CERTIFIED CROP ADVISER PERFORMANCE OBJECTIVES FOR THE SOUTHEAST

ALABAMA-FLORIDA-GEORGIA-SOUTH CAROLINA

August, 2016

FOREWORD

Performance Objectives for the Southeast Region (Alabama, Florida, Georgia, and South Carolina) were developed by members of the Alabama, Florida, Georgia, and South Carolina Certified Crop Adviser Boards, individual Certified Crop Advisers, and faculty selected from soil, crop, and plant science departments at Auburn University, Clemson University, the University of Georgia, and the University of Florida. They are reviewed periodically by practicing Certified Crop Advisers and representatives of the four Southeast Region CCA Boards to reflect changes in technology and continuing relevance.

Alabama CCA Board
Florida CCA Board
Georgia CCA Board
South Carolina CCA Board

INTRODUCTION

These Performance Objectives provide guidance to individuals preparing for the Southeast Region Certified Crop Adviser Exam. They supplement the International Performance Objectives and emphasize certain aspects of nutrient, soil and water, pest, and crop management principles that are of particular importance in the Southeast Atlantic Coastal Plain and Piedmont. Exam questions are based on these Performance Objectives and the International Performance Objectives as they apply to providing advice to crop producers in this region.

As is true of the International Performance Objectives, the Southeast Performance Objectives outline the knowledge and skill areas that Certified Crop Advisers in this region have indicated they need in order to effectively carry out their duties. Performance Objectives cover the minimum level of fundamental principles considered essential for effective crop advising. Continuing education programs pursued after individuals achieve certification expand upon these principles and cover with greater rigor the four technical areas as well as changes in science and technology, and topics important to development as a professional. Thus Performance Objectives are a first step in the continuing process of professional development.

TABLE OF CONTENTS

KEY SOUTHEAST REGION CROPS				
Blueberries	Corn	Cotton	Cover Crop: Grass/legume/brassica mixes	Cucurbits
Forages: Bermuda grass and Bahia grass	Orchard Crops: Pecans, Citrus, Peaches	Peanut	Peppers	Small grains
Soybeans	Strawberries	Tobacco	Tomato	Turf

Certified Crop Advisers in the Southeast Region should be familiar with the crops listed in the box above. Although there are a number of other crops grown in the region that are very important locally, these Performance Objectives and the corresponding Local Board Exam will focus on the crops indicated in the table above.

NUTRIENT MANAGEMENT

COMPETENCY AREA 1: Nutrient transformation and mobility in soils common to the Southeast

1. Describe how mineralization affects soil nitrogen, phosphorus and sulfur availability in the Southeast and the factors that affect nitrogen immobilization.
2. Describe carbon cycling.
3. Divide the essential elements into two groups, 1) those that are prone to leaching, and 2) those that are not likely to be leached from surface soil horizons in significant amounts.
4. Describe the importance of clay content, depth to the argillic horizon (clay layer), and subsoiling in soil sampling and nutrient management of S, K, and Mg.
5. Describe how nutrient mobility can affect scheduling of nutrient applications.
6. Describe the tendency for phosphorus to be moved overland into surface water.
7. Describe the soil colloids that predominate in the Southeast.
8. Recognize how depth of sampling is related to tillage method and/or land-use and depth to clay layer.

COMPETENCY AREA 2: Soil pH management

1. List the elements that become deficient in Coastal Plain soils when the pH is raised too high.
2. Explain how soil pH would exceed pH 8.5.
3. Describe the management of soil acidity that is appropriate for soils having an organic matter content of 10 percent or more.
4. Explain the difference between active soil acidity and exchangeable acidity.
5. Explain how nitrogen fertilizer sources can influence soil acidity.
6. Explain how elemental sulfur can be used to lower soil pH.
7. Explain what determines an effective liming source as per state laws.
8. Describe buffer pH, water pH, and target pH (for crops).
9. Explain the differences between gypsum and lime.

COMPETENCY AREA 3: Soil testing and plant analysis: understanding approaches and recommendation philosophies

1. Compare soil test recommendations based on basic cation saturation ratio vs sufficiency level.
2. Relate % base saturation and pH in kaolinitic soils and non-kaolinitic soils.
3. Understand the regionality of soil test extractants.

4. Identify the common soil test methods (Mehlich I and Mehlich III) used in the region for estimating plant available nutrients and lime requirement and differentiate between the following terms as used to describe nutrient concentrations in soil:

    a. total.
    b. extractable.
    c. available.
    d. exchangeable.

5. Know how to interpret soil, plant tissue, and manure test reports.

6. Describe the components of a soil testing program and the potential limitations involved in each.

7. Describe the following combinations of crop and visual nutrient deficiency symptoms:

    a. corn: nitrogen, phosphorus, potassium, sulfur, and zinc.
    b. small grains: nitrogen, sulfur, and phosphorus.
    c. soybean: manganese, potassium, and magnesium.
    d. tomatoes: nitrogen, calcium, and iron.

8. Recognize the importance of taking soil samples and plant tissue analysis when trouble shooting.

9. Describe what plant part to sample for plant tissue analysis of corn, tomato, and small grain.

COMPETENCY AREA 4: Nutrient recommendations and scheduling applications based on soil test results using various sampling approaches

1. Recognize that Cu deficiency may occur with some crops when grown on soils containing10% or more soil organic matter.

2. Compare the approximate plant available nitrogen and phosphorus concentrations of the following organic sources:

    a. legumes.
    b. animal manure.
    c. biosolids.
    d. composts.

3. Define and calculate agronomic rate for manure and other organic wastes based on the following parameters:

    a. nitrogen content.
    b. phosphorus content.
    c. calcium carbonate equivalent.

4. Describe how nutrient mobility in soil can influence method of application, timing of application, and placement of nitrogen and phosphorus fertilizer.

5. Describe the potential for crop response to nutrient application when soil test levels are Low, Medium, High, or Very High.

6. Explain the potential benefits of using both topsoil and subsoil samples for fertilizer recommendations.

7. Describe how crop rotations or multiple cropping affect scheduling of fertilization.

8. Describe conditions that may require manure and waste application rates to be limited by phosphorus content, alkalinity, or chemical characteristics other than the material's nitrogen concentration.
9. Describe how soil test results should be used to determine agronomic application rates for animal manure.
10. List the considerations involved in developing a nutrient management plan for confined animal feeding operations.
11. Describe the importance of maintaining crop, soil, and water management records in confirming that a nutrient management plan is functioning properly.

COMPETENCY AREA 5: Emerging technologies for fertilizer management

1. Remote sensing technologies (NIR, NDVI, drone, satellite imagery).
2. Significance of GPS, GIS, mapping technologies.
3. Variable rate application equipment.
4. Define RTK (Real Time Kinetics).

COMPETENCY AREA 6: Waste and biosolids management

1. Significance of sampling and testing waste and biosolids for nutrient management.
2. Describe proper sampling techniques.
3. Explain potential problems with use of biosolids and other waste as nutrient sources.
4. Synchronization of nutrient availability in relation to plant uptake.

SOIL AND WATER MANAGEMENT

COMPETENCY AREA 1: Basic soil characteristics: chemistry, physics, biology, morphology, and classification

1. Describe how soil structure affects
    a. soil productivity.
    b. soil drainage.
    c. water storage and availability.
2. Explain how anion exchange capacity affects nitrate and sulfate leaching.
3. Explain why soil depth to the argillic horizon is important in soils.
4. Know the difference between 2:1 and 1:1 clays.
5. Distinguish between macropore flow and finger flow (sandy soils).
6. Distinguish between Alfisols, Entisols, Ultisols, and Spodosols.
7. Define soil classification terms Typic, Arenic, Grossarenic.

8. Demonstrate the ability to identify soil map units.
9. Explain a soil water retention curve.

COMPETENCY AREA 2: Erosion, crusting and compaction

1. Explain how tillage affects the rate of erosion by water.
2. Describe how soil crusting affects water movement and gas exchange.
3. Describe the physical process of soil erosion by water and wind.
4. Define bulk density and explain how tillage can affect it.
5. Describe farming operations cause or alleviate compaction.

COMPETENCY AREA 3: Conservation tillage and cover crops

1. Describe how tillage and cropping system affect soil structure.
2. Identify the current species recommended for cover cropping.
3. Describe management of small grains, legumes, and mixtures of the two.
4. Describe the limitations of cover cropping and conservation tillage.

COMPETENCY AREA 4: Soil health and sustainability

1. Relate soil health to basic soil characteristics.
2. Understand biological systems associated with soil health.
3. Define soil sustainability and health.

COMPETENCY AREA 5: Irrigation methods and scheduling

1. Describe how to use surface and subsurface water management systems and methods to control excess soil water.
2. Describe methods for measuring soil moisture for irrigation scheduling.
3. Describe how the water balance equation can be used for irrigation scheduling.
4. Describe how water potential can be used for irrigation scheduling.
5. Identify emerging technologies in irrigation management.
6. Describe the following irrigation methods:
    a. drip/trickle (micro-irrigation).
    b. subsurface.
    c. overhead.

7 Describe conditions influencing water use efficiency/effectiveness:

   a. needs according to plant growth stage.
   b. soil and landscape characteristics.
   c. equipment calibration and adjustment.

COMPETENCY AREA 6: Irrigation water quality

1. Describe how high bicarbonate concentration in irrigation water is managed.
2. Describe how acidic water can affect irrigation systems.
3. Describe how salinity concentration in irrigation water is managed.
4. Explain testing and interpretation of irrigation water analyses.
5. Define electrical conductivity and its importance in irrigation water quality.

COMPETENCY AREA 7: Water quality impacts

1. Define the term watershed and criteria used to delineate.
2. Identify reasons for water quality impairments.
3. Describe processes that transport contaminants into surface waters and groundwater:

   a. nitrogen.
   b. phosphorus.
   c. potassium.
   d. bacteria.
   e. pesticides.

4. Describe processes to prevent contaminants movement into surface and groundwater.
5. Describe the relationship between water quality and federal regulations such as TMDLs, CAFOs, and NPDES.

PEST MANAGEMENT

COMPETENCY AREA 1: Fundamentals of Integrated Pest Management (IPM)

1. Explain the benefits and limitations of the following pest management practices in the Southeast:

   a. alternating pesticides.
   b. crop rotation.
   c. use of biological controls.
   d. varietal resistance.

2. Describe pest problems associated with the following tillage systems:

   a. conventional tillage.
   b. conservation tillage.
   c. moving from one tillage system to the other.

3. Describe IPM methods for controlling the following common pests:
    a. perennial versus annual weeds.
    b. grasses and broadleaf weeds.
    c. nematodes.
    d. corn earworm.
    e. fusarium wilt.
    f. tomato spotted wilt virus.
4. Describe the advantages and limitations of chemical versus cultural management of plant pests in the Southeast.
5. Distinguish general resistance, race specific resistance, and tolerance.
6. Distinguish systemic and non-systemic pesticides.
7. Given a specific case situation, make economically and environmentally sound pest management recommendations.
8. Describe the effects of soil moisture, temperature, pH, and other environmental factors on pesticide effectiveness and persistence.
9. Explain the use and importance of scouting as an IPM tool.

COMPETENCY AREA 2: Weed management

1. Know general characteristics about the following weeds in the Southeast:
    a. Johnsongrass.
    b. Yellow nutsedge.
    c. Palmer Amaranth (pigweed).
    d. Crabgrass.
    e. Wild mustard.
    f. Fall panicum
    g. Common cocklebur.
    h. Morningglory.
    i. Sicklepod.
    j. Bermudagrass.
2. Describe the anatomical features and growth habits that can be used to identify the weeds listed in the above PO (Comp. Area 2, PO 1).
3. Describe how the following weed characteristics affect the ability of weeds to survive and be competitive:
    a. growth rate of crop.
    b. germination and emergence.
    c. shade tolerance.
    d. life cycle.
4. Classify the weeds listed above (Comp. Area 2, PO 1) as annual, perennial, or biennial.

5. List the factors affecting the performance of a post emergence herbicide:
    a. plant vigor.
    b. weed growth stage.
    c. herbicide effectiveness.
    d. plant growth stage.
    e. water quality, e.g., pH.
    f. tank mix compatibility.
6. Define the mechanism/mode of action for the following herbicide families:
    a. triazines.
    b. sulfonyl ureas.
    c. phenoxys.
    d. dinitroanalines.
    e. imidazolinone.
7. Describe advantages and disadvantages of preplant incorporated, preemergence, and postemergence herbicide applications.

COMPETENCY AREA 3: Insect management

1. Identify and classify by feeding habit, crops attacked, and life cycle the following pests:
    a. Japanese beetle.
    b. aphid.
    c. leafhoppers.
    d. European corn borer.
    e. Southern corn rootworm.
    f. soybean cyst nematode.
    g. corn earworm.
    h. stink bugs.
    i. grubs.
    j. fall armyworm.
2. Describe the potential adverse effects of insecticides on beneficial insects.
3. Understand the importance of the following beneficial insects in IPM:
    a. lacewings.
    b. ladybugs.
    c. fire ants.
    d. big-eyed bug.
    e. predatory stink bugs.
    f. assassin bugs.
4. Understand and be able to explain the use of refuges as a resistance management tool.
5. Understand how insects can be vectors of disease.

COMPETENCY AREA 4: Disease management

1. Identify each of the following diseases by host-plant symptoms:
    a. stalk rots.
    b. Pythium.
    c. phytophthora root rot.
    d. southern corn rust.
    e. septoria leafspot.
    f. powdery mildew.
    g. fusarium wilt.
    h. southern corn leaf blight.
    i. tomato spotted wilt virus.
2. Describe the potential for certain insects to serve as vectors for plant diseases.

COMPETENCY AREA 5: Pesticide application and environmental considerations

1. Describe performance of each of the following nozzle types and explain what conditions would favor their selection for pesticide application:
    a. standard flat fan.
    b. even flat fan.
    c. hollow cone.
    d. flood tip.
    e. air induction nozzles.
2. Explain how weather conditions, pesticide properties, formulation and additives affect spray drift and spray volatilization.
3. Describe how soil, climatic, and antagonistic factors affect the performance of preplant incorporated, preemergence, and postemergence applied pesticides.
4. Describe how weather factors can affect herbicide carryover from year to year.
5. Explain how the following factors interact to influence the migration of pesticides into groundwater and surface water:
    a. clay and organic matter content.
    b. pesticide persistence.
    c. potential for erosion and runoff.
    d. depth to water table.
    e. filter strips and buffer zones.
6. Describe issues affecting pollinators.

COMPETENCY AREA 6: Organic Pest Management

1. Define organic pest management.
2. Differentiate between organic pest management and integrated pest management.
3. Describe organic pest management options in fruit and vegetable production.

4. Describe the role of beneficial insects in organic pest management.
5. Describe the difference between organic and certified organic.
6. Explain the role of cover crops in organic weed control.
7. Explain the importance of crop rotation on organic crop production.

CROP MANAGEMENT

COMPETENCY AREA 1: Basic crop science

1. Describe the basic plant physiological processes involved in growth and development:
    a. the function of xylem and phloem.
    b. photosynthesis and respiration.
    c. physiological maturity.
2. Describe the factors that control seed quality.

COMPETENCY AREA 2: Application of soil conservation principles

1. List the crops most useful as cover crops and conditions that favor their selection.
2. List the cover crops most useful for improving soil health.
3. Describe the factors to consider when adopting a conservation tillage system.

COMPETENCY AREA 3: Information specific to crops of major importance in the Southeast

1. Describe the growth and management practices from planting to harvest for the listed key crops grown in the Southeast.
2. Describe how changing from a wide row to a narrow row planting system would impact conservation.
3. Describe factors that influence the planting, establishment and maintenance of tall fescue, coastal bermudagrass, alfalfa, and grass-legume-brassica mixtures.
4. Describe methods and equipment used for planting the following:
    a. cool season grasses.
    b. warm season grasses.
    c. winter legumes.
    d. small grains.
    e. corn.
    f. soybean.
5. Explain how nutrient imbalances can affect forage quality and animal performance.

COMPETENCY AREA 4: Genetically modified crops

1. Define a genetically modified organism (GMO) and identify the most common GMO crops being grown in the Southeast.
2. List the most common concerns among the general public with regards to acceptance of GMO crops.
3. Explain the importance of finding alternative crops for the Southeast, and helping farmers to identify and develop a niche market.
4. Describe the debate concerning GMO crops and pollinators.