FARM Assistance Focus

TEXAS A&M AGRILIFE EXTENSION

Water Savings and Higher Profit Margins Possible in Cotton and Other Field Crops in the Lower Rio Grande Valley

Mac Young
Shad Nelson
Steven Klose
Juan Enciso

Department of Agricultural Economics
Texas A&M AgriLife Extension
Texas A&M University System

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FARM Assistance Planning Solutions

"Water availability in late 2013 and 2014 is uncertain which will influence future production plans."

The 2013 crop year will be remembered for water shortages and restrictions across the four-county Lower Rio Grande Valley (LRGV). Much like 1999-2001, producers have been confronted with making planting and production decisions on depleted and limited water supplies.

Water levels in the Amistad and Falcon reservoirs on the Rio Grande River have become extremely low. A prolonged 2011-13 drought in the U.S.-Mexico watershed and new reservoirs in Mexico have diminished water flowing into the Rio Grande River. The outlook will likely continue to be bleak until rainfall from a tropical system replenishes the reservoirs.

Agricultural producers have had to cope with irrigation restrictions and curtailment by water districts. Some producers were able to purchase higher-priced, out-of-district water to sustain field, vegetable, and citrus crops early on in the spring. However, water availability in late 2013 and 2014 is uncertain which will influence future production plans.

The potential for overall crop production into 2014 may be reduced, especially citrus and sugar cane. As a result, the overall LRGV economy and population will feel the economic pinch.

The availability of water to fulfill urban and agricultural needs in the LRGV will continue to be issues in the foreseeable future. Irrigation conservation and efficient use of available water supplies will likely become more and more important, even after drought conditions are alleviated. Growing demands in Mexico and non-agricultural uses in the LRGV will encourage more efficient use of water and delivery systems. Evaluating the economic viability of water conservation practices such as surge vs. furrow irrigation in field crops is necessary to identify cost-effective and efficient water delivery systems, especially in times of limited water availability.

The Texas Project for Ag Water Efficiency (AWE) has laid the groundwork for identifying and analyzing cost-effective water conservation practices. AWE is a joint effort involving the Texas Water Development Board, the Harlingen Irrigation District, South Texas agricultural producers, Texas A&M AgriLife Extension (Extension), Texas A&M AgriLife Research, Texas A&M University-Kingsville, and others.

Between 2005-13, furrow vs. surge valve technology demonstrations associated with the AWE project have been completed analyzing potential water application and irrigation costs scenarios in cotton, sugar cane, and other field crops. These demonstrations have consistently shown that under surge irrigation a producer may potentially apply 23% less water. But a surge valve would be an added cost at about $2,000. The following analysis evaluates the potential financial incentives for using surge technology under restricted water supplies and volumetric water pricing. For this paper, it was assumed that water delivery was metered.

Assumptions

Table 1 provides the basic per acre water use and irrigation cost assumptions for cotton under furrow and surge irrigation. Irrigation application rates and yields were based on previous AWE demonstration results (Young, 2011). For the purpose of evaluating these technologies, in-district and out-of-district water pricing scenarios were established. The water pricing scenarios represent actual 2013 conditions in the LRGV, where "in-district" pricing means the grower owns the water rights, and "out-of-district" means the grower must acquire and purchase water from another water right holder outside the district, thus leading to a higher water delivery cost.

Table 1. Furrow and Surge Irrigation Cost Per Acre for Cotton

Irrigation Scenario	Water Source	Water Price (4/Acre In)	Water Applied (Acre In)	Water Cost/Acre	Poly-Pipe & Labor Cost/Acre	Variable Irrigation Cost/Acre	Surge Valve Cost/Acre/Year (Over 10 Years)	Total Irrigation Costs/Acre
1-Furrow	In-District	1.50	18.00	$27.00	$37.00	$64.00	N/A	$64.00
2-Surge	In-District	1.50	14.00	$21.00	$37.00	$58.00	$5.13	$63.13
3-Furrow	Out-of-District	5.40	18.00	$97.20	$37.00	$134.20	N/A	$134.20
4-Surge	Out-of-District	5.40	14.00	$75.60	$37.00	$112.60	$5.13	$117.73

"Average cash costs were lower for surge under current in-district and out-of-district purchased water pricing scenarios. Using average net cash farm income (NCFI) as a criterion, surge is more profitable than furrow."

Table 2. 10-Year Average Financial Indicators for Irrigated Cotton

Irrigation Scenario	Water Source	Water Price ($/Ac/In)	10-Year Averages/Acre			Cumulative 10-Yr Cash Flow/Acre ($1000)	Cumulative 10-Yr Cash Gain/Acre ($)
			Total Cash Receipts ($1000)	Total Cash Costs ($1000)	Net Cash Farm Income ($1000)		
1-Furrow	In-District	1.50	1.024	0.892	0.132	1.368	
2-Surge	In-District	1.50	1.024	0.891	0.133	1.382	14
3-Furrow	Out-of-District	5.40	1.024	0.985	0.039	0.252	
4-Surge	Out-of-District	5.40	1.024	0.963	0.061	0.363	111

It was assumed that the furrow and surge fields were side-by-side and 19.5 acres each. The average cotton price received in 2013 was $.80 per pound. A five-year 1,000-lb. average yield per acre was assumed for both irrigation methods. Costs were derived from actual producer costs and estimates of per acre overhead charges. They are assumed to be typical for the region and were not changed for analysis purposes. The in-district price of water in scenarios 1 and 2 was $1.50/acre inch or $18/acre foot in 2013. The $5.40/acre inch price in scenarios 3 and 4 assumes out-of-district water at $37/acre foot with 15% water loss and a $18/acre foot pumping charge. Based on 3 irrigations, irrigation labor was $21/acre and poly-pipe $16/acre. These assumptions are meant to make the illustration relevant to a wide range of producers in the area.

The two irrigation scenarios were assumed to be on the same site and considered a relatively controlled case study for comparison purposes. Differences in soil types, rainfall and management practices did not affect irrigation water application, production costs, and yields. The surge site assumes a surge valve cost of $2,000. The surge valve expense is evenly distributed over the 10-year period ($200 or $10.26/acre assuming 39 acres) with the assumption of no financing costs. For the analysis, no other major differences were assumed for the furrow and surge sites.

For each 10-year outlook projection, commodity price trends follow projections provided by the Food and Agricultural Policy Research Institute (FAPRI, at the University of Missouri) with costs adjusted for inflation over the planning horizon. Actual 2005-13 demonstration findings reflect no significant differences in yields between furrow and surge.

Results

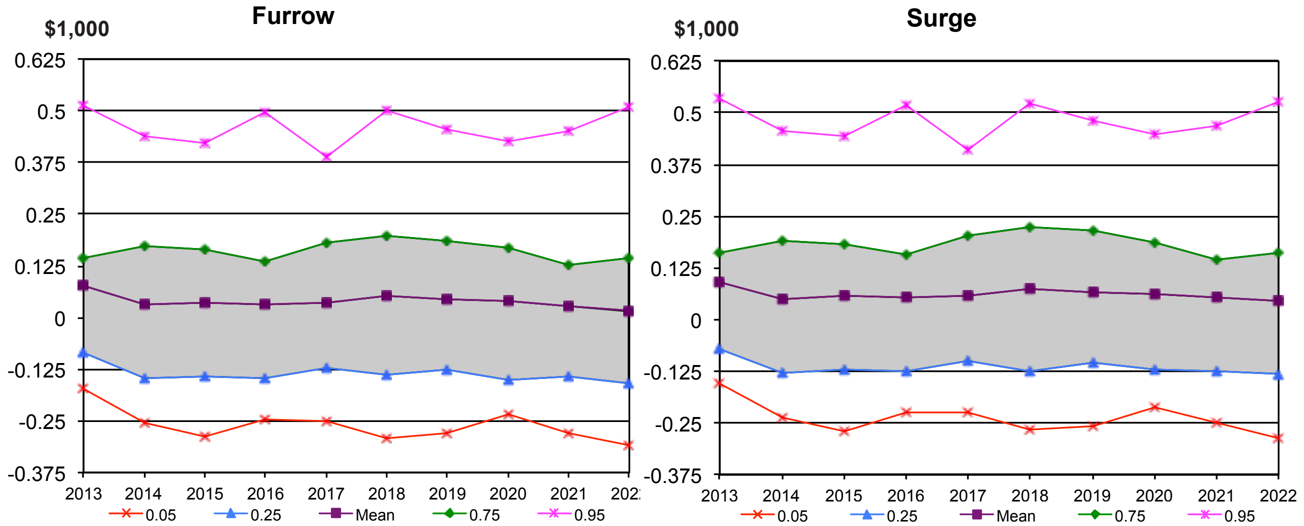
Comprehensive projections, including price and yield risk for surge irrigation, are illustrated in Table 2 and Figure 1. Table 2 presents the average outcomes for selected financial projections in the 4 scenarios. The graphical presentation in Figure 1 illustrates the full range of possibilities for net cash farm income in scenarios 3 (furrow) and 4 (surge) at the $5.40/acre inch out-of-district purchased water price. Cash receipts average $1,024/acre over the 10-year period for all four scenarios. Average cash costs were lower for surge under current in-district and out-of-district purchased water pricing scenarios.

Using average net cash farm income (NCFI) as a criterion, surge is more profitable than furrow (Table 2; Figure 1). In Figure 1, at both the $1.50 and $5.40 water price levels, the additional cost of a surge valve is covered by the water cost savings from using less water. The NCFI advantage of surge over furrow improves significantly as the price for irrigation water increases. The advantage at $1.50/acre inch is marginal, but the advantage at $5.40/acre inch is a 56% increase in NCFI/acre.

Liquidity or cash flow also improves with surge irrigation at current in-district and out-of-district purchased water prices (Table 2). Ending cash reserves are expected to grow to $1,382/acre for surge, only $14/acre more than furrow in the in-district water pricing scenario. In the higher out-of-district price scenario, the cash flow advantage of surge is more significant at $111/acre.

"Demonstration results indicate that incentives to invest and adopt surge irrigation currently exist and improve as water prices increase."

Figure 1. Projected Variability in Net Cash Farm income Per Acre for Irrigated Cotton at $5.40/Acre Inch Water Cost



Summary

Surge offers the opportunity to conserve irrigation water in cotton and other field crops. The incentive for producers to switch to the new technology has been minimal under current water delivery methods and past water pricing levels. Under water restrictions and current water pricing, surge is emerging as a viable irrigation method assuming metered water. Demonstration results indicate that incentives to invest and adopt surge irrigation currently exist and improve as water prices increase.

The incentives for producers to switch to surge become more substantial at higher prices for irrigation water. In drought or other high water demand situations where the availability of water is restricted or limited, economic forces will ration supplies through higher prices and water will likely be metered. Water use efficiency will then become more crucial in controlling water cost.

This case study assumes higher water prices throughout the 10-year projection period. Scenarios 1 and 2 vs. 3 and 4 were actual 2013 water availability and pricing situations. If water shortages and higher prices occur only in 2013 crop year and return to normal levels in 2014, producers likely will have little incentive to change to the new surge technology. However, if tighter water supplies and higher pricing persists, metering to manage water supplies and delivery by irrigation districts, and surge technology may be more widely accepted by producers as viable alternatives for the LRGV. In summary, the economic incentives for producers to switch to surge irrigation systems will likely be determined by the future availability and cost of water.

Reference

Young, Mac, Klose, Steven, and Reynolds, Valorie. Furrow vs. Surge Irrigation in Cotton Assuming Restricted Water Availability in the Lower Rio Grande Valley. Farm Assistance Focus Series 2011-2. Texas AgriLife Extension Service, Department of Agricultural Economics, Texas A&M University System. March 2011.