# Agricultural and Environmental Systems Career Field

## Greenhouse and Nursery Management

**Subject Code: 010610**

**Outcome & Competency Descriptions**

**Course Description:**

Students will learn the operational practices needed for the successful growth of nursery stock and/or greenhouse plants. They will learn essential greenhouse practices including water and fertilizer distribution, lighting, ventilation and temperature control. Students will learn pest and disease identification and methods of control. Students will demonstrate knowledge of plant propagation, health, nutrition, and growth. Throughout this course, business and employability skills will be emphasized.

**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.

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

1.1.6. Explain the importance of work ethic, accountability and responsibility and demonstrate associated behaviors in fulfilling personal, community and workplace roles.

1.1.8. Identify the correlation between emotions, behavior and appearance and manage those to establish and maintain professionalism.

1.1.9. Give and receive constructive feedback to improve work habits.

1.1.10. Adapt personal coping skills to adjust to taxing workplace demands.

1.1.12. Identify healthy lifestyles that reduce the risk of chronic disease, unsafe habits and abusive behavior.

**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.

1.2.10. Use interpersonal skills to provide group leadership, promote collaboration, and work in a team.

1.2.11. Write professional correspondence, documents, job applications and resumés.

1.2.12. Use technical writing skills to complete forms and create reports.

**Outcome: 1.3. Business Ethics and Law**

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

**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.

1.3.2. Follow protocols and practices necessary to maintain a clean, safe and healthy work environment.

1.3.3. Use ethical character traits consistent with workplace standards (e.g., honesty, personal integrity, compassion, justice).

1.3.4. Identify how federal and state consumer protection laws affect products and services.

1.3.5. Access and implement safety compliance measures (e.g., quality assurance information, safety data sheets [SDSs], product safety data sheets [PSDSs], United States Environmental Protection Agency [EPA], United States Occupational Safety and Health Administration [OSHA]) that contribute to the continuous improvement of the organization.

1.3.7. Identify the labor laws that affect employment and the consequences of noncompliance for both employee and employer (e.g., harassment, labor, employment, employment interview, testing, minor labor laws, Americans with Disabilities Act, Fair Labor Standards Acts, Equal Employment Opportunity Commission [EEOC]).

1.3.9. Identify potential conflicts of interest (e.g., personal gain, project bidding) between personal, organizational and professional ethical standards.

**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).

**Outcome: 1.5.**  **Global Environment**

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

**Competencies**

1.5.2. Identify business opportunities.

1.5.3. Describe organizational structure, chain of command, the roles and responsibilities of the organizational departments and interdepartmental interactions.

**Outcome: 1.6. Business Literacy**

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

**Competencies**

1.6.1. Identify business opportunities.

1.6.5. Describe organizational structure, chain of command, the roles and responsibilities of the organizational departments and interdepartmental interactions.

1.6.9. Explain how the performance of an employee, a department and an organization is assessed.

**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.

1.10.4. Identify the company policies and procedures for initiating product and service improvements.

1.10.5. Monitor customer expectations and determine product/service satisfaction by using measurement tools.

1.10.6. Discuss the importance of correct pricing to support a product’s or service’s positioning in the marketing mix.

1.10.7. Describe the importance and diversity of distribution channels (i.e., direct, indirect) to sell a product.

1.10.8. Use promotional techniques to maximize sales revenues (e.g., advertising, sales promotions, publicity, public relations).

1.10.9. Describe how product mix (e.g., product line, product items) maximizes sales revenues, market share and profit margin.

1.10.10. Demonstrate sales techniques.

**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.

**Competencies**

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.

1.12.7. 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.

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

1.12.17. Identify symptoms of exposure to health-threatening environments (e.g., temperature; chemical noise, vibration, harshness [NVH] hazards).

**Strand 3.**  **Biotechnology**

Learners engage in the scientific process, learn fundamental process using modern tools and laboratory techniques, adhere to safety protocols, and bring a biotechnology product to the market.

**Outcome: 3.1. Research and Experiments**

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

**Competencies**

3.1.3. Apply sampling methods that appropriately represent the population and implement procedures for systematic data collection.

**Outcome: 3.5. Microbiology Testing and Technology**

Classify, differentiate between, and test for various kinds of microorganisms and microbial by-products.

**Competencies**

3.5.9. Obtain specimens for microbiological testing.

**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.

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

6.1.4. Identify and describe factors (e.g., climate, soil texture, mineralogy, soil organisms, drainage co-efficient, land use, vegetation types, management practices) affecting organic matter and its function in soil quality.

**Outcome: 6.2. Water Quality**

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

**Competencies**

6.2.4. Explain the hydrological cycle and how human and animal activity impacts the cycle.

6.2.5. Explain the biotic and abiotic factors affecting water quality.

6.2.6. Monitor and analyze water quality and quantity.

6.2.7. Identify and describe best management and industry (e.g., agriculture, timber, construction) production practices that maintain or improve water quality.

**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 from the use of industry-driven testing and application methods and optimum management strategies 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. Identify and describe the nutrient recommendations of a plant for a desire production setting.

8.1.4. Identify symptoms and causes of plant nutrient deficiencies and toxicities.

8.1.5. Collect soil and plant tissue for testing and analysis using standard industry practice.

8.1.6. Analyze and draw conclusions from soil and plant tissue test data and determine management recommendations for increasing production, increasing profitability, enhancing environmental protection and improved sustainability.

8.1.7. Distinguish between biotic and abiotic factors (e.g., soil type, minerals, pH, microorganisms) that influence and optimize the availability of nutrients for plants.

8.1.8. Calculate nutrient requirements and select nutrient sources and additives for highest potential yield.

8.1.9. Calculate nutrient requirements and select nutrient sources and additives for the highest return on investment.

8.1.10. Determine the nutrient content of organic and inorganic fertilizers.

8.1.11. Select the methods and time of nutrient application and apply nutrients.

8.1.12. Describe and apply the 5 R's of nutrient management: (1) right source of fertilizer at the (2) right rate at the (3) right time in the (4) right place with the (5) right irrigation method.

**Outcome: 8.2. Plant Reproduction**

Propagate plants and cultivars for specific performance characteristics under a variety of production systems.

**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 plant reproduction.

8.2.3. Compare and contrast variations of plant reproductive systems among plant species.

8.2.4. Describe how artificial selection methods are used in plant breeding to improve plant traits.

8.2.5 Select and apply methods of asexual plant propagation.

**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 applying specialized control methods.

**Competencies**

8.3.1. Identify and classify insects, weeds, pathogens, animal pests and describe the damage they cause.

8.3.2. Examine the interrelationships of the disease triangle among host, pathogen, and environment.

8.3.3. Analyze and calculate the economic threshold of pest damage.

8.3.4. Determine the components of an integrated pest management plan and related safety practices.

8.3.5. Describe native and transgenic adaptations and modifications that led to plant tolerance or resistance to fungal, bacteria, and insect pests.

8.3.6. Describe the types and functions of biological and mechanical control methods.

8.3.7. Develop an IPM plan, based on pest life cycles, available treatments, application methods and evaluate its impact on the environment (e.g. drift, application rate and long-term soil health).

**Outcome: 8.4. Growth and Management**

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

**Competencies**

8.4.1. Identify and classify plants using taxonomy.

8.4.2. Identify plant anatomical structures and their functions.

8.4.3. Identify and classify seeds.

8.4.4. Identify and classify plants and describe management decisions at all stages.

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

8.4.6 Explain the process and importance of transpiration in plant growth and development.

8.4.7. Understand aerobic respiration and its relationship to plant growth and management.

8.4.8. Explain primary and secondary plant growth.

8.4.9. Identify the plant responses to plant growth regulators and different forms of tropism.

8.4.10. Understand the environmental and artificial factors that influence plant germination, growth, and development.

8.4.11. Select, evaluate and prepare soil or media for planting.

8.4.12. Understand and evaluate the process by which plants are selected in relation to production use.

8.4.13. Evaluate and implement planting practices.

8.4.14 Describe factors related to seed quality, treatment, and density that affect emergence, stand uniformity and seedling health.

8.4.15. Evaluate and implement transplanting practices.

8.4.16. Control plant growth through mechanical and chemical means.

8.4.17. Analyze plant water requirements and describe methods of irrigation.

8.4.18. Compare and contrast inorganic and organic production practices.

8.4.19. Identify and describe production practices that lead to plant resistance and tolerance.

8.4.20. Compare and contrast management practices in controlled and natural growing environments.

8.4.21. Distinguish between biotic and abiotic factors that influence plant stress.

**Outcome: 8.6. Handling and Storage**

Handle and store plants and plant products to maximize quality and longevity.

**Competencies**

8.6.1. Describe safety precautions in handling and storage practices.

8.6.2. Explain, monitor, and manipulate conditions for optimal handling and storage of plants and plant products.

8.6.4. Prepare products for sale, transportation and storage.

8.6.5. Identify storage methods and storage capacity for plants and plant products.

8.6.6. Explain the reasons for preparing plants and plant products for distribution.

8.6.7. Implement and evaluate techniques for grading, handling, blending, segregating, packaging, and loading plants and plant products for distribution or transportation.