SDSU Extension

iGrow Corn

BEST MANAGEMENT PRACTICES

Chapter 13:
Preparing a Corn Seedbed and Managing Crop Residues

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Crop residues that are not uniformly distributed can cause uneven soil temperatures and soil moisture levels that impact seed germination and stand variability. A goal in residue management and seedbed preparation is to minimize this variability. The purpose of this chapter is to provide a checklist of residue-management options (Table 13.1).

Table 13.1 Checklist for preparing for seeding:

1. Seedbed preparation starts by evenly distributing crop residues during harvest.
2. A good residue-management plan can reduce pest problems. However, it does not replace the importance of using an appropriate seed treatment or using pre- and post-plant herbicide treatments.
3. Removing corn residue is not generally recommended in South Dakota for disease management. Options for improved disease management are tillage, use of residue manager, rotations, seed treatments, and foliar fungicide applications, if warranted.
4. Review the seeder owner's manual.
5. On the planter, replace worn parts, calibrate seed meters, calibrate planter fertilizer and pesticide applicators, check down-pressure springs, maintain even and recommended tire pressure, and lubricate bearings and other moving parts.
6. Do not plant if soil is too wet.

Residue Removal and Crop Yields

In a continuous corn rotation, harvesting corn residues can produce a short-term yield increase in the following corn crop that often diminishes with time (Chapter 24). This increase is attributed to many factors including warmer soils, improved germination, and reduced variability of the distance between adjacent plants. However, the practice may also produce a long-term yield decrease that is attributed to a gradual decline in soil health and organic C. The organic C is important because it builds soil resilience and provides important nutrients to the plant (Clay et al., 2012). Clay et al. (2014) reported that 22%, 63%, and 36% of the increases in corn, soybean, and wheat yields, respectively, from 1974 to 2012, could be linked to soil health improvements. They also reported that improved soil health had a $1.1 billion impact on the South Dakota economy in 2012. Removing the surface residue can place these gains in jeopardy.

Residue Management and Seedbed Preparation

Since 1970, the corn harvest index [harvest index = lbs of grain / (lbs of stover + lbs of grain)] has remained stable at about 0.5, while statewide corn yields have been increasing at a rate of 2.9 bu/acre. This means that as yield increased from 75 to 150 bu/acre, the amount of surface residue increased from 3550 pounds of biomass/acre to 7400 pounds of biomass/acre. This residue contains nutrients required by the plant and helped South Dakota farmers increase their soil organic matter content 24% over the past 25

years (Clay et al., 2012). However, the increased crop residue has complicated preparing a "good" seedbed and slowed soil warming in the spring (Gentry et al., 2013).

Good residue management starts in the fall during harvest and continues through planting. The residue-management plan should consider both the chaff and straw. Chaff is discharged from the cleaning unit, whereas straw consists of corncobs, husks, and cornstalks. A chaff spreader uses spinning discs to distribute the fine materials, whereas a straw chopper uses knives to break or cut residue prior to distribution. Additional information for individual combines is available in Butzen et al. (2015).

A corn combine that chops the stalks can be used to evenly spread the residue on the soil surface. If the combine does not have the equipment to uniformly distribute residue, an aftermarket purchase may be needed. Recommendations for improving residue distributions include:

1. Visit with your dealer and refer to the owner's manual.
2. Check the distribution pattern and add residue-spreading attachments if needed.
3. Check residue distribution pattern periodically during harvest.
4. Do not overcorrect for windrowing problems.
5. Adjust the speed of the straw spreaders by changing the pulleys.
6. Inspect, sharpen, and replace chopper blades when needed.

A good residue-management plan can also reduce disease and insect problems, while improving stand uniformity and yields (Gentry et al., 2013). A poor residue-management plan can:

1. Push residue into the seed furrow.
2. Slow soil warming.
3. Cause toxic impact on the germinating seed.
4. Delay emergence.
5. Increase overwintering of insects and diseases.

Plant at Appropriate Soil Moisture Content

Planting a field when it is too wet can cause emergence and compaction problems. When planting, the top 4 inches of soil should be dry enough that it crumbles easily and does not form a ribbon when compressed in your hand. The soil moisture content should be below field capacity to avoid sidewall compaction, which can lead to a shallow root system. Field capacity is the amount of water remaining in the soil after gravity has removed the gravitational water. Most soils approach field capacity 2 or 3 days after a rainfall. If the soil is too wet, the disc openers can cause sidewall compaction, which produces variable emergence. Compaction can also be reduced by lowering the tire pressure to the minimal allowable pressure, using flotation tires, and installing larger diameter tires.

Preseason Pest Management

High residue can shelter germinating pests from chemical pesticides. In high-residue systems, consider using a variety of control strategies. Since early planting is recommended, a fungicide and insect seed treatment is also suggested. Producers are encouraged to combine practices such as including residue cleaners on planters, using strip-tillage to devoid the planting zone of residue, or incorporating genomic and cultural options with chemical solutions for weed, insect, and disease control.

Planter Maintenance and Preparation

A corn planter is a piece of precision equipment that requires all of the components to be adjusted correctly. Research suggests that the uniform spacing of seed can increase yields up to 20 bu/acre (Doerge and Hall, 2000). Although plant spacing and density are conducted too late to correct an in-season problem, stand counts and planter variability information is useful in assessing whether a new planter or refurbishing is needed. Examples for determining emergence rates are available in Chapter 34.

Growing conditions should also be evaluated to assess whether soil crusting, compaction, temperature, or moisture could be responsible for nonuniform stands. Information for assessing compaction is available

in Chapter 14. Potential yield losses due to uneven stands can be estimated (Carlson et al., 2000; Chapter 34). If planter calibration is necessary, always follow the manufacturer's instructions for calibrating seed-metering equipment. Assistance is available from local Extension educators, crop consultants, seed dealers, and the equipment manufacturer. Different adjustments may be required for different tillage systems. For example, the downward pressure of the planter should be higher for no-tillage vs. a tilled seedbed.

During planting, it is important to place seed at the proper depth and ensure that the opener does not smear the walls of the furrow. Down-pressure tension should be adjusted if the seed is not placed at the desired depth (1½ to 2 inches). Closers or packing wheels should apply enough pressure for "good" seed-to-soil contact; too much pressure will compact the seedbed, whereas too little will provide poor soil-to-seed contact. Adjust down-pressure tension in consideration of soil moisture and residue conditions.

As no-till and reduced-till systems become increasingly popular, the planter takes on the added responsibility of assisting in residue management. Hence, there are more parts to wear out and maintain. Residue managers can help cut residue and clear a path for the planting unit. If residue is not managed appropriately, it can interfere with seed placement, delay germination, produce a physical barrier to the emerging seedling, slow plant growth, increase pest problems, and reduce nutrient efficiency.

Planting Dates

The spring planting window generally ranges from late April to mid-June. Historically, 90% of the corn acres in South Dakota are seeded by mid-May and completed by mid-June. Seed germination depends on soil moisture and temperature. Care should be taken to avoid tillage and planting operations when the soil is wet.

As a general rule, corn should not be planted until the soil temperature (measured at 2" between 7 and 8 a.m.) approaches 50°F. In cold soil conditions (below 50°F), seeds will readily absorb water but will not initiate root or shoot growth. This can lead to seed rots and poor emergence. If circumstances force planting before soil temperatures reach 50°F, it is recommended to use a seed treatment and consult with a reputable seed dealer or agronomist to select an appropriate hybrid. Delaying seeding can reduce corn grain yields (Table 13.2).

Use of a Packer Wheel

High germination rates require good soil-to-seed contact. Packer wheels can improve soil-to-seed contact, nutrient uptake, and stand uniformity in dry soil, whereas in wet soil, packer wheels can increase soil compaction and crusting. The use of packer wheels should be based on the soil conditions at the site when planting.

Delayed Planting and Replanting Considerations

Delayed planting reduces the number of growing-degree units (GDU) accumulated during the season, hindering the crop from maturing before the first fall killing frost. Corn killed by frost before maturity will have lower yields and higher drying costs. If planting is delayed, late-maturing hybrids can lose up to 1.1 bu/acre per day compared with earlier-maturing hybrids. Often, the trade-off is that earlier hybrids have a lower yield potential.

The number of GDUs that a hybrid needs to reach physiological maturity is related to maturity ratings. Hybrids with an 80-day maturity rating often require 1900 growing-degree days (GDD), whereas a 95-day hybrid requires approximately 2200 GDD. Additional information is available in Chapter 10. A rule of thumb is to plant 20% of your acres with a full-season hybrid, 60% with a mid-season hybrid, and the remaining 20% with a short-season hybrid (i.e., the "20-60-20 rule"). When you are developing a seeding strategy, you should also develop a harvest strategy. If planting is delayed, growers are urged to consult their seed dealer to determine whether an earlier-maturing hybrid is warranted or available.

Depth and Planting Operations

Under optimal conditions (warm, moist soil), seed placement is 1½ to 2 inches below the soil surface.

However, in dry soil it may be advantageous to plant deeper (2 to 3 inches). Planting deeper than 3 inches is not recommended because seed emergence is very low. Although soil conditions may be dry, consider the probability of rain in the near future. Rain can seal the soil surface, resulting in soil crusting and reduced emergence rates. Seeds should be placed at shallower depths (< 2 inches) if rain is likely.

When planting into areas with heavy residue, seed depth should be at least 1.25 inches but not deeper than 1½ inches if soil moisture conditions are favorable. High residue can result in seeds being left on the surface and variable soil temperature and emergence. Seed left on the soil surface or in the residue layer will not properly develop. To ensure that seeds are placed at the proper depth, check seed depth in high-residue situations. These measurements should not include any surface residue. If residue is problematic, consider residue management planter attachments (residue cleaners).

References and Additional Information

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