

AGRONOMIC Spotlight



2009 Conditions in North and South Dakota Lead to High Moisture November 20, 2009

The 2009 growing season has not been ideal for corn growth. Initially, the wet spring delayed planting then, cool air temperatures lingered all season long. Currently, harvest is late and corn moisture content is high. Conditions this season left soil temperatures below average and also decreased growing degree day (GDD) accumulation which, resulted in slow corn growth and delayed corn development. In fact, some corn never reached physiological maturity.

GDD

Growing degree-days are used to measure heat accumulation during the growing season. They are calculated by averaging the daily high (maximum 86° F) and the daily low (minimum 50° F) and then subtracting 50° F. The maximum and

minimum temperatures are used in the calculation as corn growth is impeded when the temperature is below 50° F and when the temperature exceeds 86° F. During the growing season, the accumulated growing degree-days (AGDD) can be utilized to measure crop development compared to normal long term (30 year average) records. Table 1 lists the AGDDs in 2009 across some cities in North and South Dakota. Accumulated growing degree days were lower than normal with the deficit from the normal long term record ranging from -140 days in Hettinger, ND to as many as -455 days in Redfield, SD. Figure 1 also shows the reduction in AGDDs in 2009, making it easy to see how the cooler than normal temperatures had a negative impact on corn development and maturity.

Table 1. 2009 Accumulated Growing Degree Days (AGDD) for Corn Compared to Normal (30 year average 1971-2000).

| Location | First Frost 2009 | AGDD for Corn 2009 From May 1st to First Frost | Normal AGDD for Corn 30 year average 1971-2000 | 2009 Deficit in AGDD (2009-Normal) |
|-----------------|------------------|--|--|------------------------------------|
| Williston, ND | Sept. 22 | 2138 | 2300 | -162 |
| Grand Forks, ND | Sept. 29 | 2091 | 2238 | -147 |
| Carrington, ND | Sept. 29 | 1926 | 2265 | -339 |
| Fargo, ND | Oct. 8 | 2238 | 2393 | -155 |
| Hettinger, ND | Sept. 28 | 1985 | 2125 | -140 |
| Leola, SD | Oct. 8 | 2104 | 2505 | -401 |
| Bowdle, SD | Oct. 8 | 2025 | 2396 | -371 |
| Redfield, SD | Sept. 29 | 2180 | 2635 | -455 |
| Pierre, SD | Sept. 29 | 2467 | 2733 | -266 |
| Brookings, SD | Sept. 29 | 2114 | 2315 | -201 |

(North Dakota State University Agricultural Weather Network (NDAWN) and South Dakota State University Climate and Weather (SDSUCW))

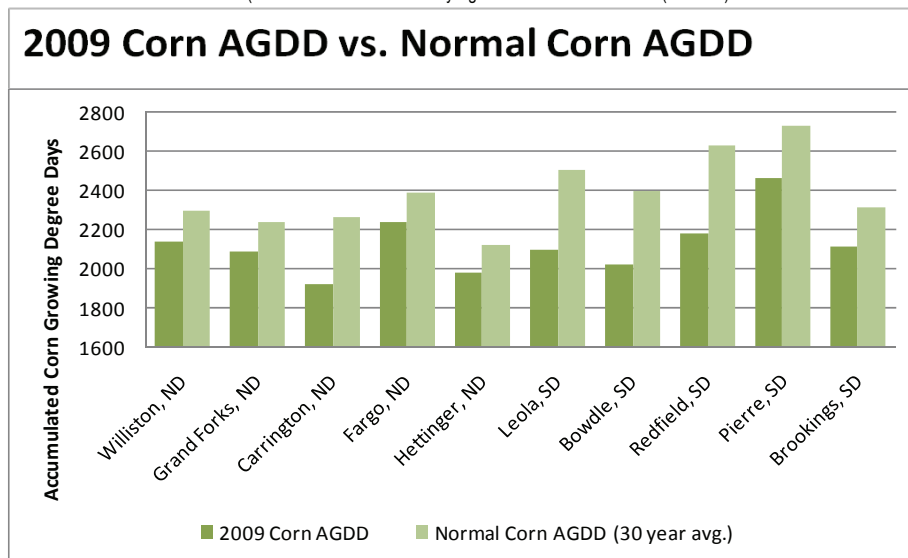


Figure 1. 2009 Corn Accumulated Growing Degree Days vs. Normal Corn Accumulated Growing Degree Days (30 year average). (adapted from NDAWN and SDSUCW)

(continued on page 2)

Crop Residue

Crop residue left in the field from no-till or reduced till systems can be beneficial for many reasons; erosion control, increases in soil organic matter, increases in nutrient availability, and increases in biological activity, to name a few. Crop residue may also help maintain soil moisture which can be beneficial in some instances or a hindrance in years like 2009. Crop residue reduces evapotranspiration which does not allow the soil to dry out as fast as soils without residue. Crop residue also shades soil from sun and does not allow it to warm as quickly as soils with no residue. The wet spring coupled with last year's crop residue left soils wet and cold for extended periods of time which delayed planting. When the crops were finally planted the soil temperatures remained low contributing to slow emergence and delayed growth. North Dakota Agricultural Weather Network (NDAWN) collects soil temperature readings at a 4 inch depth every 60 seconds and records the average temperatures of bare soil versus turf in identical soil types and environments. Data from two locations (Britton, SD and Hettinger, ND) during May, June, and July of 2009 indicate the bare soil had

consistently higher soil temperatures compared to the turf at both locations (Table 2). The data helps illustrate how a conventional tillage field with less crop residue (hypothetically the bare soil) would have higher soil temperatures compared to a no till field with heavy residue (hypothetically the turf).

In summary, a series of weather conditions this season caused the high moisture content corn that is now being harvested. To begin with the wet spring resulted in late planting. In addition, crop residue from no-till or reduced till fields allowed soils to stay cooler than normal, resulting in slow emergence and slow early growth. Throughout the season cool temperatures and a decrease in GDDs continued to keep plant growth slow and development delayed. Decreases in AGDDs were wide-ranging from -140 days deficient to as many as -455 days deficient in some areas of North and South Dakota. This caused corn development delays to the extent that some corn never reached physiological maturity. The end result is high moisture or wet corn that does not seem to be drying down in the field.

Table 2. Soil Temperature Comparisons of Bare Soil vs. Turf in May, June and July 2009

| Location | Month | Soil Temperature °F | | Difference in Soil Temperature °F (Bare Soil-Turf) |
|---------------|-------|---------------------|------|---|
| | | Bare Soil | Turf | |
| Britton, SD | May | 59 | 51 | 8 |
| Hettinger, ND | May | 58 | 47 | 11 |
| Britton, SD | June | 67 | 62 | 5 |
| Hettinger, ND | June | 66 | 57 | 9 |
| Britton, SD | July | 73 | 67 | 6 |
| Hettinger, ND | July | 74 | 64 | 10 |

(North Dakota State University Agricultural Weather Network)

Sources: Andrews, S. 2006. *Crop Residue Removal for Biomass Energy Production: Effects on Soils and Recommendations*. USDA. Available On-line: <http://soils.usda.gov> validated 11/19/09. North Dakota State University Agricultural Weather Network. Available On-line: <http://ndawn.ndsu.nodak.edu> validated 11/19/09; South Dakota State University Climate and Weather. Available On-line: <http://climate.sdstate.edu> Validated on 11/19/09; R. Neild, et al. *Growing Season Characteristics and Requirements in the Corn Belt*. National Corn Handbook. NCH-40. University of Illinois. 1987; North Dakota State University. 1997. *Corn Production Guide*. North Dakota State University publication A-1130. Available On-line: <http://www.ag.ndsu.edu> validated 11/15/09; Ritchie, S.W., Hamway, J.J., Benson, G.O., Herman, J.C., Lupkes, S.J., Salvador, R.J., Satter, R., Miller, W., Kitzman, A. 1993. *How a Corn Plant Develops*. Iowa State University. Cooperative Extension Service. Special Report No. 48. Available On-line: <http://www.extension.iastate.edu> validated 11/15/09

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