

Corn Production Guide (continued)

A-1130, May 1997

Irrigation Management

Corn needs between 18 to 22 inches of soil moisture during most growing seasons to achieve maximum yield potential. In North Dakota, irrigation is used to supplement rain to maintain optimum soil moisture for growth. Under these conditions, corn is capable of producing 8 to 14 bushels of grain corn and 1.25 to 1.75 tons of silage for each inch of additional applied water. Corn variety maturity length will affect seasonal water use. For example, water use during a particular growing season will be greater for 90 day corn than for 80 day corn.

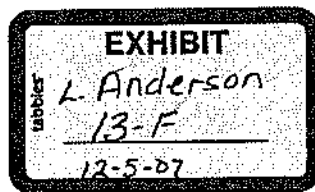
The water that evaporates from the soil near a corn plant plus the soil water used by the corn is called evapotranspiration (ET) or simply water use. The frequency and amount of irrigation depends on the growth stage of the corn (which determines the daily water use), the water-holding capacity of the soil in the root zone and the prevailing weather conditions.

Corn Rooting Depth and Water Use

Corn is a relatively deep rooted crop. Typically, in deep soils, roots grow laterally 12 to 18 inches from the stalk and downward to a depth of 4 feet or more. About 90 percent of the roots will be found in the top 3 feet, which is considered the effective rooting depth for irrigation purposes. Over the course of a growing season, about 40% of the water used by corn will come from the first foot of soil, 30% from the second foot and 20% from the third foot. Less than 10 percent will be obtained from the soil below 3 feet.

Average corn water use will increase from about 0.03 inches per day soon after emergence to over 0.27 inches per day during ear formation (Figure 1). However, during July and August, hot, windy days can push water use to over 0.35 inches per day. The water use is given as a depth measurement because it is assumed that corn removes soil water from under every square foot of soil surface in the field.

Figure 1. Corn water use and soil moisture management criteria. (8KB b&w)



Anderson Exhibit #13F

chart)

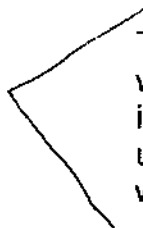
Water Holding Capacities of Soil

The depth and water holding capacity of soil has a great influence over when and how often irrigations are required. Soil texture determines the amount of available water it will hold (Table 1). Note that the greater the water holding capacity of the soil in the root zone, the less frequent the irrigations should be. It is important to know the soil texture and water holding capacity of the dominant soil type in a corn field and use that information for making irrigation decisions.

Irrigation Water Management

It is desirable to have a soil profile that is near field capacity at planting. Most years this will happen naturally with normal winter snow and spring rainfall. Less than a full soil moisture profile to a depth of at least 3 feet at planting could hinder root development later in the season. Also, stored soil moisture in the root zone serves as a supplement during high water use periods.

From emergence to the onset of tassels (about 40 days), corn is relatively drought tolerant. It can withstand up to 60 percent soil water depletion in the root zone without a significant impact on yields (Figure 1). However, from the onset of tasseling to the blister kernel stage (40 to 80 days after emergence), soil moisture levels in the root zone should not be depleted more than 50 percent to achieve maximum yields. After blister kernel development, corn can again withstand 60 percent soil water depletion without much impact on yields.



The period of greatest water stress sensitivity coincides with the time of highest water use demands (July and August). Corn water use will average around 7 to 8 inches in July and 6 to 7 inches in August. With temperatures in the 80s, corn will use about 1.75 inches per week (net). Temperatures in the 90s will increase the water demand to around 2.1 inches per week (net).

Most center pivots are set to apply from 0.5 to 1 inch of water per revolution. For a center pivot system covering 128 acres with 800 gallons per minute (gpm) of capacity, it will take about three days to put on 1 inch (net) of irrigation water. Therefore, when the corn begins to tassel it is critical that the soil moisture profile be monitored frequently, or it may be difficult to keep up with corn water use during periods of high temperatures and wind. Scheduling of irrigations during these periods is extremely important.

Corn planted on relatively deep soil where the full 3-foot root zone can develop should receive at least 1.0 inches (net) of water each irrigation during the period of highest water use.

Corn planted on shallow soils (12 to 24 inches of top soil) underlain by coarse

sand and gravel can pose irrigation management problems. The roots will be concentrated only where there is top soil, thus this becomes the management root zone. A shallow root zone means there is less available water. For this situation, applying less water (0.5 to 0.7 inches) more frequently would be produce better results than applying a larger amount less frequently.

For corn grain, the last irrigation of the season is determined by the maturity of the corn kernels. Corn should be irrigated until sufficient soil moisture is available to ensure the milk layer in the kernel moves down to the tip of the kernel or black layer formation. This generally occurs about 55 days after 75% of the plants have visible silks on the ears. Yellow dent corn is usually well dented at maturity.