# Agricultural and Environmental Systems Career Field

## Agriculture, Food, and Natural Resources

**Subject Code: 010105**

**Course and Unit Descriptions**

**Course Description:**

This first course in the career field is an introduction to Agricultural and Environmental Systems. Students will be introduced to the scope of the Agricultural and Environmental Systems career field. They will examine principles of food science, natural resource management, animal science & management, plant & horticultural science, power technology, and bioscience. Students will examine the FFA organization and Supervised Agricultural Experience programs. Throughout the course, students will develop communication, leadership, and business skills essential to the agriculture industry.

**Unit: Production Agriculture & Agribusiness**

Students will be introduced to the vast operations and opportunities within the Food, Fiber, and Natural Resources Industries. They will explore general agricultural topics such as top grossing commodities, career opportunities within the agribusiness field, as well as terminology essential to the understanding of the agricultural world.

**Outcome 1.1.**

Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

**Competency:**

* + 1. Identify the knowledge, skills, and abilities necessary to succeed in careers.
    2. Identify the scope of career opportunities and the requirements for education, training, certification, licensure, and experience.

1.1.3. Develop a career plan that reflects career interests, pathways, and secondary and postsecondary options.

1.1.4. Describe the role and function of professional organizations, industry associations, and organized labor and use networking techniques to develop and maintain professional relationships.

**Unit: Sustainable Agriculture**

This unit asks the question, what is sustainable agriculture? Students will learn which basic practices will allow the sustainability of life through one’s own efforts in producing agricultural products in various climates and atmospheres.

**Outcome 1.8.**

Operations Management: Plan, organize, and monitor an organization or department to maximize contribution to organizational goals and objectives.

**Competency:**

1.8.9. Develop a budget that reflects the strategies and goals of the organization.

**Outcome 5.12.**

Precision Agriculture: Analyze data from precision agriculture platforms and prepare recommendations.

**Competencies:**

5.12.1. Identify a list of agricultural enterprises that can benefit from precision agriculture.

5.12.8. Apply precision agriculture information to specifically reduce the negative environmental impacts of production practices.

**Outcome 9.1.**

Energy Sources: Identify energy sources according to their economic viability, sustainability, and environmental impact.

**Competency:**

9.1.2. Identify, compare, and contrast renewable energy sources and the technology used to generate energy.

9.1.4. Identify the social, economic, and environmental drivers and barriers that influence the development and use of energy sources.

**Unit: Industrial Technology & Safety**

Students will explore engineering and structural principles utilized in the agriculture industry and the coordinating career opportunities. Topics could include an overview of estimating and building, fundamental principles of metal working, and engine repair. Safety will be an essential underlying theme in all fields explored.

**Outcome 1.1.**

Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

**Competency:**

1.1.3. Develop a career plan that reflects career interests, pathways, and secondary and postsecondary options.

1.1.4. Describe the role and function of professional organizations, industry associations, and organized labor and use networking techniques to develop and maintain professional relationships.

**Outcome 1.12.**

Site and Personal Safety Procedures: Follow site and personal safety procedures in specific situations with specialized tools and equipment, evaluate the situation, and take corrective action.

**Competency:**

1.12.1. Use Occupational Safety and Health Administration (OSHA) defined procedures for identifying employer and employee responsibilities, working in confined spaces, managing worker safety programs, using ground fault circuit interrupters (GFCIs), maintaining clearance and boundaries, and labeling.

1.12.2. Interpret safety signs and symbols.

1.12.5. Identify the location of emergency flush showers, eyewash fountains, Safety Data Sheets (SDSs), fire alarms, and exits.

1.12.7. Select, use, store, maintain, and dispose of personal protective equipment (PPE), appropriate to job tasks, conditions, and materials.

1.12.8. Identify safety hazards and take corrective measures.

1.12.9. Identify, inspect, and use safety equipment appropriate for the task.

1.12.10. Follow established procedures for the administration of first aid and contact emergency medical personnel when necessary.

**Outcome 4.1.**

Tool, Stationary, and Mobile Equipment Maintenance: Inspect, clean, maintain, and perform preventative maintenance on equipment.

**Competency:**

4.1.2. Identify types of hand tools, power tools, and equipment and describe their functions.

**Outcome 4.3.**

Engines: Apply concepts to service components of both small and large internal combustion engines per the OEM (original equipment manufacturer) operators manual.

**Competency:**

4.3.1 Assess the physical and mechanical principles of engine operation, including motion, friction, and thermodynamics.

4.3.5. Compare and contrast two-cycle and four-cycle engines and their operating principles.

**Outcome 5.3.**

Design and Estimate: Interpret basic site plan for desired outcome or company specification.

**Competency:**

5.3.1. Identify, interpret, and use symbols, drawings, prints, and blueprints.

5.3.2. Apply proportional measurement and scale techniques.

**Outcome 5.5.**

Geographic Information Systems (GIS): Employ GIS computer applications to interpret data, maps, and land use.

**Competencies**

5.5.8. Determine one’s position on the earth using GPS.

5.5.12. Identify suitability of given area for agricultural applications.

**Outcome 5.6.**

Construction: Follow architectural plans to construct and repair agricultural structures and hardscapes.

**Competency:**

5.6.2. Lay out, cut, smooth, shape, and bore construction materials.

**Outcome 5.9**

Physics and Metallurgy of Welding: Apply the physics and metallurgy of welding in joining metals.

**Competency:**

5.9.1. Assess how the welding arc produces a weld.

**Outcome 5.10.**

Joining and Cutting Ferrous and Non-Ferrous Materials with Heat: Join and cut ferrous and non-ferrous materials using heat in horizontal and vertical positions.

**Competency:**

5.10.3. Compare and contrast ferrous and non-ferrous material welding operating characteristics and performance.

**Unit: Biotechnology**

Learners will explore introductory principles in biotechnology, including microbiology and genetics to plant and animal research and product development. Students will apply genetic principles to determine genotypes and phenotypes and discover the career opportunities within these industries.

**Outcome 1.1.**

Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

**Competency:**

1.1.3. Develop a career plan that reflects career interests, pathways, and secondary and postsecondary options.

1.1.4. Describe the role and function of professional organizations, industry associations, and organized labor, and use networking techniques to develop and maintain professional relationships.

**Outcome 3.1.**

Research and Experiments: Use scientific methodology to conduct problem-based studies, develop products, and interpret results.

**Competencies**

3.1.1. Design a research plan, including the significance of the problem, purpose, hypotheses, objectives, appropriate controls, independent variables, dependent variables, methods of study, and a list of materials.

3.1.2. Examine sources for credibility.

3.1.6. Create, interpret, and use tabular and graphical displays, and describe the data.

3.1.10. Describe the relationships among variables using correlations and draw conclusions.

3.1.14. Describe how biotechnology products are produced and used in the United States.

3.1.15. Describe how biotechnology products are regulated in the United States.

**Outcome 3.3.**

Specimen, equipment, and chemical handling: Handle, prepare, transport, store, and dispose of specimens and chemicals. Monitor, record, and maintain the integrity of equipment and instrumentation, environmental conditions of the facility and inventory.

**Competencies**

3.3.7. Select personal protective attire for various laboratory protocols.

3.3.8. Identify required tools and procedures of different biosafety levels.

**Outcome. 3.6.**

Molecular-Genetics Technology: Apply knowledge of genetic inheritance and modification to organisms and use genetic information and bioinformatics to analyze specimens.

**Competency:**

3.6.1. Use a Punnett Square to predict and explain Mendel’s Laws, genotype, and phenotype.

**Unit: Food Science**

Students will be exposed to careers in the research, marketing, processing, and packaging techniques applied to the development of food products. Learners will be introduced to nutrient content in the development of food products.

**Outcome 1.1.**

Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

**Competency:**

1.1.3. Develop a career plan that reflects career interests, pathways, and secondary and postsecondary options.

1.1.4. Describe the role and function of professional organizations, industry associations, and organized labor and use networking techniques to develop and maintain professional relationships.

**Outcome 7.2.**

Quality Assurance: Inspect the food production process and locate potential sources of food quality and safety deviations in facilities and prepare a corrective action plan.

**Competency:**

7.2.2. Describe the quality attributes (e.g. color, flavor, texture) that a food product possesses.

**Outcome 7.5.**

Food Product Development: Apply principles of nutrition and human behavior to create a new food prototype.

**Competency:**

7.5.1. Conduct a sensory evaluation of food products.

7.5.4. Identify nutrient values, serving sizes, and nutrient variability for a food product.

**Unit: Animal Science**

Students will be introduced to the five main areas of animals: production, exotic, companion, wildlife, and research. They will examine career opportunities in both the small and large animal sectors as well as learn basic terminology to understand the similarities and differences of each.

**Outcome 1.1.**

Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

**Competency:**

1.1.3. Develop a career plan that reflects career interests, pathways, and secondary and postsecondary options.

1.1.4. Describe the role and function of professional organizations, industry associations, and organized labor and use networking techniques to develop and maintain professional relationships

**Outcome 2.3.**

Care and Management: Apply animal care, management, and record procedures to ensure husbandry and welfare, including managing environmental conditions to ensure health and performance.

**Competency:**

2.3.1. Identify species-specific terminology (gender, age, reproductive status).

2.3.2. Identify, classify, evaluate, and select animal species or breeds for a desired outcome.

**Outcome 5.15**

Animal Behavior: Apply management practices to assure animal welfare considering species-specific behaviors, human safety, social influences, public perception, and regulations associated with animal welfare.

**Competencies:**

5.15.1. Understand social influences, public perception, and regulations that are associated with animal welfare.

5.15.9. Identify and describe the impacts of animal welfare and handling on meat quality and food safety.

**Unit: Plant and Horticulture Science**

Students will be introduced to the main areas of the green industry (e.g. floral, turf grass, crop production, greenhouse management). They will examine career opportunities in both the research and production sectors as well as learn basic terminology to understand the similarities and differences of each.

**Outcome 1.1.**

Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

**Competency:**

1.1.3. Develop a career plan that reflects career interests, pathways, and secondary and postsecondary options.

1.1.4. Describe the role and function of professional organizations, industry associations, and organized labor, and use networking techniques to develop and maintain professional relationships.

**Outcome 8.1.**

Plant Nutrition: Select and apply macronutrients and micronutrients based on deficiencies identified from the use of industry driven testing, application, methods, and optimum management strategies that account for environmental factors.

**Competency:**

8.1.3. Identify and describe the nutrient recommendations of a plant for a desired production.

**Outcome 8.4.**

Growth and Management: Explain, manage, and manipulate plants through all stages of growth and development.

**Competency:**

8.4.1. Identify and classify plants using taxonomy.

8.4.2 Identify plant anatomical structures and their functions.

8.4.5. Explain the requirements of photosynthesis and identify the products and byproducts.

**Unit: Natural Resources**

Students will be introduced to the various career opportunities in the natural resources areas, including forestry and wildlife, natural resource and energy management, and water quality control. They will be exposed to the relationships between organisms and their environment.

**Outcome 1.1.**

Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

**Competency:**

1.1.3. Develop a career plan that reflects career interests, pathways, and secondary and postsecondary options.

1.1.4. Describe the role and function of professional organizations, industry associations, and organized labor and use networking techniques to develop and maintain professional relationships.

**Outcome 6.1.**

Soils: Apply knowledge of soil characteristics and soil information resources to overcome any existing soil use limitations while maintaining or improving soil quality.

**Competency:**

6.1.1. Identify soil forming factors and explain how they produce variability in soils.

6.1.3. Collect, test, and analyze soil samples for physical and chemical properties.

**Outcome 6.2.**

Water Quality: Analyze, interpret, and manage the biological, chemical, and physical properties of water quality.

**Competency:**

6.2.1. Assess and explain the interactions between human activities and the Earth’s hydrosphere (e.g., septic systems, desalinization, point and non-point source pollution).

**Outcome 6.11.**

Habitat Management and Restoration: Develop a plan for the management and restoration of a specific habitat.

**Competency:**

6.11.3. Evaluate the current and historical (e.g., industrialism, agriculture, climate change) impacts of human interactions on ecosystems and habitats.

6.11.4. Identify and differentiate extinct, endangered, extirpated, threatened, and species of concern.

**Outcome 9.1.**

Energy Sources: Identify energy sources according to their economic viability, sustainability, and environmental impact.

**Competency:**

9.1.1. Identify, compare, and contrast fossil fuel sources (e.g., oil, natural gas, and coal) and the technology used to generate energy.

9.1.2. Identify, compare, and contrast renewable energy sources and the technology used to generate energy.

9.1.3. Identify, compare, and contrast alternative and emerging energy sources and technology used to generate energy (e.g., fuel cells, hydrogen, nuclear).

9.1.4. Identify the social, economic, and environmental drivers and barriers that influence the development and use of energy sources.

**Unit: Supervised Agricultural Experiences and Record Keeping**

Students will use technology such as word processors, databases, spreadsheets, and electronic mail to maintain accurate business records. They will explore entrepreneurial ventures as well as research, placement, and exploratory work-based learning options.

**Outcome 1.1.**

Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

**Competency:**

1.1.3. Develop a career plan that reflects career interests, pathways, and secondary and postsecondary options.

1.1.4. Describe the role and function of professional organizations, industry associations, and organized labor, and use networking techniques to develop and maintain professional relationships.

**Outcome 1.4.**

Knowledge Management and Information Technology: Demonstrate current and emerging strategies and technologies used to collect, analyze, record, and share information in business operations.

**Competency:**

1.4.1. Use office equipment to communicate (e.g., phone, radio equipment, fax machine, scanner, public address systems).

1.4.2. Select and use software applications to locate, record, analyze, and present information (e.g., word processing, e-mail, spreadsheet, databases, presentation, Internet search engines).

1.4.5. Use information technology tools to maintain, secure, and monitor business records.

**Outcome 1.6.**

Business Literacy: Develop foundational skills and knowledge in entrepreneurship, financial literacy, and business operations.

**Competency:**

1.6.1 Identify business opportunities.

1.6.2. Assess the reality of becoming an entrepreneur, including advantages and disadvantages (e.g., risk versus reward, reasons for success and failure).

1.6.3. Explain the importance of planning your business.

1.6.4. Identify types of businesses, ownership, and entities (i.e., individual proprietorships, partnerships, corporations, cooperatives, public, private, profit, not-for-profit).

1.6.11. Describe how all business activities of an organization work within the parameters of a budget.

**Outcome 1.7.**

Entrepreneurship/Entrepreneurs: Analyze the environment in which a business operates, and the economic factors and opportunities associated with self-employment.

**Competency:**

1.7.7. Create a list of personal strengths, weaknesses, skills, and abilities needed to be successful as an entrepreneur.

**Outcome 1.8.**

Operations Management: Plan, organize, and monitor an organization or department to maximize contribution to organizational goals and objectives.

**Competency:**

1.8.9. Develop a budget that reflects the strategies and goals of the organization.

**Outcome 1.9.**

Financial Management: Use financial tools, strategies, and systems to develop, monitor, and control the use of financial resources to ensure personal and business financial well-being.

**Competency:**

1.9.1. Create, analyze, and interpret financial documents (e.g., budgets, income statements).

1.9.2 Identify tax obligations.

1.9.3. Review and summarize savings, investment strategies, and purchasing options (e.g., cash, lease, finance, stocks, bonds).

1.9.8. Identify income sources and expenditures.

**Unit: FFA**

Students will demonstrate how FFA can make a positive influence in leadership skills. Students will lead group discussions, conduct business meetings using Robert’s Rules of Order, as well as demonstrate the professionalism needed to foster positive working relationships. They will be introduced to the structure, history, and opportunities within the organization and how these serve as foundational career skills.

**Outcome 1.1.**

Employability Skills: Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

**Competency:**

1.1.4. Describe the role and function of professional organizations, industry associations, and organized labor, and use networking techniques to develop and maintain professional relationships.

**Outcome 1.2.**

Leadership and Communications: Process, maintain, evaluate, and disseminate information in a business. Develop leadership and team building to promote collaboration.

**Competency:**

1.2.1. Extract relevant, valid information from materials and cite sources of information.

1.2.2. Deliver formal and informal presentations.

1.2.3. Identify and use verbal, nonverbal, and active listening skills to communicate effectively.

1.2.5. Communicate information (e.g., directions, ideas, vision, workplace expectations) for an intended audience and purpose.

1.2.6. Use proper grammar and expression in all aspects of communication.

1.2.7. Use problem-solving and consensus-building techniques to draw conclusions and determine next steps.

1.2.14. Use motivational strategies to accomplish goals.