FARM Assistance

Focus

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Impact of Volumetric Water Pricing for Seed Corn Comparing Surge vs. Furrow Irrigation in the Lower Rio Grande Valley

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Water conservation is becoming an area-wide issue in the Lower Rio Grande Valley. Population growth in recent years has lead to a significant increase in the region's overall demand for water. This increasing non-farm usage, along with the demands of irrigated agriculture, has led to an interest in evaluating the potential of water saving practices in irrigated farming. As a result, water use demonstrations on irrigated crops, such as seed corn, are being conducted to evaluate this issue. Historically, agricultural irrigation water has been sold on a "per event" basis rather than volume as is the case for residential and commercial users. A volumetric pricing structure or water shortages could be in the future for irrigated agriculture in the Lower Rio Grande Valley region. Evaluating the economic viability of surge vs. furrow irrigation in seed corn at different water rates allows for a more accurate assessment of the viability of surge irrigation as an efficient delivery system.

The Agricultural Water Demonstration Initiative (ADI) project is a coordinated effort between the Texas Water Development Board, the Harlingen Irrigation District, South Texas agricultural producers, Texas Cooperative Extension, Texas A&M University

Kingsville, and other agencies. The purpose is to demonstrate state-of-the-art water distribution network management and on-farm, cost-effective irrigation technologies to maximize surface water use efficiency. The project includes maximizing the efficiency of irrigation water diverted from the Rio Grande River to water consumption by various field, vegetable and citrus crops.

Texas Cooperative Extension (TCE) is responsible for the economic analyses of demonstration results to evaluate the potential impact of adopting alternative water conserving technologies. TCE works individually with agricultural producers using the Financial And Risk Management (FARM) Assistance financial planning model to analyze the impact and cost-effectiveness of the alternative irrigation technologies.

In 2007, a surge technology demonstration associated with the ADI project suggests potential water savings in seed corn production (Table 1). Irrigation water in the Lower Rio Grande Valley is currently sold on a per-watering basis regardless of amount used. For example, in a growing season a seed corn crop may be watered 3 different occasions at a price of $7 per watering. In this example, a producer

would pay approximately $21 in total water costs. Under current water pricing structures, an initial financial analysis of the surge irrigation technology indicates no financial advantages compared to the furrow irrigation. In fact, the surge scenario is worse off compared to the furrow irrigation due to the $180/year average cost for the surge valve. The following analysis evaluates the potential financial incentives for surge technology and water savings under hypothetical volumetric water pricing, which may be a possibility in the near future or in times of water shortages.

Assumptions

Table 1 provides the basic water use and irrigation cost assumptions for seed corn comparing surge (19.5-acre site) and furrow (19.5-acre site) irrigation methods. Poly-pipe was used in both sites. For the purpose of presenting comparative costs, two water price levels ($1 and $5) were assumed for the two sites. Non-irrigation production costs were derived from custom rates and estimates of per acre overhead charges typical for the region and were not changed for analysis purposes. The assumptions are intended to make the illustration relevant to a wide range of producers in the Lower Rio Grande

Table 1: Irrigation Application and Cost Information for Seed Corn, Volumetric Pricing , 2007								
Scneario & Demo Site	Irrigation Method	Cost Per Acre Inch	Acre Inches Applied	Water Cost Per Acre	Polypipe Per Acre	Irrigation Labor Per Acre	Irrigation Cash Costs Per Acre	Surge Valve Cost Per Acre
1-41A	Surge	$1.00	17.32	$17.32	$7.00	$3.00	$27.32	$9.23
2-41B	Furrow	$1.00	23.95	$23.95	$7.00	$3.00	$33.95	
3-41A	Surge	$5.00	17.32	$86.60	$7.00	$3.00	$96.60	$9.23
4-41B	Furrow	$5.00	23.95	$119.75	$7.00	$3.00	$129.75	

Surge irrigation saved approximatly 6.63 inches of water per acre or 27.7 percent compared to furrow.

Table 2: 10-Year Average Financial Indicators Per Acre for Seed Corn, Volumetric Pricing						
Scenario & Demo Site	Irrigation Method	Total Cash Receipts ($1,000)	Total Cash Costs ($1,000)	Net Cash Farm Income ($1,000)	Prob Net Cash Income <0 (%)	Avg Annual Operating Expense/Receipts
1-41A	Surge	13.01	4.64	8.37	1.00	0.36
2-41B	Furrow	13.01	4.59	8.42	1.00	0.36
3-41A	Surge	13.01	5.97	7.04	1.00	0.46
4-41B	Furrow	13.01	6.42	6.58	1.00	0.50

Valley area.

The analysis consists of four scenarios—surge and furrow irrigation at $1 and $5 per acre inch for irrigation water. Scenario 1 represents surge irrigation and Scenario 2 represents basic furrow flood irrigation at a price of $1/acre inch projected for a 10-year period. The other two scenarios represent the pricing of water at $5/acre inch. The two surge scenarios assume an average cost of

$180/year for the surge valve. For the current analysis, no other differences were assumed. Both sites were watered three times during the crop season.

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. Demonstration

findings suggest no variance in yields (49 bushels per acre) between surge and furrow irrigation methods.

Results

Comprehensive projections including price and yield risk for surge and furrow irrigation methods at the $1 and $5 per acre inch water prices are illustrated in Table 2 and Figure 1. Table 2 presents the average outcomes for selected

Figure 1. Projected Variability in Net Cash Farm Income for Seed Corn ($5/acre inch water cost)
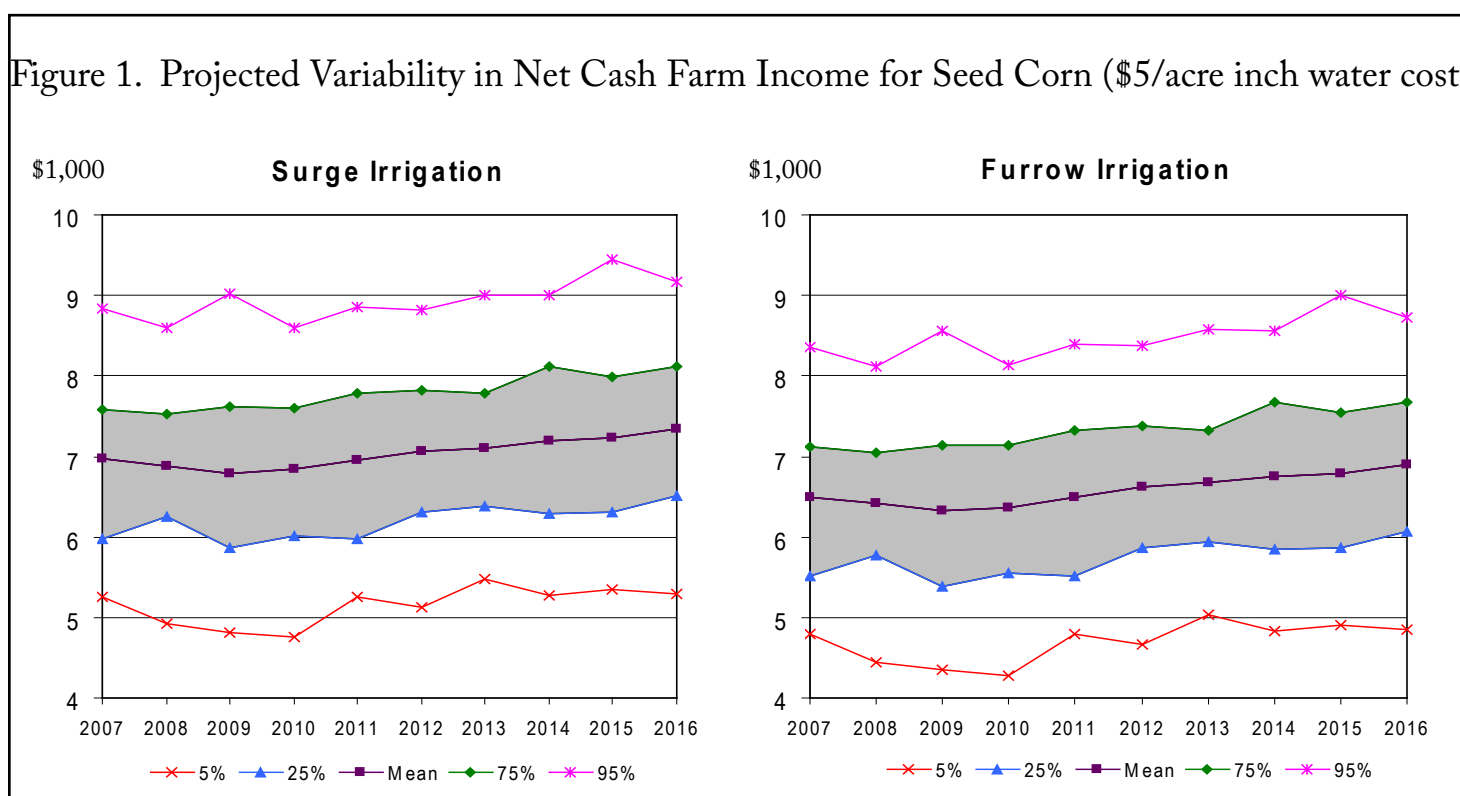
financial projections, while the graphical presentations illustrate the full range of possibilities for net cash farm income for each scenario and demonstration site. Cash receipts average $13,010 over the 10-year period for all four scenarios as the case study yields were the same under both irrigation methods. Average cash costs range from $4,590 for Scenario 2 to $6,430 for Scenario 4. Surge irrigation saved approximately 6.63 inches of water or 27.7% compared to furrow. This results in a $6.63/acre variable cost savings at a price of $1/acre inch, or a $33.15/acre savings assuming a $5/acre inch price of water (Table 1).

Average Net Cash Farm Income (NCFI) at the $1/acre inch water cost level is the highest for Scenario 2 (furrow) at $8,420 followed by Scenario 1 (surge) at $8,370 (Table 2). The additional average $180/year cost for the surge

valve offsets the savings from lower water usage. As expected, the lowest NCFI was in the two $5/acre inch water cost scenarios. However, adjusting for the surge valve cost per acre, there was a $23.59/acre irrigation cost savings. At $5 per acre inch, the average NCFI for surge was $7,040 or 7% more than furrow at $6,580. NCFI rises slightly in all scenarios from 2007 to 2016 years (Figure 1). All four scenarios reflect comparable, high levels of risk. But, risk projections also indicate only a 1% chance of negative NCFI (Table 2).

At the high water cost level, ending cash reserves and liquidity are better with surge (Scenario 3) than with furrow (Scenario 4) reflecting lower irrigation costs (Table 3). With $1/acre inch water price, ending cash reserves are expected to grow to $85,010 in Scenario 1 and $85,540 in Scenario 2 during the projection period. Assuming a $5

per acre inch water price, ending cash reserves with surge reach $71,460, 7% more than furrow.

Summary

The case study results of surge vs. furrow irrigation methods for seed corn comparing water application rates and irrigation costs show significant water use and economic implications. At the low water price, there is no economic incentive to switch to the new surge technology as the cost of the surge valve offsets the potential water cost savings. However, at the high water price, there is a $23.59 per acre irrigation cost savings. Previous studies have also shown potential water use and cost savings. The economic incentives for producers to switch to surge will likely be determined by the future availability and cost of water.

Table 3: Ending Cash Reserves Per Acre in Year 2016 for Seed Corn, Volumetric Pricing			
Scenario & Demo Site	Irrigation Method	Water Cost Per Acre Inch	Ending Cash Reserves ($1,000)
1-41A	Surge	$1.00	85.01
2-41B	Furrow	$1.00	85.54
3-41A	Surge	$5.00	71.46
4-41B	Furrow	$5.00	66.81