

# **Appendix O**

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

### **PLANT PATHWAY CROPS UNIT UNIT 7**

## Unit 7: Plant Pathway Crops

Competency

### 1. Assist to plan crop from rotation schedule

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:**

- Reviews past crop history by crop, sequence of botanical families, performance, production, logistics issues
- Considers field needs and conditions of disease and/or fertility
- Considers companion planting options
- Considers harvest logistics
- Determines field locations of most-profitable, beneficial, and/or at risk crops
- Determines field locations of lower priority crops
- Groups crops according to botanical families
- Groups crops according to maturity dates for simultaneous or sequential harvesting
- Determines crop quantities
- Schedules succession plantings of cash crops
- Determines cover crop types, field locations, and quantities
- Integrates cash & cover crops
- Determines managed fallow field locations

Learning Objectives

- Define land capability and describe ways to improve it
- Identify factors that determine land capability

**CORN**

- Identify the types of corn and their uses
- Identify and describe the parts of a mature corn plant
- Identify and describe the components of a corn seed
- Compare and contrast the characteristics of corn varieties

**WHEAT/GRAINS**

- Identify the types of wheat
- Determine the uses of wheat
- Identify and describe the parts of a mature wheat head
- Compare and contrast the types of wheat flour
- Describe the characteristics used for the selection of wheat varieties
- Compare and contrast oats, barley, and rye, and determine their uses

**SOY**

- Identify the different types of soybeans
- Determine the many uses of soybeans
- Identify and describe the parts of a mature soybean plant

- Identify and describe the components of a soybean seed
- Compare and contrast the characteristics of various soybean varieties
- Examine the soybean seed selection process

#### OILS

- Compare and contrast vegetable oils from soybeans, corn, sunflowers, canola, and peanuts
- Determine the use of valuable byproducts of the oil extraction process

#### FORAGE

- Compare and contrast the common types of forage grasses and legumes
- Determine the steps involved in the hay-making process
- Describe the forage quality standards and explain their importance

#### FIBER

- Compare cotton to other fiber crops

#### VEGETABLES

- Describe the characteristics of potatoes, sweet corn, snap beans, cabbage, and other vegetable crops

#### FRUITS

- Explain how to prepare and plant small fruits
- Explain how to plan and lay out an orchard
- Describe how fruit trees should be planted

#### **Comments:**

## Unit 7: Plant Pathway Crops

Competency

### 2. Till and test the soil

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

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

TILL

- Reviews the safety procedures for tilling the soil
- Adjusts and calibrates equipment according to facility requirements
- Wears any required Personal Protective Equipment (PPE)
- Sets up chisel plow OR Disc OR other
- Adjusts depth of disc AND adjust disc for level operation
- Performs periodic checks to determine accurate depth and angle of chisel OR specific depth of disc is achieved
- Adjusts machinery after periodic checks
- Completes plowing as assigned
- Documents tillage
- Cleans equipment
- Identifies field conditions and report back to worksite professional

TEST

- Checks fertilization plan for testing the soil
- Collects samples of soil/media and/or plant tissue
- Assists worksite professional to test or send sample for soil testing
- Interprets test results of soil/media and/or plant tissue with worksite professional
- Notes deficiencies of nitrogen, phosphorus, potassium, pH, etc.
- Determines mix of fertilizers needed based on soil report with worksite professional
- **Mixes fertilizers and additives**

Learning Objectives

- Describe the safety processes for tilling soil
- Explain why tillage is used in crop production
- Describe tillage methods and their purpose
- Discuss the relationship between tillage systems and soil loss or compaction
- Describe the impact of tillage systems on soil fertility and pest management
- Explain the production practices involved in the seedbed preparation and planting of corn, wheat/grains, and soybeans
- Explain how soils within a profile change over time
- Explain the role of organic matter, soil depth, surface slope, soil organisms, and nutrient balance in soil productivity

**Comments:**

## Unit 7: Plant Pathway Crops

Competency

### 3. Plant crops

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

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

- Reviews rotation and production plans
- Prepares planting and irrigation equipment
- Orders seeds and supplies
- Monitors weather for best day to plant
- **Tills and tests soil** at appropriate times using appropriate tillage
- Adjusts and calibrates equipment according to facility requirements
- Wears any required PPE
- Loads hopper(s) OR other with seeds and fertilizers and additives in appropriate containers. **NOTE:** Only certified professionals can prepare, load, apply, and handle pesticide(s).
- Starts GPS application job if applicable
- Periodically verifies planting depth and number of seeds per acre
- Adjusts depth/number of seeds/acres accordingly
- Completes acreage
- Completes GPS application
- Documents planting map and operation
- Removes excess seed and fertilizer from equipment
- Keeps unused soil covered with cover crops, mulch, trap crops
- Documents time, location, and types of crops on fields

Learning Objectives

- Describe the safety processes for planting crops
- Explain how to monitor and verify planting depth and seed number while planting
- Discuss how to choose appropriate seed quality for planting
- Explain the importance of spatial mapping
- Discuss the concept and principles of spatial mapping
- Describe equipment used for spatial mapping
- List techniques used to spatially map
- Explain the application of GIS/GPS systems with map development output
- Explain how planting preparation differs across geographical areas

**Comments:**

## Unit 7: Plant Pathway Crops

Competency

### 4. Assist to maintain and monitor crops

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:**

- Walks fields regularly to observe crop growth and field conditions
- Scouts for weeds, insects and plant diseases
- Tests soils
- Evaluates records and current information and maps on crops and fields
  - Study existing data on pests, diseases, cover crops, fertility etc.
  - Consult field records for previous years' successes and failures
  - Consult meteorological data
  - Create field maps which include items such as acreage, soils, physical characteristics, frost pockets, air damage and microclimates
- Plots areas with known problems on map
- Analyzes data collected to determine actions to be taken
- Adjusts actions based on field and crop conditions for pest spraying, irrigating, fertilizing, etc. **NOTE:** Only certified professionals can prepare, load, apply, and handle pesticide(s).
- Documents actions taken and results of action

Learning Objectives

- Identify basic principles of crop monitoring
- Describe proper sampling techniques used when monitoring field crops
- Describe the process of scouting for weeds, insects, and plant diseases
- Examine the developmental stages of a corn plant, and determine factors that affect each stage
- Determine the nutrient and climatic requirements of wheat/grains
- Identify and describe the growth stages of a wheat plant and determine factors that affect each stage
- Examine the development stages of a soybean plant
- Analyze the phases of perennial grass growth
- Analyze the stages of forage legume growth
- Describe how forage crops are established and maintained
- Describe the maintenance of a small fruit planting
- Discuss how to maintain the orchard

**Comments:**

## Unit 7: Plant Pathway Crops

Competency

### 5. Assist to prevent the spread of weeds, pests, and diseases

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:**

- Identifies plant pests (e.g., insects, diseases, weeds, rodents)
- Determines pest management safety practices and methods to be used
- Implements pest control plan with appropriate treatments
- Documents pest identity and control actions taken

**INSECTS/RODENTS/DISEASES**

- Arranges for pesticide application or apply pesticide if licensed. **NOTE:** Only certified professionals can prepare, load, apply, and handle pesticide(s).

**WEED CONTROL by row cultivation**

- Row cultivates field to prevent weeds
- Adjusts and calibrates equipment row cultivator to facility requirements
- Wears any required PPE
- Performs test run
- Verifies soil is cultivated to specified depth and desired weed control is achieved
- Adjusts depth of cultivator
- Completes field
- Cleans equipment
- Documents row cultivation

Learning Objectives

- Identify common weeds, insects, nematodes, and diseases that affect corn, wheat, soybeans and forages

**PESTS**

- Identify and describe types of pests
- Describe how pests affect plants and cause economic losses
- Define integrated pest management (IPM) and keys to a successful IPM program
- Compare and contrast the methods used in IPM to control pest problems

**PESTICIDES**

- Define toxicity
- Identify the major classifications of pesticides, and describe how they are used
- Identify the information that should be included on the pesticide label
- Identify the safety practices that should be followed when applying pesticides
- Identify the environmental concerns involved with pesticide use
- Explain pesticide persistence and its impact on the environment

**WEEDS**

- Define weed and explain how weeds affect crops and pasture
- Determine how vegetative characteristics are used to identify weeds
- Identify common weeds in crop production
- Discover how weeds are spread
- Describe methods of weed control
- Describe the types of herbicides

#### INSECTS

- Identify and classify common insects
- Identify insect damage signs
- Describe the biological characteristics of insects
- Compare and contrast the types of insect life cycles
- Explain how insects damage plants
- Describe methods of insect control
- Describe the types of insecticides

#### DISEASES

- Identify and describe the agents that cause infectious and non-infectious plant diseases
- List conditions that are necessary for disease problems
- List and describe common plant diseases caused by bacteria
- Examine methods used to control bacterial diseases
- Describe how fungi diseases are spread
- Examine methods used to control diseases caused by fungi
- List and describe common plant diseases caused by fungi
- Identify symptoms associated with fungi diseases
- Describe common viral plant diseases
- Identify symptoms of viral diseases
- Describe how viral diseases are spread
- Examine methods used to control viral plant diseases
- Identify symptoms of diseases caused by nematodes
- Examine methods used to control the impact from nematodes

#### Comments:



## Unit 7: Plant Pathway Crops

Competency

### 6. Harvest crop product

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

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

- Verifies product is ready for harvest based on facility requirements
- Reviews the safety procedures for harvesting
- Adjusts and calibrates any harvest/combine equipment according to facility requirements
- Wears any required Personal Protective Equipment (PPE)

**AUTOMATED HARVESTS**

- Starts GPS application job if applicable
- Completes a test run
- Walks harvested area of the field to observe machine and header loss
- Makes appropriate adjustments to minimize crop loss
- Continues to harvest
- Off loads to a transport vehicle
- Repeats steps harvest checks and adjustments until the field is harvested
- Completes the GPS application
- Documents harvest map and operation
- Cleans and prepares equipment for next harvest location as required

**MANUAL HARVEST**

- Harvests only product that is mature
- Picks and handles the product carefully to prevent unnecessary damage
- Off loads product to collection containers
- Documents picking
- Cleans equipment

Learning Objectives

- Describe the safety processes for harvesting crops
- Identify harvesting methods and equipment
- Describe factors that influence harvest time including moisture content, hybrid or variety characteristics, product end use and weather
- Explain how to determine crop maturity for corn, wheat and soybeans
- Calculate yield estimates and determine harvest loss
- Estimate the fixed and variable costs to produce an acre of crop
- Determine factors that affect the profitability of crop production
- Examine the effects of wheat shattering
- Describe the vegetable oil extraction process
- Identify harvesting and marketing systems for small fruits

- Explain when and how to harvest tree fruit

**Comments:**

## Unit 7: Plant Pathway Crops

Competency

### 7. Assist to transport and unload crop

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:**

- Identifies and adheres to all related safety standards/regulations
- Determines load capacities and license restrictions of transport vehicle
- Secures load
- Checks load
- Verifies destination
- Transports product to destination
- Weighs transport vehicle prior to unloading, if applicable
- Transfers harvested product to sorting/storage area as required
- Weighs empty transport vehicle, if applicable
- Documents transport and delivery of product with weigh in and weigh out as applicable

Learning Objectives

- Describe safety processes for loading, transporting and unloading crops
- List regulations pertaining to loading/unloading of crops
- Describe different kinds of loading equipment and their applicable safety and regulatory use standards
- Discuss the function of verification at the loading/shipping stage
- List common types of transportation vehicles used for different types of agricultural crops
- Describe storage conditions for transportation required for the crops you work with
- Explain the importance of efficient transportation of crops
- Compare processes for transporting and unloading grain crops, fruit crops and vegetable crops

**Comments:**

## Unit 7: Plant Pathway Crops

Competency

### 8. Inspect, sort, and store product

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

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

- Reviews the safety procedures for sorting and storing
- Adjusts and calibrates any equipment according to facility requirements
- Wears any required Personal Protective Equipment (PPE)
- Sorts through the product prior to storage and removes damaged or diseased product immediately if required
- Confirms that products conform to specified requirements
- If applicable, processes and grades the product prior to shipments for sale or further processing
- Stores product as required for humidity, temperature and in appropriate containers for maximum storage life

**GRAIN DRYING**

- Obtains representative sample
- Calculates moisture content
- Determines amount of time needed for drying
- Operates dryers according to manufacturer's guidelines
- Rechecks moisture content
- Continues process until grain is dried to within to desired level
- Moves grain to storage bin
- Samples grain for insect, mold and rodent damage
  - Insert probe and withdraw sample and inspect for damage
  - Scout interior and exterior of storage bin
  - Report conditions to worksite professional
- Records and documents all drying activities

Learning Objectives

- Compare storage methods for crops
- Describe techniques for grading, handling and packaging crops for distribution
- Describe factors that influence crop quality in storage including temperature, moisture, aeration, pests, crop condition, post-harvest handling and length of storage
- Describe how to maintain purity of an identity-preserved (IP) crop
- Describe the rationale and process for drying grains
- List other post-harvest activities that may occur for fruit, grains, and vegetables
- Discuss the role of the FDA and FDA food storage regulations for maintaining quality product

**Comments:**

## Unit 7: Plant Pathway Crops

Competency

### 9. Operate crop equipment & machinery safely

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

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

- Operates only equipment that he/she is trained on
- Verifies tool/equipment is available for use and in working order
- Verifies tool/equipment is current for preventative maintenance and/or calibration
- Verifies safety equipment and any Personal Protective Equipment (PPE) needed for tool/equipment use
- Inspects tool/equipment and work area for safety considerations
- Sets up and prepares tool/equipment for safe operation including lubrication and fluid level checks
- Wears the required Personal Protective Equipment (PPE) at all times as required for the operation of the tool/equipment
- Operates tool/equipment safely with guarding devices if applicable in the manner required for the job task
- Monitors tool/equipment for safe operation while operating
- Follows procedures for clean up and shut down after use
- Investigates and promptly reports abnormal tool/equipment conditions
- Shuts down and label any tool/equipment that is not operating as expected, if applicable
- Stores tools

Learning Objectives

- List the various tools and equipment used at your worksite such as farm vehicles, crop processing vehicles and equipment, cutting and non-cutting hand tools, sawing machines, diagnostic tools, etc.
- Outline applications of each tool and equipment
- Demonstrate the proper usage of a tool or piece of equipment
- Describe and demonstrate the safety requirements for each tool and equipment
- Discuss start up and shut down procedures for each tool/equipment you will operate
- Describe emergency shutdown procedures for the tool/equipment you will operate
- Describe the characteristics of a tool in need of maintenance
- Explain how to recognize and address malfunctions for the tool/equipment you will operate
- Describe how to recognize wear and tear on equipment components
- Describe regulations for the use of tools and equipment at your facility
- Explain Lock Out/Tag Out indications and procedures
- Compare various crop production tools such as those used for chisel plowing, disc cultivation, combine harvesters, and cultivating & unloading augers

- Identify equipment and structures used to handle, transport, and store corn, wheat/grains, soybean, hay and forage products

**Comments:**

## Unit 7: Plant Pathway Crops

Competency

### 10. Clean and service equipment & machinery

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

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

- Performs required cleaning and preventive maintenance (PM) on equipment as required by schedule
- Reviews safety requirements and PM procedures first
- Sets up and prepares tool/equipment for safe operation including lubrication and fluid level checks
- Maintains fluid levels
- Calibrates metering, monitoring, and sensing equipment
- Refers to technical information manuals for inoperative equipment
- Checks correct amount and types of lubricant, fuel amount, coolant amount, belt tension, temperatures, pressures, gaskets & seals, leaks, etc.
- Arranges for service of vehicles as needed with worksite professional

Learning Objectives

- Define preventative maintenance
- List common agricultural equipment and machinery requirements
- Demonstrate how to replace tool parts and components as needed
- List which tools and equipment require calibration and/or safety certification
- Describe how to use the repair manual to apply repairs and look up parts information
- Discuss the safe operation of 2 stroke and 4 stroke cycle engines
- Describe engine systems and components
- Compare engine cooling, electrical and fuel systems
- Describe physical principles of operations of hydraulic systems
- Describe the general operation of electrical systems (circuits design, starting, charging, and safety circuits)

**Comments:**