

## SOUTH DAKOTA CCA STUDY GUIDE

The publications listed here are reference materials for the **Performance Objectives for South Dakota Certified Crop Adviser Exam**. Publications are listed for each area under the four competency areas: Nutrient Management, Soil and Water Management, Pest Management and Crop Management. In many instances, individual publications cover more than one area, though they have been specifically identified for a given area objective.

South Dakota State University (SDSU) has several publications for specific crops and these are listed individually under each Competency Area, as they apply. The entire list of publications can be found on the SDSU Extension website at <https://extension.sdstate.edu/agriculture/crops>

*This study guide is not intended to provide direct questions and answers for the South Dakota CCA exam, but rather to provide reference materials for continuing education.*

### NUTRIENT MANAGEMENT COMPETENCY AREAS:

1. Nutrient movement in soil and water
2. N, P, K plant requirements
3. Secondary nutrient and micronutrient plant requirements
4. Nutrient application
5. Plant nutrient sources and application
6. Lime application
7. State laws and rules governing fertilizer and manure use in storage and handling

### COMPENTENCY AREA 1: Nutrient movement in soil and water

- [How a Soil Holds Water](#)

### COMPENTENCY AREA 2: N, P, K plant requirements

#### Nitrogen

- *South Dakota Fertilizer Recommendation Guide, SDSU*  
[https://extension.sdstate.edu/sites/default/files/2019-03/P-00039\\_0.pdf](https://extension.sdstate.edu/sites/default/files/2019-03/P-00039_0.pdf)
- *Corn Nitrogen Timing, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-20-Corn.pdf>
- *Nitrogen Fixation, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-23-Soybean.pdf>
- *Agronomic Management for Reduced Nitrate Leaching, UNL*  
<https://cropwatch.unl.edu/2020/agronomic-management-reduced-nitrate-leaching>
- *Types and Uses of Nitrogen Fertilizers for Crop Production, Purdue*  
<https://www.extension.purdue.edu/extmedia/AY/AY-204.html>

#### Phosphorus

- *Agronomic and Environmental Management of Phosphorus, UMN*  
<https://extension.umn.edu/phosphorus-and-potassium/agronomic-and-environmental-management-phosphorus>

- *Understanding Phosphorus Fertilizers, UMN*  
<https://extension.umn.edu/phosphorus-and-potassium/understanding-phosphorus-fertilizers>

#### **Potassium**

- *Potassium for Crop Production, UMN*  
<https://extension.umn.edu/phosphorus-and-potassium/potassium-crop-production>

#### **COMPENTENCY AREA 3: Secondary nutrient and micronutrient plant requirements**

- *Micro- and Secondary Macronutrients, UMN*  
<https://extension.umn.edu/nutrient-management/micro-and-secondary-macronutrients>

#### **COMPENTENCY AREA 4: Nutrient Recommendations**

- *Take a Good Soil Sample to Help Make Good Fertilization Decisions, ISU*  
<https://store.extension.iastate.edu/product/3915>
- *Testing and Analysis, UMN*  
<https://extension.umn.edu/nutrient-management/testing-and-analysis#plant-analysis-testing-and-interpretation-695210>

#### **COMPENTENCY AREA 5: Plant nutrient sources and application**

- *Estimating Yield Goals and Nitrogen Phosphorus, Potassium, Iron, and Zinc Recommendations, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-23-Corn.pdf>
- *Fertilizers Used in Soybean and Corn Production, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-21-Soybean.pdf>
- *Starter, Banding, and Broadcasting Phosphorus Fertilizer for Profitable Corn Production, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-26-Corn.pdf>
- *Calibration of Fertilizer Application Equipment, NSFA*  
<http://www.nsfafane.ca/efp/wp-content/uploads/2019/09/Calibration-of-Fertilizer-Application-Equipment-On-Farm.pdf>
- *Fertilizing with Biosolids, UNL*  
<https://lancaster.unl.edu/enviro/biosolids/fertil.shtml>
- *Factors that Affect the Price of Manure as a Fertilizer, UNL*  
<https://water.unl.edu/documents/Value%20of%20Manure%20As%20A%20Fertilizer.pdf>

#### **COMPENTENCY AREA 6: Lime application**

- *Lime Use for Soil Acidity Management, UNL*  
<https://extensionpublications.unl.edu/assets/html/g1504/build/g1504.htm#:~:text=For%20each%200.1%20pH%20buffer,in%20the%20top%207%20inches.>

#### **COMPENTENCY AREA 7: State laws and rules governing fertilizer and manure use in storage and handling**

- *Fertilizer Handling and Safety, Yara*  
<https://www.yara.us/crop-nutrition/fertilizer-handling-and-safety/fertilizer-storage/>

- *Bulk Fertilizer Transport: A Guide for Shippers, USA Trucking*  
<https://usatruckloadshipping.com/bulk-fertilizer-transport/>
- *South Dakota Spill Reporting Requirements, SD DENR*  
<https://denr.sd.gov/des/gw/Spills/Spills.aspx>
- *South Dakota Fertilizer Program Brochure, SD Department of Agriculture*  
[https://sdda.sd.gov/legacydocs/Ag\\_Services/Agronomy\\_Services\\_Programs/Fertilizer\\_Soil\\_Amendment\\_Program/2010\\_08fertilizerpgmbrochure-web.pdf](https://sdda.sd.gov/legacydocs/Ag_Services/Agronomy_Services_Programs/Fertilizer_Soil_Amendment_Program/2010_08fertilizerpgmbrochure-web.pdf)
- *South Dakota Laws and Regulations, SD Codified Law*  
Fertilizer: [SDCL 38-19](#)  
Commercial Fertilizer: [ARSD 12:44](#)
- *South Dakota Feedlot Permit Program, SD DENR*  
<https://denr.sd.gov/des/fp/fphome.aspx>

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

- 1. Soil conservation**
- 2. Water quality**
- 3. Tillage operations and soil characteristics**
- 4. Management of saline and sodic soils**
- 5. Irrigation**
- 6. Soil drainage and water movement in soils**
- 7. Cover crops**

### **COMPETENCY AREA 1: Soil conservation**

- *Soil Erosion & Water Quality, ISU*  
<https://store.extension.iastate.edu/Product/5501-pdf>
- *Conservation Buffers & Water Quality, ISU*  
<https://store.extension.iastate.edu/Product/5502-pdf>
- *Methods for Measuring Crop Residue, ISU*  
<https://crops.extension.iastate.edu/encyclopedia/methods-measuring-crop-residue>

### **COMPETENCY AREA 2: Water Quality**

- *Nitrogen Management for Water Quality in the Midwest, UNL*  
<https://agronomy.unl.edu/faculty/ferguson/rp189.pdf>

### **COMPETENCY AREA 3: Tillage Operations and soil characteristics**

- *Tillage, Manure Management and Water Quality, ISU*  
<https://store.extension.iastate.edu/Product/12004-pdf>
- *Soil Compaction, UMN*  
<https://extension.umn.edu/soil-management-and-health/soil-compaction>

#### **COMPETENCY AREA 4: Irrigation**

- *Irrigating Corn, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-33-Corn.pdf>
- *Soybean Irrigation, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-49-Soybean.pdf>

#### **COMPETENCY AREA 5: Management of saline and sodic soils**

- *Saline and Sodic Soils, NDSU*  
<https://www.ndsu.edu/soilhealth/wp-content/uploads/2014/07/Saline-and-Sodic-Soils-2-2.pdf>
- *Soybeans, Salinity, and Sodicity in South Dakota, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-48-Soybean.pdf>

#### **COMPETENCY AREA 6: Soil drainage and water movement in soils**

- *Managing High Water Tables in Corn Production, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-30-Corn.pdf>
- *Managing High Water Tables and Saline Seeps in Soybean Production, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-47-Soybean.pdf>
- *Managing Wetlands, NRCS*  
<https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/water/wetlands/>

#### **COMPETENCY AREA 7: Cover crops**

- *Cover Crops in Rotations Including Corn, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-15-Corn.pdf>
- *Cover Crops in Rotations with Soybeans, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-05-Soybean.pdf>

#### **PEST MANAGEMENT COMPETENCY AREAS**

1. Basic pest management practices
2. Management of weeds
3. Management of plant diseases
4. Management of insects
5. Calibration of pesticide application equipment
6. Using pesticides in an environmentally sound way
7. Integrated pest management
8. Pesticide resistance management

#### **COMPETENCY AREA 1: Basic pest management practices**

- *Integrated Pest Management Control Tactics, Cornell University*  
<https://biocontrol.entomology.cornell.edu/ipm.php>

#### **COMPETENCY AREA 2: Management of weeds**

- *Common Broadleaf Weeds of South Dakota, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-31-Soybean.pdf>

- *Identification of South Dakota Grass and Grass-like Weeds of Importance, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-30-Soybean.pdf>
- *Resistance Management, UNL*  
<https://cropwatch.unl.edu/resistance-management>
- *Herbicide Mode of Action, OK State*  
<https://extension.okstate.edu/fact-sheets/herbicide-how-to-understanding-herbicide-mode-of-action.html>
- *State Noxious Weed & Pest List, SD Department of Agriculture*  
<https://sdda.sd.gov/ag-services/weed-and-pest-control/weed-pest-control/sd-state-noxious-weed-declared-pest-list-and-distribution-maps/default.aspx>
- *Weed and Pest Control Laws, SD Codified Law*  
[https://sdlegislature.gov/statutes/Codified\\_laws/DisplayStatute.aspx?Statute=38-22&Type=Statute](https://sdlegislature.gov/statutes/Codified_laws/DisplayStatute.aspx?Statute=38-22&Type=Statute)

### **COMPETENCY AREA 3: Management of plant diseases**

- *Scouting for Corn Diseases, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-45-Corn.pdf>
- *Corn Diseases in South Dakota and Their Management, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-47-Corn.pdf>
- *Bacterial Diseases of Soybeans, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-58-Soybean.pdf>
- *Fungal and Fungal-like Diseases in Soybeans, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-59-Soybean.pdf>
- *Viral Diseases of Soybeans. SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-60-Soybean.pdf>
- *Soybean Cyst Nematode, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-57-Soybean.pdf>
- *Fungicidal Seed Treatments for Soybeans, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-08-Soybean.pdf>
- *Wheat Diseases Identification, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2018-12/03-2000-2018.pdf>
- *Fungicide Resistance, Penn State*  
<https://extension.psu.edu/fungicide-resistance>

#### **COMPETENCY AREA 4: Management of insects**

- *Corn Insect Pests, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-51-Corn.pdf>
- *Soybean Aphid Identification, Biology, and Management, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-35-Soybean.pdf>
- *Bean Leaf Beetle Identification, Biology, and Management, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-36-Soybean.pdf>
- *The Identification, Biology, and Management of Two-spotted Spider Mites, Grasshoppers, and Caterpillar, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-37-Soybean.pdf>

#### **COMPETENCY AREA 5: Calibration of pesticide application equipment**

- *Chemical Sprayer Application and Calibration, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-41-Corn.pdf>
- *Chemigation, NDSU*  
<https://www.ag.ndsu.edu/irrigation/chemigation>

#### **COMPETENCY AREA 6: Using pesticides in an environmentally sound way**

- *Pesticide Applicators and Dealers, SD Department of Agriculture*  
<https://sdda.sd.gov/ag-services/pesticide-program/certification-licensing-registration/licensing-and-education/default.aspx>
- *Pesticide Product Registration, SD Department of Agriculture*  
<https://sdda.sd.gov/ag-services/pesticide-program/certification-licensing-registration/product-registration/default.aspx>
- *Pesticide Handling, Use and Storage, SD Department of Agriculture*  
<https://sdda.sd.gov/ag-services/pesticide-program/compliance/pesticide-program-pesticide-handling-use-and-storage/>

#### **COMPETENCY AREA 7: Integrated pest management**

- *IPM Solutions to Pest Management for Corn Production, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-03-Corn.pdf>
- *Scouting for Corn Diseases, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-45-Corn.pdf>
- *Stored Grain Pests of Corn, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-52-Corn.pdf>

- *Stored Grain Pests of Soybeans, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-42-Soybean.pdf>

#### **COMPETENCY AREA 8: Pesticide resistance management**

- *Management, IRAC*  
<https://irac-online.org/about/resistance/management/>

#### **CROP MANAGEMENT COMPETENCY AREAS**

1. General crop adaptation
2. Soil management used for seedbed preparation of row crops, small grains, and forages
3. Seeding date factors
4. Seeding rates and pattern factors of major crops
5. Seeding depth factors
6. Crop damage, mortality, and factors influencing replanting decisions
7. Cropping systems
8. Identification of crops in both seed and vegetative states
9. Growth and development stages of major agronomic crops
10. Crop improvement and biotechnology
11. Precision agriculture

#### **COMPETENCY AREA 1: General crop adaptation**

- *Management Strategies to Reduce the Rate of Soil Acidification, UNL*  
<https://extensionpublications.unl.edu/assets/html/g1503/build/g1503.htm>

#### **COMPETENCY AREA 2: Soil management used for seedbed preparation of row crops, small grains, and forages**

- *Soil Tillage, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-11-Corn.pdf>
- *Developing a Tillage System that Increases Soybean Long-term Sustainability, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-15-Soybean.pdf>
- *No-till planting, UNL*  
<https://cropwatch.unl.edu/planting-tips-successful-no-till-2015>

#### **COMPETENCY AREA 3: Seeding date factors**

- *Spring Planting Guide for South Dakota, SDSU*  
[https://www.farmforum.net/farm\\_forum\\_columnists/spring-planting-guide-for-south-dakota/article\\_b65bbf63-522c-5575-9686-b5523631d4cd.html](https://www.farmforum.net/farm_forum_columnists/spring-planting-guide-for-south-dakota/article_b65bbf63-522c-5575-9686-b5523631d4cd.html)
- *Soil Temperature for Planting Spring Crops, SDSU*  
<https://extension.sdstate.edu/soil-temperature-planting-spring-crops>

#### **COMPETENCY AREA 4: Seeding rates and pattern factors of major crops**

- *Corn Seeding Rates in South Dakota, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-08-Corn.pdf>
- *Soybean Planting Recommendations, South Dakota Soybean Association*  
<https://www.sdsoybean.org/topics/production-resources/optimal-planting-date-seeding-rates-row-spacing/>

#### **COMPETENCY AREA 5: Seeding depth factors**

- *Adjusting Planting Soil Depth for Better Germination, ISU*  
<https://crops.extension.iastate.edu/encyclopedia/adjusting-planting-soil-depth-better-germination>
- *Soybean Planting Depth: Consider Planting Deeper, UNL*  
<https://cropwatch.unl.edu/soybean-planting-depth-consider-planting-deeper>

#### **COMPETENCY AREA 6: Crop damage, mortality, and factors influencing replanting decisions**

- *Resources for Early-Season Crop Damage, UNL*  
<https://cropwatch.unl.edu/2020/resources-early-season-crop-damage>

#### **COMPETENCY AREA 7: Cropping systems**

- *Cover Crops in Rotations Including Corn, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-15-Corn.pdf>
- *Crop Rotations Can Increase Corn Profitability and Reduce Pests, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-09-Corn.pdf>

#### **COMPETENCY AREA 8: Identification of crops in both seed and vegetative states**

- *Plant Identification, NRCS*  
[https://www.nrcs.usda.gov/Internet/FSE\\_PLANTMATERIALS/publications/wapmstn9835.pdf](https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/wapmstn9835.pdf)

#### **COMPETENCY AREA 9: Growth and development stages of major agronomic crops**

##### **Plant Staging**

- *Corn Growth and Development, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-05-Corn.pdf>
- *Soybean Growth Stages, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-03-Soybean.pdf>
- *Identifying Leaf Stages in Small Grain, NDSU*  
<https://www.ag.ndsu.edu/publications/crops/identifying-leaf-stages-in-small-grain>



## Harvesting and regrowth

- *Timing Critical in Alfalfa Harvest, NDSU*  
<https://www.ag.ndsu.edu/news/newsreleases/2013/sept-23-2013/timing-critical-in-alfalfa-harvest/>
- *Fall Forage Management, NDSU*  
<https://www.ag.ndsu.edu/plantsciences/research/forages/docs/FallHarvestManagement2011-PPT.pdf>

## Management factors related to morphology, growth and development of major crops

- *Environmental Factors Affecting Plant Growth, OSU*  
<https://extension.oregonstate.edu/gardening/techniques/environmental-factors-affecting-plant-growth>

## COMPETENCY AREA 10: Crop improvement and biotechnology

- *How to Make a GMO, Harvard*  
<http://sitn.hms.harvard.edu/flash/2015/how-to-make-a-gmo/>
- *USDA Modernizes Plant Biotechnology Regulations, BIO*  
<https://www.bio.org/news/issue-briefs>
- *How Biotech Crops are Evaluated for Environmental Safety in the United States, UNL*  
<http://agbiosafety.unl.edu/environment.shtml>
- *The Plant Variety Protection Act, CSU*  
<https://extension.colostate.edu/topic-areas/agriculture/the-plant-variety-protection-act-0-301/>
- *Food Crops Derived from Agricultural Biotechnology, BIO*  
<https://archive.bio.org/articles/food-crops-derived-agricultural-biotechnology>
- *Definitions to Common Biotechnology Terms, UNL*  
<http://agbiosafety.unl.edu/terms.shtml>

## COMPETENCY AREA 11: Precision agriculture

- *Precision Farming Opportunities, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-19-Corn.pdf>
- *Troubleshooting Precision Agricultural Equipment, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2019-09/S-0003-02-Corn.pdf>
- *Soil Sampling for Precision Phosphorus Soybean Management, SDSU*  
<https://extension.sdstate.edu/sites/default/files/2020-03/S-0004-20-Soybean.pdf>
- *Corn seeding rates and variable-rate seeding, ISU*  
<https://crops.extension.iastate.edu/encyclopedia/corn-seeding-rates-and-variable-rate-seeding>
- *Site-specific Farming: Economics and the Environment, NDSU*  
<https://www.ag.ndsu.edu/publications/crops/site-specific-farming-economics-and-the-environment>