

# Agriculture, Food, and Natural Resources

Comprehensive Career Cluster Review  
(C3R)

College, Career & Technical Education | Spring 2024



# Comprehensive Career Cluster Review (C3R)

The comprehensive career cluster review (C3R) is the intentional review of career and technical education (CTE) programs and the course standards within each program to ensure students have up-to-date course standards aligned to postsecondary and career needs. Each career cluster is reviewed annually with input from the state-wide advisory councils comprised of postsecondary partners, industry partners, and secondary CTE teachers. Advisory council meetings allow the stakeholders to engage in dialogue and discuss current needs, emerging trends, and necessary course revisions to course standards. Advisory council input could potentially lead to new or retired programs of study, new courses or retired courses, or revised course standards within existing courses, if necessary. Collaborative engagement ensures students receive instruction on the most up-to-date and relevant course standards, so they are prepared for postsecondary and the workforce.

## Agriculture, Food, and Natural Resources

The Agriculture, Food, and Natural Resources (AFNR) career cluster equips students for various careers in the planning, implementation, production, management, processing, and/or marketing of agricultural commodities and services. This includes food, fiber, wood products, natural resources, horticulture, and other plant and animal products. It also includes related professional, technical, and educational services. As the food, agricultural, and natural resources systems continue to globalize, there are expanding opportunities for graduates who understand the socio-economic factors that define international markets. Graduates who know how to satisfy the diverse consumer needs and preferences in different cultures, and who have the language skills to communicate effectively, will have the best opportunities to be employed by the growing number of multinational businesses.

Through the Agriculture, Food, and Natural Resources career cluster, students are provided opportunities for leadership development, personal growth, and career success. Instruction is delivered through the three-circle model including Classroom/Laboratory instruction, Supervised Agricultural Experience (SAE) programs, and Student Leadership (FFA). This career cluster contains six programs of study (POS): Agribusiness, Agricultural Engineering, Industrial, and Mechanical Systems, Environmental and Natural Resources, Food Science, Horticulture Science, and Veterinary and Animal Science. The number of concentrators continues to increase as indicated below.

School Year	Agriculture, Food, and Natural Resources Concentrators
2020-21	11,049
2021-22	11,157
2022-23	13,125

# Agribusiness

2023-24 Program of Study	Year 1	Year 2	Year 3	Year 4
<b>Agribusiness</b>	Agriscience (C18H19) -or- Foundational Supervised Agricultural Experience (C18H58)	Principles of Farm and Agribusiness Management (C18H41)	Organizational Leadership & Communications (C18H18) -or- Capstone Supervised Agricultural Experience (C18H57) -or- <b>Dual Enrollment</b> Agribusiness I (C18H03) -or- <b>Dual Enrollment</b> Agribusiness II (C18H32)	Agricultural Business & Finance (C18H11) -or- <b>SDC</b> Introduction to Agriculture Business (C18H10) -or- <b>Dual Enrollment</b> Agribusiness III (C18H43) -or- <b>Dual Enrollment</b> Agribusiness IV (C18H44) -or- <b>WBL</b> Agribusiness Career Practicum (C18H61)

## Description

The *Agribusiness* program prepares students to apply principles of economics, business, and effective communication skills that are applied to the sale and supply of agricultural products to a broad spectrum of industry careers. Courses help students develop the critical leadership, management, and communication skills they need to succeed in agribusiness careers in addition to providing a foundational understanding of finance and marketing principles as they relate to agricultural businesses. Overall, this pathway provides students with a comprehensive understanding of the agricultural business ecosystem and equips them with the knowledge and skills needed to pursue diverse career opportunities in agriculture, agribusiness, food production, and related industries. This pathway will pave the way for students interested in building a strong base of leadership, communication, and basic business principles, leading to a career as a salesperson, agricultural policy analyst, financier, or agricultural lawyer.

This POS is aligned with the [National FFA Organization](#) (FFA) career and technical student organization (CTSO).

## ***Job Outlook***

According to the Bureau of Labor Statistics, United States jobs related to Agribusiness vary based on occupation. The top two occupations with the highest projected growth Financial Managers and Sales Representative of Services except Advertising, Financial Services, and Travel are expected to grow 30 percent and the lowest two, Farmers, Ranchers, and other Agricultural Managers and General and Operations Managers, are expected to grow three to five percent from 2020 to 2030<sup>1</sup>. The 2024, Academic Supply for Occupational Demand Report states, that agriculture careers have expanded in recent years generating 5,800 new jobs<sup>2</sup>.

United States Department of Agriculture posted an article, "Trade and Exports Continue to Strengthen American Agriculture, it states, "American agriculture remains strong. Total U.S. agricultural exports reached \$174.9 billion in 2023. American farmers, ranchers, and agribusiness owners continue to have success abroad as USDA's Foreign Agricultural Service works for U.S. agriculture. Exports are critical to the health of America's farm sector and the nation's economy." (Taylor, 2024)<sup>3</sup>.

As reported in the Economic Report to the Governor of the State of Tennessee, 2024, "The state's 2,414 food and fiber processing and manufacturing facilities employed over 91,300 workers with a payroll of \$5.7 billion in 2022. By comparison, the state's overall manufacturing employment was 364,182 workers in 2022. Thus, food- and fiber-related manufacturing in Tennessee employed more than one in four manufacturing workers"<sup>4</sup>.

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<sup>1</sup> Bureau of Labor Statistics, U.S. Department of Labor, O\*NET Online, Occupation Specific Information, (2024), [Agriculture, Food & Natural Resources Career Cluster \(ononline.org\)](https://ononline.org)

<sup>2</sup> Tennessee Department of Economic and Community Development, Tennessee Department of Education, Tennessee Department of Labor, and Workforce Development, & Tennessee Higher Education Administration, *Improving the Pipeline for Tennessee's Workforce: Academic Supply for Occupational Demand Report 2023*, (2023) <https://www.tn.gov/thec/research/supply-and-demand.html>

<sup>3</sup> United States Department of Agriculture, Trade and Exports Continue to Strengthen American Agriculture. (2024), <https://www.usda.gov/media/blog/2024/03/19/trade-and-exports-continue-strengthen-american-agriculture>

<sup>4</sup> Haslam College of Business. An Economic Report to the Governor of the State of Tennessee, 2024, page 51-53, 59-60, (2024), [An Economic Report to the Governor of the State of Tennessee, 2024: Publication - Haslam College of Business \(utk.edu\)](https://utk.edu)

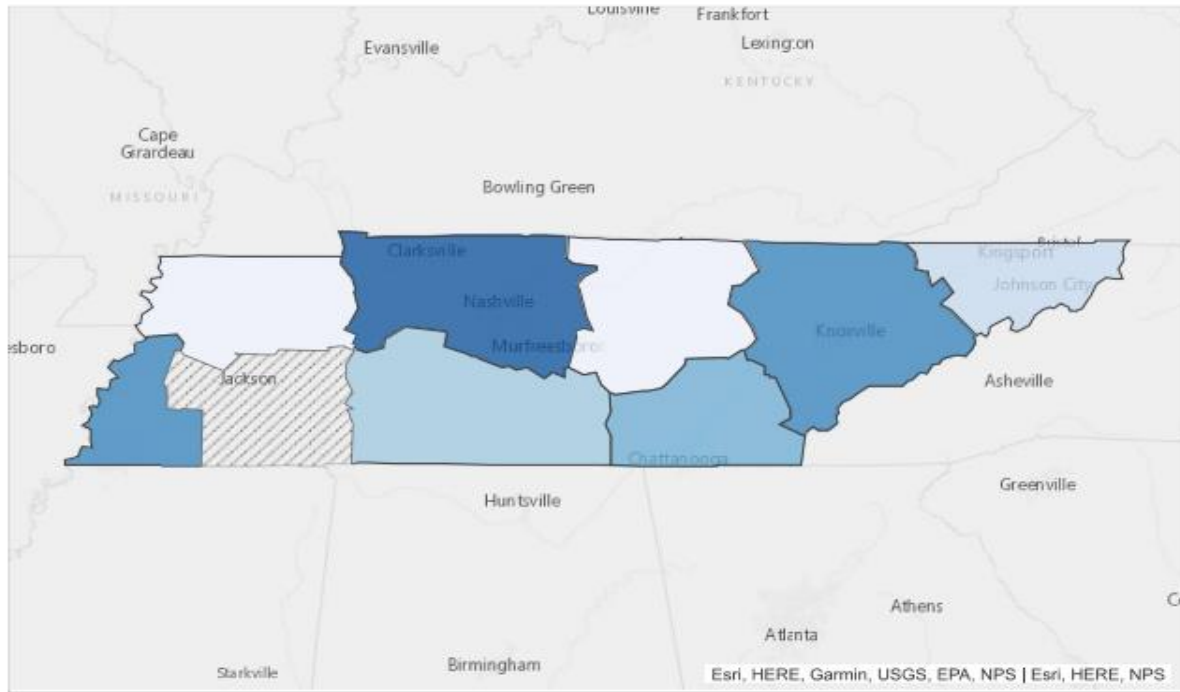
**Figure 1.** Tennessee employment for agribusiness-related occupations that are projected for high-skill, high-wage, or high-demand for 2020-2030 according to the Tennessee Higher Education Commission, [Supply and Demand Report](#)<sup>5</sup>

Occupation	SOC Code	Employment (2020)	Projected Employment (2030)	Projected Growth (2020-2030)	Projected Annual Job Openings (2020-2030)
<b>General and Operations Managers</b>	11-1021	46,120	56,270	5%	710
<b>Sales Managers</b>	11-2022	7,860	9,400	20%	870
<b>Sales Representatives, Wholesale and Manufacturing, except Technical, and Scientific Products</b>	41-4012	17,310	20,370	18%	2,140
<b>Farmers, Ranchers, and Other Agricultural Managers</b>	11-9013	22,880	23,510	3%	2,300
<b>Sales Representative of Services Except Advertising, Financial Services, and Travel</b>	41-3091	17,410	22,680	30%	2,790
<b>Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products</b>	41-4011	13,580	16,160	19%	1,700
<b>Insurance Sales Agents</b>	41-3021	10,200	12,320	21%	1,220
<b>Construction Managers</b>	11-9021	10,070	11,940	19%	970
<b>Financial Managers</b>	11-3031	17,370	22,520	30%	1,930
<b>Claims Adjusters, Examiners, and Investigators</b>	13-1031	7,020	7,910	13%	650

<sup>5</sup> Tennessee Department of Economic and Community Development, Tennessee Department of Education, Tennessee Department of Labor, and Workforce Development, & Tennessee Higher Education Administration, *Improving the Pipeline for Tennessee's Workforce: Academic Supply for Occupational Demand Report 2023*, (2023) <https://www.tn.gov/thec/research/supply-and-demand.html>

**Figure 2.** Tennessee employment projections for Insurance Sales Agents with positive job openings projected 2020-2030

The map below shows the distribution of the 2020 estimated employment for Insurance Sales Agents in Tennessee by local workforce development areas.



Source: TN Dept of Labor & Workforce Dev, Div Emp Sec, LMI

The top three local workforce development areas in Tennessee with the highest 2030 projected employment for Insurance Sales Agents were Northern Middle TN (4,129), East TN (1,406), and Greater Memphis (1,289)<sup>6</sup>.

### ***Program of Study Level***

The Tennessee Investment in Student Achievement (TISA) provides direct funding for student participation in career and technical education (CTE) programs to drive college and career readiness outcomes. Pursuant to [T.C.A. § 49-3-105\(c\)\(2\)](#), a direct allocation amount will be generated for each student membership in a CTE program based on the rule:

<sup>6</sup> Jobs4tn. Labor Market Data. Occupation Data. Area Employment Area Data Distribution. (2024) , [JOBS4TN.GOV - Occupation Profile](https://jobs4tn.gov/occupation-profile)

1. The level of the program
  - Programs shall be designated into one (1) of three (3) levels.
  - Programs will be classified into one of the three (3) levels based on alignment to wage-earning potential indicators and additional resources required to support the program if aligned to wage-earning potential occupational pathways.
2. The student progression in coursework through the program

\*The state budget keeps all programs funded at \$5,000 for 2024-25 school year funding. See the [CTE TISA Programs of Study Leveling Guide 2024-25](#) for the TISA funding formula for program of study levels.

## **Agribusiness Program: Level 2**

### ***Postsecondary Opportunities***

Upon completion of this POS, students will be prepared to further their education at community colleges and universities in the area within the Agribusiness of the Agriculture, Food, and Natural Resources cluster. While some occupations within the field may require only a high school diploma or a postsecondary degree, many positions in agribusiness typically necessitate a bachelor's degree. This underscores the importance of obtaining a higher level of education to access more opportunities within the industry. Community colleges offering degree programs with transfer pathways to bachelor's degree programs provide students with a seamless transition to four-year institutions. Universities across the state offer concentrations for students to specialize in specific content to pursue employment in specialty areas.

Tennessee College of Applied Technologies (TCATs) across the state offer Administrative Office Technology designed to develop the skills, knowledge, and attitudes that office professionals need to secure good jobs and succeed in today's computerized offices as well as the more traditional office environments. Students gain work and experience extensive "hands-on" training with modern office equipment and computer software.

Walter's State (WSCC), Cleveland State (CSCC), Columbia State, and Jackson State Community Colleges (JSCC) provide business courses in agriculture to students enrolled in the Tennessee Transfer Pathway (TTP). The community college's courses give students the foundational knowledge and prerequisites they need to enroll in upper-division agricultural courses at senior colleges offering degree programs.

University of Tennessee (UT) at Martin prepares students for careers in the growing agricultural business sector providing them with an understanding of how the economic system operates and the significance of agriculture in both the U.S. and global economies. The curriculum focuses on training students for various

roles in agriculture-related industries, including farm product transportation, distribution, marketing, and processing; agricultural banking and farm credit organizations; farm real estate and land appraisal services; insurance; cooperative management and agricultural supply companies; state and federal agricultural policy; market research; and international agricultural trade. Through this program, students acquire the knowledge and skills necessary to succeed in diverse roles within the agricultural business sector.

UT Knoxville offers two majors Food and Agricultural Business and Natural Resources and Environmental Economics as well as concentrations and minors.

- Food and Agricultural Business Major is centered on understanding the operations of the agri-food sector within the global economic system and the economic principles that influence decision-making for business managers, consumers, policymakers, and other stakeholders in this sector. This pathway is specifically designed for careers in the agri-food industry and emphasizes developing strong microcomputer skills to excel in this field.
  - Agricultural Production and Technology Management Concentration emphasizes futures/options markets and agricultural commodity policy. This concentration is suitable for students who plan to engage in farm or agricultural production facility management, as well as those aiming for careers in the farm input supply sector. This concentration offers specialized knowledge and skills relevant to effectively managing agricultural operations and navigating the agricultural commodities market.
  - Law and Policy Concentration is designed for students who are considering law school or a graduate program in public administration or public policy. It is also beneficial for students interested in working for government agencies or industry organizations. This concentration focuses on legal and policy issues relevant to the agricultural sector, providing students with the knowledge and skills necessary to navigate the complex regulatory landscape and advocate for agricultural interests in various governmental and organizational contexts.
  - Finance and Risk Management Concentration, coupled with a Business Administration Minor, is tailored to equip students with the expertise required to tackle the financial, risk management, and regulatory hurdles encountered by agricultural businesses and stakeholders. This pathway enables students to pursue various roles, including agricultural loan officers, risk analysts, insurance agents, farm managers, real estate brokers, agricultural economists, or policy analysts, among others. By focusing on these industries, students gain valuable knowledge and skills essential for success in the agricultural finance and risk management sectors.
  - Food Industry Management Concentration, combined with a Business Administration Minor, builds upon management, marketing, and finance courses to provide specialized knowledge tailored for students interested in working within companies involved in producing, distributing, or selling food items at retail establishments or processing agricultural

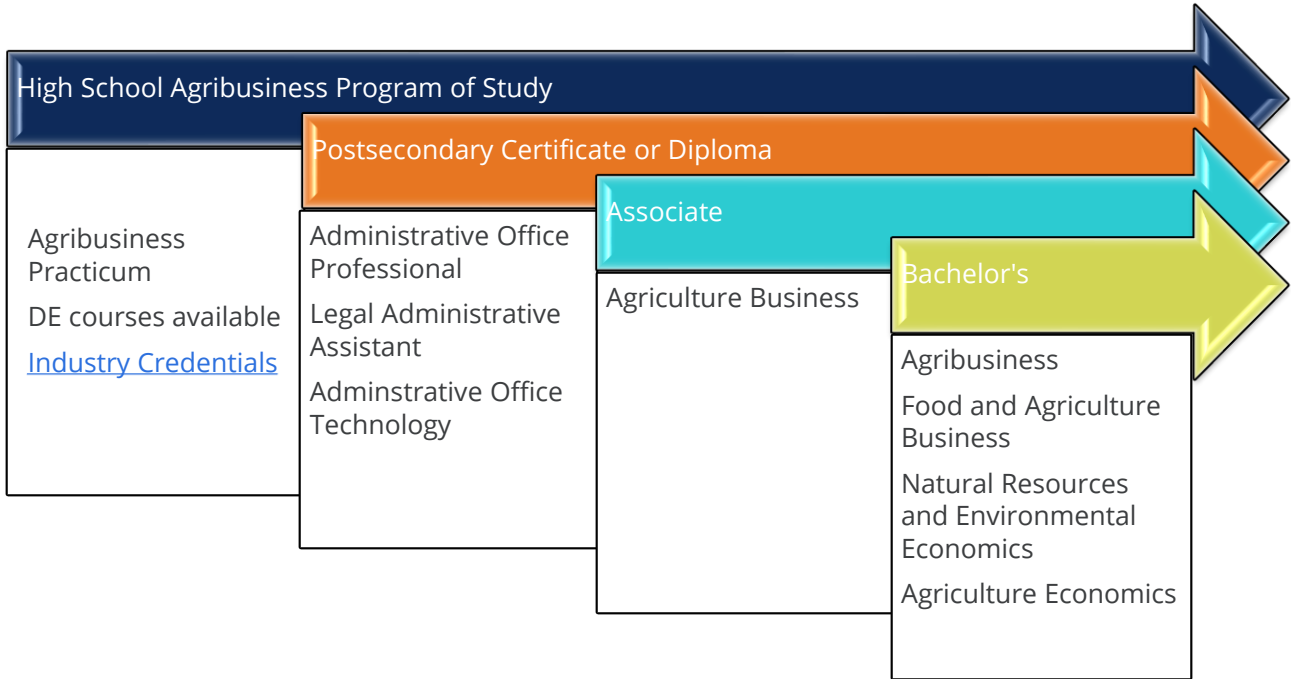
commodities. This concentration expands upon the foundational business skills gained through the Business Administration Minor, making it an ideal choice for students aiming for careers in the food industry.

- Natural Resources and Environmental Economics major equips students for diverse careers in both the private and public sectors. Graduates are knowledgeable about complying with environmental laws and collaborate with corporate and private organizations to find solutions that balance environmental conservation with economic considerations. The curriculum covers topics such as soil and water resources, ecology, forestry, and conservation, with a specific focus on the economic dimensions of laws aimed at preserving natural resources and improving environmental quality. Through this program, students develop the skills and knowledge necessary to address complex environmental challenges while considering economic implications.

Middle Tennessee State University (MTSU) Agribusiness major prepares students for careers in an industry that plays a vital role in local, national, and global economies. This program emphasizes the importance of effectively managing farms and supply chains to meet the demands of the agricultural sector. Students gain knowledge and skills in areas such as agricultural policy, commodity trading, agribusiness management, and hands-on learning. Through this program, students are equipped to contribute to the success and sustainability of the agribusiness industry.

Figure 3 illustrates which opportunities are available for a student graduating from a Tennessee Agribusiness program in high school. The figure outlines some of the related postsecondary certificates and degrees, career opportunities, and salaries available to students in the pathway. Students may acquire hours transferable to a postsecondary institution for the completion of certificates and degrees.

**Figure 3.** Postsecondary Opportunities



Additional opportunities are offered at multiple postsecondary institutions as indicated in the [Tennessee Department of Labor and Workforce Dashboard](#).

High School Diploma	Certificate	Associate	Bachelor's
<ul style="list-style-type: none"> <li>• Retail Salesperson (<b>\$30,600</b>)</li> <li>• Accounting Clerk (<b>\$41,113</b>)</li> <li>• Farmer, Ranchers and other Agricultural worker (<b>\$29,403</b>)</li> </ul>	<ul style="list-style-type: none"> <li>• Legal Administrative Assistant (<b>\$48,780</b>)</li> </ul>	<ul style="list-style-type: none"> <li>• Buyers and Purchasing Agents (<b>\$58,925</b>)</li> </ul>	<ul style="list-style-type: none"> <li>• Insurance Sales Agent (<b>\$101,480</b>)</li> <li>• Environmental Economist (<b>\$78,000</b>)</li> <li>• Farm Manager Operators Supervisor (<b>\$75,760</b>)</li> </ul>

## Current Secondary Landscape

Over the past three years, the number of schools offering Agribusiness has decreased from 30 to 24 in 2023 as shown in the open enrollment analysis (Figure 4a). There were 17,325 students enrolled in the Agribusiness program of study including Agriscience which flows into all Agriculture Food and Natural Resources pathways (Figure 4b). Agribusiness had 921 students enrolled in specific content courses (years two through four in the program matrix).

Figure 4 shows the open enrollment analysis for the 2020-21 through the 2022-23 school year and student enrollment for the Agribusiness program of study.

Figure 4a. Open Enrollment Analysis for Agribusiness

School Year	Schools Offering Agribusiness
2020-21	30
2021-22	23
2022-23	24

Figure 4b. Student Enrollment for Agribusiness

School Year	Agriscience	Principles of Farm and Agribusiness Management	Organizational Leadership & Communications	Agricultural Business & Finance	SDC Introduction to Agriculture Business*	Dual Enrollment Agribusiness
2020-21	13,287	150	356	264	194	10
2021-22	14,431	250	391	336	221	6
2022-23	15,224	182	233	275	149	82

\*Statewide Dual Credit (SDC)

# Agricultural Engineering, Industrial and Mechanical Systems

2023-24 Program of Study	Year 1	Year 2	Year 3	Year 4
<b>Agricultural Engineering, Industrial, and Mechanical Systems</b>	Agriscience (C18H19) -or- Foundational Supervised Agricultural Experience (C18H58)	Principles of Agricultural Mechanics (C18H12)	Agricultural Power & Equipment (C18H13) -or- Capstone Supervised Agricultural Experience (C18H57) -or- <b>Dual Enrollment</b> Agricultural Engineering, Industrial, and Mechanical Systems I (C18H45) -or- <b>Dual Enrollment</b> Agricultural Engineering, Industrial, and Mechanical Systems II (C18H46)	Agricultural Fabrication and Biosystems Engineering (C18H42) -or- Unmanned Aircraft Systems in Agriculture (C18H40) -or- <b>Dual Enrollment</b> Agricultural Engineering, Industrial, and Mechanical Systems III (C18H47) -or- <b>Dual Enrollment</b> Agricultural Engineering, Industrial, and Mechanical Systems IV (C18H48) -or- <b>WBL</b> Agricultural Engineering, Industrial, and Mechanical Systems Career Practicum (C18H62)

## **Description**

*Agricultural Engineering, Technical, and Mechanical Systems* is a POS designed for students to apply knowledge of engineering technology and biological science to agricultural problems concerned with power and machinery, electrification, structures, soil and water conservation, and processing of agricultural products. This pathway includes various disciplines of engineering and engineering technology. Course content is arranged around four sequenced, progressive courses that provide students with the opportunity to develop critical thinking skills and an understanding of engineering concepts. Students then apply these skills with the multi-step engineering design process to solve real-world problems. Overall, this pathway equips students with a blend of technical skills, problem-solving abilities, and a deep understanding of agricultural systems. This pathway will pave the way for students interested in being prepared to pursue careers in various sectors, including agricultural equipment manufacturing, agribusiness, contractors, and engineers.

This POS is aligned with the [FFA](#) CTSO.

## **Job Outlook**

According to the Bureau of Labor Statistics, United States jobs related to Agricultural Engineering, Industrial, and Mechanical vary based on occupation. The top three occupations with the highest projected growth are Laborers and Freight, Stock and Material Movers, Hand, Industrial Truck and Tractor and Production Workers operators are expected to grow 22-25 percent and the lowest two are Inspectors, Testers, Sorters, Samplers, and Weighers is expected to decline three percent and First-Line Supervisors of Mechanics, Installers, and Repairers are expected to grow 14 percent from 2020 to 2030<sup>7</sup>. Many of these openings are expected from the need to replace workers who transfer to different occupations or exit the labor force, such as to retire.

Several new sectors and developing technologies are having an impact on agriculture, one of the world's greatest industries. To meet the demand for agricultural jobs in the 21st century, there is an increased need for the adoption of new agricultural technology in agricultural industrial mechanical systems. Career One Stop states, "the operation of highly advanced production, processing, and management systems, employment prospects in the agriculture equipment occupation are predicted to grow much faster than

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<sup>7</sup> Bureau of Labor Statistics, U.S. Department of Labor, O\*NET Online, Occupation Specific Information, (2024), [Agriculture, Food & Natural Resources Career Cluster \(onetonline.org\)](https://onlinetoolsonline.org/)

average”<sup>8</sup>. My Next Move reports, “74 percent of all agricultural equipment operators work in farming, forestry, fishing, and hunting”<sup>9</sup>.

**Figure 1.** Tennessee employment projections for Agriculture Engineering, Industrial, and Mechanical Systems related occupations aligned to the program for high-skill, high-wage, or high-demand for 2020-2030 according to the Tennessee Higher Education Commission, [Supply and Demand Report](#)<sup>10</sup>

Occupation	SOC Code	Employment (2020)	Projected Employment (2030)	Projected Growth (2020-2030)	Projected Annual Job Openings (2020-2030)
<b>Laborers and Freight, Stock and Material Movers, Hand</b>	53-7062	93,790	116,920	25%	16,090
<b>Industrial Truck and Tractor Operators</b>	53-7051	17,140	20,940	22%	2,410
<b>First-Line Supervisors of Mechanics, Installers, and Repairers</b>	49-1011	9,410	10,720	14%	1,020
<b>First-line supervisors of Production and Operating Workers</b>	51-1011	18,620	21,500	15%	2,240
<b>Inspectors, Testers, Sorters, Samplers, and Weighers</b>	51-9061	14,750	14,310	-3%	1,670
<b>Construction Managers</b>	11-9021	10,070	11,940	19%	970
<b>Welders, Cutters, Solderers, and Brazers</b>	51-4121	10,180	11,740	15%	1,310
<b>Heavy and Tractor Trailer Truck Drivers</b>	53-3032	70,000	79,420	14%	9,070
<b>Maintenance and Repair Workers, General</b>	49-9071	28,240	33,130	17%	3,360
<b>Production Workers, All Others</b>	51-9199	18,210	22,280	22%	2,600

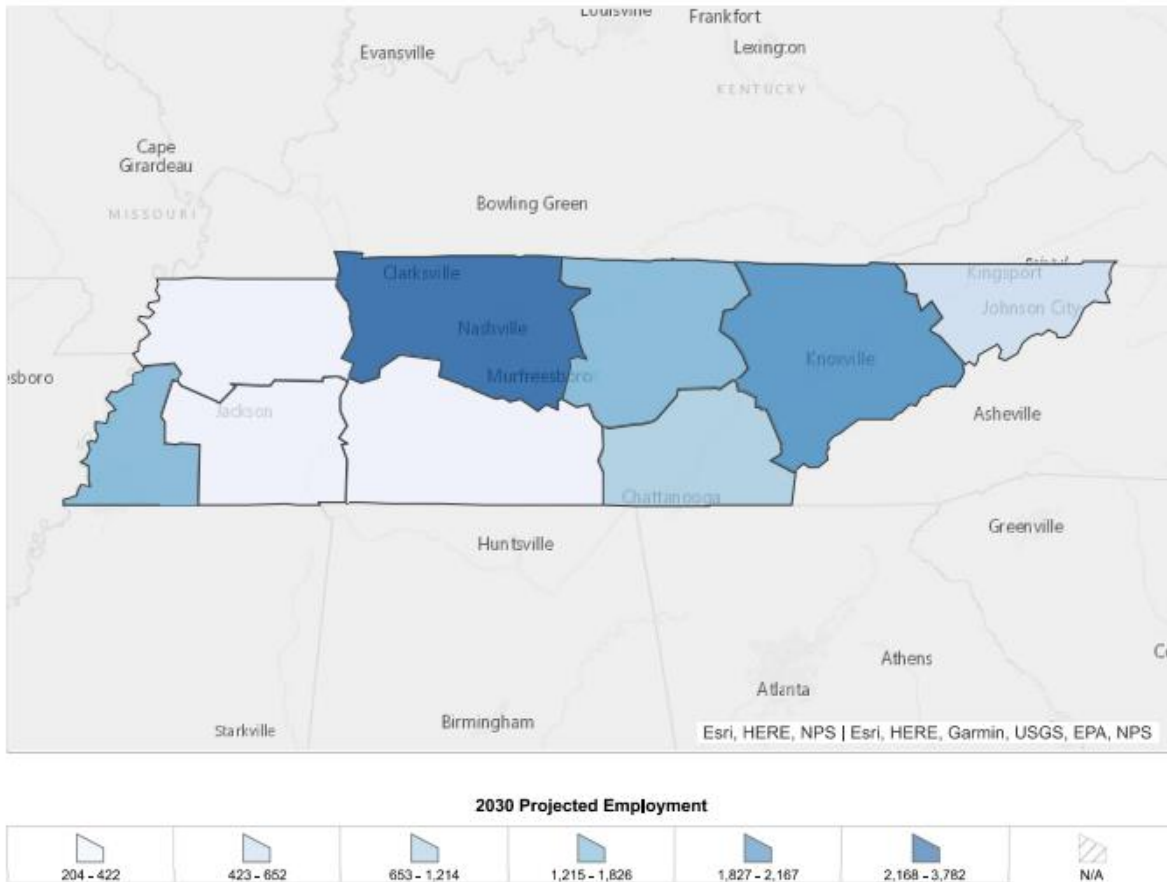
<sup>8</sup> Career One Stop. U.S. Department of Labor. Career Clusters. (2024) [Agriculture, Food & Natural Resources career cluster | Explore Careers | CareerOneStop](#)

<sup>9</sup> My Next Move. O\*Net, (2024) [Careers in Farming, Forestry, Fishing, & Hunting at My Next Move](#)

<sup>10</sup> Tennessee Department of Economic and Community Development, Tennessee Department of Education, Tennessee Department of Labor, and Workforce Development, & Tennessee Higher Education Administration, *Improving the Pipeline for Tennessee’s Workforce: Academic Supply for Occupational Demand Report 2023*, (2023) <https://www.tn.gov/thec/research/supply-and-demand.html>

**Figure 2.** 2030 projected employment for First-Line Supervisors of Mechanics Installers and Repairers in Tennessee

The map below shows the distribution of the 2030 projected employment for First-Line Supervisors of Mechanics, Installers, and Repairers in Tennessee by local workforce development areas.



Source: TN Dept of Labor & Workforce Dev, Div Emp Sec, LMI

The top three local workforce development areas in Tennessee with the highest 2030 projected employment for First-Line Supervisors of Mechanics, Installers, and Repairers were Northern Middle TN (3,782), East TN (2,167), and Greater Memphis (1,826)<sup>11</sup>.

<sup>11</sup> Jobs4tn. Labor Market Data. Occupation Data. Area Employment Area Data Distribution. (2024), [JOBS4TN.GOV - Occupation Profile](https://jobs4tn.gov/occupation-profile)

## ***Program of Study Level***

TISA provides direct funding for student participation in CTE programs to drive college and career readiness outcomes. Pursuant to [T.C.A. § 49-3-105\(c\)\(2\)](#), a direct allocation amount will be generated for each student membership in a CTE program based on the rule:

1. The level of the program
  - Programs shall be designated into one (1) of three (3) levels.
  - Programs will be classified into one of the three (3) levels based on alignment to wage-earning potential indicators and additional resources required to support the program if aligned to wage-earning potential occupational pathways.
2. The student progression in coursework through the program

\*The state budget keeps all programs funded at \$5,000 for 2024-25 school year funding. See the [CTE TISA Programs of Study Leveling Guide 2024-25](#) for the TISA funding formula for program of study levels.

### **Agricultural Engineering, Industrial, and Mechanical Systems Program: Level 2**

## ***Post Secondary Opportunities***

Upon completion of this POS, students will be prepared to further their education at community colleges and universities in the areas of Agricultural Engineering, Industrial, and Mechanical Systems. A high school degree or a postsecondary certificate or degree are prerequisites for some jobs. There are a few Tennessee Colleges of Applied Technology (TCAT) that offer certificates and diplomas and community colleges that offer a degree program as well as a transfer pathway to earn a bachelor's degree. Throughout the state, universities provide concentrations that allow students to focus on subjects to pursue careers in specialized fields.

TCAT Northwest and Oneida offer a Farming Operations Technology program that equips students with the skills and knowledge necessary for modern farming operations, encompassing row crops, animal agriculture, and precision agriculture. Through completing courses, students can earn certificates that expose them to agricultural principles, livestock equipment, and precision agriculture. Additional credential courses cover welding, farm-based electricity, shop principles, and agriculture finance. Students will learn about farm machinery maintenance, soil and plant management, crop and livestock marketing, and herd management. Precision agriculture, seen as the future of the industry, will be offered as a standalone diploma, providing students with specialized expertise in this field.

Building Construction Technology Program offered by TCATs across the state provides the student with the fundamental skills in carpentry, residential electrical wiring, residential plumbing, and block and bricklaying.

This program aims to develop students' skills, attitudes, and proper working habits necessary for successful entry into the building construction technology field. Additionally, it offers opportunities for the student to learn the standards, codes, and regulations governing various phases of general building construction. The program aims to develop certain ethics that will cause them to realize the importance of quality workmanship to the customer as a part of the Agricultural Engineering, Industrial, and Mechanical Systems field.

TCAT Chattanooga offers a Drone Technology certificate program, which is an introductory, one-semester course in unmanned aerial vehicles (UAVs), aka "drones," and the technologies involved in their operation. The curriculum covers UAV (unmanned aerial vehicles) components, command and control communication systems, basics of flight, registration and regulations, safety, and societal considerations. Laboratory activities provide an opportunity for students to gain hands-on experience in working with UAVs. A key focus of the program is on Federal Aviation Administration (FAA) regulations, specifically CFR14, Part 107C, enabling students to utilize their skills for commercial purposes.

WSCC offers Engineering Systems Technology program is designed to provide students with an effective blending of diverse industrial skill sets through a variety of specializations, preparing program completers with the skills needed for immediate entrance into the industrial workforce. Skills emphasized in the program include advanced manufacturing applications, computerized design and industrial equipment programming, operations management, and maintenance of electrical and mechanical systems.

UT Martin's agricultural engineering technology program is designed for students interested in applying technologies in food and fiber. engineering disciplines and includes specializations in construction, environmental, transportation, structural, geotechnical, and water resource engineering.

UT Knoxville offers three majors to prepare students to work with environmental, ecological, biological, or agricultural systems.

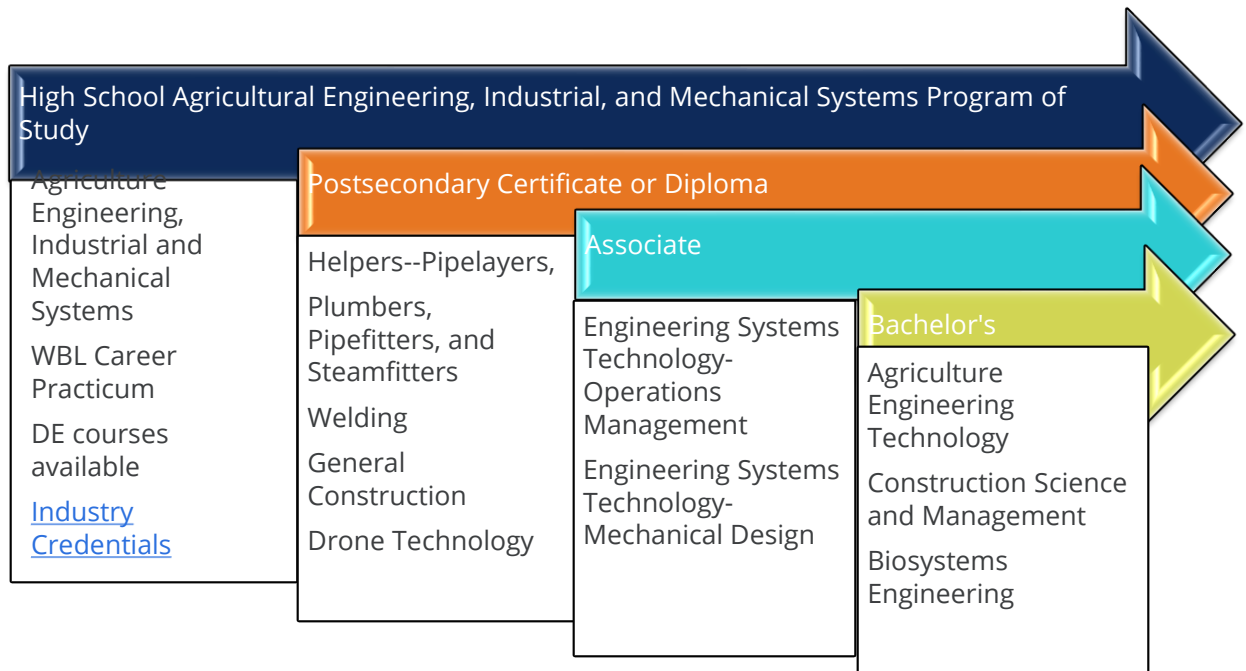
- Environmental and Soil Science major uses modern technologies such as geographical information systems, global positioning systems, and computer applications in managing natural resources. Students gain knowledge of basic natural sciences, ecology, and soil sciences combined with an understanding of the societal issues related to the environment are useful tools. Soil scientists learn to evaluate soil characteristics in the field and lab, using industry-standard tests and techniques. They learn to survey, identify, classify, and map soils, and to predict the suitability of a soil for specific uses. Graduates from the conservation agriculture and environmental sustainability concentration will have the skills to work as agronomic consultants, agribusiness managers, agricultural production, and other employment within the agricultural value chain.

- Construction Science and Agricultural Systems major uses science and technology and offers three options for students interested in agricultural systems technology, construction science, and off-road vehicle technology. This degree is designed to be a broad and diverse range of management careers related to the modern construction industry to produce Project Managers, Estimators, Superintendents, and Construction Entrepreneurs.
- Biosystems Engineering major integrates knowledge of engineering, mathematics, biology, chemistry, and physics to conserve natural resources, protect the environment, and efficiently produce and process safe, plentiful, high-quality food and fiber. includes a broad slate of fundamental engineering skills, including soil and water conservation, machine design, sensor development, and bioprocessing. This concentration also has a pre-professional concentration for students interested in pursuing law, medicine, pharmacy, etc.

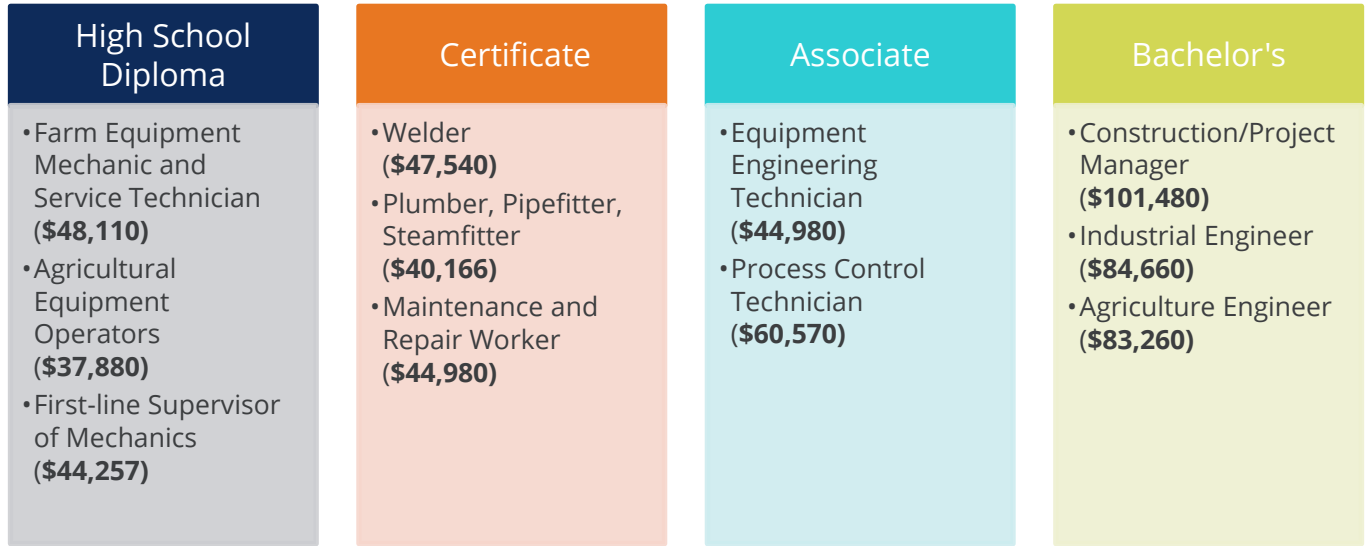
Tennessee Technological University (TTU) agricultural engineering technology provides training in engineering and agriculture, preparing students to solve problems related to agricultural production and processing systems and the management and conservation of agricultural land and water resources. Students apply engineering principles and technology to agricultural problems in the food and agricultural industries. Graduates pursue careers in food and fiber handling and processing facilities, farm machinery sales and service, management of large, mechanized farms, and other sectors of agricultural engineering technology.

Figure 3 illustrates which opportunities are available for a student graduating from a Tennessee Agricultural, Engineering, Industrial, and Mechanical Systems program in high school. The figure outlines some of the related postsecondary certificates and degrees, career opportunities, and salaries available to students in the pathway. Students may acquire hours transferable to a postsecondary institution for the completion of certificates and degrees.

**Figure 3.** Postsecondary Opportunities



Additional opportunities are offered at multiple postsecondary institutions as indicated in the [Tennessee Department of Labor and Workforce Dashboard](#).



### Current Secondary Landscape

Over the past three years, the number of schools offering Agricultural Engineering, Industrial, and Mechanical Systems has decreased from 97 to 92 in 2023 as shown in the open enrollment analysis (Figure 4a). There were 21,168 students enrolled in the Agricultural Engineering, Industrial, and Mechanical Systems program of study including Agriscience which flows into all Agriculture Food and Natural Resources pathways (Figure 4b). Agricultural Engineering, Industrial, and Mechanical Systems had 4,745 students enrolled in specific content courses (years two through four in the program matrix).

Figure 4 shows the open enrollment analysis for the 2020-21 through the 2022-23 school year and student enrollment for the Agricultural Engineering, Industrial, and Mechanical Systems program of study.

Figure 4a. Open Enrollment Analysis

School Year	Schools Offering Agricultural Engineering, Industrial and Mechanical Systems
2020-21	97
2021-22	93
2022-23	92

**Figure 4b.** Student Enrollment

School Year	Agriscience	Principles of Agricultural Mechanics	Agricultural Power and Equipment	Agricultural Fabrication and Biosystems Engineering	Unmanned Aircraft Systems in Agriculture	Dual Enrollment Agricultural Engineering, Industrial, and Mechanical Systems
<b>2020-21</b>	13,287	2,148	1,290	380	70	167
<b>2021-22</b>	14,431	2,375	1,393	622	163	231
<b>2022-23</b>	15,224	2,204	1,443	625	134	339

# Environmental and Natural Resource Management

2023-2024 Program of Study	Year 1	Year 2	Year 3	Year 4
<b>Environmental and Natural Resource Management</b>	Agriscience (C18H19) -or- Foundational Supervised Agricultural Experience (C18H58)	Applied Environmental Science (C18H25) -or- <b>IGCSE</b> Environmental Management (C18H07)	Plant & Soil Science (C18H15) -or- Capstone Supervised Agricultural Experience (C18H57) -or- <b>Dual Enrollment</b> Environmental & Natural Resource Management I (C18H06) -or- <b>Dual Enrollment</b> Environmental & Natural Resource Management II (C18H36) -or- <b>IB</b> Environmental Systems & Societies I SL (G03H36)	Natural Resources Management (C18H28) -or- Unmanned Aircraft Systems in Agriculture (C18H40) -or- <b>AP</b> Environmental Science (G03H25) -or- <b>Dual Enrollment</b> Environmental & Natural Resource Management III (C18H49) -or- <b>Dual Enrollment</b> Environmental & Natural Resource Management IV (C18H50) -or- <b>IB</b> Environmental Systems & Societies II SL (G03H34) -or- <b>WBL</b> Environmental and Natural Resource Management Career Practicum (C18H63)

## **Description**

*Environmental and Natural Resource Management* introduces how to manage natural resources for economic, recreational, and health reasons, as well as how to take care of the air, soil, water, land, fish, and wildlife resources. Using tools and technology to track and reduce the effects of human activity on the environment and natural resources. After completing this pathway, students should be equipped with the knowledge and abilities necessary to be responsible environmental stewards with management, and conservation of natural resources ensuring the well-being of both ecosystems and human societies now and in the future. Students should also have a solid understanding of societal issues about waste management and land use, as well as concepts of sustainability as they relate to agricultural production. This pathway will pave the way for students who want to pursue a career as environmental scientists, conservationists, foresters, or wildlife managers.

This POS is aligned with the [FFA](#) CTSO.

## **Job Outlook**

According to the U.S. Bureau of Labor Statistics (BLS), United States jobs related to Environmental and Natural Resources vary with expected growth based on occupation. The top three occupations Entertainment and Recreation Managers, Environmental Compliance Inspectors, and Biofuels Production Managers are expected to grow 17-to 23 percent and the lowest two Industrial Ecologist and Foresters are expected to grow three to five percent from 2020 to 2030<sup>12</sup>. Environmental protection is a major aspect of natural resources and includes recycling, rehabilitating contaminated land sites, and reducing pollution.

As reported in the Economic Report for the Governor for the State of Tennessee, 2024, "Forestry accounted for 2.9 percent of the state's economy, supported 84,360 Tennessee jobs, and generated \$23.4 billion in output"<sup>13</sup>.

Environmental service systems deal with recycling, waste disposal, public health, and air and water pollution control. Environmental engineers and technicians carry out studies on the management of hazardous waste, assess the risk's importance, provide treatment and containment analysis, and create regulations to

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<sup>12</sup> Bureau of Labor Statistics, U.S. Department of Labor, O\*NET Online, Occupation Specific Information, (2024), [Agriculture, Food & Natural Resources Career Cluster \(onetonline.org\)](#)

<sup>13</sup> Haslam College of Business. An Economic Report to the Governor of the State of Tennessee, 2024, page 51-53, 59-60, (2024), [An Economic Report to the Governor of the State of Tennessee, 2024: Publication - Haslam College of Business \(utk.edu\)](#)

avoid accidents. They create industrial and municipal wastewater systems. They conduct quality control inspections, study environmental projects, and analyze scientific data.

Natural resources systems carry out a wide range of activities, such as assisting in the growth, upkeep, and management of forests and other natural areas as well as capturing and trapping various kinds of marine life for use as bait, food for animals, and human consumption. In addition to providing wood products, minerals, water, and pasture for cattle, forests, and rangelands also act as recreation areas and wildlife habitats. These and other natural resources are developed, managed, and protected with assistance from conservation scientists and foresters.

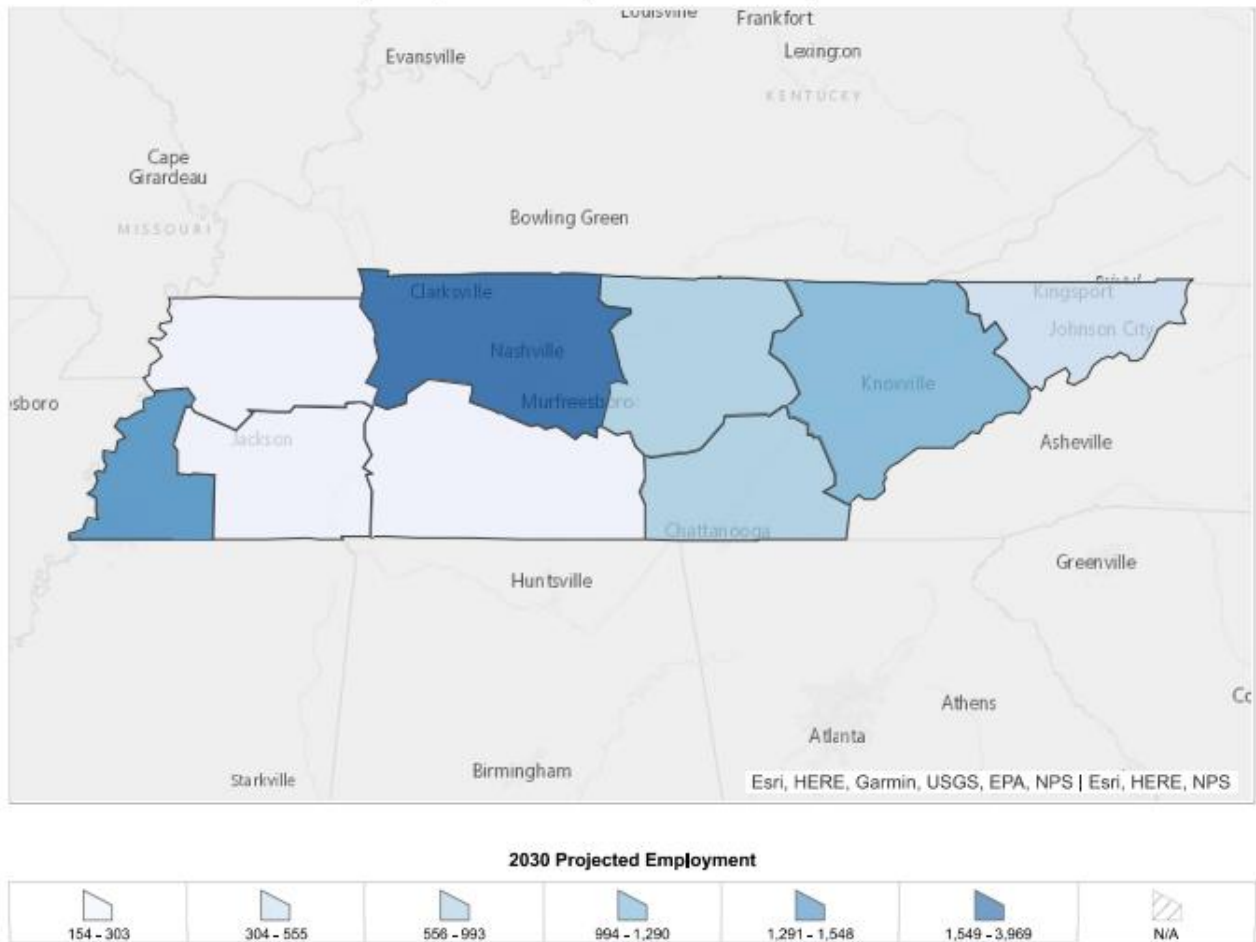
**Figure 1.** Tennessee employment projections for Environmental Science and Natural Resource Management occupations aligned to the program for high-skill, high-wage, or high-demand for 2020-2030 according to the Tennessee Higher Education Commission, [Supply and Demand Report](#)<sup>14</sup>

Occupation	SOC Code	Employment (2020)	Projected Employment (2030)	Projected Growth (2020-2030)	Projected Annual Job Openings (2020-2030)
<b>Environmental Compliance Inspectors</b>	13-1041	6,720	7,840	17%	680
<b>Environmental Scientists and Specialists including Health</b>	19-2041	1,620	1,660	3%	160
<b>Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products</b>	41-4011	13,580	16,160	19%	1,700
<b>Engineers</b>	17-2199	4,260	5,200	22%	390
<b>Refuse and Recyclable Materials Collector</b>	53-7081	3,070	3,320	8%	450
<b>Water and Wastewater Treatment Plant and Systems Operators</b>	51-8031	2,780	2,730	-2%	240
<b>Chemical Technicians</b>	19-4031	2,200	2,430	11%	270
<b>Career/Technical Education Teachers, Secondary School</b>	25-2032	2,220	2,320	5%	160
<b>Occupational Health and Safety Specialist</b>	19-5011	1,730	1,940	12%	150
<b>Biological Science Teachers, Post-Secondary</b>	25-1042	1,410	1,840	31%	190

<sup>14</sup> Tennessee Department of Economic and Community Development, Tennessee Department of Education, Tennessee Department of Labor, and Workforce Development, & Tennessee Higher Education Administration, *Improving the Pipeline for Tennessee's Workforce: Academic Supply for Occupational Demand Report 2023*, (2023) <https://www.tn.gov/thec/research/supply-and-demand.html>

**Figure 2.** Tennessee employment projections for Compliance Officers with positive job openings projected 2020-2030.

The map below shows the distribution of the 2030 projected employment for Compliance Officers (no data available for Environmental Compliance Inspectors) in Tennessee by local workforce development areas.



Source: TN Dept of Labor & Workforce Dev, Div Emp Sec, LMI

The top three local workforce development areas in Tennessee with the highest 2030 projected employment for Compliance Officers were Northern Middle TN (3,969), Greater Memphis (1,548), and East TN (1,290)<sup>15</sup>.

<sup>15</sup> Jobs4tn. Labor Market Data. Occupation Data. Area Employment Area Data Distribution. (2024) , [JOBS4TN.GOV - Occupation Profile](https://jobs4tn.gov/occupation-profile)

## ***Program of Study Level***

TISA provides direct funding for student participation in CTE programs to drive college and career readiness outcomes. Pursuant to [T.C.A. § 49-3-105\(c\)\(2\)](#), a direct allocation amount will be generated for each student membership in a CTE program based on the rule:

1. The level of the program
  - Programs shall be designated into one (1) of three (3) levels.
  - Programs will be classified into three (3) levels based on alignment to wage-earning potential indicators and additional resources required to support the program if aligned to wage-earning potential occupational pathways.
2. The student progression in coursework through the program

\*The state budget keeps all programs funded at \$5,000 for 2024-25 school year funding. See the [CTE TISA Programs of Study Leveling Guide 2024-25](#) for the TISA funding formula for program of study levels.

### **Environmental and Natural Resources Program: Level 3**

## ***Postsecondary Opportunities***

Upon completion of this POS, students will be prepared to further their education in the areas within the Environmental and Natural Resource Management program. Some occupations require a high school diploma or a postsecondary certificate or degree, most occupations in natural resources require a bachelor's degree. There are a few community colleges that offer a degree program as well as a transfer pathway to earn a bachelor's degree. Universities across the state offer concentrations for students to specialize in specific content to pursue employment in specialty areas.

TCAT Northwest, Jackson, and Oneida offer a Digital Agronomy Program that provides students with a foundation in both conventional and regenerative agricultural practices, emphasizing 21<sup>st</sup>-century technology. The curriculum includes exposure to GIS (Geographic Information Systems) mapping, precision agriculture, and the latest crop management and irrigation practices. The program spans three trimesters and is heavily focused on work-based learning opportunities, with each trimester completion resulting in an industry-recognized certificate. Students who complete at least two trimesters are eligible to apply for their FAA Drone Pilot's License. Upon completion of the entire program, students receive their Digital Agronomy Assistant Diploma, qualifying them for various positions in agriculture, landscape and nursery management, irrigation, and fields requiring drone pilot skills.

TCAT Hohenwald Forestry and Ag Technology program aims to equip students with the necessary knowledge and skills for entry-level positions in the forestry and agricultural industries. Through technical

instruction and skill development, students will become proficient in various areas such as forestry work, agricultural technology, and equipment operation. The curriculum covers a wide range of topics including forest product methods, timber harvesting, forest conservation, agriculture, soil science, basic electricity, machinery maintenance and repair, welding, sawmill operation, and heavy equipment operation. Safety procedures and equipment specifications are also emphasized throughout the training. Overall, the program prepares students for careers as forestry workers, agricultural technicians, or equipment operators in these industries.

Columbia State and Cleveland State Community College offer the Forestry, Wildlife, and Fisheries emphasis designed to prepare students for transfer to a bachelor's degree-granting institution. This program prepares students for more advanced study in a pathway through which students can pursue careers in Wildlife Management, Forestry, and Fisheries Management.

Roane State Community College offers an Environmental Health Technology program that prepares students for jobs on the Oak Ridge reservation, in private consulting, industrial facilities, waste treatment and disposal facilities, and in government agencies. Some jobs may require the use of personal protective equipment including hazmat suits.

Chattanooga State Community College (ChSCC) offers different pathways in the environmental sector.

- Nuclear Power Engineering Technology concentration trains students to safely operate nuclear power plant equipment, follow procedures, troubleshoot problems, and communicate effectively. They gain comprehensive knowledge of plant systems, components, and safety awareness, preparing them for entry-level roles in the nuclear power industry.
- Radiation Protection Concentration provides students with advanced training in handling radioactive substances, preparing them for diverse career paths in industries such as advanced manufacturing, life sciences, research reactors, nuclear power, hazardous waste removal, and governmental agencies. Graduates are equipped with high-tech skills and knowledge to excel in roles involving radiation safety and management.

Tennessee State University (TSU) offers a concentration in Environmental Sciences in the Agricultural Science pathway research program and a concentration in the Department of Agricultural and Environmental Sciences is focused on environmental quality and natural resource systems. This program ensures a sustainable global community. TSU also offers graduate certificates in biotechnology and Applied Geospatial Information Sciences for students to become more marketable by receiving hands-on training in emerging biotechnologies and analyzing data in a highly skilled modernized technology workforce.

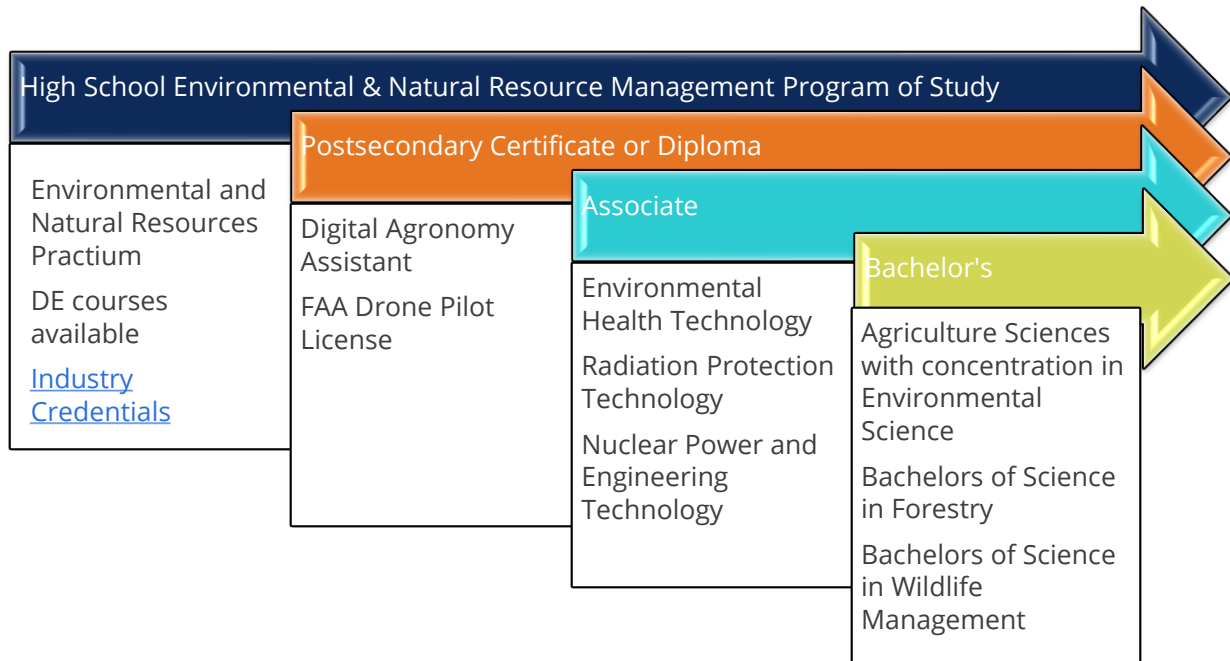
TTU Environmental Agriscience major educates students in the fundamental and applied principles of environmental quality with an emphasis on soil science and water quality. In addition to agriculture courses, this program of study includes courses in geology, biology, hydrology, and GIS (Geographic Information Systems).

UT Knoxville offers two majors (Forestry, Wildlife, and Fisheries) and with various concentrations in both majors in the Natural Resources pathway.

- Forestry major has four concentrations in Forest Resources Management, Restoration and Conservation Science, Urban Forestry, and Wildland Recreation.
  - Forest resources management concentration provides an education related to managing the broad spectrum of natural resources.
  - Restoration and Conservation Science concentration prepares students for a career in maintaining and restoring the health of our natural landscapes.
  - Urban Forestry concentration is an interdisciplinary program emphasizing forestry, arboriculture, horticulture, urban forest management, and urban wildlife.
  - Wildland Recreation is an interdisciplinary program that prepares students to work in natural resource-based recreation settings. Students can obtain specializations in complementary areas such as education, cultural and natural history interpretation, communications and public relations, landscape design and ornamental horticulture, or business and public administration.
- Wildlife and Fisheries offers two concentrations wildlife and fisheries management and wildlife health.
  - Wildlife and fisheries concentration study the science and art of maintaining populations of wild animals at levels consistent with the best interests of both wild species and people. Management goals may be aesthetic, economic, or ecological.
  - Wildlife health concentration provides training for biologists interested in ensuring the health of wildlife and fisheries populations, conserving wild species, and protecting domestic animals and humans from diseases spread by wildlife.

Figure 3 illustrates which opportunities are available for a student graduating from a Tennessee Environmental and Natural Resource Management program in high school. The figure outlines some of the related postsecondary certificates and degrees, career opportunities, and salaries available to students in the pathway. Students may acquire hours transferable to a postsecondary institution for the completion of certificates and degrees.

**Figure 3** Postsecondary Opportunities



Additional opportunities are offered at multiple postsecondary institutions as indicated in the [Tennessee Department of Labor and Workforce Dashboard](#).

High School Diploma	Certificate	Associate	Bachelor's
<ul style="list-style-type: none"> <li>• Tree Trimmers and Pruners (<b>\$36,081</b>)</li> <li>• Logging Equipment Operators (<b>\$35,389</b>)</li> <li>• Plant Operator (<b>\$33,640</b>)</li> </ul>	<ul style="list-style-type: none"> <li>• Precision Agronomist (<b>\$41,760</b>)</li> <li>• Forestry Technician (<b>\$39,980</b>)</li> <li>• Water Plant Operator (<b>\$46,660</b>)</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental Health Technician (<b>\$56,603</b>)</li> <li>• Agricultural Technician (<b>\$48,360</b>)</li> <li>• Power Plant Operator (<b>\$93,060</b>)</li> </ul>	<ul style="list-style-type: none"> <li>• Wildlife and Fisheries Biologist (<b>\$67,430</b>)</li> <li>• Forester (<b>\$59,469</b>)</li> <li>• Environmental Scientist (<b>\$65,946</b>)</li> </ul>

## Current Secondary Landscape

Over the past three years, the number of schools offering Environmental and Natural Resources Management has remained the same from 2020-2021 to 2022-2023 with 42 schools as shown in the open enrollment analysis (Figure 4a). There were 15,224 students enrolled in the Environmental and Natural Resources program of study including Agriscience which flows into all Agriculture Food and Natural Resources pathways (Figure 4b). The Environmental and Natural Resources Management program of study had 1,419 students enrolled in specific content courses (years two through four in the program matrix).

Figure 4 shows the open enrollment analysis for the 2020-21 to 2022-23 school year and student enrollment for the Environmental Science and Natural Resources program of study.

Figure 4a. Open Enrollment Analysis

School Year	Schools Offering Environmental and Natural Resources Management
2020-21	42
2021-22	46
2022-23	42

Figure 4b. Student Enrollment

School Year	Agriscience	Applied Environmental Science	Plant and Soil Science	Natural Resources Management	Unmanned Aircraft Systems in Agriculture	Dual Enrollment Environmental and Natural Resources Management
2020-21	13,287	539	409	682	70	20
2021-22	14,431	481	328	645	163	17
2022-23	15,224	442	325	473	134	45

# Food Science

2023-2024 Program of Study	Year 1	Year 2	Year 3	Year 4
<b>Food Science</b>	Agriscience (C18H19) -or- Foundational Supervised Agricultural Experience (C18H58)	Principles of Food Production (C18H29)	Food Science & Safety (C18H26) -or- Capstone Supervised Agricultural Experience (C18H57) -or- <b>Dual Enrollment</b> Food Science I (C18H04) -or- <b>Dual Enrollment</b> Food Science II (C18H37)	Advanced Food Science (C18H24) -or- <b>Dual Enrollment</b> Food Science III (C18H51) -or- <b>Dual Enrollment</b> Food Science IV (C18H52) -or- <b>WBL</b> Food Science Career Practicum (C18H64)

## Description

The *Food Science* program prepares students to be well-prepared to address issues related to food production, safety and sanitation, foodborne pathogens, food standards, processing and grading methods, and packaging. Students will investigate new food sources, learn how to make processed foods safe, palatable, and healthful, and apply their knowledge of food science to determine the best methods of processing, packaging, preserving, storing, and distributing food. They will also use engineering and other sciences to study the principles underlying the processing and deterioration of foods. Students following this path will be positioned to pursue professions in the food science sector as food scientists, technicians, managers of food processing, and managers of production and food science focus on key topics associated with food production, safety and sanitation, foodborne pathogens, food standards, processing and grading techniques, and packaging.

This POS is aligned with the [FFA](#) CTSO.

## ***Job Outlook***

According to the U.S. Bureau of Labor Statistics (BLS), United States jobs related to Food Science vary with expected growth based on occupation. The top two occupations Sales Representative, Wholesale and Manufacturing, Technical and Scientific Products and Packers and Packagers, Hand workers are expected to grow 19-20 percent and the lowest two Farmworkers, Farm, Ranch, and Aquacultural Animals and Career/Technical Education Teachers, Secondary are expected to grow two to five percent from 2020 to 2030<sup>16</sup>. Many of those openings are expected to result from the need to replace workers who transfer to different occupations or exit the labor force, such as to retire.

On the Tennessee Department of Economic and Community Development, Mastered in Tennessee webpage, it states, Tennessee beverage industry is robust with \$986 million in beverage exports ranked third in the nation in 2023.” It also lists that there are 42.9 thousand Tennesseans employed in the 1600 registered establishments in the Food and agriculture industry, and since 2018, 5,400 new jobs have been created”<sup>17</sup>.

The Food Science industry employs a wide range of professionals who research to find ways to increase agricultural products' safety and efficiency. The nation's food supply is maintained and grown by agricultural and food scientists. Many engage in fundamental or practical research and development. The goal of applied research is to identify strategies for raising the level of quality, yield, and security of agriculture. In the private sector, farms, processing facilities, and food production companies are the usual employers for agricultural and food scientists. They might raise the standard for inspections or food quality. They work in a lab conducting experiments and tests, or they go out into the field collecting samples, or developing new food products to keep up with consumers' tastes. Other agricultural and food scientists work for pharmaceutical companies, where they use biotechnology processes to develop drugs or other medical products. Some look for ways to process agricultural products into fuels, such as ethanol produced from corn. According to My Next Move, 29 percent of all food science technicians work in farming, forestry, fishing, and hunting<sup>18</sup>.

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<sup>16</sup> Bureau of Labor Statistics, U.S. Department of Labor, O\*NET Online, Occupation Specific Information, (2024), [Agriculture, Food & Natural Resources Career Cluster \(ononline.org\)](https://ononline.org)

<sup>17</sup> Tennessee Department of Economic and Community Development. *Mastered in Tennessee, Foods, and Agriculture*, (2024), [Food and Agriculture - Tennessee Department of Economic and Community Development \(tneecd.com\)](https://tneecd.com)

<sup>18</sup> My Next Move. O\*Net, (2024) [Careers in Farming, Forestry, Fishing, & Hunting at My Next Move](https://mynextmove.org)

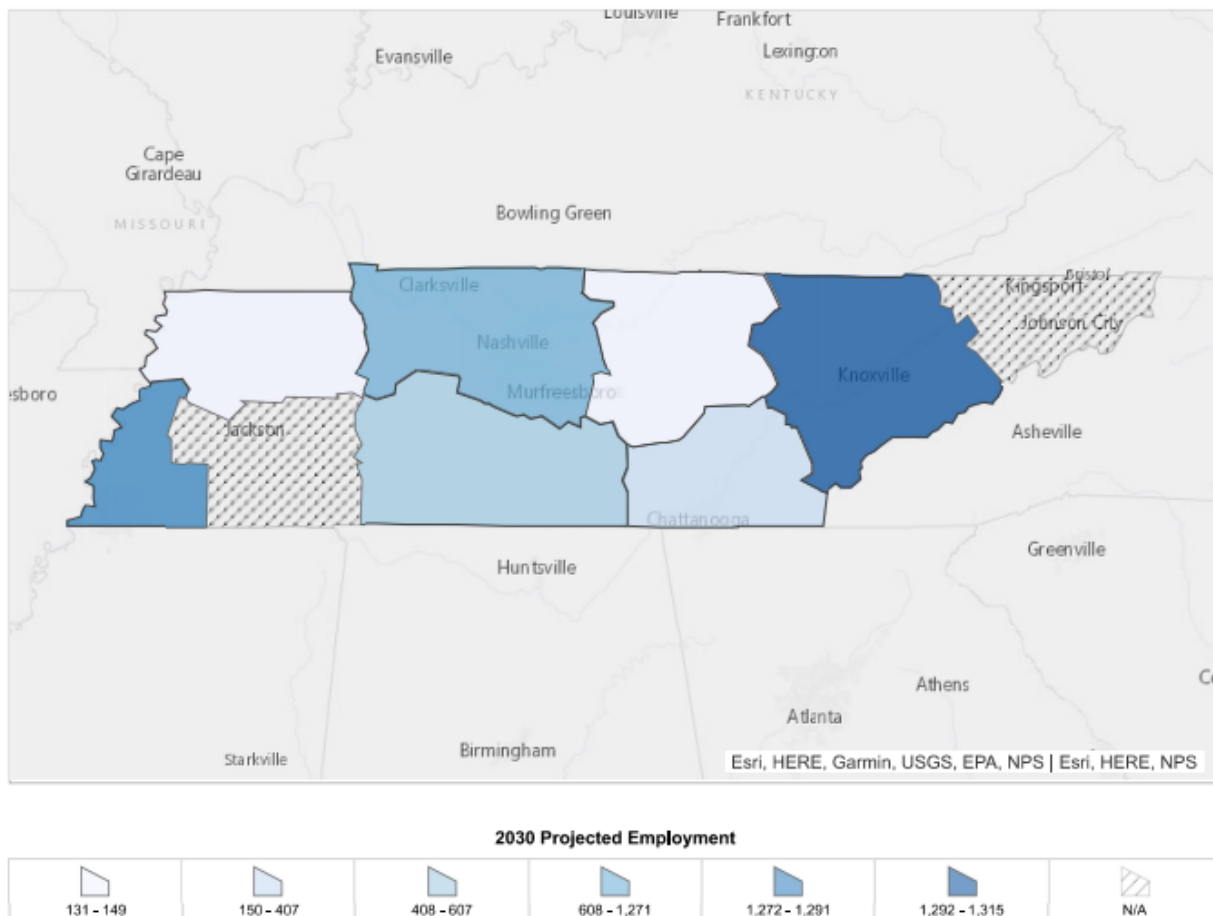
**Figure 1.** Tennessee employment projections for Food Science related occupations aligned to the program for high-skill, high-wage, or high-demand for 2020-2030 according to the Tennessee Higher Education Commission, [Supply and Demand Report](#)<sup>19</sup>

Occupation	SOC Code	Employment (2020)	Projected Employment (2030)	Projected Growth (2020-2030)	Projected Annual Job Openings (2020-2030)
<b>Sales Representative, Wholesale and Manufacturing, Technical and Scientific Products</b>	41-4011	13,580	16,160	19%	1,700
<b>Packers and Packers, Hand</b>	53-7064	17,950	21,610	20%	3,100
<b>Food Batch makers</b>	51-3092	5,900	6,730	14%	850
<b>Farmworkers, Farm, Ranch, and Aquacultural Animals</b>	45-2093	5,830	5,960	2%	940
<b>Farm and Laborers, Crop, Nursery and Greenhouse</b>	45-2092	15,030	15,910	6%	2,510
<b>Compliance Officers</b>	13-1041	6,720	7,840	17%	680
<b>Career/Technical Education Teachers, Postsecondary</b>	25-1194	2,440	2,830	16%	280
<b>Career/Technical Education Teachers, Secondary</b>	25-2032	2,220	2,320	5%	160
<b>Meat, poultry, and Fish Cutters and Trimmers</b>	51-3022	3,450	3,760	9%	450
<b>Agricultural Equipment Operators</b>	45-2091	2,780	3,150	13%	500

<sup>19</sup> Bureau of Labor Statistics, U.S. Department of Labor, O\*NET Online, Occupation Specific Information, (2024), [Agriculture, Food & Natural Resources Career Cluster \(onetonline.org\)](#)

**Figure 2.** Tennessee employment projections for Food Batch makers with positive job openings projected 2020-2030

The map below shows the distribution of the 2030 projected employment for Food Batchmakers in Tennessee by local workforce development areas.



Source: TN Dept of Labor & Workforce Dev, Div Emp Sec, LMI

The top three local workforce development areas in Tennessee with the highest 2030 projected employment for Food Batch makers were East TN (1,315), Greater Memphis (1,291), and Northern Middle TN (1,271)<sup>20</sup>.

<sup>20</sup> Jobs4tn. Labor Market Data. Occupation Data. Area Employment Area Data Distribution. (2024) , [JOBS4TN.GOV - Occupation Profile](https://jobs4tn.gov/occupation-profile)

## ***Program of Study Level***

TISA provides direct funding for student participation in CTE programs to drive college and career readiness outcomes. Pursuant to [T.C.A. § 49-3-105\(c\)\(2\)](#), a direct allocation amount will be generated for each student membership in a CTE program based on the rule:

1. The level of the program
  - Programs shall be designated into one (1) of three (3) levels.
  - Programs will be classified into three (3) levels based on alignment to wage-earning potential indicators and additional resources required to support the program if aligned to wage-earning potential occupational pathways.
2. The student progression in coursework through the program

\*The state budget keeps all programs funded at \$5,000 for 2024-25 school year funding. See the [CTE TISA Programs of Study Leveling Guide 2024-25](#) for the TISA funding formula for program of study levels.

### **Food Science Program: Level 1**

## ***Postsecondary Opportunities***

Upon completion of this POS, students will be prepared to further their education at universities in the Food Science pathway. Some occupations require a high school diploma, a postsecondary degree, or an advanced degree. Food Science majors have options for students to earn pre-professional degrees in the health field, such as dentistry, medicine, pharmacy, or veterinary care. There are a few community colleges that offer a degree program as well as a transfer pathway to earn a bachelor's degree. Universities across the state offer concentrations for students to specialize in specific content to pursue employment in specialty areas.

TCAT Elizabethton offers an online program credential for Sanitation and Food Safety.

Southwest Tennessee Community College offers a biotechnology technician degree. Students completing the program will be employed in medical, research, and industrial laboratories. Other community college options would be the pre-professional health field, biology, or chemistry transfer pathway to seamlessly transition to a Food Science pathway at a university.

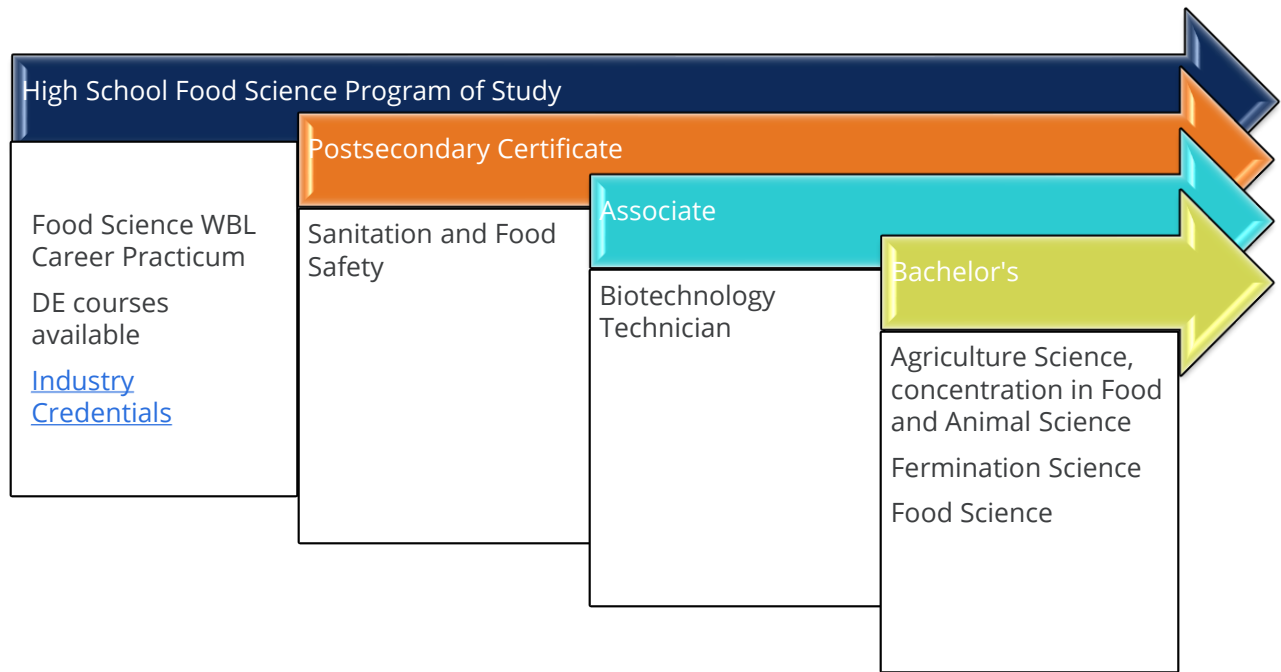
UT Knoxville Food Science has been a leader in contributing to food quality, safety, marketability, and availability through excellence in teaching, research, and extension since 1972. Food science is an exciting multidisciplinary field aiming to improve the quality, safety, and nutrition of the world's food supply. Students study food and the entire process, from design to digestion and everything in between.

TSU offers a concentration in Food and Animal Sciences in the Agricultural Science pathway. This major provides a rigorous scientific curriculum that is necessary to comprehend the real-world challenges associated with many facets of the food system. The nation is experiencing an increasing need for professionals trained in Food and Animal Science. Students are trained with the knowledge and skills needed for the many job opportunities in the food and animal industry and the public sector.

MTSU offers Fermentation Science. The program leading to a major in Fermentation Science is designed for students interested in the science and art of fermentation in all its applications (foods and beverages, industrial chemicals, medications, water treatment, flavors, and aromas) as well as developing practical research and outreach initiatives to answer questions facing the growing fermentation-related industries in Tennessee, the United States, and the world. This is the first-degree program of its type in Tennessee and is rare in the Southeast region. Students have interned with wineries, distilleries, breweries, cheese-making operations, and state governmental agencies within Tennessee, the US, and around the world.

Figure 3 illustrates which opportunities are available for a student graduating from a Tennessee Food Science program in high school. The figure outlines some of the related postsecondary certificates and degrees, career opportunities, and salaries available to students in the pathway. Students may acquire hours transferable to a postsecondary institution for the completion of certificates and degrees.

**Figure 3.** Postsecondary Opportunities



Additional opportunities are offered at multiple postsecondary institutions as indicated in the [Tennessee Department of Labor and Workforce Dashboard](#).

High School Diploma	Certificate	Associate	Bachelor's
<ul style="list-style-type: none"> <li>• Food batchmaker (<b>\$37,320</b>)</li> <li>• Ice cream Maker (<b>\$42,420</b>)</li> <li>• Machine Operator (<b>\$43,560</b>)</li> </ul>	<ul style="list-style-type: none"> <li>• Agriculture Inspectors (<b>\$44,720</b>)</li> <li>• Quality Assurance Technician (<b>\$45,910</b>)</li> </ul>	<ul style="list-style-type: none"> <li>• Food Science Technician (<b>\$47,860</b>)</li> <li>• Agricultural Research Technician (<b>\$48,490</b>)</li> </ul>	<ul style="list-style-type: none"> <li>• Professor of Food Science (<b>\$59,840</b>)</li> <li>• Food Scientist (<b>\$63,820</b>)</li> <li>• Flavor Chemist (<b>\$83,980</b>)</li> </ul>

## Current Secondary Landscape

Over the past three years, the number of schools offering Food Science has remained at 12 in 2021 and 2023 as shown in the open enrollment analysis (Figure 4a). There were 16,776 students enrolled in the Food Science program of study including Agriscience which flows into all Agriculture Food and Natural Resources pathways (Figure 4b). Food Science had 353 students enrolled in specific content courses (years two through four in the program matrix).

Figure 4 shows the open enrollment analysis for the 2020-21 through the 2022-23 school year and student enrollment for the Food Science program of study.

Figure 4a. Open Enrollment Analysis

School Year	Schools Offering Food Science
2020-21	12
2021-22	7
2022-23	12

Figure 4b. Student Enrollment

School Year	Agriscience	Principles of Food Production	Food Science & Safety	Advanced Food Science	Dual Enrollment Food Science
2020-21	13,287	216	127	24	0
2021-22	14,431	110	68	50	22
2022-23	15,224	211	86	43	13

# Horticulture Science

2023-2024 Program of Study	Year 1	Year 2	Year 3	Year 4
<b>Horticulture Science</b>	Agriscience (C18H19) -or- Foundational Supervised Agricultural Experience (C18H58)	Principles of Plant Science & Hydroculture (C18H30)	Greenhouse Management (C18H17) -or- Capstone Supervised Agricultural Experience (C18H57) -or- <b>SDC</b> Introduction to Plant Science (C18H09) -or- <b>Dual Enrollment</b> Horticulture Science I (C18H05) -or- <b>Dual Enrollment</b> Horticulture Science II (C18H33)	Landscaping & Turf (C18H16) -or- Unmanned Aircraft Systems in Agriculture (C18H40) -or- <b>Dual Enrollment</b> Horticulture Science III (C18H53) -or- <b>Dual Enrollment</b> Horticulture Science IV (C18H54) -or- <b>WBL</b> Horticulture Science Career Practicum (C18H65)

## Description

The *Horticulture* POS is designed to equip students with a diverse set of career skills spanning various aspects of plant growth, management, and science. This pathway introduces students to scientific theories, principles, and practices involved in the production and management of plants for various purposes, including food, feed, fiber, conservation, and ornamental use. Through this program, students will gain practical knowledge in areas such as turf and landscape design, plant science, and horticultural management in both controlled and open environments. The skills acquired in this program are valuable for students interested in pursuing careers as entrepreneurs in the horticulture field or working in scientific labs focusing on crop development, such as careers as Landscape or Lawn Care Entrepreneur, plant biotechnician, or turfgrass specialist for sports fields.

This POS is aligned with the [FFA](#) CTSO.

## ***Job Outlook***

According to the U.S. Bureau of Labor Statistics (BLS), United States jobs related to horticulture vary with expected growth based on occupation. The top two occupations Postsecondary Biological Teachers and Tree Trimmers and Pruners are expected to grow 31-33 percent and the lowest two Farmworkers, Farm, Ranch, and Aquacultural Animals, and Farmers, Ranchers, and other Agriculture Managers are expected to grow two to three percent from 2020 to 2030<sup>21</sup>. Many of those openings are expected to result from the need to replace workers who transfer to different occupations or exit the labor force, due to retirement.

In the horticulture sector, there are numerous job opportunities. American Farm Bureau reports under “Fast Facts about Agriculture and Food,” the global population is expected to increase by 2.2 billion by 2050, which means the world’s farmers will have to grow about 70 percent more food than what is now produced<sup>22</sup>. In the Supply and Demand Report, it states that supervisors of landscaping workers and landscaping workers are in high demand in more than four regions of the state<sup>23</sup>.

An Economic Report to the Governor of the State of Tennessee, 2024 reports, “In 2022, farming operations occupied 10.7 million acres in Tennessee, around 39.6 percent of the state’s 27.0 million acres of land area. Acreage-wise, just under 49 percent of the farmland in Tennessee is operated as cropland. Cash receipts from farming in Tennessee for 2022 were \$5.2 billion (USDA/NASS, 2023a), with about 59.2 percent of this value coming from crops and 40.8 percent from animals and animal products (USDA/ERS, 2023a)”<sup>24</sup>.

Plant scientists advise strategies to increase yields and improve production for food and crop developers. They develop plans to address pests and weeds. Soil scientists study soil characteristics, the impact of treatments on crop productivity, and soil composition's influence on plant growth. They develop methods

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<sup>21</sup> Bureau of Labor Statistics, U.S. Department of Labor, O\*NET Online, Occupation Specific Information, (2024), [Agriculture, Food & Natural Resources Career Cluster \(ononline.org\)](https://ononline.org)

<sup>22</sup> American Farm Bureau. “Fast Facts about Agriculture and Food.” (2024) [Fast Facts About Agriculture & Food | American Farm Bureau Federation \(fb.org\)](https://www.fb.org)

<sup>23</sup> Tennessee Department of Economic and Community Development, Tennessee Department of Education, Tennessee Department of Labor, and Workforce Development, & Tennessee Higher Education Administration, *Improving the Pipeline for Tennessee’s Workforce: Academic Supply for Occupational Demand Report 2023*, (2023) <https://www.tn.gov/thec/research/supply-and-demand.html>

<sup>24</sup> Haslam College of Business. An Economic Report to the Governor of the State of Tennessee, 2024, page 51-53, 59-60, (2024), [An Economic Report to the Governor of the State of Tennessee, 2024: Publication - Haslam College of Business \(utk.edu\)](https://www.utk.edu)

that farmers and forestry companies can use to manage and conserve soil. Because soil science and environmental science are closely related fields, people with training in soil science also work to ensure effective land use and environmental quality. This pathway supports farmers and aims to preserve the environment while enhancing crop nutritional content and seed quality through genetic engineering for pest and drought resistance.

**Figure 1.** Tennessee employment projections for Horticulture Science-related occupations aligned to the program for high-skill, high-wage, or high-demand for 2020-2030 according to the Tennessee Higher Education Commission, [Supply and Demand Report](#).<sup>25</sup>

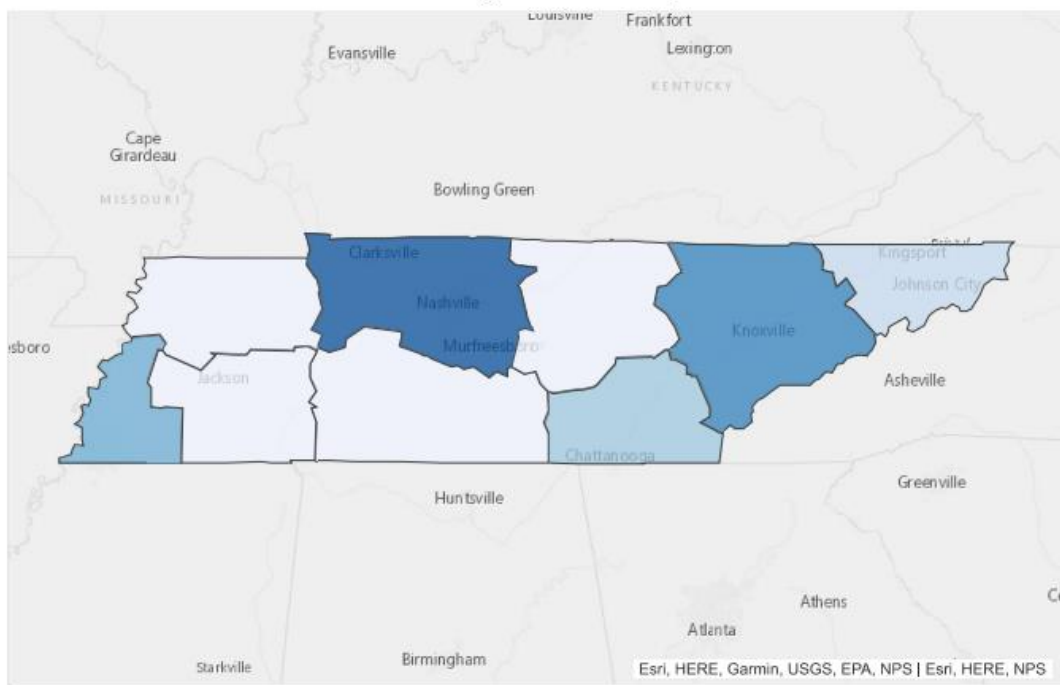
Occupation	SOC Code	Employment (2020)	Projected Employment (2030)	Projected Growth (2020-2030)	Projected Annual Job Openings (2020-2030)
<b>Landscaping and Groundskeeping Workers</b>	37-3011	19,600	24,830	27%	3,380
<b>Farmers, Ranchers, and other Agriculture Managers</b>	11-9013	22,880	23,510	3%	2,300
<b>Farmworkers and Laborers, Crop, Nursery and Greenhouse</b>	45-2092	15,030	15,910	6%	2,510
<b>Farmworkers, Farm, Ranch and Aquacultural Animals</b>	45-2093	5,830	5,960	2%	940
<b>First Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers</b>	37-1012	5,420	5,420	25%	610
<b>Career/Technical Education Teachers, Postsecondary</b>	25-1194	2,440	2,830	16%	280
<b>Agricultural Equipment Operators</b>	45-2091	2,780	3,150	13%	500

<sup>25</sup> Tennessee Department of Economic and Community Development, Tennessee Department of Education, Tennessee Department of Labor, and Workforce Development, & Tennessee Higher Education Administration, *Improving the Pipeline for Tennessee's Workforce: Academic Supply for Occupational Demand Report 2023*, (2023) <https://www.tn.gov/thec/research/supply-and-demand.html>

<b>Career/Technical Education Teachers, Secondary School</b>	25-2032	2,220	2,320	5%	160
<b>Biological Science Teachers, Postsecondary</b>	25-1042	1,410	1,840	31%	190
<b>Tree Trimmers and Pruners</b>	37-3013	1,860	2,480	33%	340

**Figure 3.** 2030 projected employment for First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers in Tennessee.

The map below shows the distribution of the 2030 projected employment for First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers in Tennessee by local workforce development areas.



**2030 Projected Employment**



Source: TN Dept of Labor & Workforce Dev, Div Emp Sec, LMI

The top three local workforce development areas in Tennessee with the highest annual openings for First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers in 2020-2030 were Northern Middle TN (275), East TN (192), and Greater Memphis (88)<sup>26</sup>.

### ***Program of Study Level***

TISA provides direct funding for student participation in CTE programs to drive college and career readiness outcomes. Pursuant to [T.C.A. § 49-3-105\(c\)\(2\)](#), a direct allocation amount will be generated for each student membership in a CTE program based on the rule:

1. The level of the program
  - Programs shall be designated into one (1) of three (3) levels.
  - Programs will be classified into three (3) levels based on alignment to wage-earning potential indicators and additional resources required to support the program if aligned to wage-earning potential occupational pathways.
2. The student progression in coursework through the program

\*The state budget keeps all programs funded at \$5,000 for 2024-25 school year funding. See the [CTE TISA Programs of Study Leveling Guide 2024-25](#) for the TISA funding formula for program of study levels.

### **Horticulture Science Program: Level 2**

### ***Postsecondary Opportunities***

Upon completion of this program of study, students will be prepared to further their education at TCATs, community colleges, and universities in the areas within the horticulture pathway. Some occupations require a high school diploma, post-secondary certificate or diploma, or a postsecondary degree. There are a few TCATs, and community colleges that offer a degree program as well as a transfer pathway to earn a bachelor's degree. Universities across the state offer industry-specific majors and concentrations for students to specialize in specific content to pursue employment in specialty areas.

The TCAT Chattanooga Landscape & Turf Management program offers technical training and skill development for careers in the landscape and turf industries. Students gain hands-on experience through fieldwork on various grounds, including baseball and softball fields, a golf green, turf demonstration areas, landscape beds, and a greenhouse. They learn to operate landscape equipment such as skid-steer loaders

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<sup>26</sup> Jobs4tn. Labor Market Data. Occupation Data. Area Employment Area Data Distribution. (2024), [JOBS4TN.GOV - Occupation Profile](#)

safely and effectively, zero-turn mowers, reel mowers, hand-held power equipment, and hand tools. The program emphasizes practical application to reinforce classroom learning and prepare students for success in the landscape industry.

TCAT Northwest, Livingston, and Oneida offer a Farming Operations Technology program that equips students with the skills and knowledge necessary for modern farming operations, encompassing row crops, animal agriculture, and precision agriculture. Through completing courses, students can earn certificates that expose them to agricultural principles, livestock equipment, and precision agriculture. Additional credential courses cover welding, farm-based electricity, shop principles, and agriculture finance. Students will learn about farm machinery maintenance, soil and plant management, crop and livestock marketing, and herd management. Precision agriculture, seen as the future of the industry, will be offered as a standalone diploma, providing students with specialized expertise in this field.

CSCC offers students a transfer pathway to a university with an emphasis in Agriculture: Plant and Science concentration.

TTU offers a bachelor's in agriculture with four concentrations related to horticulture.

- **Agronomy and Soils:** This program focuses on the relationship between plants and soil in the production of agronomic crops for various purposes such as food, fuel, and fibers. Students study a mix of crop science and soil science coursework to prepare for careers in agronomic crop production.
- **Horticulture:** Students in this pathway receive training in biological and physical sciences along with practical plant cultural practices. The curriculum covers plant identification, greenhouse and nursery crop production, landscape design and management, preparing students for careers in horticulture.
- **Nursery and Landscape Management:** This program combines agribusiness management and horticulture training to prepare students for managerial roles in the nursery and landscaping industries. Students learn both business management principles and horticultural practices.
- **Turfgrass Management:** Students in this program receive basic training in the science and cultural practices involved in managing turfgrasses, along with instruction in economics and business management principles related to the turf industry. Graduates are equipped for careers in managing diverse types of turf, including athletic fields, golf courses, municipal areas, home lawns, and related businesses.

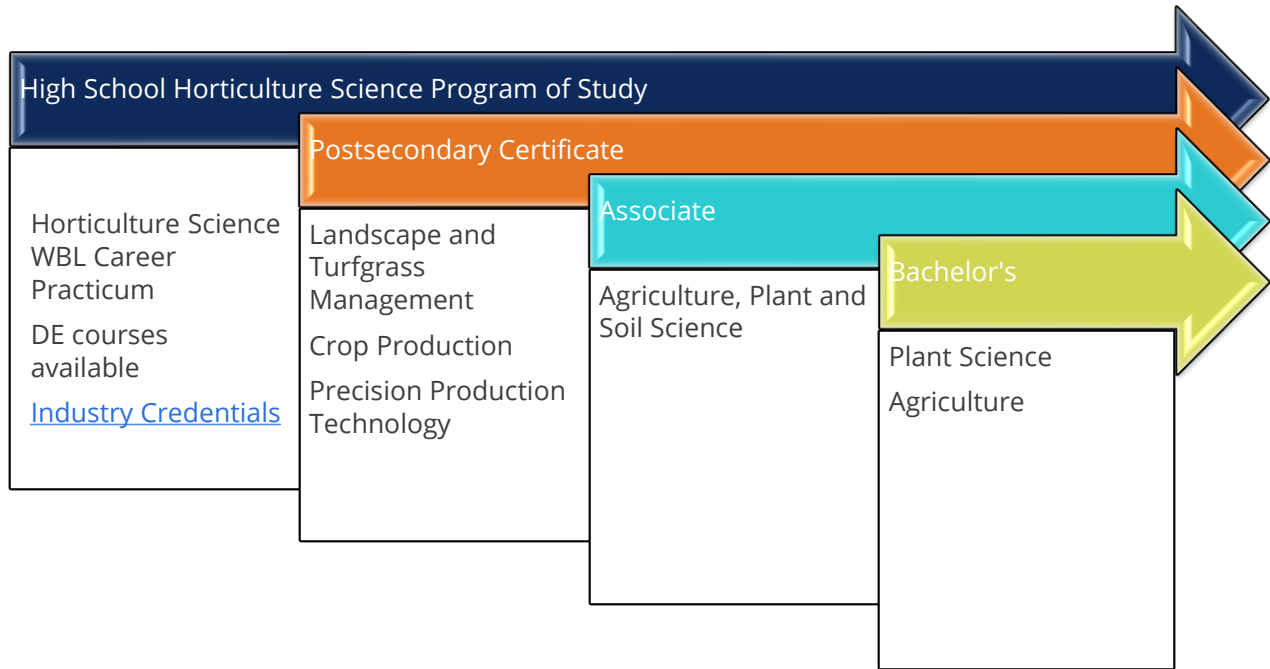
UT Knoxville offers a plant major, and students are required to choose a concentration to help students specialize in an area for their desired career path. These concentrations are designed to help students specialize in specific areas within plant science, aligning with various career paths. Each concentration is

tailored to different career trajectories, allowing students to focus on their desired area of specialization within the broader field of plant science.

- Horticulture Science and Production focuses on the cultivation, management, and production of fruits, vegetables, ornamental plants, and other crops. It may involve greenhouse management, nursery operations, and crop production techniques.
- Organic Production concentrates on sustainable and organic methods of crop production, emphasizing environmentally friendly practices, soil health, and natural pest management.
- Plant Genetics and Biotechnology explores the application of biotechnology in plant science, including genetic engineering, molecular biology, and genomics to enhance crop traits, improve disease resistance, and increase yield.
- Public Horticulture involves the management and curation of public gardens, botanical gardens, arboreta, and other green spaces. It may include aspects of education, outreach, and community engagement.
- Sustainable Landscape Design focuses on designing environmentally sustainable landscapes, incorporating principles of ecological balance, water conservation, native plant selection, and low-impact design techniques.
- Turfgrass Science and Management concentrates on the cultivation, maintenance, and management of turfgrass for various purposes, including sports fields, golf courses, parks, and residential landscapes.

Figure 3 illustrates which opportunities are available for a student graduating from a Tennessee Horticulture program in high school. The figure outlines some of the related postsecondary certificates and degrees, career opportunities, and salaries available to students in the pathway. Students may acquire hours transferable to a postsecondary institution for the completion of certificates and degrees.

**Figure 3** Postsecondary Opportunities



Additional opportunities are offered at multiple postsecondary institutions as indicated in the [Tennessee Department of Labor and Workforce Dashboard](#).

High School Diploma	Certificate	Associate	Bachelor's
<ul style="list-style-type: none"> <li>• Tree Trimmers and Pruners (<b>\$47,080</b>)</li> <li>• Entrepreneur of Residential Lawncare (<b>\$32,510</b>)</li> <li>• Pesticide Handler and Applicator (<b>\$39,460</b>)</li> </ul>	<ul style="list-style-type: none"> <li>• Greens Keeper Technician/ Golf and Sports Fields (<b>\$44,520</b>)</li> </ul>	<ul style="list-style-type: none"> <li>• Precision Agriculture Technician (<b>\$41,760</b>)</li> </ul>	<ul style="list-style-type: none"> <li>• Plant Scientist (<b>\$65,730</b>)</li> <li>• Landscaping Architects (<b>\$74,930</b>)</li> <li>• Landscaping Sales Representative (<b>\$57,100</b>)</li> </ul>

## Current Secondary Landscape

Over the past three years, the number of schools offering Horticulture Science has increased from 142 to 145 in 2023 as shown in the open enrollment analysis (Figure 4a). There were 19,867 students enrolled in the Horticulture Science program of study including Agriscience which flows into all Agriculture Food and Natural Resources pathways (Figure 4b). Horticulture Science presented growth with 7,445 students enrolled in specific content courses (years two through four in the program matrix).

Figure 4 shows the open enrollment analysis for the 2020-21 through the 2022-23 school year and student enrollment for the Agricultural Engineering, Industrial, and Mechanical Systems program of study.

Figure 4a. Open Enrollment Analysis

School Year	Schools Offering Horticulture Science
2020-21	142
2021-22	138
2022-23	145

Figure 4b. Student Enrollment

School Year	Agriscience	Principles of Plant Science & Hydroculture	Greenhouse Management	Landscaping & Turf Science	SDC Introduction to Plant Science*	Unmanned Aircraft Systems in Agriculture	Dual Enrollment Horticulture Science
2020-21	13,287	1,636	2,585	1,260	992	70	464
2021-22	14,431	1,966	2,678	1,443	1,109	163	365
2022-23	15,224	1,848	2,689	1,468	798	134	508

\*Statewide Dual Credit

# Veterinary and Animal Science

2023-2024 Program of Study	Year 1	Year 2	Year 3	Year 4
<b>Veterinary and Animal Science</b>	Agriscience (C18H19) -or- Foundational Supervised Agricultural Experience (C18H58)	Small Animal Science Technologies (C18H20)	Large Animal Science Technologies (C18H27) -or- Capstone Supervised Agricultural Experience (C18H57) -or- <b>Dual Enrollment</b> Veterinary & Animal Science I (C18H01) -or- <b>Dual Enrollment</b> Veterinary & Animal Science II (C18H34)	Veterinary Science Technologies (C18H21) -or- Unmanned Aircraft Systems in Agriculture (C18H40) -or- <b>Dual Enrollment</b> Veterinary & Animal Science III (C18H55) -or- <b>Dual Enrollment</b> Veterinary & Animal Science IV (C18H56) -or- <b>WBL</b> Veterinary and Animal Science Career Practicum (C18H66)

## Description

The *Veterinary and Animal Science* POS is an interdisciplinary field that encompasses various aspects of animal agriculture, husbandry, and food production. Students study the reproductive physiology and management of farm animals to maximize reproductive efficiency and ensure sustainable breeding programs. They also study the genetic principles underlying animal breeding programs aimed at improving desirable traits in livestock, such as growth rate, disease resistance, and meat quality. Finally, they study the growth and development of farm animals from birth to maturity and comprehend the nutritional requirements of domesticated farm animals to optimize growth, health, and productivity. Students gain practical skills and insights through hands-on experience raising both small and large animals. This experiential learning component enhances their understanding of animal behavior, welfare, and management. Overall, the Veterinary and Animal Science program equips students with a comprehensive

understanding of animal biology, production systems, and industry practices, preparing them for careers in various sectors of animal agriculture, food production, research, and veterinary medicine.

This POS is aligned with the [FFA](#) CTSO.

## ***Job Outlook***

According to the U.S. Bureau of Labor Statistics (BLS), United States jobs related to Veterinary and Animal Science vary with expected growth based on occupation. The top three occupations Veterinarians and Postsecondary Agricultural Science and Biological Science teachers are expected to grow by 31 percent and the lowest three occupations Pharmacy Aides are expected to decline by 17 percent and Secondary Career and Technical Educators and Farm and Home Management Educators are expected to grow five and eight percent from 2020 to 2030<sup>27</sup>. Many of those openings are expected to result from the need to replace workers who transfer to different occupations or exit the labor force, due to retirement.

Reported in An Economic Report to the Governor of the State of Tennessee, 2024, "Animals and animal products accounted for 40.8 percent (\$2.10 billion) of Tennessee agricultural receipts in 2022. Based on 2022 cash receipts, broiler receipts were ranked second after soybeans, totaling \$972.6 million and representing 18.9 percent of cash receipts. Cattle and calves ranked as the third largest agricultural sector in Tennessee with cash receipts totaling \$687.0 million, which accounted for 13.3 percent of total agricultural cash receipts. Hogs (2.8 percent of cash receipts), dairy products and milk (2.5 percent), and chicken eggs (1.5 percent) rounded out the top five Tennessee rankings for animals and animal products based on cash receipts in 2022 (USDA/ERS, 2023b)<sup>28</sup>."

People who work in the Veterinary and Animal Systems pathway aim to enhance techniques utilized in dairy, meat, poultry, egg production, and other food item processing. They research the breeding, development, growth, nutrition, and genetics of domesticated farm animals. Some engage in purchasing animals, grading, and inspecting livestock food products, or work in technical sales or marketing. Others offer advice to agricultural producers on how to properly upgrade animal housing facilities, reduce mortality rates, manage waste, or increase the output of animal products like milk or eggs. They also assist producers in selecting

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<sup>27</sup> Bureau of Labor Statistics, U.S. Department of Labor, O\*NET Online, Occupation Specific Information, (2024), [Agriculture, Food & Natural Resources Career Cluster \(ononline.org\)](https://ononline.org)

<sup>28</sup> Haslam College of Business. An Economic Report to the Governor of the State of Tennessee, 2024, page 51-53, 59-60, (2024), [An Economic Report to the Governor of the State of Tennessee, 2024: Publication - Haslam College of Business \(utk.edu\)](https://utk.edu)

animals with desired qualities for offspring. Other occupations such as breeding companion animals and raising household pets that consumers want are additional facets of the industry. Animal care workers train, feed, water, groom, bathe, and exercise animals in addition to maintaining, cleaning, and repairing their cages.

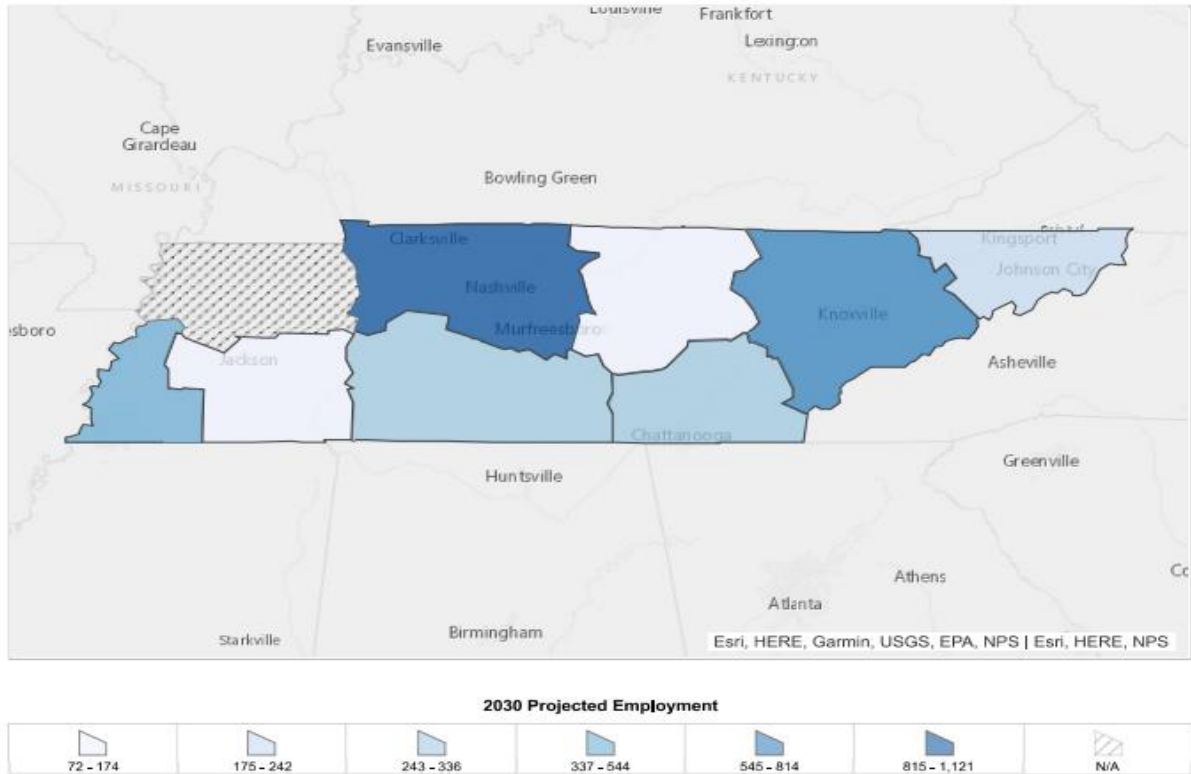
Figure 1. Tennessee employment projections for Veterinary and Animal Science related occupations aligned to the program for high-skill, high-wage, or high-demand for 2020-2030 according to the Tennessee Higher Education Commission, Supply and Demand Report<sup>29</sup>.

Occupation	SOC Code	Employment (2020)	Projected Employment (2030)	Projected Growth (2020-2030)	Projected Annual Job Openings (2020-2030)
<b>Pharmacy Technicians</b>	29-2052	10,100	11,350	12%	880
<b>Pharmacy Aides</b>	31-9095	2,480	2,060	-17%	250
<b>Veterinary Assistants and Laboratory Animal Caretakers</b>	31-9096	2,680	3,470	30%	570
<b>Veterinarians</b>	29-1131	1,940	2,550	31%	130
<b>Veterinary Technologist and Technicians</b>	29-2056	1,910	2,480	30%	210
<b>Career/Technical Education Teachers, Secondary School</b>	25-2032	2,220	2,320	5%	160
<b>Agricultural Sciences Teachers, Postsecondary</b>	25-1041	130	170	31%	20
<b>Biological Science Teachers, Postsecondary</b>	25-1042	1,410	1,840	31%	190
<b>Life, Physical, and Social Science Technicians, All others</b>	19-4099	1,210	1,520	26%	200
<b>Farm and Home Management Educators</b>	25-9021	600	650	8%	60

<sup>29</sup> Tennessee Department of Economic and Community Development, Tennessee Department of Education, Tennessee Department of Labor, and Workforce Development, & Tennessee Higher Education Administration, *Improving the Pipeline for Tennessee's Workforce: Academic Supply for Occupational Demand Report 2023*, (2023) <https://www.tn.gov/thec/research/supply-and-demand.html>

**Figure 2.** 2030 projected employment for Veterinary Assistants and Laboratory Animal Caretakers in Tennessee.

The map below shows the distribution of the 2030 projected employment for Veterinary Assistants and Laboratory Animal Caretakers in Tennessee by local workforce development areas.



Source: TN Dept of Labor & Workforce Dev, Div Emp Sec, LMI

The top three local workforce development areas in Tennessee with the highest 2030 projected employment for Veterinary Assistants and Laboratory Animal Caretakers were Northern Middle TN (1,121), East TN (814), and Greater Memphis (544)<sup>30</sup>.

<sup>30</sup> Jobs4tn. Labor Market Data. Occupation Data. Area Employment Area Data Distribution. (2024) , [JOBS4TN.GOV - Occupation Profile](https://jobs4tn.gov/occupation-profile)

## ***Program of Study Level***

TISA provides direct funding for student participation in CTE programs to drive college and career readiness outcomes. Pursuant to [T.C.A. § 49-3-105\(c\)\(2\)](#), a direct allocation amount will be generated for each student membership in a CTE program based on the rule:

1. The level of the program
  - Programs shall be designated into one (1) of three (3) levels.
  - Programs will be classified into three (3) levels based on alignment to wage-earning potential indicators and additional resources required to support the program if aligned to wage-earning potential occupational pathways.
2. The student progression in coursework through the program

\*The state budget keeps all programs funded at \$5,000 for 2024-25 school year funding. See the [CTE TISA Programs of Study Leveling Guide 2024-25](#) for the TISA funding formula for program of study levels.

### **Veterinary and Animal Science Program: Level 1**

## ***Postsecondary Opportunities***

Upon completion of this POS, students will be prepared to further their education at TCATs, community colleges, and universities in the areas within the Veterinary and Animal Science pathway. Some occupations require a high school diploma, post-secondary certificate, or diploma, or a postsecondary degree or a postgraduate degree. There is one TCAT that offers a certificate program and a few community colleges that offer a degree program in Veterinary and Animal Science as well as a transfer pathway to earn a bachelor's degree. Universities across the state offer industry-specific majors and concentrations for students to specialize in specific content to pursue employment in specialty areas.

TCAT Northwest, Livingston, Oneida offers Farming Operations Technology that equips students with the skills and knowledge necessary for modern farming operations, encompassing row crops, animal agriculture, and precision agriculture. Through completing courses, students can earn certificates that expose them to agricultural principles, livestock equipment, and precision agriculture. Additional credential courses cover welding, farm-based electricity, shop principles, and agriculture finance. Students will learn about farm machinery maintenance, soil and plant management, crop and livestock marketing, and herd management. Precision agriculture, seen as the future of the industry, will be offered as a standalone diploma, providing students with specialized expertise in this field.

TCAT Memphis offers an Assistant Animal Laboratory Technology (AALT) Program that prepares students for entry-level positions as technicians in two animal care career paths. The program offers training for working

with companion animals in veterinary hospitals or diagnostic laboratory settings and with lab animals in biomedical research facilities.

Volunteer State, Chattanooga State, and Columbia State Community College offer veterinary technology. Veterinarian Technicians primarily function as professional technical support to veterinarians, biomedical researchers, and other scientists. Examples of responsibilities qualified veterinary technicians are educated to assume include clinical pathology, radiology, surgical assisting, office/hospital management, and many more.

TSU offers a concentration in Food and Animal Science program that offers a comprehensive scientific curriculum designed to address real-world challenges within the food system. The Animal Science emphasis provides training in principles related to breeding, management, production, and marketing of food animals (such as cattle, swine, goats, sheep, poultry, etc.) and companion animals (including horses, dogs, cats, etc.). This program equips students with the knowledge and skills necessary to succeed in various aspects of animal science, and the broader food industry.

MTSU offers two Bachelor of Science programs in Animal Science and Horse Science.

- The Animal Science program includes pre-veterinary science and covers a wide range of domestic animal species including pigs, poultry, sheep, goats, dairy cattle, and beef cattle. Students study various aspects of animal science and production, including meat science, behavior, genetics, reproduction, nutrition, management, health, and biotechnology.
- The Horse Science program aims to prepare students for careers in the diverse American horse industry. It offers extensive coursework in genetics, nutrition, exercise physiology, reproductive physiology, equine event and facility management, behavior, training, horsemanship, equitation, selection, and evaluation, as well as equine-assisted activities and therapies.

Both programs provide students with a solid foundation in their respective areas of focus, equipping them with the knowledge and skills necessary to pursue careers in various sectors of the animal and horse industries.

TTU offers a Bachelor of Science that deals with all phases of the livestock and dairy industry. Nutrition, physiology, genetics, management technology, quality assurance, and environmental regulations are covered. At Tennessee Tech, there are numerous resources available to students studying animal science that will improve their educational experience. One such resource is the Tech Farm, a 300-acre working, teaching, and research farm situated three miles from campus.

UT Knoxville offers a Bachelor of Science with three concentrations in Animal Industries, Bioscience, and Pre- Veterinary Medicine. This program offers a diverse range of concentrations in animal science, each tailored to different career paths and professional goals.

- Animal Industries concentration encompasses a wide range of subjects, including pharmaceuticals, nutrition, reproduction, genetics, farm, and animal management, as well as pre- and post-harvest food safety. This comprehensive curriculum prepares students for various roles within the animal industry, equipping them with knowledge and skills relevant to pharmaceuticals, animal nutrition, breeding, farm management, and ensuring food safety throughout the production process.
- The Bioscience concentration is geared toward students intending to pursue advanced education in graduate school or other professional programs. It emphasizes building a robust foundation in biological sciences, with applications to various areas including pre- and post-harvest food safety, wildlife biology, and nutrition. This concentration provides students with the knowledge and skills needed to pursue further studies or careers in fields related to biological sciences, preparing them for advanced academic or professional endeavors.
- Pre-veterinary concentration is tailored for students who aspire to pursue a career in veterinary medicine. This concentration offers the prerequisite coursework and preparation necessary for admission to veterinary school. It focuses on providing students with the academic foundation and skills required to succeed in veterinary studies, helping them fulfill their aspirations of becoming veterinarians.

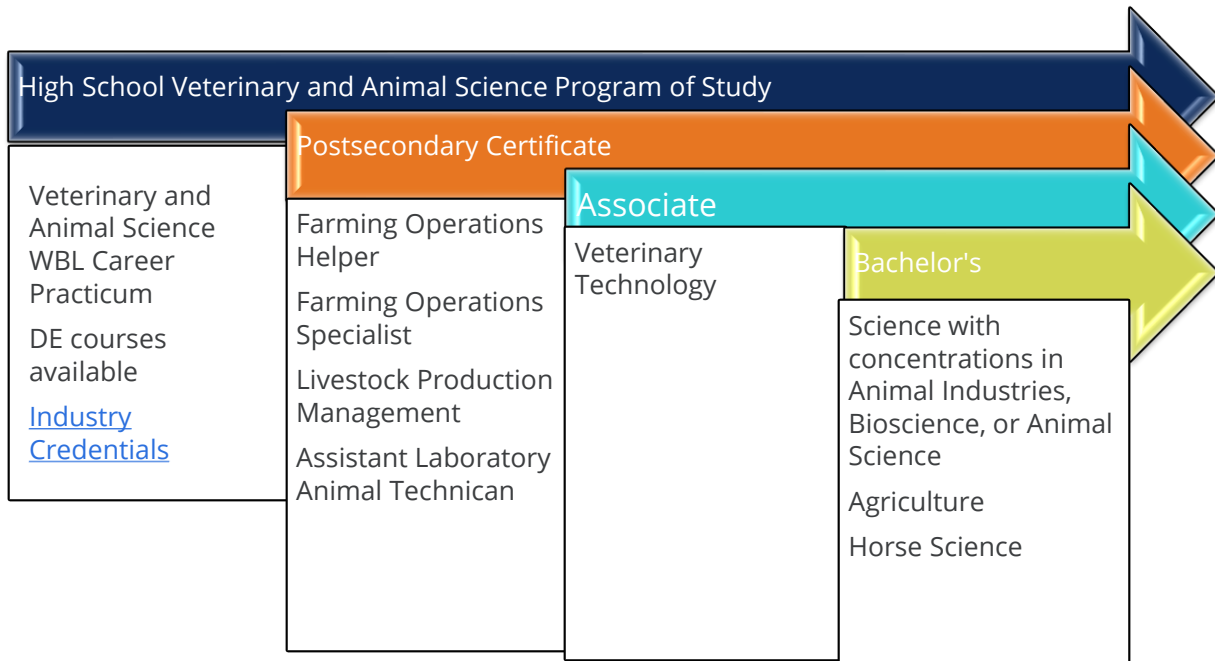
UT Martin provides a Bachelor of Science program in Animal Science and Agriculture Science with a Production Option, Veterinary Science, Veterinary Technology, and Veterinary Technology and Management.

- Animal Science tailors to students desiring to study the principles and practical applications of animal production, care, and utilization. Within the agricultural department, students can explore various areas such as applied animal physiology, nutrition, breeding and genetics, ecology and ethology, livestock, and poultry management.
- Agriculture Science with a Production Option provides a complete understanding of the agricultural industry and its significance in both the U.S. and global economies. Students have the flexibility to tailor their course selection based on their specific interests, with options such as agricultural economics, engineering, management, and more. This program allows students to explore various aspects of agriculture to align with their career goals and interests.
- Veterinary Science is tailored for students aiming for a bachelor's degree in animal science and aiming to meet the prerequisites for admission into professional schools like The University of Tennessee College of Veterinary Medicine. This concentration allows students to focus on a specific specialty, preparing them to work with diverse animal patients, ranging from livestock to exotic pets. The program's comprehensive curriculum contributes to its graduates' high acceptance rate into veterinary school, making it an attractive option for aspiring veterinarians.

- Veterinary Technology provides a pathway for individuals passionate about working with animals to enter the field of animal healthcare. Recognizing the increasing demand for skilled professionals in this area, UTM offers one of the most comprehensive veterinary health technology programs in the country. UTM is among the select few institutions nationwide offering an accredited four-year program in veterinary health technology, highlighting the program's quality and significance within the field.
- Veterinary Technology and Management is tailored for individuals who have already earned an associate degree from an AVMA CVTEA-accredited veterinary technology program. This option enables students to enhance their expertise by pursuing a bachelor's degree focusing on agribusiness management and animal science in the context of veterinary practice. Graduates are prepared for various career paths such as Assistant Director of Animal Health, Clinical Coordinator or Supervisor, or Emergency Veterinary Technician. This program offers flexibility and advanced education for those seeking to further their career in veterinary technology and management.

Figure 3 illustrates which opportunities are available for a student graduating from a Tennessee Veterinary and Animal Science program in high school. The figure outlines some of the related postsecondary certificates and degrees, career opportunities, and salaries available to students in the pathway. Students may acquire hours transferable to a postsecondary institution for the completion of certificates and degrees.

**Figure 3** Postsecondary Opportunities.



Additional opportunities are offered at multiple postsecondary institutions as indicated in the [Tennessee Department of Labor and Workforce Dashboard](#).

High School Diploma	Certificate	Associate	Bachelor's
<ul style="list-style-type: none"> <li>•Veterinary Assistant <b>(\$29,520)</b></li> <li>•Animal Groomer <b>(\$28,190)</b></li> <li>•Animal Technician <b>(\$45,320)</b></li> </ul>	<ul style="list-style-type: none"> <li>•Agriculture Inspector <b>(\$44,720)</b></li> </ul>	<ul style="list-style-type: none"> <li>•Veterinary Technician <b>(\$35,620)</b></li> <li>•Laboratory Technician <b>(\$41,230)</b></li> </ul>	<ul style="list-style-type: none"> <li>•Animal Scientist <b>(\$69,390)</b></li> <li>•Veterinarian <b>(\$99,690)</b></li> <li>•Pharmaceutical Salesperson <b>(\$75,860)</b></li> </ul>

## Current Secondary Landscape

Over the past three years, the number of schools offering Veterinary and Animal Science has decreased by 2 since 2020-2021 with 133 schools in 2023 as shown in the open enrollment analysis (Figure 4a). There were 25,786 students enrolled in the Veterinary and Animal Science program of study including Agriscience which flows into all Agriculture Food and Natural Resources pathways (Figure 4b). Veterinary and Animal Science had growth with 9,322 students enrolled in specific content courses, years two through four in the program matrix.

Figure 4 shows the open enrollment analysis for the 2020-21 to 2022-23 school year and student enrollment for the Veterinarian and Animal Science program of study.

**Figure 4a.** Open Enrollment Analysis

School Year	Schools Offering Veterinary and Animal Science
2020-21	135
2021-22	127
2022-23	133

**Figure 4b.** Student Enrollment

School Year	Agriscience	Small Animal Science Technologies	Large Animal Science Technologies	Veterinary Science Technologies	Dual Enrollment Veterinary and Animal Science
2020-21	13,287	4,181	3,009	1,549	464
2021-22	14,431	4,117	2,955	1,667	365
2022-23	15,224	4,387	2,967	1,460	508

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# Recommendations

The following includes recommendations for course standards changes to be presented to the State Board of Education (SBE) for consideration in August 2024.

Program of Study	Course	Recommendations
<ul style="list-style-type: none"> <li>• Agribusiness</li> <li>• Agricultural Engineering, Industrial and Mechanical Systems</li> <li>• Environmental and Natural Resource Management</li> <li>• Food Science</li> <li>• Horticulture Science</li> <li>• Meat Science</li> <li>• Veterinary and Animal Science</li> </ul>	<p>Agriculture, Food, and Natural Resources Practicum</p>	<p>New Course- This course will incorporate project-based learning for students enrolled in Agriculture Education courses as well as embedding projects that are related to students building on all aspects of the 3-circle model to encompass classroom, FFA, and SAE.</p>
<ul style="list-style-type: none"> <li>• Agribusiness</li> <li>• Agricultural Engineering, Industrial and Mechanical Systems</li> <li>• Environmental and Natural Resource Management</li> <li>• Food Science</li> <li>• Horticulture Science</li> <li>• Meat Science</li> <li>• Veterinary and Animal Science</li> </ul>	<p>Agriscience</p>	<ul style="list-style-type: none"> <li>• Add new standards to include research projects, incorporating the Agriscience Fair into the course. Agriscience is an FFA competition (CTSO) for students. CTSOs are a mandatory requirement in teaching TN CTE programs of study. The addition of a standard ensures all teachers are complying with Federal legislation.</li> <li>• Additional standard to include Ethical Artificial Intelligence.</li> </ul>
<ul style="list-style-type: none"> <li>• Agribusiness</li> <li>• Agricultural Engineering, Industrial and Mechanical Systems</li> <li>• Environmental and Natural Resource Management</li> <li>• Food Science</li> <li>• Horticulture Science</li> <li>• Meat Science</li> </ul>	<ul style="list-style-type: none"> <li>• Applied Environmental Science</li> <li>• Principles of Farm and Agribusiness Management</li> <li>• Principles of Plant Science and Hydroculture</li> </ul>	<p>New standard to include Data Science in all programs of study. Data analysis is a component of all sixteen career clusters. Students should be aware of the utilization of data as it applies to the aligned industry.</p>

<ul style="list-style-type: none"> <li>• Veterinary and Animal Science</li> </ul>	<ul style="list-style-type: none"> <li>• Meat Science I</li> <li>• Small Animal Science Technologies</li> </ul>	
<ul style="list-style-type: none"> <li>• Environmental and Natural Resource Management</li> </ul>	Applied Environmental	Add native species that are relevant to specific biomes for identification in Applied Environmental standards under Components of an Ecosystem (4.2).
<ul style="list-style-type: none"> <li>• Environmental and Natural Resource Management</li> </ul>	Natural Resources Management	<ul style="list-style-type: none"> <li>• Add non-native species identification that are relevant in specific biomes in Natural Resources Management standards under 4.4 Non-Native Species.</li> </ul>

## 2025-26 Recommended Program of Study Guides

### Agribusiness

2025-26 Program of Study	Year 1	Year 2	Year 3	Year 4
<b>Agribusiness</b>	Agriscience (C18H19) -or- Foundational Supervised Agricultural Experience (C18H58)	Principles of Farm and Agribusiness Management (C18H41) -or- Foundational Supervised Agricultural Experience II (C18HB7)	Organizational Leadership & Communications (C18H18) -or- Capstone Supervised Agricultural Experience (C18H57) -or- <b>Dual Enrollment</b> Agribusiness I (C18H03) -or- <b>Dual Enrollment</b> Agribusiness II (C18H32)	Agricultural Business & Finance (C18H11) -or- Agriculture, Food, and Natural Resources Practicum (TBD) -or- <b>Dual Enrollment</b> Agribusiness III (C18H43) -or- <b>Dual Enrollment</b> Agribusiness IV (C18H44) -or- <b>Dual Enrollment</b> Agribusiness V (C18H67) -or- <b>Dual Enrollment</b> Agribusiness VI (C18H68) -or- <b>Dual Enrollment</b> Agribusiness VII (C18H69) -or- <b>Dual Enrollment</b> Agribusiness VIII (C18H70) -or- <b>Dual Enrollment</b> Agribusiness IX (C18H71) -or-

				<b>Dual Enrollment</b> Agribusiness X (C18H72) -or- <b>SDC</b> Introduction to Agriculture Business (C18H10) -or- <b>WBL</b> Agribusiness Career Practicum (C18H61)
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### Agricultural Engineering, Industrial, and Mechanical Systems

2025-2026 Program of Study	Year 1	Year 2	Year 3	Year 4
<b>Agricultural Engineering, Industrial, and Mechanical Systems</b>	Agriscience (C18H19) -or- Foundational Supervised Agricultural Experience I (C18H58)	Principles of Agricultural Mechanics (C18H12) -or- Foundational Supervised Agricultural Experience II (C18HB7)	Agricultural Power & Equipment (C18H13) -or- Capstone Supervised Agricultural Experience (C18H57) -or- <b>Dual Enrollment</b> Agricultural Engineering, Industrial, and Mechanical Systems I (C18H45) -or- <b>Dual Enrollment</b> Agricultural Engineering, Industrial, and Mechanical Systems II (C18H46)	Agricultural Fabrication and Biosystems Engineering (C18H42) -or- Unmanned Aircraft Systems in Agriculture (C18H40) -or- Agriculture, Food, and Natural Resources Practicum (TBD) -or- <b>Dual Enrollment</b> Agricultural Engineering, Industrial, and Mechanical Systems III (C18H47) -or- <b>Dual Enrollment</b> Agricultural Engineering, Industrial, and Mechanical Systems IV (C18H48)

				<p>-or-</p> <p><b>Dual Enrollment</b> Agricultural Engineering, Industrial, and Mechanical Systems V (C18H73)</p> <p>-or-</p> <p><b>Dual Enrollment</b> Agricultural Engineering, Industrial, and Mechanical Systems VI (C18H74)</p> <p>-or-</p> <p><b>Dual Enrollment</b> Agricultural Engineering, Industrial, and Mechanical Systems VII (C18H75)</p> <p>-or-</p> <p><b>Dual Enrollment</b> Agricultural Engineering, Industrial, and Mechanical Systems VIII (C18H76)</p> <p>-or-</p> <p><b>Dual Enrollment</b> Agricultural Engineering, Industrial, and Mechanical Systems IX (C18H77)</p> <p>-or-</p> <p><b>Dual Enrollment</b> Agricultural Engineering, Industrial, and Mechanical Systems X (C18H78)</p> <p>-or-</p> <p><b>WBL</b> Agricultural Engineering, Industrial, and Mechanical Systems Career Practicum (C18H62)</p>
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## Environmental and Natural Resource Management

2025-2026 Program of Study	Year 1	Year 2	Year 3	Year 4
<b>Environmental and Natural Resource Management</b>	Agriscience (C18H19) -or- Foundational Supervised Agricultural Experience I (C18H58)	Applied Environmental Science (C18H25) -or- <b>IGCSE</b> Environmental Management (C18H07) -or- Foundational Supervised Agricultural Experience II (C18HB7)	Plant & Soil Science (C18H15) -or- Capstone Supervised Agricultural Experience (C18H57) -or- <b>Dual Enrollment</b> Environmental & Natural Resource Management I (C18H06) -or- <b>Dual Enrollment</b> Environmental & Natural Resource Management II (C18H36) -or- <b>IB</b> Environmental Systems & Societies I SL (G03H36)	Natural Resources Management (C18H28) -or- Unmanned Aircraft Systems in Agriculture (C18H40) -or- Agriculture, Food, and Natural Resources Practicum (TBD) -or- <b>AP</b> Environmental Science (G03H25) -or- <b>Dual Enrollment</b> Environmental & Natural Resource Management III (C18H49) -or- <b>Dual Enrollment</b> Environmental & Natural Resource Management IV (C18H50) -or- <b>Dual Enrollment</b> Environmental & Natural Resource Management V (C18H79) -or- <b>Dual Enrollment</b> Environmental & Natural Resource Management VI (C18H80)

				<p>-or-</p> <p><b>Dual Enrollment</b> Environmental &amp; Natural Resource Management VII (C18H81)</p> <p>-or-</p> <p><b>Dual Enrollment</b> Environmental &amp; Natural Resource Management VIII (C18H82)</p> <p>-or-</p> <p><b>Dual Enrollment</b> Environmental &amp; Natural Resource Management IX (C18H83)</p> <p>-or-</p> <p><b>Dual Enrollment</b> Environmental &amp; Natural Resource Management X (C18H84)</p> <p>-or-</p> <p><b>IB</b> Environmental Systems &amp; Societies II SL (G03H34)</p> <p>-or-</p> <p><b>WBL</b> Environmental and Natural Resource Management Career Practicum (C18H63)</p>
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**Food Science**

2025-2026 Program of Study	Year 1	Year 2	Year 3	Year 4
<b>Food Science</b>	Agriscience (C18H19) -or- Foundational Supervised Agricultural Experience I (C18H58)	Principles of Food Production (C18H29) -or- Foundational Supervised Agricultural Experience II (C18HB7)	Food Science & Safety (C18H26) -or- Capstone Supervised Agricultural Experience (C18H57) -or- <b>Dual Enrollment</b> Food Science I (C18H04) -or- <b>Dual Enrollment</b> Food Science II (C18H37)	Advanced Food Science (C18H24) -or- Agriculture, Food, and Natural Resources Practicum (TBD) -or- <b>Dual Enrollment</b> Food Science III (C18H51) -or- <b>Dual Enrollment</b> Food Science IV (C18H52) -or- <b>Dual Enrollment</b> Food Science V (C18H85) -or- <b>Dual Enrollment</b> Food Science VI (C18H86) -or- <b>Dual Enrollment</b> Food Science VII (C18H87) -or- <b>Dual Enrollment</b> Food Science VIII (C18H88) -or- <b>Dual Enrollment</b> Food Science IX (C18H89) -or- <b>Dual Enrollment</b> Food Science X (C18H90) -or- <b>WBL</b>

				Food Science Career Practicum (C18H64)
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### Horticulture Science

2025-2026 Program of Study	Year 1	Year 2	Year 3	Year 4
<b>Horticulture Science</b>	Agriscience (C18H19) -or- Foundational Supervised Agricultural Experience (C18H58)	Principles of Plant Science & Hydroculture (C18H30) -or- Foundational Supervised Agricultural Experience II (C18HB7)	Greenhouse Management (C18H17) -or- Capstone Supervised Agricultural Experience (C18H57) -or- <b>SDC</b> Introduction to Plant Science (C18H09) -or- <b>Dual Enrollment</b> Horticulture Science I (C18H05) -or- <b>Dual Enrollment</b> Horticulture Science II (C18H33)	Landscaping & Turf Science (C18H16) -or- Unmanned Aircraft Systems in Agriculture (C18H40) -or- Agriculture, Food, and Natural Resources Practicum (TBD) -or- <b>Dual Enrollment</b> Horticulture Science III (C18H53) -or- <b>Dual Enrollment</b> Horticulture Science IV (C18H54) -or-

				<p><b>Dual Enrollment</b> Horticulture Science V (C18H91) -or-</p> <p><b>Dual Enrollment</b> Horticulture Science VI (C18H92) -or-</p> <p><b>Dual Enrollment</b> Horticulture Science VII (C18H93) -or-</p> <p><b>Dual Enrollment</b> Horticulture Science VIII (C18H94) -or-</p> <p><b>Dual Enrollment</b> Horticulture Science IX (C18H95) -or-</p> <p><b>Dual Enrollment</b> Horticulture Science X (C18H96) -or-</p> <p><b>WBL</b> Horticulture Science Career Practicum (C18H65)</p>
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**Veterinary and Animal Science**

2025-2026 Program of Study	Year 1	Year 2	Year 3	Year 4
<p><b>Veterinary and Animal Science</b></p>	<p>Agriscience (C18H19) -or- Foundational Supervised Agricultural Experience I (C18H58)</p>	<p>Small Animal Science Technologies (C18H20) -or- Foundational Supervised Agricultural Experience II (C18HB7)</p>	<p>Large Animal Science Technologies (C18H27) -or- Capstone Supervised Agricultural Experience (C18H57) -or- <b>Dual Enrollment</b> Veterinary &amp; Animal Science I (C18H01) -or- <b>Dual Enrollment</b> Veterinary &amp; Animal Science II (C18H34)</p>	<p>Veterinary Science Technologies (C18H21) -or- Unmanned Aircraft Systems in Agriculture (C18H40) -or- Agriculture, Food, and Natural Resources Practicum (TBD) -or- <b>Dual Enrollment</b> Veterinary &amp; Animal Science III (C18H55) -or- <b>Dual Enrollment</b> Veterinary &amp; Animal Science IV (C18H56) -or- <b>Dual Enrollment</b> Veterinary &amp; Animal Science V (C18HA7) -or- <b>Dual Enrollment</b> Veterinary &amp; Animal Science VI (C18HA8) -or- <b>Dual Enrollment</b> Veterinary &amp; Animal Science VII (C18HA9) -or- <b>Dual Enrollment</b> Veterinary &amp; Animal Science VIII (C18HB0)</p>

				-or- <b>Dual Enrollment</b> Veterinary & Animal Science IX (C18HB1) -or- <b>Dual Enrollment</b> Veterinary & Animal Science X (C18HB2) -or- <b>WBL</b> Veterinary and Animal Science Career Practicum (C18H66)
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In 2025-26, students will have the option to add courses from the Business, Marketing, and Digital Technology programs to supplement their learning.