Tennessee universities

Current THEC Academic Programs Inventory https://thec.ppr.tn.gov/THECSIS/Research/Research.aspx?TabID=API%20Search reported ten master level degree programs using the various Federal CIP codes reflecting agriculture (01.000 through 01.1202). None of these programs (Table 4) duplicates the programs proposed by Tennessee Tech as our proposed program is in Agroecology and Sustainable Agriculture CIP Code: 01.0308.

Table 3. Current Master's Degree Programs in Tennessee August 2018.

Institution	Degree title/major	Degree Designation	Federal CIP
Tennessee State University	Agricultural Science	MS	01.01.0000.00
University of Tennessee, Martin	Agriculture & Natural Resource Systems Management	MS	01.01.0101.00
University of Tennessee, Knoxville	Agricultural Economics	MS	01.01.0103.00
Middle Tennessee State University	Horse Science	MS	01.01.0307.00
University of Tennessee, Knoxville	Agricultural Leadership, Education & Communication	MS	01.01.0801.00
University of Tennessee, Knoxville	Animal Science	MS	01.01.0901.00
University of Tennessee, Knoxville	Food Science & Technology	MS	01.01.1001.00
University of Tennessee, Knoxville	Plant Sciences	MS	01.01.1101.01
University of Tennessee, Knoxville	Entomology & Plant Pathology	MS	01.01.1105.00
University of Tennessee, Knoxville	Environmental & Soil Science	MS	01.01.1202.00

Table 4. Enrollment at TN Universities Represented in Table 3.

CIP	Major	University	Fall 21	Fall 20	Fall 19
01.0000	Agricultural Science	Tennessee State University	44	59	61
1.0307	Horse Science	Middle Tennessee State University	7	6	6
1.0101	Agriculture & Natural Resource Systems Mgmt	University of Tennessee, Martin	45	39	31
	Herbert College of Agriculture - Graduate Enrollment*	University of Tennessee, Knoxville*	--	245	263

Note. * UTK does not publish detailed program enrollment data on its public website.

Table 5. Degrees Conferred at TN Universities Represented in Table 3.

CIP	University	Degree Title and Designation	2019-20	2018-19	2017-18
01.0000	Tennessee State University	Agricultural Science, MS	16	12	18
01.0307	Middle Tennessee State University	Horse Science, MS	2	3	7
01.0101	University of Tennessee, Martin	Agriculture & Natural Resource Systems Management, MS	11	9	12
01.0103	University of Tennessee, Knoxville	Agricultural Economics, MS	8	10	7
01.0801	University of Tennessee, Knoxville	Agricultural Leadership, Education & Communication, MS	--	21	16
01.0901	University of Tennessee, Knoxville	Animal Science, MS	3	11	6
01.1001	University of Tennessee, Knoxville	Food Science & Technology, MS	5	13	3
01.1101 & 01.1105	University of Tennessee, Knoxville	Plant Sciences, MS Entomology & Plant Pathology, MS	12	13	11
01.1202	University of Tennessee, Knoxville	Environmental & Soil Science, MS	4	1	1

Of the above identified programs (Table 3), **none appear to offer the same educational options as this proposal**. Currently in the state of Tennessee there are graduate programs that teach siloed agricultural disciplines including animal science, plant science, and soil science. Additionally, there are programs that study environmental sciences. The Tennessee Tech Master of Science in Environmental Agriscience Technology will integrate these siloed disciplines to study the ecology of agricultural systems. We expect this degree to train highly skilled workers in the agricultural field that will be integral to the states' transition from conventional agricultural systems to the new smart systems that are being implemented globally. These skilled graduates will be trained to assess the ecology of agricultural systems using cutting edge technologies such as drones and high through put DNA sequencing to evaluate the environmental impacts of these agricultural systems. Graduates will integrate ecological and environmental data to solve real world agricultural problems to ensure high yields and low environmental impacts. The bridging of these disciplines is unique among the graduate programs offered in Tennessee and will allow for the training of students in this emerging field.

In 2022, there are no Master of Science in agriculture degrees being offered at private colleges/universities in Tennessee

Articulation and transfer

N/A

TN Department of Agriculture

October 14, 2021

Bruce Greene, Ph.D.
Director, School of Agriculture
Tennessee Technological University
Box 5034
Cookeville , TN 38505

Dear Dr. Greene:

I am writing to express my support and that of the Tennessee Department of Agriculture for the TTU School of Agriculture's proposal to establish a new Master of Science degree in Sustainable Agriculture.

U.S. and Tennessee increasingly rely upon the development and implementation of new technologies and research to boost farm production and efficiencies. These advancements, such as precision farming, minimum tillage, etc., not only can greatly minimize agriculture's impact but enhance our natural resources. Organic and minimal input farming practices are also helping to meet consumer demand for local, fresher products. It is critical in today's industry to be able to understand, accentuate and promote practices that accomplish both responsible management and increased profitability. TTU would be helping to fill an important and emerging need in the industry with this degree focus.

Several of TDA's own programs are aimed at helping farmers and forest landowners employ best management practices to improve water quality, prevent soil erosion and improve forest health. Our department is also engaged in assisting specialty crop producers with a focus on sustainable production. This new degree program would be helping to meet the workforce needs of our agency and others engaged with assisting producers.

Developing students' ability to problem-solve and address complex issues from a comprehensive perspective with a well-rounded knowledge base in sustainable production practices would be an asset to our industry.

Thank you for TTU's leadership in this area.

Sincerely,

Tom Womack
Deputy Commissioner

Ellington Agricultural Center
440 Hogan Rd., Nashville, TN 37204
Ph. 615.837.5103
www.TN.gov/Agriculture

CO-OP
DRIVEN TO SERVE

TENNESSEE FARMERS COOPERATIVE
180 OLD NASHVILLE HWY.
LA VERGNE, TN 37086-1983
615-793-8011

October 26, 2021

Dr. Bruce Greene, *Director*
Tennessee Tech School of Agriculture
715 Quadrangle
Oakley Hall 148
Cookeville, TN 38505

Dr. Greene,

As a campus recruiter and representative of Tennessee Farmers Cooperative Training & Education Department, I would like to pass along our company's support for the Master's Degree in Environmental Agriscience Technology at Tennessee Tech. We believe it is critical that students have the knowledge of the latest technological advancements in agriculture as well as the socioeconomic and biophysical aspects of our industry. As our farmers begin to adapt to this change and look for new technologies, we will rely heavily on recruiting informed students to help us offer those solutions.

Due to the evolution of the agriculture industry, our organization has recently revised our mission and vision statements. It is now our mission to 'provide innovative and quality solutions supporting the sustained success of our customers'. We are passionate about working closely with our farmer members to develop their current programs and procedures to make them become more profitable and efficient. We want 'to be the leader of the most innovative and financially successful agricultural cooperative system in the U.S.', and we will only be able to do that as we adapt to the growing technological needs and advancements. We believe many other companies are seeing the importance of higher degree programs with a focus in technology like the one you are trying to implement.

The need for employees who display a passion for a developing industry, visionary leadership, and moral/ethical integrity is great. Our organization also seeks employees who can work interdependently and collaboratively to help make each other, our local Co-ops, and our farmer members successful. It is the belief of Tennessee Farmers Cooperative (as a whole) that this new degree program will be able to help us meet the current need to reach our vision as we live out our mission statement of providing those innovative and quality solutions.

Cooperatively,

Scott Bohanon
Education & Training Specialist

Office: 615-793-8502
Mobile: 931-209-2373
Email: sbohanon@ourcoop.com

Tennessee
Poultry Association

Dr. Bruce Greene, Director
School of Agriculture
Tennessee Tech University
Box 5034
Cookeville, TN 38505

RE: Master of Science in Environmental Agriscience Technology

Dr. Greene,

This letter is in full support of developing and implementing a new Master of Science degree program in Environmental Agriscience Technology at TN Technology University, in the School of Agriculture. This well-designed degree program will serve to train students in a very exciting area of technology and sustainability that our industry and others are increasingly seeking.

To no surprise, the environmental aspects of the agrisciences are on the forefront of all major agri-businesses and the opportunities for applied technology are only just beginning. Leading national and international poultry companies already have corporate level positions dedicated to these areas and there are increased opportunities at all levels where poultry is raised, processed and marketed.

Our industry foresees a growing need for highly qualified individuals with advanced training who will be ready to make highly significant contributions in so many ways related to this proposed degree program. Individuals with visionary leadership, that additionally have strong moral and ethical training, will be sought by not only our industry but by other supporting industries and agencies, as well.

What a great opportunity this will be for TTU to train students to fill these positions that are both needed and are rapidly being created.

Most respectfully,

Dale Barnett
Executive Director
931-434-8045
dbarnett@tnpoultry.org

generation™
FARMS

Dr. Duncan,

This letter serves as my commendation for the proposed MS degree program at TN Tech in Sustainable Agriculture. I have dedicated my career to the food industry and currently work in its origins - agriculture. Ag is evolving rapidly, and it is an exciting time to be in the field.

As a proponent of small business, I recognize it is critical to adequately prepare the next generation of family farm owners to excel in stewardship, sustainability and food safety. New FSMA rules require the next generation of farmers to be knowledgeable in Regulations, SOP's and record keeping which is best obtained through higher education.

Like many formerly family owned businesses in our country, agriculture is unfortunately being driven towards corporate ownership at a rapid pace. This is fueled by Governmental Regulations for food safety and sustainability that the family farm simply can't provide in many cases. Corporate farms and regulatory agencies are currently struggling with a shortage in competent people and we project this shortage will continue for the next several years as Universities such as TN Tech develop programs that fill the pipeline.

Personally, I recognize TN Tech as a great place for creating this program. As a parent of two Tech students I find Tech to be a cut above in providing ethical integrity and moral leadership, as an employer these are the traits I seek first.

If I can be of any service in the development or implementation of this program, please let me know.

Regards,

Wendell M. Stockton
Director of Food Safety & Sustainability