Department of Education | College, Career and Technical Education

May 2023

Principles of Food Production

Primary Career Cluster:	Agriculture, Food, & Natural Resources
Consultant:	CTE.Standards@tn.gov
Course Code(s):	C18H29
Prerequisite(s):	*Agriscience* (C18H19)
Credit:	1
Grade Level:	10
Elective Focus - Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture courses.
POS Concentrator	This course satisfies one out of two required courses to meet the Perkins V concentrator definition, when taken in sequence in the approved program of study.
Programs of Study and Sequence:	This is the second course in the *Food Science* program of study.
Aligned Student Organization(s):	FFA: http://www.tnffa.org
Coordinating Work-Based Learning:	All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) program. In addition, teachers who hold an active WBL certificate may offer placement for credit when the requirements of the state board's WBL Framework and the Department's WBL Policy Guide are met. For information, visit https://www.tn.gov/education/educators/career-and-technical-education/work-based-learning.html.
Promoted Tennessee Student Industry Credentials:	Credentials are aligned with postsecondary and employment opportunities and with the competencies and skills that students acquire through their selected program of study. For a listing of promoted student industry credentials, visit https://www.tn.gov/education/educators/career-and-technical-education/student-industry-certification.html.
Teacher Endorsement(s):	048, 150, 448, and 950
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/educators/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html Best for All Central: https://bestforall.tnedu.gov/

Course at a Glance

CTE courses provide students with an opportunity to develop specific academic, technical, and 21st century skills necessary to be successful in career and in life. In pursuit of ensuring every student in Tennessee achieves this level of success, we begin with rigorous course standards which feed into intentionally designed programs of study.

Students engage in industry relevant content through general education integration and experiences such as career and technical student organizations (CTSO) and work-based learning (WBL). Through these experiences, students are immersed with industry standard content and technology, solve industry-based problems, meaningfully interact with industry professionals and use/produce industry specific, informational texts.

Using a Career and Technical Student Organization (CTSO) in Your Classroom

CTSOs are a great resource to put classroom learning into real-life experiences for your students through classroom, regional, state, and national competitions, and leadership opportunities. Below are CTSO connections for this course. This is not an exhaustive list.

- Participate in CTSO Fall Leadership Conference to engage with peers by demonstrating logical thought processes and developing industry specific skills that involve teamwork and project management.
- Participate in FFA career and leadership events (CDE/LDE) that align with this course including Agriscience Fair, Agricultural Issues, Agronomy, Dairy Evaluation, Farm Business Management, Food Science, Land Judging, Livestock Evaluation, Meats Evaluation, Milk Quality, Poultry Evaluation, Parliamentary Procedure, Public Speaking, and Employment Skills.

Using Work-Based Learning (WBL) in Your Classroom

Sustained and coordinated activities that relate to the course content are the key to successful work-based learning. Possible activities for this course include the following. This is not an exhaustive list.

- **Standards 1.1-1.3** | Invite a farmer to talk about the importance of food production (animal and plant agriculture) has on society and government relations.
- **Standards 2.1-2.4** | Have students work with a farmer on developing an annual growing calendar for food crops.
- **Standards 3.1-4.2**| Have the students develop a crop rotation plan for a specific area and have it evaluated by a soil scientist.
- **Standards 5.1-5.5** | Invite a local extension agent to discuss the cattle feed requirements based on their life stages.
- **Standards 6.1-6.3** | Conduct a price point analysis of a food crop and have it evaluated by a farm manager.
- **Standard 7.1** | Develop an informational presentation about the benefits of using biotechnology to produce safe and quality food that is reviewed by industry professionals.

Course Description

Principles of Food Production is an intermediate course in plant and animal agriculture for students interested in pursuing careers in production agriculture or food science. Students study principles related to plant and animal structural anatomy, systems physiology, the economics of production, genetics and biotechnology, and other management approaches associated with plant and animal production. Upon completion of this course, proficient students will be prepared for more advanced coursework in the Food Science program of study.

Course Standards

1. Introduction to Plant and Animal Agriculture and Safety

1.1 Role of Plants and Animals**:** Research the **roles and contributions of plants and animals in meeting the food and fiber needs of society**. Identify and describe the different aspects of plant and livestock production (such as product selection, site selection, optimal development, harvesting, and marketing), and examine characteristics of occupations in the field.

1.2 Importance of Plant and Animal Agriculture: Describe the **scope and economic importance of plant and animal agriculture** in the United States and the world. Summarize trends in crop and livestock production in Tennessee.

1.3 Safety: Review common **laboratory safety procedures for tool and equipment operation** in agricultural laboratories, including but not limited to accident prevention and control procedures. Demonstrate the ability to follow safety and operational procedures in a lab setting and complete a safety test with 100 percent accuracy.

2. Principles of Plant Science for Agricultural Production

2.1 Plant Science Principles and Plant Species: Differentiate between **major plant species used for vegetable, forage, fruit, and agronomic crop production**. Describe the basic principles of plant science required to produce healthy crops for high quality food products.

2.2 Plant Growth and Development: Identify and describe the **general growth and development processes of crops** used for food production. Analyze plant anatomy, physiology, genetics, genomics, and reproduction in the context of plant growth and productivity, including the following:

a. Describe different plant types based on their anatomy and physiology.
b. Identify the part of the plant consumed for different vegetables and fruits.
c. Investigate the relationship between form and function for the major plant structures.
d. Examine the components of the plant reproduction system and identify specific anatomical features on different species and varieties of plants.
e. Summarize the process of cross-breeding and genomics techniques to enhance identified traits and characteristics.

2.3 Disease and Pesticides Control: Relate **principles of disease and parasite control** to the

health, growth, and maintenance of food crops. Compare and contrast methods for disease and parasite controls, distinguishing between prevention and treatment methods.

2.4 Plant Nutrition and Health: Discuss the optimum levels of specific **nutritional factors influencing plant health** (such as pH, nitrogen, potassium, etc.). Identify nutritional deficiencies and disorders and make recommendations for the safe production of major food crops.

3. Principles of Soil Science for Plant and Animal Production

3.1 Soil Classification and Fertility: Evaluate the **physical and chemical properties of soils needed for optimal food crop production**. Perform technical procedures to classify soils for agricultural production by evaluating factors such as soil pH, texture, permeability, drainage class, soil depth, and water holding capacity. Interpret test results and formulate conclusions regarding production use suitability.

3.2 Soil Erosion and Conservation Practices: Evaluate factors that influence **soil erosion rates, and compare soil conservation practices** used to maintain a healthy growing environment for plant and animal production.

3.3 Land Selection and Management Practices: Analyze **land selection and conservation practices that ensure optimal productivity** in crop production and livestock operations. Select best management practices that ensure the appropriate use of land resources and maximize crop yields.

3.4 Site Selection Factors: Identify **environmental factors (such as climate and topography) considered in site selection** to ensure optimal production and economic return in plant and animal production, based on intended use and location (rural, suburban, and urban).

4. Principles of Environmental Science for Plant and Animal Production

4.1 Environmental Science Practices and Principles: Explain sustainable **environmental science practices and principles** applicable to food crops and animal production. Recommend management practices for rural, suburban, and urban settings including a justification that incorporates soil and water conservation principles.

4.2 Pollution: Debate water, air, and noise **pollution issues associated with agricultural production**, and recommend control measures for rural, suburban, and urban areas. Demonstrate adherence to procedures for handling, storing, and disposing of production waste in compliance with relevant laws and regulations in a variety of plant and animal settings.

5. Principles of Animal Science for Agricultural Production

5.1 Breeds: Identify the major **breeds of food production animals** (such as cattle, sheep, goats, poultry, swine, and specialty animals) and their associated food and by-products. Explore the basic principles of animal science needed to produce healthy livestock for high-quality food products such as nutrition, reproduction, and breed selection.

5.2 Animal Science Basics: Identify and describe the **general growth and development processes** of food production animals. Analyze animal anatomy, physiology, genetics, genomics, and reproduction in the context of animal growth and productivity, including the following:
   a. animal types based on their anatomy and physiology,
   b. components of animal reproductive systems and specific anatomical features of different food production species, and
   c. genomic techniques used to enhance identified traits and characteristics.

5.3 Disease and Parasite Control: Determine **livestock disease and parasite control practices** essential to **maintain proper health and growth** of food production animals. Develop a disease and parasite prevention and treatment program for multiple food production species.

5.4 Nutrition: Research **principles of proper nutrition to maximize livestock gains and cost efficiency**, by:
   a. Developing specific diet recommendations, based on animal breed, available resources, costs, and nutritional requirements.
   b. Differentiating between various diet alternatives to determine which feed ration is the most cost effective to obtain maximum production.

5.5 Animal Genetics: Summarize how **heritability, selection intensity, and generation interval are important to genetic change** in food production animals, including:
   a. Explaining how each concept impacts genetic change.
   b. Comparing and contrasting characteristics of each as a tool for animal producers.
   c. Determining how long it will take to get specific traits, using each method.

6. Principles of Agribusiness for Plant and Animal Production

6.1 Economics of Crop and Livestock Production: Identify and critique **factors that influence the economics of crop and livestock production** in the United States and the world. Interpret production costs for various types of plant and animal operations that impact the wholesale cost of food.

6.2 Marketing Methods and Strategies: Explore and compare **marketing methods and strategies** to develop opportunities for specialty plant and animal products in niche markets.

6.3 Global Markets: Identify and describe the **American factors impacting global commodity markets**. Compare and contrast different factors that impact food prices in specific scenarios (such as the impact of a pandemic, economic sanctions, or weather on local food prices).

7. Plant and Animal Biotechnology

7.1 Biotechnology: Examine the role and importance of genetic principles in improving plant and animal production. Summarize important historical **achievements in plant and animal biotechnology.** Research current and e**merging plant and animal biotechnologies used**

in production agriculture. Justify claims surrounding the ethical, legal, practical, and economic issues related to food production and biotechnology with evidence drawn from scientific and professional resources.

Standards Alignment Notes

References to other standards include:

- SAE for All: Evolving the Essentials: All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) program to practice and demonstrate the knowledge and skills learned in their agriculture courses.
- AFNR: National Agriculture, Food, & Natural Resources (AFNR) Career Cluster Content Standards: Students engaged in activities outlined above should be able to demonstrate fluency in Standards AS, BS and PS at the conclusion of the course.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.