

# **Kansas Certified Crop Advisor Program**

## **Performance Objectives**

Prepared by:

**Kansas CCA Board  
Subcommittee on Exam Preparation**



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## **KANSAS CERTIFIED CROP ADVISER PERFORMANCE OBJECTIVES**

The Kansas State Performance Objectives are in addition to the National Performance Objectives. These objectives and the expertise within the competency areas are also guidelines for the continuing education requirement for the those who qualify as a Kansas CCA.

Questions for the Kansas CCA State examination will be developed within the scope of the national and state performance objectives. The exam questions will be drawn from the four main competency areas in proportion to the percentages shown below.

### **COMPETENCY AREAS:**

#### **SOIL FERTILITY AND MANAGEMENT (25%)**

- I. Soil and nutrient interaction
2. Soil pH and liming
3. Major nutrients (N, P, and K)
4. Secondary nutrients and micronutrients
5. Soil test reports and nutrient recommendations
6. Nutrient sources and application methods
7. Soil amendments

#### **PEST MANAGEMENT (40%)**

1. Weed management
2. Plant disease management
3. Insect management
4. Integrated pest management
5. Government regulations

#### **SOIL AND WATER MANAGEMENT (15%)**

1. Basic physical properties of soil
2. Soil water management
3. Soil conservation
4. Irrigation management
5. Managing for water quality

#### **CROP PRODUCTION (20%)**

1. Crop growth and adaption
2. Basic principles of forage production
3. Planting and seeding management
4. Crop damage, mortality, and factors influencing replanting decisions.
5. Cropping systems
6. Site specific management

## **SOIL FERTILITY AND MANAGEMENT COMPETENCY AREAS:**

1. Soil and nutrient interaction
2. Soil pH and liming
3. Major nutrients (N, P, and K)
4. Secondary nutrients and micronutrients
5. Soil test reports and nutrient recommendations
6. Nutrient sources and application methods
7. Soil amendments

## **EXPERTISE WITHIN EACH COMPETENCY AREA:**

1. Soil and nutrient interaction
  - a. Recognize how soil, climatic, and nutrient properties affect movement and retention of nutrients in soil or water.
1. Soil pH and liming
  - a. Understand the effect of soil pH plant growth.
  - a. Recognize how each of the following factors affect lime rate.
    - 1) type of cropping and tillage system used
    - 2) soil characteristics
    - 3) soil pH
  - a. Describe how lime quality influence lime rate.
  - a. Describe the neutralizing value, physical properties, and handling precautions of the following liming materials:
    - 1) calcitic limestone
    - 2) dolomitic limestone
    - 3) fluid lime
    - 4) pelletized
    - 5) ag-lime
  - a. Be able to calculate the amount of liming material that should be applied to meet a soil test report recommended rate of lime.
1. Major nutrients (N, P, and K)
  - a. Nitrogen
    - 1) Understand the soil nitrogen cycle.
    - 1) Understand how to select nitrogen fertilizer sources for efficient use.
    - 1) Recognize how soil physical properties affect nitrogen fertilization.
    - 1) Recognize how cropping and tillage systems affect nitrogen fertilization.
  - a. Phosphorus

- 1) Recognize the advantages and disadvantages of different phosphorus application methods and sources.
- 1) Recognize how cropping and tillage systems affect phosphorus fertilization.
- a. Potassium
  - 1) Recognize the advantages and disadvantages of different potassium application methods and sources.
  - 1) Recognize how cropping and tillage systems affect potassium fertilization.
1. Secondary nutrient and micronutrients (Emphasis on sulfur (S), zinc (Zn), iron (Fe), boron (B), and chloride (Cl)).
  - a. Recognize the general deficiency symptoms of the secondary nutrients and the micronutrient.
  - a. Understand the methods of correcting secondary and micronutrient deficiencies.
1. Soil test reports and fertilizer recommendations
  - a. Understand use of soil test reports and calibration data to make economically and environmentally sound fertilizer recommendations.
  - a. Understand use of alternative nutrient sources such as animal waste, sludge or biosolids, legume crops, and soil organic matter.
1. Nutrient sources and application methods
  - a. Know the importance of and procedures to calibrate nutrient application equipment (fertilizer spreaders and manure/sludge applicators).
  - a. Know the basic characteristics of the common nutrient materials such as:
    - 1) anhydrous ammonia ( $\text{NH}_3$ )
    - 2) urea-ammonium nitrate solution (UAN)
    - 3) ammonium nitrate
    - 4) urea
    - 5) diammonium phosphate (DAP)
    - 6) monoammonium phosphate (MAP)
    - 7) ammonium polyphosphate solution (APP)
    - 8) potassium chloride (KCl)
1. Soil amendments
  - a. Be able to identify characteristics of and reclamation methods for saline and sodic soils.
  - a. Evaluation of non-traditional products for use in Kansas.

## **SOIL AND WATER MANAGEMENT COMPETENCY AREAS:**

1. Basic physical properties of soil
2. Soil water management
3. Soil conservation
4. Irrigation management
5. Managing for water quality

## **EXPERTISE WITHIN EACH COMPETENCY AREA:**

1. Basic physical properties of soil
  - a. Recognize effects of soil physical properties on:
    - 1) water holding capacity
    - 2) water intake
    - 3) internal soil drainage
    - 4) soil tilth
    - 5) compaction
    - 6) root growth
1. Soil water management
  - a. Understand how cropping systems and tillage affects water storage and availability for plant use.
1. Soil conservation
  - a. Understand factors important in controlling wind and water erosion, such as:
    - 1) Residue cover and management
    - 2) Conservation systems
    - 3) Length and grade of slope
    - 4) Soil characteristics
    - 5) Rainfall characteristics
    - 6) Crop characteristics
    - 7) Tillage
  - a. Understand how these factors affect runoff and leaching:
    - 1) Residue cover and management
    - 2) Conservation systems
    - 3) Length and grade of slope
    - 4) Soil characteristics
    - 5) Rainfall characteristics
    - 6) Crop characteristics
    - 7) Tillage
  - a. Be able to estimate residue cover.
1. Irrigation management
  - a. Understand how the following factors affect water efficiency, infiltration, and runoff:
    - 1) weather
      - a) precipitation
      - b) temperature

- c) season
- d) crop residue

- 1) soil factors
- a) texture
- b) slope
- c) compaction
- d) soil amendments
- 2) irrigation system type
- a) sprinkler
- b) gravity/furrow
- c) drip

- 1) crop management
- a) tillage
- b) residue
- c) cropping system

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a. Understand how the following factors affect crop water use:

- 1) temperature
- 2) wind
- 3) solar radiation
- 4) relative humidity
- 5) crop growth stage (plant canopy, rooting depth, etc.)
- 6) soil factors (texture, compaction, etc.)

a. Understand basic differences between irrigation system types:

- 1) gravity/furrow
- a) conventional
- b) surge flow

- 1) sprinkler
- a) center pivot (conventional, low pressure, LEPA (low energy precision application), etc.)
- b) solid set sprinkler
- c) towable

- 1) drip (buried or surface)

a. Identify critical water use periods for different crops and the effect of water stress on growth and yield.

a. Understand the relationship between available water holding capacity and soil texture.

a. Understand how irrigation water supply and irrigation well output affect crop selection and crop management.

- 1) be able to calculate crop water use and irrigation output.

a. Understand how to use moisture management techniques and weather information to schedule and manage irrigation. Examples include:

- 1) "feel" method
- 2) gypsum blocks
- 3) tensiometer
- 4) checkbook method

- 5) computer models
    - a. Understand and define the following terms:
      - 1) evapotranspiration
      - 2) available water holding capacity
      - 3) field capacity
      - 4) wilting point
      - 5) consumptive use or crop water use
      - 6) potential evapotranspiration (PET)
      - 7) chemigation (including application of pesticides and fertilizers)
      - 8) water use efficiency
      - 9) leaching
      - 10) effective root zone
    - a. Identify and understand how irrigation water quality affects crop and soil management.
      - 1) Effect of total salinity concentration on crop growth and yield.
      - 2) Effect of excess sodium on soil characteristics.
      - 3) Effect of dissolved ions on potential plant toxicity, such as chloride (Cl), nitrate (NO<sub>3</sub>), sulfate (SO<sub>4</sub>), boron (B), etc.
    - a. Have an awareness of state and national rules and regulations for irrigation water quality and use, including:
      - 1) application of nutrients and pesticides through irrigation systems.
      - 2) system calibration for nutrient and pesticide application.
      - 3) water use limitations and restrictions.
    1. Managing for water quality
      - a. Have an awareness of state and national rules and regulations concerning:
        - 1) Pest Management Areas (PMAs)
        - 2) Wildlife Management Areas
        - 3) Wellhead Protection Areas
        - 4) Groundwater Management Areas
- PEST MANAGEMENT COMPETENCY AREAS:**
1. Weed management
  2. Plant disease management
  3. Insect management
  4. Integrated pest management
  5. Government regulations
- EXPERTISE WITHIN EACH COMPETENCY AREA:**
1. Weed management
    - a. Weed biology: Understand the biology, interaction with crops, and control of the following weeds within different cropping strategies:
      - 1) foxtail
      - 2) johnsongrass
      - 3) yellow nutsedge
      - 4) barnyardgrass
      - 5) cheat grasses

- 6) fall panicum
- 7) Canada thistle
- 8) common cocklebur
- 9) velvetleaf
- 10) ivyleaf morningglory
- 11) hemp dogbane
- 12) giant ragweed
- 13) pigweed and waterhemp species
- 14) Pennsylvania smartweed
- 15) field bindweed
- 16) shattercane
- 17) jointed goatgrass
- 18) musk thistle
- 19) Russian thistle
- 20) field pennycress
- 21) mustards
- 22) henbit
- 23) large crabgrass
- 24) wild buckwheat
- 25) kochia

1. Plant disease management

a. Biology of plant diseases: Identify each of the following diseases by host plant systems, and classify each by crops infected and type of causal organism:

- 1) fusarium stalk rots (corn and sorghum)
- 2) gray leaf spot (corn)
- 3) pythium seeding rot (all crops)
- 4) phytophthora root rot (soybeans and alfalfa)
- 5) soybean cyst nematode
- 6) charcoal rot (all crops)
- 7) rust (all crops)
- 8) sooty stripe (sorghum)
- 9) maize dwarf mosaic (corn and sorghum)
- 10) wheat streak mosaic
- 11) tan spot
- 12) Rhizopus head rot (sunflower)
- 13) barley yellow dwarf (cereals)
- 14) take-all (wheat)

1. Insect management

a. Insect biology: Identify the dispersing and damaging stages of the following pests; classifying them by feed habits, crops attacked, type of metamorphosis, and predominant management strategies employed:

- 1) corn rootworms; Western, Northern, and Southern
- 2) European and Southwestern corn borers
- 3) spider mites; Banks and two-spotted
- 4) alfalfa weevil
- 5) greenbug
- 6) chinch bugs
- 7) Hessian fly
- 8) Russian wheat aphid
- 9) grasshoppers
- 10) stored grain insect complex

- 11) black cutworm
- 12) corn earworm
- 13) Western bean cutworm
- 14) wireworm
- 15) white grubs
- 16) aphids: pea, blue alfalfa, and spotted alfalfa
- 17) sunflower head moth
- 18) cereal leaf beetle
- 19) armyworm
- 20) fall armyworm
- 21) potato leafhopper
- 22) corn flea beetle
- 23) blister beetles
- 24) sunflower seed weevil
- 25) sunflower stem weevil
- 26) sunflower head clipper weevil

1. Integrated pest management

- a. Make economically and environmentally sound pest management recommendations for a specific site or situation.
  - a. Understand the relationship between pest management practices and development of pest resistance.
  - a. Recognize the need for following up to verify that pest management intervention strategies have had the desired effect.

1. Pesticide use and safety

- a. Understand pesticide labels and labeling
- a. Exhibit competency in pesticide record keeping
- a. Demonstrate an awareness of worker protection laws (notification, protective gear, and re-entry)

## **CROP MANAGEMENT COMPETENCY AREAS:**

1. Crop growth and adaption
2. Basic principles of forage production
3. Planting and seeding management
4. Crop damage, mortality, and factors influencing replanting decisions.
5. Cropping systems
6. Site specific management

## **EXPERTISE WITHIN EACH COMPETENCY AREA:**

1. Crop growth and adaption
  - a. Identify the life cycle and adaptation of each of the following crops:
    - 1) alfalfa
    - 2) corn
    - 3) wheat
    - 4) cool season grasses (smooth brome grass, tall fescue, western wheatgrass, etc.)
    - 5) sorghum (grain and forage)
    - 6) soybean
    - 7) sunflower
    - 8) small grains and cereals (other than wheat)
    - 9) clovers
    - 10) introduced and native warm-season grasses (bermudagrass, bluestem, buffalograss, grama, lovegrass, etc.)
  - a. Describe and use the staging systems to identify growth stages between emergence and physiological maturity for corn, soybean, small grains, and sorghum.
  - a. Recognize relationships between the growth and development of major crops and management factors.
1. Basic principles of forage production
  - a. Describe how frequency of harvest is related to forage yield and quality.
  - a. Describe how frequency and timing of harvest affects stand longevity, food reserves, and stand persistence.
  - a. Be able to distinguish between warm and cool season and perennial and annual forages.
1. Planting and seeding management
  - a. Describe factors affecting seeding date of above crops.
  - a. Describe environmental and cultural factors that influence the seeding rate.
  - a. Describe factors influencing seeding depths.
  - a. Hybrid/variety selection
  - a. Seed quality
1. Crop damage, mortality, and factors influencing replant decisions

- a. Understand the effect of hail, frost, flooding, drought, insect, disease, and wind damage on crops listed above.
- a. Recognize when major Kansas crops are most susceptible to specific environmental stresses.
- a. Describe climatic and plant factors which influence a plant's ability to resume growth after being damaged.
- 1. Cropping systems
  - a. Understand the advantages and limitations of growing cover and companion crops.
  - a. Compare and contrast single crop systems and crop rotations.
  - a. Adaptation and use of biotechnology in cropping systems.
- 1. Site specific management
  - a. Understand concepts of "site specific" management ("precision farming"), including, but not limited to:
    - 1) Global positioning systems (GPS)
    - 2) Geographic information systems (GIS)
    - 3) Grid sampling
    - 4) Variable rate technology
    - 5) Monitoring technology
    - Field mapping