5-2009

Best Management Practices for Corn Production in South Dakota: Corn Planting Guide

Robert G. Hall
South Dakota State University

Kurtis D. Reitsma
South Dakota State University

David E. Clay
South Dakota State University

CHAPTER 3
Corn Planting Guide

Obtaining maximum profit from a corn crop depends on the timely planting of an appropriate hybrid, at the proper depth, with a planter that evenly spaces the seed. The success of a corn crop is dependent on equipment maintenance, seedbed preparation, the development of a sound fertility and pest management program, and planting the seed. Early planting is best, but temperatures should be warm enough to assure quick germination and emergence, and late enough to avoid hard frosts. Planting-opportunity windows can be narrow due to spring rains or a late warm-up. Time spent in the off-season maintaining equipment and planning tentative season-long schedules can increase planting efficiency. This section discusses planter maintenance, planting date, replanting considerations, seeding rate, and planting depth.

Planter Maintenance and Preparation

A corn planter is a piece of precision equipment, with each component working together to place the seed in the ground at a uniform depth and with a uniform distance between seeds. Research has shown that the uniform spacing of seed can increase yields up to 20 bu/acre (Doerge and Hall 2000). Although they are conducted too late to correct an in-season problem, stand counts and population surveys can be useful for determining if planter calibration is needed. Growing conditions should also be evaluated, as poor seed quality or problems such as soil crusting, areas that are too wet or too dry, or cold soil temperatures for extended periods may be responsible for non-uniform stands.

Table 3.1. Planter maintenance checklist

- ✓ Review owner's manual.
- ✓ Replace worn parts.
- ✓ Calibrate seed meters.
- ✓ Calibrate planter fertilizer and pesticide applicators.
- ✓ Check down pressure springs.
- ✓ Maintain even and recommended tire pressure.
- ✓ Lubricate bearings and other moving parts.

Potential yield losses due to uneven stands can be estimated (Carlson et al. 2000). 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, or seed dealers.

During planting, it is important to place seed at the proper depth and ensure that the walls of the furrow are not smeared by the opener. Down-pressure tension should be adjusted if seed is not placed at the desired depth (1½ to 2") (see "Depth and Planting Options" section on pg. 15 of this publication). Closers or packing wheels should apply enough pressure for good seed-to-soil contact; too much pressure will compact the seedbed. 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 additional task of manipulating soil and crop residue. Hence, there are more parts to wear out and maintain. Implements that manage residue on the planter are critical in no-till and other high-residue systems, as crop residue can interfere with openers and closures.

Planting Dates

The spring planting window generally ranges from late April to mid-June (Table 3.2). Historically, 10% of the corn acres in South Dakota are seeded by mid-May, continuing to mid-June. Seed germination depends on soil moisture and temperature. Care should be taken to avoid tillage and planting operations when soil is wet. Yields may or may not be reduced due to delayed planting. However, due to problems associated with compaction, "mudding" the seed in will reduce current and future yields.

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 leads to seed rots and poor emergence. If circumstances force planting before soil temperatures reach 50°F, it is recommended to consult with a reputable seed dealer or agronomist to select an appropriate hybrid (one where the seed has been treated with a fungicide).

Table 3.2. Suggested and historical dent corn planting dates in South Dakota by region

Approximate planting dates by reporting region						South Dakota reporting region
Suggested planting dates*			Historical acres planted, 1970–1994**			
Earliest	Latest	Desired range	10%	50%	90%	
May 4	June 5	May 12 – 26	May 10	May 26	June 9	Northwest
5	5	May 10 – 24	9	20	5	North Central
6	5	May 10 – 24	6	18	4	Northeast
April 29	June 8	May 12 – 24	May 12	May 25	June 10	West Central
May 3	5	May 6 – 26	9	20	5	Central
6	5	May 6 – 26	4	16	3	East Central
May 4	June 3	May 7 – 24	May 7	May 20	June 2	Southwest
April 29	8	May 3 – 17	10	22	7	South Central
27	10	May 1 – 15	6	15	2	Southeast

* Dates are best estimates obtained from historical and research data within a reporting region.
** Adapted from National Agricultural Statistics Service (NASS) – South Dakota Field Office.

Delayed Planting or 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 (see Chapter 4). Corn killed by frost before maturity may not have completely filled kernels and has a slower dry-down rate, which can lead to excessive drying costs. If planting is delayed, late-maturing hybrids can lose up to 1.1 bu/acre per day compared to earlier-maturing hybrids that can be planted later in the season without realizing a loss (Table 3.3). The trade-off for planting earlier hybrids is that they have lower yield potentials.

The number of GDUs that a hybrid needs to reach physiological maturity is related to maturity ratings (Table 3.4.). Since GDUs are based on temperature (see Chapter 2), the amount of GDUs accumulated in the spring and fall are less than during the peak summer months. Available GDUs decline with later planting dates. However, corn will usually emerge quicker if soil temperatures are warmer.

Table 3.3. Yield response of corn to planting date

Relative Maturity (MN Rating)	------Average planting date-----					Daily yield loss from May 7
	April 17	April 27	May 7	May 17	May 27	
	------Average yield (bu/acre)----------					(bu/acre)
101 – 103 d. (early)	130	132	131	132	119	0.06
112 – 118 d. (late)	143	145	141	131	109	1.6
Average	137	139	136	131	114	1.1

Yield data collected from 1986 to 2001 (14 yrs*).
*No data for 1995 or 2000.
Southeast South Dakota Experiment Station, Beresford SD.
(Berg et al. 2001)

A "rule of thumb" is to plant 20% of fields with a full-season hybrid, 60% with a mid-season hybrid, and the remaining 20% with a short-season hybrid ("20-60-20 rule"). If planting is delayed, growers are urged to consult their seed dealer to determine if an earlier-maturing hybrid is warranted.

Table 3.4. Estimated accumulated GDUs required for corn

Growth Stage	RM* – 80 days (Early)	RM* – 95 days (Mid)	RM* – 110 days (Late)
	----------GDUs----------		
Emergence	110	110	110
R1 (silking)	1100	1250	1400
R6 (maturity)	1900	2200	2500

* Relative maturity (RM) of hybrid in days.

Seeding Rates

The optimal population for an area is influenced by available water, nutrients, and overall soil productivity. Even within a field, optimal populations may vary by soil type or landscape position. Low populations can lead to increased weed pressure (from lack of competition), whereas higher plant populations increase seed investment with little return. Achieving an optimal population throughout the field gives corn a competitive edge over weeds and can optimize grain dry-down time in the fall.

Optimal corn populations vary from 24,000 to 32,000 plants per acre. Higher-productive soils with sufficient drainage and available water can support higher populations. Data in Table 3.5 provide a guide for selecting optimal population rates.

Table 3.5. Influence of soil type and yield potential on target population and seeding rate

Yield potential by soil type	Target population (1,000 plants/acre)	Planting rate[1] (1,000 seeds/acre)	
		No-till	Tilled
High Yield Potential • deep loams • well drained	28 – 32	32 – 34	30 – 32
Moderate Yield Potential • clays – sandy loams • well to moderately drained	26 – 28	30 – 32	28 – 30
Low Yield Potential • droughty soils • somewhat to poorly drained • excessively drained	24 – 26	28 – 30	26 – 28

[1]Increase population by 10% for silage corn.

Some overall recommendations for seeding rate include the following:

- Increase populations by ≈10% for silage crops.
- Set seeding rates higher than target population to account for less than 100% germination and seedling mortality.
- Increase seeding rate by ≈ 2000 seeds/acre in no-till systems.
- Increase seeding rate by ≈ 2000 to 3000 seeds/acre in irrigated fields.

Depth and Planting Operations

Depending on field conditions at the time of planting, depth can vary from 1½ to 3 inches. Under optimal conditions, seed is commonly placed 1½ to 2 inches below the soil surface. In dry conditions, it may be advantageous to plant deeper (2 to 3"). If soil is very dry and rain is not expected, seed may be placed up to 3 inches deep. Planting deeper than 3 inches is not recommended, as reduced emergence rate may result. The likelihood of rain is an important factor when making planting depth decisions. If surface residue has been removed, rain can seal the surface of the soil, making it difficult for the developing plant to emerge.

Crop residue can affect seeding date (as soils warm slower in high-residue systems). Seed can be left on the surface when seed openers "ride-up" over residue. When seeding into areas with heavy residue, if moisture conditions are favorable, plant at least 1¼ inches deep. Check seed depth often in high-

residue situations to make sure that seed is placed at the proper depth. Do not include surface residue when measuring seeding depth. Seed left on the surface or in the residue layer will not grow or properly develop. If residue is problematic, consider residue manager planter attachments.

Additional Information and References

Berg, R., D. DuBois, B. Jurgensen, R. Stevens, and G. Williamson. 2001. Date of planting corn. SE South Dakota Experiment Farm Progress Report 41:37–42. http://plantsci.sdstate.edu/Farm%20Reports/Beresford%202001/0105.pdf.

Carlson, C.G., T.A. Doerge, and D.E. Clay. 2002. Estimating corn yield losses from uneven spaced corn. SSMG-37 Clay et al. (ed.). Site-Specific Management Guidelines. http://www.ppi-far.org/ssmg.

Doerge, T.A. and T.E. Hall. 2000. The value of planter calibration using the MeterMax* system. Pioneer Hi-Bred International, Inc. Crop Insights 10:23. http://www.pioneer.com/web/site/portal/menuitem.268d86162ece78de3c3d48e7d10093a0/.

USDA-NASS. 2007. Annual Summary Bulletin. http://www.nass.usda.gov/sd.

Hall, R.G., K.D. Reitsma, and D.E. Clay. 2009. "Corn planting guide." Pp. 13–16. In Clay, D.E., S.A, Clay, and K. Reitsma (eds). Best Management Practices for Corn Production in South Dakota. EC929. South Dakota State University, South Dakota Cooperative Extension Service, Brookings, SD.

Support for this document was provided by South Dakota State University, South Dakota Cooperative Extension Service, South Dakota Agricultural Experiment Station; South Dakota Corn Utilization Council; USDA-CSREES-406; South Dakota Department of Environment and Natural Resources through EPA-319; South Dakota USGS Water Resources Institute; USDA-North Central Region SARE program; Colorado Corn Growers Association; and Colorado State University.