gallala Aquifer
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# Computer Simulations to Save the Aquifer

By: Jarrott Wilkinson

Researchers are using their computers to save the Ogallala, by looking at the past. Targeted irrigation could be the economic and environmental solution.

Through modeling and crop simulation, a group of researchers from the U.S. Department of Agriculture-Agricultural Research Service at Bushland, Texas and Kansas State University are trying to predict how greater crop diversification and use of drought-tolerant crops can improve water efficiency.

The team consists of Dr. Louis Baumhardt, a USDA-ARS soil scientist; Dr. Scott Staggenborg, KSU professor of agronomy; and Dr. Prasanna Gowda, USDA-ARS agricultural engineer. They are studying the last 30 years to determine what the best possible practices are for farmers and the aquifer.

"What we wanted to do was evaluate crop growth and crop yield to see if we could introduce some alternative crops further up the Plains into Kansas," Baumhardt said. "The problem of low-irrigation capacity that is common in Lubbock is being seen up there too. Our objectives are to identify alternate crops and irrigation practices that will stretch our irrigation further."

Sorkam, Gossym and Ceres-corn – all computer crop-growth models -- were used to calculate yields of sorghum, cotton and corn at various irrigation levels. All of the models were based on measured crop growth at Bushland and western Kansas.

"We can use years of data and weather to get an idea of how new cropping systems and irrigation strategies would work in the long run so that producers don't get any surprises," Baumhardt said. "We will continue with these simulations as a preliminary investigation of irrigation strategies. When we get this done, we will be able to field test for the best irrigation practices, and we will report that out as we go."

Findings show that as irrigation-water resources decline, crop yield and water-use efficiency can be maintained or increased by converting uniform deficit irrigation (water spreading) to variable irrigation (concentrating water) on a part of a field with a complementary dryland area.

This research shows producers can optimize overall water use by adequately irrigating a portion of a pivot and farming the balance as dryland acres. Application of these results could increase overall crop yields 5 to 20 percent with the same amount of water over the 4 million acres of irrigated lands.

Cotton is suitable for production in the Texas Panhandle and into Kansas as an alternate crop. Compared with corn, cotton has the potential to reduce irrigation by 8 inches ($150 cost) while maintaining profit.

"We will continue to do the research to find out more; that's the good thing about simulations, you can do several years to find out how a cropping system would work in the long run," Baumhardt said.

"I would suggest focusing water resources, rather than trying to spread a few gallons per minute per acre to the whole pivot," he said. "Irrigate two-thirds of the acreage with that same amount of water and get better overall yields when averaged with the dryland crop in the balance."

Sorghum photo by Peggy Greb
Cotton photo by David Nance