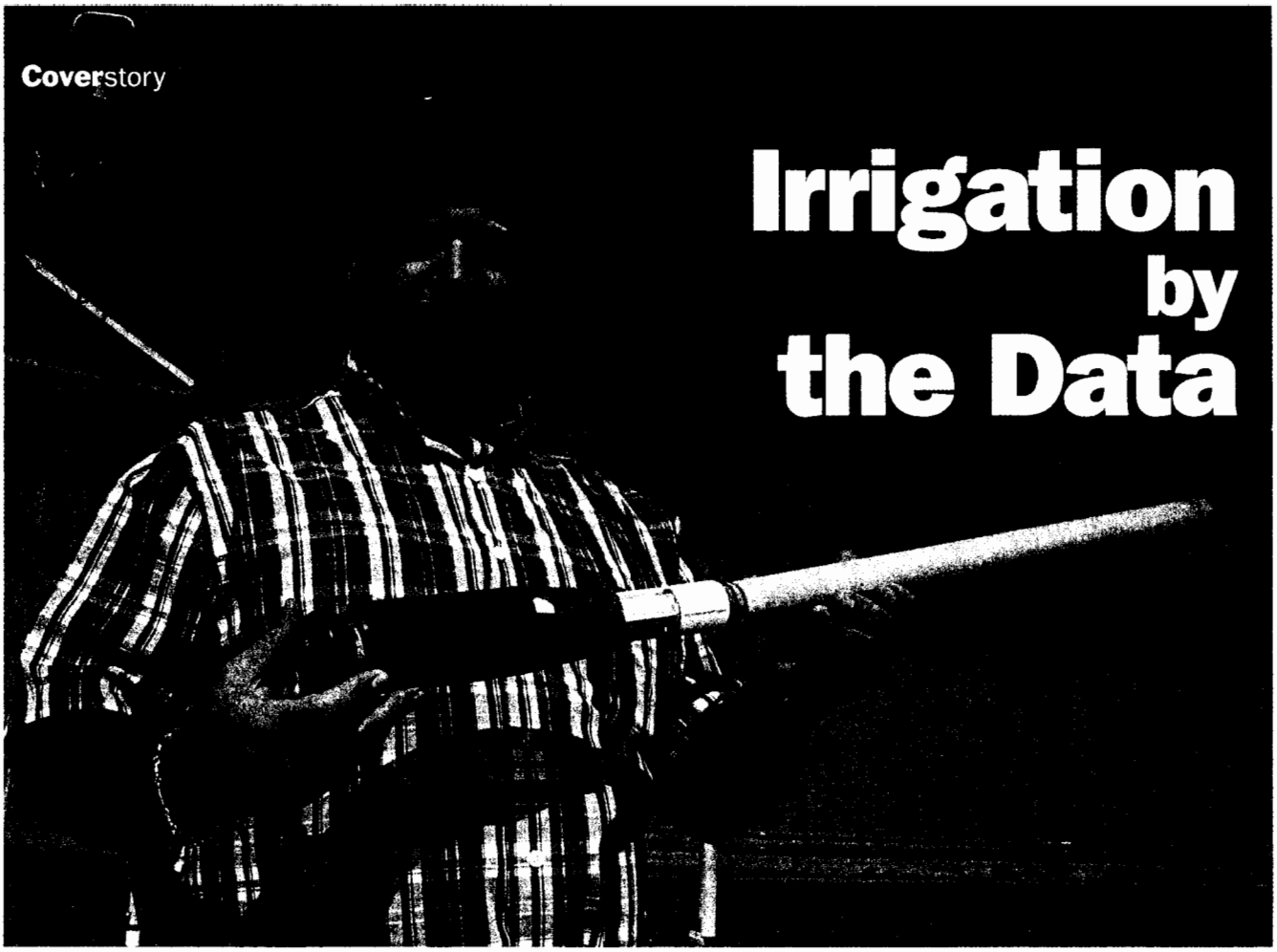

Irrigation by the Data

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WITH THE SCORCHING hot and dry summer of 2003, the Gilbreath brothers and many other West Texas growers had little choice but to irrigate as much as possible. But in "normal" years, when July and August provide reasonable rainfall, using the tools available to gauge a crop's water needs can save one or more waterings.

When and How Much Water

Knowing when to irrigate and how much water to put down is essential at a time when water sources are declining and energy costs are up, says Coby Gilbreath, who farms in partnership with his brother, Matt, outside Dimmitt, Texas. They use a crop consulting service to help determine their irrigation schedule. Both the latest technology and old-time methods are incorporated into their watering program.

The Gilbreaths farm mainly cotton, corn and wheat under 16 center pivot irrigation systems. Two pivots are half-mile circles that enable them to irrigate virtually an entire section of land, other than the corners. They plant cotton on land that had corn the previous year. If there is substantial soil moisture remaining after the corn crop, they will usually apply 13 to 15 inches of irrigation water to make a cotton crop. But that amount can easily vary if July and August see barely a few tenths-inch of rainfall.

"The evapotranspiration of cotton is hard to replace when you are dry for two months, even if your irrigation wells are running nearly all the time," says Gilbreath. "But we still depend on data that is received by our consultant to help us make the overall watering decisions."

Evapotranspiration (ET) basically is the amount of moisture a plant utilizes in a specific period. Many things impact the ET. Canopy size and shape; leaf size, shape and orientation; plant population; rooting depth; and stage of growth and development of the crop all contribute. Air temperature, humidity, wind and solar radiation are factors that determine ET.

Irrigation Information Network

The Texas PET (Potential Evapotranspiration) networks, which gather numerous data at various weather stations for distribution to growers and others, have become a vital link for producers eager to achieve and maintain efficient irrigation. The information is either faxed or e-mailed to growers set up on the program, who can take the information and apply it to their specific farms.

Dr. Dana Porter, irrigation specialist for Texas Cooperative Extension in Lubbock, says more than 300 growers in the northern Texas Panhandle, a fairly new cotton producing area, receive the PET fax. In the Lubbock and South Plains region, nearly 130 users receive data via the Internet each day. "It ranges from 50 per day in the winter to over 120 per day in the summer," she says. "Early in the season they are looking for soil temperature information. Later on they are looking for water-use data."

The Gilbreaths utilize this data, as well as information they receive from

gypsum moisture blocks strategically placed across their fields. The blocks are read once or twice a week. Their consultant takes that information, combines it with other data, and creates graphs and charts used by the growers to manage their irrigation.

"We like it because it lets you know how wet the ground is when the cotton begins to cut out," says Gilbreath. "We feel irrigation management and soil profile indications are most important at the end of the season than at any time. They can help you decide when you should or can quit irrigating. For example, if you have an early maturing crop, you know if the soil is wet or dry. The same goes for a late maturing crop.

"We also use the information to help determine how much PIX (growth regulator) is needed. If you have good soil moisture, then PIX will help the crop fruit more."

In some cases information obtained from moisture blocks and PET data even call for the Gilbreaths to apply a growth regulator by air at the same time they chemigate fertilizer through the center pivots. "That may sound odd," says Gilbreath. "But this program allows you to push the cotton for better fruiting without the plants getting too tall."

The moisture block system once provided proof that one pivot was doing a poor job of water distribution. The Gilbreaths count on drop tubes from the main pivot line to feed water to nozzles. On this occasion, the data indicated that the 120-inch spacings of drop tubes could not provide enough water for every row.

"That was on a old pivot we had refurbished," says Gilbreath. "It helped us decide to stick with 60-inch spacings and put a modified LEPA system on many of our pivots."

Low Pressure Nozzling

He says the majority of the 16 pivots are equipped with low-pressure nozzles that can be used for both irrigation and chemigation. The nozzles are situated about 30 inches above the ground. "We like the nozzles at that height so we can make sure we get plenty of water on top of the canopy," he notes.

Since most of the cotton is grown behind corn, which leaves valued residual nitrogen in the soil, there is little need for the Gilbreaths to fertilize early. "We will not fertilize until the crop starts to fruit," says Gilbreath, "and then we inject the fertilizer through the irrigation nozzles."

New and Older Wisdom

Despite the technology used in the PET networks and gypsum blocks, the Gilbreaths are like many other growers who sometimes depend on a decades old, tried and true method of measuring soil moisture. "My family has used the old sharp shooter (shovel) method of digging down and observing soil moisture since my grandfather farmed," says Gilbreath.

Porter and her scientific colleagues are also known to take the sharp shooter route. That information can tie in with the sophisticated data to help growers be better irrigation managers, she says.

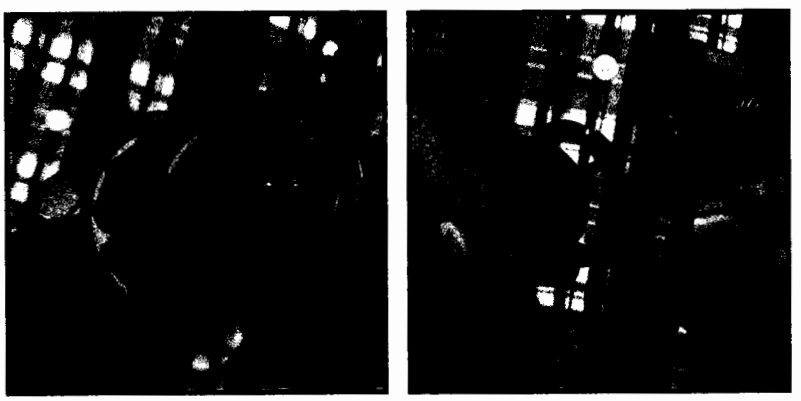
Reference ET is another term for PET. It is an estimate of water requirement for a well-watered reference crop, generally a cool season grass or alfalfa. Reference ET is calculated by applying climate data, such as temperature, solar radiation, wind and humidity in a model equation.

Crop-specific ET is estimated by multiplying the Reference ET by a crop coefficient. The crop coefficient takes into account the crop's water use at a given growth stage compared to the reference crop. The crop coefficient follows a pattern curve. The further along into plant development and growth, the higher the coefficient, thus, the need for more water.

"For instance," says Porter, "seedling cotton does not use as much water as the idealized grass reference crop used in PET calculations. But during peak bloom, cotton could actually use more water. Using the crop coefficient model can help growers make decisions on whether to increase irrigation, or begin irrigation reduction."

She says that having an objective number from an independent source helps growers have a more objective estimate of how much water the crop is using. "People are often too busy to go out and keep track of this information on their own," says Porter. "This is a convenient tool for growers to know when they need to the increase irrigation rate or cut back. If they get a rain, they can see what soil moisture is. They can use information to determine when to start irrigation again after a rain, or when to terminate at the end of the season."

Porter points out that the crop coefficient levels were compiled from various sources to develop the various relationships. "Actual crop water demand can be affected by many factors, including health of the crop, and likely by plant populations and crop variety traits," she says. "These factors are not taken into account by the models, so ET data provided by on-line networks are probably best used as guidelines and verified with in-field observations." ■



Gilbreath keeps irrigation nozzles 30 inches off the ground, so water will get good coverage on the canopy. This insures better fertigation.