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

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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

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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

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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

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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

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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

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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

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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
  o Insert probe and withdraw sample and inspect for damage
  o Scout interior and exterior of storage bin
  o 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:
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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 labels 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

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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: