Appendix N

AGRICULTURE, FOOD, AND NATURAL RESOURCES (AFNR)
YOUTH APPRENTICESHIP

PLANT PATHWAY
PLANT BASICS UNIT
UNIT 6
Unit 6: Plant Pathway
Plant Basics

Competency

1. Prepare planting spaces

Performance Standard Condition

Competence will be demonstrated
- at the worksite

Performance Standard Criteria

Performance will be successful when the learner:
- Makes site measurements
- Evaluates site for easements, setbacks, etc, if applicable
- Ensures utility companies have pre-marked locations of buried utility lines
- Produces maps using drawings, surveys, CAD, and/or geospatial computerized applications
- Obtains appropriate soil/media OR prepare current soil
- Prunes or trims around space to allow for appropriate lighting and air circulation
- Removes sticks, stones, and other trash
- Removes plant debris that may harbor insects and diseases
- Tills current soil
- Levels site
- Takes soil sample to determine fertilizer needs

Learning Objectives

• Describe the various uses of plants in everyday life
• Identify important types of plants and explain their uses
• Identify land use management regulations
• Compare local land use management systems

EROSION & DEGRADATION

• Describe soil degradation
• Identify sources of soil degradation
• Examine management strategies that limit soil degradation
• Define soil erosion
• Identify the causes of soil erosion
• Explain the ways in which different types of wind erosion occur and the associated problems
• Distinguish between the different types of water erosion
• Discuss erosion control methods

Comments:
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Plant Basics

Competency

2. Prepare soils/media

Performance Standard Condition

**Competence will be demonstrated**
- at the worksite

Performance Standard Criteria

**Performance will be successful when the learner:**
- Collects sample from soil or media
- Tests soil/media OR send sample for testing
- Evaluates soil/media permeability and water-holding capacity
- Interprets tests of soil/media with worksite professional
- **Assists to** develop planting and fertilization plan with worksite professional based on plants to be grown
- Plows or tills or turns soil to appropriate depth
- **Mixes fertilizers and additives**
- **Applies fertilizers**

Learning Objectives

- List major soil components and types
- Explain how soil structure, texture, pH and salinity affect plant growth
- Describe organisms found in soil and their benefits to the soil
- Describe the ways plants use soil
- Identify soil formation factors
- Describe how time and weathering affect properties of soil
- Examine how climate affects the development of soil
- Analyze soil/media limitations related to crop production, greenhouse production and/or landscape utilization
- Explain moisture-holding capacity
- Explain what determines a soil’s moisture-holding capacity
- Examine the difference between soil, soil-less media and hydroponics
- Examine the effects of media components on plant growth

Comments:
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Competency

3. Plant seeds, seedlings, or cuttings

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when the learner:

- Obtains seeds, seedlings, or cuttings to be planted
- Removes any plastic or paper pots
- Cracks peat pots
- Determines spacing of plants
- Add seeds, seedlings, or cuttings as required to appropriate depths
- Adds any nutrient mix or solution as required
- Covers with fine soil/media
- Waters generously with a gentle spray or mist
- Stores or discards any leftover seed as required

Learning Objectives

PLANT BASICS

- Describe the components of a plant cell and explain their functions
- Identify and describe the basic types of plant cells
- Define basic Mendelian principles: dominance, recessive, incomplete dominance, etc.
- Discuss the importance of improved organisms in agriculture
- Identify methods used in agriscience to improve organisms
- Describe plant taxonomy and hierarchical classification
- Explain plant nomenclature

ROOTS

- Describe the parts and functions of roots
- Explain root growth
- Describe how roots absorb water and nutrients
- Recognize the characteristics of a healthy root system

STEMS

- Describe the parts and functions of a stem
- Compare types of specialized stems
- Explain factors involved in translocation

LEAVES

- Identify the parts and functions of leaves
- Identify and describe the patterns of leaf arrangement

FLOWERS

- Identify the parts of flowers and explain their functions
- Compare and contrast types of flowers

FRUIT
• Define fruit and describe its functions
• Compare and contrast the basic types of fruits
• Describe fruit development
• Identify the parts of a fruit
• Describe how seedless fruits are produced

SEEDS
• List the parts of a seed
• Describe the process of seed germination
• Discuss the conditions required for seed germination
• Explain the importance of seed quality

Comments:
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Competency

4. **Monitor plants for light, moisture, and temperature requirements**

Performance Standard Condition

*Competence will be demonstrated*
- at the worksite

Performance Standard Criteria

**Performance will be successful when the learner:**
- Periodically checks the planting spaces as required
- Prior to germination, keeps seeds thoroughly watered
- After germination, pulls any excess seedlings
- Waters during dry periods
- Covers during frost periods
- Controls weeds by pulling, mulching, etc.
- Monitors plants for insects and disease signs
- After harvesting, removes spent plant debris into compost

Learning Objectives

- Explain the growth processes of photosynthesis, respirations and transpiration
- **LIGHT**
  - Examine the role of chloroplasts and plant pigments in photosynthesis
  - Analyze the major steps involved in photosynthesis
  - Identify factors that affect photosynthesis
  - Describe the role of the sun, sugar, oxygen, carbon dioxide, and water in photosynthesis
  - Describe the effects of light quality, quantity and duration on plant growth
- **CELL RESPIRATION**
  - Describe the respiration process in the breakdown of food and organic matter
  - Identify factors that affect cellular respiration
- **TEMPERATURE**
  - Discuss the effect of temperature on plant growth
  - Describe plant responses to temperature
  - Explain cardinal temperature range for growth and survival of common plants
  - Explain plant hardiness and heat tolerance
- **MOISTURE**
  - Identify important characteristics of water
  - Explain the hydrologic cycle
  - Describe the functions of water in plant growth
  - Explain plant responses to water shortage and to excess water
- **OTHER**
  - Compare annual, biennial and perennial life cycles
  - Explain growing degree days
  - Calculate growing degree days
  - Explain the effects of humidity on plant growth
• Discuss the effects of air pollution on plant growth

Comments:
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Competency

5. Assist to install and maintain watering and/or irrigation systems

Performance Standard Condition

**Competence will be demonstrated**
- at the worksite
- while assisting a worksite professional

Performance Standard Criteria

**Performance will be successful when the learner:**
- Determines irrigation requirements
- Verifies local building codes that must be followed
- Ensures utility companies have pre-marked locations of buried utility lines
- Reviews manufacturer procedures for the watering/irrigation system chosen
- Sketches or plans locations of watering heads in accordance with types of plantings, buried utility lines, plant irrigation needs, and existing property structures
- Determines water pressure from water source using a water pressure gauge
- Checks the flow rate by calculating gallons per minute or applicable
- Finds spacing of watering heads
- Determines number of watering heads based on head ratings and water source calculations
- Establishes sprinkler circuits and install valves
- Locates controllers and size wiring
- Installs and connects pipes, tubing, watering heads, etc. as required for the type of system
- Monitors and checks system periodically as required by facility or system manufacturer

Learning Objectives
- Compare water delivery and irrigation methods and options
- Determine the need for drainage and describe the benefits of tile drainage
- Examine subsurface drainage techniques and determine the equipment and types of pipe available
- Describe the benefits of irrigation
- Identify ways of determining the need of irrigation
- Describe irrigation scheduling
- Explain methods of water application
- Describe the efficient use of water
- Identify sources of soil water depletion
- Describe soil conditions conducive to artificial drainage
- Describe soil conditions conducive to irrigation
- Explain how watering systems are chosen based on planting space shape, type of plants, adaptability and cost
- List contaminants in water that come from agriculture
- Describe how agricultural practices affect drinking water quality
• Describe how agricultural chemicals and sediments move to off-site areas
• Explain how nitrogen and phosphorus affect surface and ground water quality
• Explain the purposes of filter/buffer strips and riparian areas/tree plantings on water quality

Comments:
Competency

6. Mix fertilizers and additives

Performance Standard Condition

**Competence will be demonstrated**
- at the worksite

Performance Standard Criteria

**Performance will be successful when the learner:**
- Determines the nutrient requirements based on soil report with worksite professional
- Calculates the proper amount and type of fertilizer to apply for the soil and type of plants to be grown with worksite professional
- Reviews the safety requirements for the mixing procedure
- Wears any appropriate PPE
- Obtains the appropriate equipment, supplies and fertilizers/additives
- Mixes the fertilizer ingredients in the appropriate ratios using the appropriate containers
- Labels fertilizer mixture
- Documents mixing process
- Cleans equipment
- Discards any excess disposable materials as required

Learning Objectives

- Define nutrient
- Discuss the role of the essential nutrients in plant growth
- Compare types, uses, and applications of fertilizers
- Identify non-fertilizer nutrients and describe their functions
- Identify macro and micronutrients and describe their functions
- Describe the meaning and importance of soil fertility
- Define pH and discuss its role in plant nutrition
- Describe environmental conditions that influence nutrient deficiencies
- Explain the development of a nutrient management plan
- Describe organic and inorganic fertilizers
- Explain fertilizer analysis, grade, and ratio
- Explain the mixing of fertilizers
- Describe the selection of fertilizers
- Identify classes of plant growth regulators
- Discuss how and why synthetic growth regulators are used
- Describe commercial uses of plant growth regulators

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Competency
7. Apply fertilizers

Performance Standard Condition

Competence will be demonstrated
• at the worksite

Performance Standard Criteria

Performance will be successful when the learner:
• Checks the facility fertilization plan
• Determines the need for the application of fertilizer
• Mixes the fertilizers and additives
• Reviews any safety requirements for the application procedure
• Wears any appropriate PPE
• Obtains the appropriate equipment, supplies and fertilizers mixtures
• Identifies the most appropriate method of fertilizer application
• Determines the appropriate fertilizer application rate
• Fertilizes the plants as required
• Documents fertilization process
• Cleans equipment
• Discards or stores any excess fertilizer as required

Learning Objectives
• Examine the equipment and technology used to apply fertilizers
• Identify forms of nitrogen and describe their characteristics
• Identify and describe the symptoms of nitrogen deficiency and nitrogen toxicity
• Describe the nitrogen cycle and explain how it influences the availability of nitrogen to plants
• Identify plants capable of nitrogen fixation and describe factors that influence nitrogen fixation
• Identify and describe natural and synthetic fertilizer sources of nitrogen
• Identify the forms of phosphorus in soil
• Examine factors that affect phosphorus availability
• Identify and describe symptoms of phosphorus deficiency and phosphorus toxicity
• Identify and describe fertilizer sources of phosphorus
• Describe the availability of potassium to plants
• Identify and describe symptoms of potassium deficiency and potassium toxicity
• Identify and describe the fertilizer sources of potassium
• Identify the forms of calcium, magnesium, and sulfur in soil and identify their fertilizer sources
• Identify the fertilizer sources of micronutrients
• Identify and describe symptoms of nutrient deficiency and toxicity from secondary macronutrients and micronutrients
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Competency

8. Manage inventory

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when the learner:**

- Checks incoming items for damage
- Verifies incoming items match purchase order and description
- Notifies appropriate parties and take corrective action when defective items are identified
- Monitors location of items
- Monitors inventory use for ordering levels
- Assists worksite professional to perform inventory checks
- Checks that proper inventory levels are maintained
- Rotates items to minimize old and outdated inventory
- Performs inventory counts
- Assists with inventory inaccuracies investigations
- Documents inventory activities

Learning Objectives

- Explain the purpose of an inventory plan
- Identify the costs of maintaining inventory
- List methods of productivity measurement and just-in-time inventory control
- Explain the importance of maintaining inventory levels to minimize inventory value
- Discuss the timing of inventory audits to production requirements
- Describe your facility’s policy in the event of inventory shortage
- List examples of situations that indicate the need for a review of storage and retrieval systems to determine if upgrades and replacement are warranted

Comments:
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Competency  
9. Maintain agribusiness records

Performance Standard Condition  
**Competence will be demonstrated**  
- at the worksite

Performance Standard Criteria  
**Performance will be successful when the learner:**  
- Selects appropriate forms/records  
- Labels and/or codes documents as required  
- Files forms/records in appropriate location  
- Retrieves and replaces files in correct position  
- Adds, Edits, Verifies and Queries data in electronic files if applicable  
- Uses appropriate computer codes, formatting, macros, charts, spreadsheets, etc.  
- Verifies data prior to entry/storage  
- Maintains files as required

Learning Objectives  
- Describe the functions of business records  
- Identify common kinds of business records  
- Define terms used in horticulture records  
- Discuss common legal forms used in horticulture services  
- Explain why record keeping is necessary to assess the current financial condition of a business and why it is helpful in planning and preparing for the future  
- Identify and describe the characteristics of good record keeping  
- Compare manual and electronic record keeping systems  
- Demonstrate how electronic data is manipulated such as in a spreadsheet system  
- Explain how data & files are stored and “backed up”  
- Describe the purpose of security and ID information within record keeping systems

Comments:
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Competency

10. Evaluate the facility business and marketing plan

Performance Standard Condition

Competence will be demonstrated
- at the worksite OR in the classroom in a simulated setting
- NOTE: A simulated setting should ONLY be used IF there is no possibility of skill performance at the worksite

Performance Standard Criteria

Performance will be successful when the learner:
- Identifies the goals and objectives for the business
- Verifies records are kept and maintained on finances, production, plant health, harvest, and sales as required
- Identifies what products are for sale
- Identifies pricing goals
- Describes how product will be merchandised
- Evaluates cost of production
- Evaluates pricing opportunities (cash, futures, options)
- Evaluates pricing indicators (supply & demand)
- Reviews the strategy for evaluating and updating the marketing plan
- Identifies markets for selling products

Learning Objectives

- Define agribusiness and describe the sectors of agribusiness
- Identify and describe basic categories of resources, and explain why each is necessary to produce a product
- Explain factors that determine the ability of a business to start successfully
- List and explain the factors that typically contribute to the success and failure of agribusinesses
- Explain the purpose and importance of a business plan
- Describe the parts of a business plan
- Appraise and evaluate the economic value of certain crops and plants for various applications in the agriculture industry
- Review pricing methods
- Explain how to price that includes a reasonable return on investment
- Relate production size to costs
- Calculate various costs- planting, soils, fertilizers, watering, maintenance costs
- Define marketing and the marketing mix
- Define the purpose for developing a marketing plan
- Explain the essential elements of a marketing program
- List marketable plant products and byproducts
- Compare organic plant industry to traditional plant production