

# Agricultural and Environmental Systems Career Field Animal and Plant Science

Subject Code: 010125

## Outcome & Competency Descriptions

### Course Description:

Students will apply knowledge of animal and plant science to the agriculture industry. They will be introduced to the value of production animals relative to the agricultural marketplace. Students will engage in animal classification and selection, body systems, along with animal welfare and behavior in relation to the production of animals. Students will learn principles of plant anatomy and physiology, and the role of nutrition, deficiencies and growing environment on plant production. Throughout the course, business principles and professional skills will be examined.

### Strand 1. Business Operations/21st Century Skills

Learners apply principles of economics, business management, marketing and employability in an entrepreneur, manager and employee role to the leadership, planning, developing and analyzing of business enterprises related to the career field.

### 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.

#### Competencies

- 1.1.1. Identify the knowledge, skills and abilities necessary to succeed in careers.
- 1.1.2. 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.

### Outcome: 1.2. Leadership and Communications

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

#### Competencies

- 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.
- 1.2.4. Use negotiation and conflict-resolution skills to reach solutions.
- 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.
- 1.2.13. Identify stakeholders and solicit their opinions.
- 1.2.14. Use motivational strategies to accomplish goals.

### Outcome: 1.3. Business Ethics and Law

Analyze how professional, ethical and legal behavior contributes to continuous improvement in organizational performance and regulatory compliance.

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**Competencies**

- 1.3.1. Analyze how regulatory compliance (e.g., United States Department of Agriculture [USDA], Food and Drug Administration [FDA], United States Department of Interior [USDI], Ohio Livestock Care Standards, water quality standards, local water regulations, building codes) affects business operations and organizational performance.

**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.

**Competencies**

- 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).
- 1.4.4. Use system hardware to support software applications.
- 1.4.5. Use information technology tools to maintain, secure and monitor business records.
- 1.4.6. Use an electronic database to access and create business and technical information.

**Outcome: 1.6. Business Literacy**

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

**Competencies**

- 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).
- 1.6.7. Identify the effect of supply and demand on products and services.
- 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.

**Competencies**

- 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.

**Competencies**

- 1.8.1. Forecast future resources and budgetary needs using financial documents (e.g., balance sheet, demand forecasting, financial ratios).
- 1.8.2. Select and organize resources to develop a product or a service.

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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.

**Competencies**

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

**Outcome: 1.10. Sales and Marketing**

Manage pricing, place, promotion, packaging, positioning and public relations to improve quality customer service.

**Competencies**

- 1.10.1. Identify how the roles of sales, advertising and public relations contribute to a company's brand.
- 1.10.2. Determine the customer's needs and identify solutions.
- 1.10.3. Communicate features, benefits and warranties of a product or service to the customer.
- 1.10.6. Discuss the importance of correct pricing to support a product's or service's positioning in the marketing mix.
- 1.10.8. Use promotional techniques to maximize sales revenues (e.g., advertising, sales promotions, publicity, public relations).
- 1.10.10. Demonstrate sales techniques.

**Outcome: 1.11. Principals of Business Economics**

Examine and employ economic principles, concepts and policies to accomplish organizational goals and objectives.

**Competencies**

- 1.11.3. Use economic indicators to identify economic trends and conditions (e.g., inflation, interest rate fluctuations, unemployment rates).
- 1.11.4. Determine how the quality, quantity and pricing of goods and services are affected by domestic and international competition in a market economy.
- 1.11.8. Identify the relationships between economy, society and environment that lead to sustainability.

*An "X" indicates that the pathway applies to the outcome.*

<b>Pathways</b>	x	Agribusiness and Production Systems	Animal Science and Management	Bioscience	Horticulture
		Natural Resource Management	Power Technology		
<b>Green Practices</b>		Green-specific	Context-dependent	Does not apply	

**Strand 2. Animal Science**

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Learners apply principles of animal anatomy, physiology, genetics, behavior and nutrition to the research and development, selection and reproduction, health and management of animals in domestic and natural environments.

**Outcome: 2.1. Nutrition**

Analyze, formulate, prepare and administer a ration for a population of specific animal species based on economic, nutrition and availability of feed and evaluate its effects on animals.

**Competencies**

- 2.1.2. Determine the role of nutrients and the nutritional requirements of different animal life processes and species.
- 2.1.3. Analyze the nutritional content and quality of feeds.
- 2.1.4. Identify and address major nutrient deficiency and toxicity symptoms.

**Outcome: 2.2. Body Systems**

Describe the interrelationships of animal body systems with growth, development, health, maintenance, reproduction and economic production.

**Competencies**

- 2.2.1. Describe external anatomical parts and their functions.
- 2.2.2. Identify the anatomical parts of the digestive system and describe their physiology.
- 2.2.12. Differentiate between the male and female reproductive system, structures and functions.

**Outcome: 2.3. Care and Management**

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

**Competencies**

- 2.3.1. Identify species-specific terminology based on gender and age.
- 2.3.2. Identify, classify, evaluate and select animal species or breeds for a desired outcome.
- 2.3.5. Perform species-specific animal identification techniques (e.g., chipping, tagging, branding, notching, tattooing).
- 2.3.9. Evaluate and perform animal care procedures throughout the life of the animal.
- 2.3.10. Monitor and evaluate the quality of an animal's habitat and implement corrective methods as needed.

**Outcome: 2.4. Recognizing Diseases and Disorders**

Evaluate animal conditions for species-specific diseases and disorders to assess an animal's health and welfare.

**Competencies**

- 2.4.2. Examine an animal to evaluate its general condition.
- 2.4.8. Explain the health risk of zoonotic diseases on humans and their historical significance and future implications.

**Outcome: 2.5. Animal Health**

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Implement preventive measures, treatment and maintenance options for species-specific diseases and disorders to improve an animal's health and welfare.

**Competencies**

- 2.5.3. Recognize the preventative measures or treatments needed to maintain animal health.
- 2.5.4. Apply basic principles of first-aid.

**Outcome: 2.6. Population Management**

Manage reproduction practices in animal populations across habitats to achieve the desired outcomes and specific goals.

**Competencies**

- 2.6.2. Compare and select superior individuals based on phenotype.
- 2.6.3. Compare and select superior individuals based on breeding values and heritability of the desired traits.

**Outcome: 2.7. Animal Behavior**

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

**Competencies**

- 2.7.1. Understand social influences, public perception and regulations that are associated with animal welfare.
- 2.7.2. Describe the adaptations and special senses (e.g., sight, hearing, smell, touch) of animals and how they contribute to animal behavior.
- 2.7.5. Interpret an animal's intent based on its vocalization, body posture and chemical means of communication.
- 2.7.6. Recognize behavior abnormalities and employ corrective action.

*An "X" indicates that the pathway applies to the outcome.*

<b>Pathways</b>	X	Agribusiness and Production Systems	Animal Science and Management	Bioscience	Horticulture
		Natural Resource Management	Power Technology		
<b>Green Practices</b>		Green-specific	Context-dependent		Does not apply

**Strand 6. Environmental Science**

Learners apply earth, life, and physical sciences to the production, extraction, processing, protection, use, and renewal of both renewable and non-renewable resources.

**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.

**Competencies**

- 6.1.1. Identify soil forming factors and explain how they produce variability in soils.
- 6.1.2. Describe the relationship among physical properties of soils.

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- 6.1.3. Collect, test and analyze soil samples for physical and chemical properties.
- 6.1.4. Identify factors (e.g., climate, vegetation, soil texture, drainage, management practices, landscape) affecting organic matter and its function in soil quality.
- 6.1.5. Determine land use and identify land capabilities classes.
- 6.1.6. Apply soil conservation practices to reduce soil erosion and compaction.
- 6.1.7. Compare and contrast the causes and effects of soil erosion.

**Outcome: 6.2. Water Quality**

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

**Competencies**

- 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).
- 6.2.4. Explain the hydrological cycle (e.g., condensation, evaporation, transpiration) and how human and animal activity impacts the cycle.
- 6.2.5. Explain the biotic and abiotic factors affecting water quality.
- 6.2.7. Implement procedures and management practices that maintain or improve water quality.

**Outcome: 6.3. Air Quality**

Analyze, interpret and manage the biological, chemical and physical properties of air quality.

**Competencies**

- 6.3.5. Explain human and natural factors (e.g., volcanic eruptions, forest fires, greenhouse gases, farming practices, transportation) affecting air quality.

**Outcome: 6.4. Water Use and Management**

Collect, analyze and interpret data for a localized water use and management plan.

**Competencies**

- 6.4.1. Explain the domains of hydrology.
- 6.4.2. Describe the geological and meteorological principles affecting water supplies.

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<b>Green Practices</b>		Green-specific	Context-dependent	Does not apply	

**Strand 7. Food Science**

Learners apply principles of biology, chemistry and physics to the research, development, production, processing and distribution of food products meeting quality assurance standards in a system that is safe and secure.

**Outcome: 7.5. Food Product Development**

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Apply principles of nutrition and human behavior to create a new food prototype that meets a specific dietary need or demand for consumption, design packaging and seek label approval.

#### Competencies

7.5.2. Identify consumer preferences, trends and opportunities affecting food product development.

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<b>Pathways</b>	X	Agribusiness and Production Systems	Animal Science and Management	Bioscience	Horticulture
		Natural Resource Management	Power Technology		
<b>Green Practices</b>		Green-specific	Context-dependent	Does not apply	

#### Strand 8. Plant Science

Learners apply principles of plant anatomy, physiology, nutrition and genetics to the research and development, selection and reproduction, planting, fertilization, health, harvesting and management of plants in a domestic and/or natural environment.

#### Outcome: 8.1. Plant Nutrition

Select and apply macronutrients and micronutrients based on deficiencies identified using testing application methods and optimum management that account for environmental factors.

#### Competencies

- 8.1.1. Compare and contrast organic and inorganic sources of macronutrients and micronutrients.
- 8.1.2. Describe the functions of macronutrients and micronutrients in plants and the role that microorganisms play in plant nutrition.
- 8.1.3. Determine the nutrient requirements of plants.
- 8.1.4. Identify symptoms and causes of plant nutrient deficiencies and toxicities.

#### Outcome: 8.2. Plant Reproduction

Propagate and cultivate plants for specific characteristics and economic variables for both greenhouses and crops.

#### Competencies

- 8.2.1. Identify the reproductive anatomy of plants and describe their physiological functions.
- 8.2.2. Describe how biotic and abiotic factors (e.g., insects, light, temperature, microorganisms, moisture, location) influence and optimize plant reproduction.
- 8.2.3. Compare and contrast variations of plant reproductive systems among plant species.

#### Outcome: 8.3. Pest Management

Develop and implement an integrated pest management (IPM) plan by scouting and identifying specific plant pests and the damage they cause and apply specialized control methods.

#### Competencies

- 8.3.1. Identify and classify insect, weed, disease and animal pests.

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- 8.3.2. Examine the interrelationships among plants, pests, humans and the environment.
- 8.3.3. Analyze and calculate the economic threshold of pest damage.

**Outcome: 8.4. Growth and Management**

Manage and manipulate plant development through the selection, planting and growing of seeds and plants, based on global demand, economic importance and growing conditions.

**Competencies**

- 8.4.1. Identify and classify plants using taxonomy.
- 8.4.2. Identify plant anatomical structures and tissues.
- 8.4.3. Identify and classify seeds and plants at all stages of growth.
- 8.4.4. Explain requirements necessary for photosynthesis to occur and identify the products and byproducts of photosynthesis.
- 8.4.6. Identify the principles of primary and secondary plant growth.
- 8.4.10. Select, evaluate and prepare soil or media for planting.
- 8.4.11. Understand and evaluate the process by which plants are selected.
- 8.4.12. Evaluate and implement planting practices (e.g., population rate, germination, seed vigor, inoculation, seed and plant treatments, type of planter, cuttings, pot in pot).
- 8.4.14. Control plant growth through mechanical and chemical means.
- 8.4.15. Analyze plant water requirements and provide water through artificial or natural means.
- 8.4.16. Explain the process and importance of transpiration in plant growth and development.
- 8.4.17. Recognize plant disease symptoms, prevention, avoidance, and treatments.

**Outcome: 8.5. Harvesting**

Evaluate and implement harvesting methods to maximize yield.

**Competencies**

- 8.5.1. Identify characteristics of grains, seeds, vegetables, fruits and ornamental plants that indicate crop maturity.
- 8.5.5. Calculate potential yield and loss due to harvesting.
- 8.5.6. Evaluate the impact of harvest techniques on the quality of plants and plant products.
- 8.5.7. Identify harvesting methods and harvesting equipment.

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<b>Pathways</b>	X	Agribusiness and Production Systems	Animal Science and Management	Bioscience	Horticulture
		Natural Resource Management	Power Technology		
<b>Green Practices</b>		Green-specific	Context-dependent	Does not apply	