Try checkbook method for scheduling corn irrigation

NEWARK, Del. — With record high prices possible by harvest time, corn producers will want to have plenty to sell. Since irrigation is the best way to ensure a bumper crop on Delmarva, many growers put in new center-pivot systems this year.

Last summer at least three farms in Sussex County grew over 200 bushels of corn per acre under irrigation, so this is a realistic goal on sandy soils, according to University of Delaware extension agricultural engineer Tom Williams. The state record is 291 bushels on an irrigated silt loam.

It takes a lot of water to grow 200-bushel corn, though–about 25 inches or 700,000 gallons per acre total, applied as irrigation and rain at the right time throughout the growing season.

Research at the University of Delaware Agricultural Experiment Station has shown that corn water use starts slowly in May (1.7 inches), accelerates in June (5.4 inches), peaks in July (9.5 inches), declines in August (7.5 inches) and ends at maturity in September (1.3 inches).

July is the most critical month, with corn water use peaking at about 0.32 inches a day during pollination. To keep up with this peak demand when no rain falls and there's limited soil moisture stored in the root zone, Williams says an irrigation system with 75 percent efficiency would have to supply 8 gallons per minute per acre continuously (24 hours a day, 7 days a week).

"Scheduling irrigation is a real challenge in the East where rain can mess up your schedule but save on pumping costs," he says. "Too little water reduces yields; too much leaches out valuable plant nutrients."

He recommends growers use what he calls a "checkbook method" to keep track of available water, so that they know when to turn their systems on and off for maximum benefit to the crop.

Rainfall and irrigation water are the deposits to the account. Corn water use is the withdrawal. One point to remember is that the account can't exceed the soil's water-holding capacity in the root zone. So growers must know how much water their soil will hold and how much is available for plant growth. This can vary from less than 1 inch per foot to over 2.5 inches per foot. Coarse textured soils hold the least amount of available water. The Soil Conservation Service and the Cooperative Extension Service can both provide information on soil type and moisture-holding capacity in individual fields.

Next, a farmer using this water accounting method should determine the crop rooting depth. According to Williams, corn usually reaches its maximum rooting depth by tasselling time. "Roots may reach down 4 feet," he says, "but our studies have shown that most of the water is drawn from the top foot of soil. If you don't want to dig a few holes and look for roots, assume a 2-foot rooting depth. This sets the limit on how large your soil water account can get. Rooting depth times available moisture per foot equals the maximum amount of water available to the crop."

When the water account is down to half this amount, it's time to irrigate. In other words, irrigate when the soil moisture deficit is 50 percent of the available soil moisture capacity within the major root zone.

Growers can estimate how fast water is being withdrawn by the corn crop in a number of ways, but one of the easiest methods is to simply read it off the graph of corn water use developed at the University of Delaware. (Copies of this graph are available at county extension offices in Newark, Dover or Georgetown, or by calling Williams directly at 451-2468).

Here's an example of how to estimate the rate of water use. Assume it's the second week in July and corn is pollinating, using 0.32 inches of water per day. If the soil mosture-holding capacity is 1 inch per foot and the major rooting depth is 2 feet, when the soil is at field capacity after a heavy rain or irrigation, the maximum water available will be 2 inches. Under these conditions, the crop should be irrigated when 1 inch of water has been withdrawn or used.

That means the corn needs to receive 1 inch of water every 3 days until the end of July, when water use starts to decline.

"If you set the system to apply 1 inch of water," says Williams, "an efficiency of 60 to 90 percent will leave a margin of safety in your water account for some rain. If the system is 70 percent efficient, then you're still 0.30 inches short of filling the soil back up to field capacity."

The probability of receiving 0.30 inches of rain within a 3-day period in July in southern Delaware is about 40 percent. So, in four years out of 10, rainfall will make up the difference. But in six years out of 10, the irrigation system will have to make up the difference. "Take this into consideration in managing your water account," the specialist says.

With a little programming, he adds, all this bookkeeping could be done on a microcomputer.

Every bookkeeping system needs an audit occasionally to make sure the accounts are balanced. In irrigation scheduling, soil tensiometers serve that function. They will indicate when the bookkeeping is getting ahead of or behind actual soil moisture content.

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