HALFWAY—Is there a better way to water cotton using subsurface drip irrigation? Research under way at the Helms Research Farm near here has found that concentrating subsurface irrigation on smaller acreages can increase cotton yields, water use efficiency and returns per acre.

"We started this study in 2001. We are trying to figure out the best strategy for installing and using subsurface drip irrigation in cotton production," said Jim Bordovsky, Texas Agricultural Experiment Station agricultural engineer based at Halfway. "Should producers stretch their limited irrigation water over a large field and provide irrigation as a supplement to normal rainfall? "Or can they get more bang for their irrigation buck by concentrating their limited water resource on a smaller acreage? That's the question in a nutshell."

Bordovsky conducts this research on the 373-acre Helms Research Farm, adjacent to the Halfway Experiment Station in Hale County. The Halfway Station is a substation of the Texas A&M University System Agricultural Research and Extension Center at Lubbock.

"Our prior experience with center pivot irrigation favored the first scenario… spreading the water resource over an entire field," Bordovsky said. "But the initial cost of installing a subsurface irrigation system is much higher, so it makes sense that concentrating that investment on a smaller acreage might help boost returns and help recoup that cost faster."

A 12-acre drip irrigated field is the proving ground for this study. The field is divided into ten zones of 1.2 acres each. The "high maintenance" cotton grown in four of these zones receives unlimited irrigation water, more fertilizer and intense insect pest management. Cotton grown in another four zones is "normal maintenance," receiving less water, nutrients and insect management.

Two zones are grown dryland as a check/comparison for the other scenarios. "We are using two typical cotton varieties in this study. Roundup Ready Paymaster 2326 in the normal and dryland scenarios, and Bollgard Roundup Ready Fibermax 989 in the high maintenance scenario treatments," Bordovsky said. "Each zone is 16 rows wide and 1,300 feet long. The subsurface drip lines were installed on alternate furrows of 30-inch rows, about 10 to 12 inches beneath the bottom of the furrows."

"The Paymaster 2327 cotton received no more than 0.2 inches of irrigation water per day, and we fertilized for a two and a half- to three-bale per acre yield goal. We applied insect control using thresholds that most farmers use," Bordovsky said. "Meg Parajulee, Experiment Station research entomologist, provides our pest management expertise."

The high-maintenance Fibermax cotton was fertilized for a four bale per acre yield goal and received all the irrigation necessary to meet its daily evaporative demand. It was scouted for insects weekly and treatments were applied for fewer insects. A growth regulator was also applied to keep plant growth in check.
During two years of research, the "high maintenance" cotton outperformed the "normal maintenance" cotton in total yield per acre, water use efficiency and dollars returned per acre.

"Both years were extremely dry. Almost no appreciable rainfall at all. Even so, in 2002 and 2003 our high-maintenance cotton produced at least 400 more pounds of lint per acre than the normal maintenance cotton," Bordovsky said. "And its water use efficiency rating was higher by more than 10 pounds of lint per acre-inch of seasonal irrigation applied.

"If we figure the increased value of the high-maintenance treatment strictly on the cotton loan value, the return was $45 more per acre than the normal-maintenance cotton. We figured we would see a difference, but the yield and return-per-acre we noted was surprising."

Bordovsky, Parajulee and research technicians Joe Mustian and Cody Mull will continue the study for several years to generate a long-term comparison between these two management strategies.

"Based on these preliminary results, installing subsurface drip irrigation on a portion of a field and concentrating production resources there helps maximize yields and returns per acre at a lower investment cost," Bordovsky said. "That may be more profitable in the long run than stretching subsurface drip irrigation and limited production resources over a larger area."

Comparing the profitability and performance of different irrigation strategies is not the only aspect of this work. Bordovsky and other researchers are also studying cotton germination and soil compaction with subsurface drip irrigation, and strategies for minimizing problems such as emitter plugging. They are also comparing the performance of 24 cotton varieties grown with subsurface drip irrigation.

"John Gannaway, Experiment Station cotton breeder, has a variety performance study using the high and normal maintenance production scenarios," Bordovsky said. "That will help us get a handle on how genetics respond to different management strategies when irrigation water is limited."

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