Northwest Regional Certified Crop Adviser

Performance Objectives

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INTRODUCTION

Certified Crop Adviser Northwest Regional Performance Objectives

The Certified Crop Adviser Performance Objectives outline the knowledge and skill areas that are covered on the Northwest Regional Certified Crop Adviser Examination. The Northwest Regional Performance Objectives are a modification of the National Certified Crop Adviser Performance Objectives that outline knowledge and skill areas needed in the Northwest Region.

These Performance Objectives are dynamic, and will be upgraded, changed, and modified as the needs of the drop production industry evolve. The Certified Crop Adviser program will then remain a viable and useful tool that will recognize the high level of competence displayed by those who choose to earn this designation.

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SOIL FERTILITY COMPETENCY AREAS:

1. Basic concepts of soil fertility
2. Nutrient movement in soil and water
3. Soil pH and modification
4. N, P, and K considerations
6. Secondary and micronutrients
7. Soil testing, plant analysis and fertilizer recommendations
8. Fertilizer forms and application
9. Manure and other organic by-products

COMPETENCY AREA 1. Basic concepts of soil fertility

I. The soil as a source of nutrients

1. List the 16 nutrients essential for plant growth
2. List the ionic form in which each nutrient is available to plants
3. Describe the role of cation exchange in plant nutrition
4. Define soil solution and describe its relationship to nutrient mobility
5. Describe how immobilization and mineralization affect nutrient availability
6. Describe how soil pH affects nutrient availability
7. Recognize how cation exchange capacity affects nutrient leaching
8. Recognize nutrient uptake and translocation
9. Fertilizer salt index
10. Other nutrient sources, eg. irrigation, H_2O, atmospheric, legume credits, and crop residue
11. Influence of microbial activity on nutrient cycling and nutrient availability

II. Assessment of soil productivity based on soil physical properties

12. Describe how texture, structure, organic matter, and bulk density affect the productivity of soil
13. Describe how banding and broadcasting affects nutrient availability

COMPETENCY AREA 2. Nutrient movement in soil and water

14. Distinguish between point and non-point sources of entry into the environment
15. Recognize how soil, climatic, and nutrient properties affect movement of a nutrient in soil or water

16. Recognize how soil properties, irrigation practices and, cropping patterns affect nutrient runoff and leaching

17. Understand the forms of N fertilizers commonly applied and their relative immediate potential for leaching.

18. Recognize how application timing affects nutrient runoff and leaching

19. Recognize how fall fertilizer applications affects nutrient runoff and leaching

20. Understand precautions that reduce runoff and nutrient leaching, eg. filter strips, grass waterways, PAM etc.

21. Recognize difference in movement between organic and inorganic nutrient sources, e.g. P movement.

COMPETENCY AREA 3. Soil pH and modification

22. Define soil pH and the pH scale

23. List processes or practices that cause soil pH to change

24. Recognize benefits from lowering or raising soil pH

25. Recognize how soil pH and physical properties affect soil processes such as nitrogen volatilization

26. Recognize how free lime (calcium carbonate) affects nutrient availability

27. Understand the process of liming to increase soil pH.

28. Understand pH modification associated with addition of various nitrogen sources

29. Recognize the process by which various sulfur sources cause soil acidification

30. Recognize the various kinds of liming materials available and their characteristics.

COMPETENCY AREA 4. N, P, K considerations

I. Nitrogen

31. Understand the role of nitrogen in plants

32. Recognize general deficiency symptoms

33. Understand the nitrogen cycle and how it affects nitrogen availability

34. Recognize the ways nitrogen may be lost from the soil or the plant

35. Understand N movement in soil and into surface and groundwater

36. Understand the limitations of N fertilizers

37. Understand the process of biological and chemical N fixation

38. Understand how soil physical properties affect the effectiveness of nitrogen fertilizers to supply crop demands for nitrogen

39. Recognize how cropping systems and agronomic practices affect nitrogen fertilization

40. Recognize how soil drainage, irrigation, precipitation levels, and potential for water contamination affect nitrogen fertilization including organic sources

41. Understand the safety precautions that should be taken in handling various nitrogen fertilizers

42. Recognize the role of application timing on plant availability and environmental protection

43. Understand how to incorporate nitrogen contribution from all N sources soil into fertilizer recommendations.

44. Recognize primary environmental concerns win nitrogen use

II. Phosphorus

45. Understand the role of phosphorus in plants

46. Recognize general phosphorus deficiency symptoms

47. Understand how soil properties affect phosphorus fertilization

48. Understand how cropping systems and agronomic practices affect phosphorus fertilization

49. Understand how the soil retains or loses phosphorus

50. Recognize the analysis and chemical composition of different phosphorus fertilizers

51. Understand how nitrogen and phosphorus applications differ relative to water quality pollution

52. Recognize phosphorus index concepts and factors contributing to phosphorus index as well as soil phosphorus threshold levels

53. Recognize the primary environmental concerns with phosphorus

III. Potassium

54. Understand the role of potassium in plants

55. Recognize general potassium deficiency symptoms in plants

56. Understand potassium luxury consumption

57. Understand how the soil retains potassium

58. Recognize how soil properties affect potassium fertilization

59. Recognize how cropping systems and agronomic practices affect potassium fertilization

60. Recognize the analysis and chemical composition of different potassium fertilizers

COMPETENCY AREA 5. Secondary and micronutrients

61. Recognize the general deficiency and toxicity symptoms of the secondary nutrients

62. Recognize the general deficiency and toxicity symptoms of the micronutrients

63. Know methods of correcting secondary and micronutrient deficiencies

64. Recognize the affect of soil pH on micronutrient availability

COMPETENCY AREA 6. Soil testing, plant analysis and fertilizer recommendations

65. Use a map to locate a tract of land and give a legal description

66. Use a soil survey to describe characteristics of a soil profile

67. Describe soil sampling and handling procedures

68. Describe the philosophy of soil testing and the role of sampling, analysis, interpretation and recommendation in making a fertilizer recommendation

69. Describe the agronomic importance of items on a soil test report

70. Use information from soil test reports and calibration data to determine economically and environmentally sound fertilizer recommendations

71. Use fertilizer analysis information to calculate amounts of different fertilizers required to meet a specific recommendation

72. Understand soil spatial variability in relation to precision agriculture

COMPETENCY AREA 7. Fertilizer forms and application

73. Understand potential advantages and disadvantages of broadcast versus banded fertilizer applications

74. Recognize how fertilizer placement and time of application affect nutrient availability and leaching

75. Understand special environmental concerns associated with fertigation

76. Recognize agronomic practices designed to address variable rate technology

77. Understand fertilizer application equipment operation and calibration, including fertigation

COMPETENCY AREA 8. Manure and other organic by-products

78. Understand calculations related to manure production from animal units, manure types, application, and calibration of application equipment, including irrigation systems

79. Recognize site calculations and practices that influence manure off-site movement

80. Understand manure nutrient analysis for determining application rates, manure handling, and sampling practices

81. Recognize risks, benefits, and limitations of manure applications

82. Understand nutrient losses associated with manure handling and storage systems

83. Understand confined animal feedlot ordinances CAFO regulatory process

84. Understand composting principles and odor control practices

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SOIL AND WATER MANAGEMENT COMPETENCY AREAS:

1. Basic physical properties of soils
2. Soil water management
3. Soil conservation
4. Tillage operations and soil characteristics
5. Management of saline and sodic soils

COMPETENCY AREA 1. Basic physical properties of soils

I. Soil texture

1. Understand characteristics of sand, silt, and clay

2. Use a textural triangle to determine textural classification of a soil when given the percents of two of the soil separates

3. Understand importance of sand, silt and clay in plant growth

4. Understand how soils are formed

II. Soil structure

5. Understand benefits of well-developed soil aggregation

6. Recognize how soil organisms, tillage, and cropping systems affect soil structure

7. Recognize characteristics of soil horizons

III. Soil organic matter

8. Understand the importance of soil organic matter in nutrient management

9. Understand the role of soil organic matter in pesticide management

10. Recognize how soil organic matter is related to soil color, structure, and soil warming

11. Understand how the carbon nitrogen ratio of organic materials in the soil may affect the availability of soil nitrogen to plants

12. Recognize advantages and disadvantages of organic matter contributions including cover crops

13. Recognize how soil organic matter affects soil aggregation, water holding capacity and water infiltration

14. Understand ways to maintain the organic matter content of an agricultural soil

15. Understand how soil organic matter is created and lost.

COMPETENCY AREA 2. Soil water management

16. Define plant available water

17. Understand how pore size distribution affects the drainage characteristics and water holding capacities of soils

18. Recognize how soil texture, soil structure, and the content of soil organic matter affects pore size, soil drainage and plant available water

19. Recognize how cropping systems and agronomic practices affect infiltration rate

20. Recognize factors that influence the rate and timing of irrigation

21. Recognize the role of soil erosion in nutrient loss

22. Recognize how infiltration and percolation rate affects potential ground water contamination

23. Understande how sprinkler, furrow, rill, and drip irrigation methods can impact surface and ground water quality

24. Understand how to use soil and crop characteristics, and climatic data to develop an irrigation schedule

COMPETENCY AREA 3. Soil conservation

25. Recognize types of water and wind erosion

26. Understand management practices that reduce wind and water erosion, as well as reduce runoff and leaching

27. Describe how soil loss through erosion affects loss of plant nutrients

COMPETENCY AREA 4. Tillage operations and soil characteristics

28. Recognize how tillage operations influence erosion, soil structure, organic matter content, compaction, surface residue, and biological activity

29. Identify plant symptoms and soil characteristics associated with compaction and impermeable layers

30. Recognize methods that alleviate compaction and conditions necessary for successful implementation

COMPETENCY AREA 5. Management of saline and sodic soils

31. Define saline, saline-sodic, and sodic soils

32. Understand how to prevent and reclaim saline, saline-sodic, and sodic soils

33. Understand the complications associated with irrigation water management and control of saline conditions

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PEST MANAGEMENT COMPETENCY AREAS:

1. Management of weeds
2. Management of plant diseases
3. Management of nematodes and vertebrates
4. Management of insects
5. Calibration of pesticide application equipment
6. Pesticide resistance
7. Using pesticides in an environmentally sound way
8. Protecting humans against pesticide exposure
9. Integrated pest management

COMPETENCY AREA 1. Management of weeds

I. Weed biology

1. Recognize how plant growth and development is related to weeds competitiveness

2. Understand distinguishing characteristics of annual, biennial, and perennial weeds

3. Understand weed reproduction and survival strategies, including seed dormancy.

II. Weed management practices

4. Understand cultural, chemical, biological, and mechanical weed management

5. Understand management, plant, and environmental factors important in making non-chemical weed management recommendations

6. Understand how to determine economically important weed populations

III. Herbicide application

7. Define herbicide persistence

8. Understand the difference between contact and systemic herbicides

9. Understand how adjuvants affect herbicide performance

10. Recognize the importance of timing in herbicide application

11. Recognize the relationship between plant vigor and herbicide effectiveness in postemergence applications

12. Identify general plant symptoms caused by various herbicide mode of action groups

13. Understand factors that affect the performance of herbicides

14. Understand management, plant, and environment factors involved in making a herbicide recommendation

15. Recognize the possible non-target affects of herbicide application

16. Understand common factors that cause herbicides to leach into groundwater

17. Understand different herbicide modes of action and how they relate to weeds controlled and herbicide resistant weeds

18. Understand differences in action between soil and foliar applied herbicides

19. Understand herbicide selectivity

COMPETENCY AREA 2. Management of plant diseases

I. Biology of plant diseases

20. Understand environmental and other factors affecting disease development

21. Understand plant factors affecting disease development

22. Understand cultural factors affecting disease development

23. Recognize symptoms caused by fungi, bacteria, viruses, abiotic factors and other organisms

24. Understand interactions among disease organisms and other plant health factors

II. Plant disease management practices

25. Understand cultural, chemical, biological, and genetic disease management

26. Recognize how to determine plant disease economic threshold levels

27. Recognize differences between systemic and non-systemic fungicides

28. Recognize different strategies involved with the use of seed, foliar, and soil treatments

COMPETENCY AREA 3. Management of nematodes and vertebrates

I. Nematode and vertebrates biology

29. Identify plant damage symptoms caused by nematodes and vertebrates

II. Nematode and vertebrate management practices

30. Understand cultural and chemical types of nematode and vertebrate management

31. Understand management, plant and environmental factors to include in making recommendations for nematode and vertebrate management

COMPETENCY AREA 4. Management of insects

I. Insect biology

32. Understand complete and simple metamorphosis

33. Understand insect life cycles and their impact on cropping systems.

II. Insecticide application

34. Distinguish among contact insecticides, stomach poisons, systemic insecticides, and insect growth regulation

35. Recognize the importance of timing when applying insecticides

36. Understand management, plant and environmental factors used in making insect management recommendation (chemical and non chemical)

37. Understand cultural, chemical, mechanical and biological insect management

COMPETENCY AREA 5. Calibration of pesticide application equipment

I. Pesticide formulations and labels

38. Recognize the physical characteristics of pesticide formulations

39. Recognize the types of information found on a label

40. Use information on a label to determine proper dosage in a given situation

41. Recognize sources of information or assistance for interpreting label directions

II. Identification of application equipment and critical components

42. Recognize pattern, relative droplet size and primary uses of different nozzle types

43. Understand how to determine nozzle tip wear

44. Understand application techniques and equipment that avoid or reduce drift

III. Basic principles of calibration

45. Understand methods used to establish accurate ground speed under field conditions

46. Understand factors affecting uniform spray coverage.

47. Calculate the amounts of pesticide an applicator applies at a specific rate, either band or broadcast, on a given area

48. Understand the procedure used to adjust the output of a sprayer

49. Use the calibration factors of gallons per acre, gallons per minute, width of nozzle spacing, spray pressure and ground speed to demonstrate how to calibrate a sprayer

50. Recognize the importance of field calibration to insure accuracy of application

51. Understand use of back siphon to protect water quality

COMPETENCY AREA 6. Pesticide resistance

I. Management of resistance

52. Understand factors influencing the development of pesticide resistance

53. Recognize ways to prevent the occurrence of pesticide resistant weeds, insects, and pathogenic microbes

54. Understand ways to manage pesticide resistant insects, weeds and pathogen once they have occurred

55. Recognize why pesticide tolerance and/or resistance is a concern for pest control

COMPETENCY AREA 7. Using pesticides in an environmentally sound way

I. Pesticide movement and degradation in soil and water

56. Distinguish between point source and non-point sources of entry into the environment

57. Recognize how soil, environmental, and pesticide properties affect movement of pesticides in soil or water.

58. Describe the differences between, and the factors leading to, point source and nonpoint source water quality contamination from pesticides commonly used in the Pacific Northwest

59. Recognize how soil properties, environmental, and biological factors affect pesticide degradation

60. Recognize how sandy soil, sinkholes, shallow water table and water management affect potential for groundwater contamination

61. Recognize how equipment calibration and maintenance affects potential for groundwater contamination

62. Understand the fate of pesticides in groundwater and surface waters

II. Government regulations

63. Interpret a Material Safety Data Sheet (MSDS)

64. Understand the proper disposal procedure for pesticide waste, rinsates and spills

65. Understand sources of information to determine toxicity levels, first aid procedures, and other safety and toxicity information

66. Understand record-keeping regulations for restricted use pesticides

COMPETENCY AREA 8. Protecting humans against pesticide exposure

I. Keeping pesticides on target

67. Understand differences between spray drift, volatilization, and temperature inversion

68. Recognize factors that affect off-target pesticide movement

69. Understand means of checking for off-target movement

II. Human toxicity

70. Understand pesticide modes of entry into the human system

71. Distinguish between chronic and acute poisoning effects

72. Recognize general symptoms of acute pesticide poisoning

73. Recognize possible chronic effects of pesticide poisoning

74. Recognize general procedures to follow if pesticide gets on the skin, in the eyes, in the mouth or stomach, or if inhaled

III. Handling pesticides safely

75. Recognize that pesticide labels are the best source of information concerning toxicity levels, handling precautions, first aid procedures, and other safety information

76. Recognize protective gear used during mixing and application of pesticides

77. Understand proper cleanup procedures for application equipment and protective gear

78. Understand proper ways of storing and disposing of pesticide containers

COMPETENCY AREA 9. Integrated pest management

79. Recognize how field scouting and economic threshold levels relate to integrated pest management

80. Recognize steps in carrying out an integrated pest management program

81. Understand the advantages and limitations of integrated pest management

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CROP PRODUCTION COMPETENCY AREAS:

1. General crop adaptation
2. Tillage systems used for seedbed preparation of row, small grain and forage crops
3. Hybrid and cultivar selection - GMO
4. Seeding depth factors
5. Crop damage, mortality, and factors influencing replanting decisions
6. Cropping systems

COMPETENCY AREA 1. General crop adaptation

I. Soil adaptations

1. Recognize how crops respond to soil fertility, soil pH extremes, and soil drainage

2. Describe the soil pH ranges where agronomically important crops will perform best

II. Climatic adaptation

3. Recognize how the water needs of a crop typically change during growth and development

COMPETENCY AREA 2. Tillage systems used for seedbed preparation of row, small grain and forage crops

I. Adaptation of tillage system to different cropping systems

4. Recognize the environmental and management factors that influence the selection and use of a tillage system

5. Recognize how cropping systems, environment, and tillage affect soil residue cover

II. No-till

6. List the advantages and limitations of a no-till system

COMPETENCY AREA 3. Hybrid and cultivar (variety) selection

II. Seed quality

7. Recognize how test weight influences seed quality

8. Explain how storage time, handling, and storage conditions may affect seed quality

9. Define seed dormancy and hard seed

COMPETENCY AREA 4. Seeding depth factors

10. Describe seed, soil, and environmental conditions that affect recommended seeding depths for agronomically important crops

COMPETENCY AREA 5. Crop damage, mortality, and factors influencing replanting decisions

11. Recognize the type of damage hail, frost, flooding, drought, and wind can cause agronomic crops

12. List climatic and plant factors which influence plant mortality or its ability to resume growth after injury

COMPETENCY AREA 6. Cropping systems

13. Describe the function(s) of fallow in crop production

14. Recognize advantages and limitations of growing cover crops

15. Recognize advantages and limitations of a monoculture system versus a crop rotation