FARM Assistance Focus

Texas Cooperative EXTENSION
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Narrow Border Flood and 2-Line Drip Irrigation Illustration for Valencia, Navel and Marrs Oranges in the Lower Rio Grande Valley

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The [Agricultural Demonstration Initiative] project includes maximizing the efficiency of irrigation water diverted from the Rio Grande River to water consumption by various field, vegetable and citrus crops.

The overall demand for water in the Lower Rio Grande Valley has grown in recent years due to increasing population. This growing demand combined with the ongoing needs of irrigated production agriculture has resulted in a need to evaluate water conservation practices. As a result, water use demonstrations on irrigated crops, such as narrow border flood and 2-line drip irrigation, have been initiated. Illustrating the economic viability of site demonstrations allows for an evaluation of the viability of alternative irrigation methods as efficient water delivery systems.

The Agricultural Demonstration Initiative (ADI) project is a coordinated effort between the Texas Water Development Board, Harlingen Irrigation District, South Texas agricultural producers, Texas Cooperative Extension, Texas A&M University Kingsville, and other agencies. It is designed 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) conducts the economic analyses of demonstration results, evaluating 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.

Three technology demonstrations associated with the ADI project, narrow border flood on Valencia oranges and 2-line drip on Navel and Marrs oranges, illustrate potential water application and irrigation costs scenarios (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 an orange crop may be watered 12 different occasions at a price of $7 per watering. In this example, a producer would pay approximately $84 in water costs. Labor and system costs, where applicable, add to the total irrigation costs per acre. A 2-line drip system, for example, may possibly cost as much as $1,000/acre or more. The following analysis evaluates the potential financial incentives for using narrow border flood and 2-line drip technologies.

Assumptions

Table 1 provides the basic water use and irrigation cost assumptions for irrigated oranges in 2006. For the purpose of illustrating the narrow border flood and 2-line drip technologies, three demonstration sites were used, including a 15-acre site (Site 1B), a 3.5-acre site (Site 28D1) and a 3.5-acre site (Site 28D2). 2006 crop prices and yields reflect actual levels received by the producers. Projected 2007-2015 prices and yields were held constant at expected levels. Production costs were derived from custom rates and estimates of per acre overhead charges from the individual cooperators, and are assumed to be typical for the region and were not changed for analysis purposes. These assumptions are intended to make the illustration relevant to a wide range of citrus producers in the Lower Rio Grande Valley area.

The analysis consists of three separate demonstration sites not located adjacent to one another. Site 1B is several miles from Sites 28D1 and 28D2. Differences in soil types, rainfall and management practices likely affected irrigation water application, production costs and yields. Moreover, the analysis consists of three different crops. As a result,

Table 1: Narrow Border Flood and 2-Line Drip
Irrigation Application and Cost Information Per Acre for Oranges, 2006

Demo Site	Irrigation Method	Acres	Acre Inches Applied	Irrigation Costs Per Acre	Irrigation Costs Per Acre Inch	Yields Per Acre (Tons)	Yields Per Acre Inch (Tons)	Micro-Jet Spray System Capital Cost Per Acre
1B-Valencias	Narrow Border Flood	15.00	23.86	$100.00	$4.19	13.57	0.57	-
28D1-Navel	2-Line Drip	3.50	33.72	$210.00	$6.23	9.93	0.29	$1,000.00
28D2-Marrs	2-Line Drip	3.50	33.72	$210.00	$6.23	16.11	0.48	$1,000.00

The demonstration sites reflect profitable use of narrow border flood and 2-line drip technology in irrigated production of oranges.

Table 2: 10-Year Average Financial Indicators Per Acre for Oranges, Narrow Border Flood and 2-Line Drip Irrigation						
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
1B-Valencias	Narrow Border Flood	2.53	1.27	1.26	11.40	0.63
28D1-Navel	2-Line Drip	1.85	0.96	0.89	6.40	0.60
28D2-Marrs	2-Line Drip	2.08	0.96	1.12	4.80	0.56

the three are not replicated trials and the three combined are not a controlled experiment for comparison purposes. The analyses simply provide a case study example illustrating results of different sites. The first site is irrigated by narrow border flood and the other two by 2-line drip. The 2-line drip system expense is evenly distributed over the 10-year period ($100/year/acre) with the assumption of no financing costs. For the current analysis, no other major differences were assumed for the three sites.

For each 10-year outlook projection, input prices and overhead cost trends follow projections provided by the Food and Agricultural Policy Research Institute (FAPRI, at the University of Missouri). Citrus prices used are demonstrator estimates and expectations. Demonstration findings suggest a range of possible yields based on varying management practices and production conditions.

Results

Comprehensive projections, including price and yield risk for narrow border flood and 2-line drip irrigation, are illustrated in Table 2 and Figures 1-3. Table 2 presents the average per acre outcomes for selected financial projections, while the graphical

Figure 1. Projected Variability in Net Cash Farm Income for Valencia Oranges, Irrigation Demonstration Site 1B.

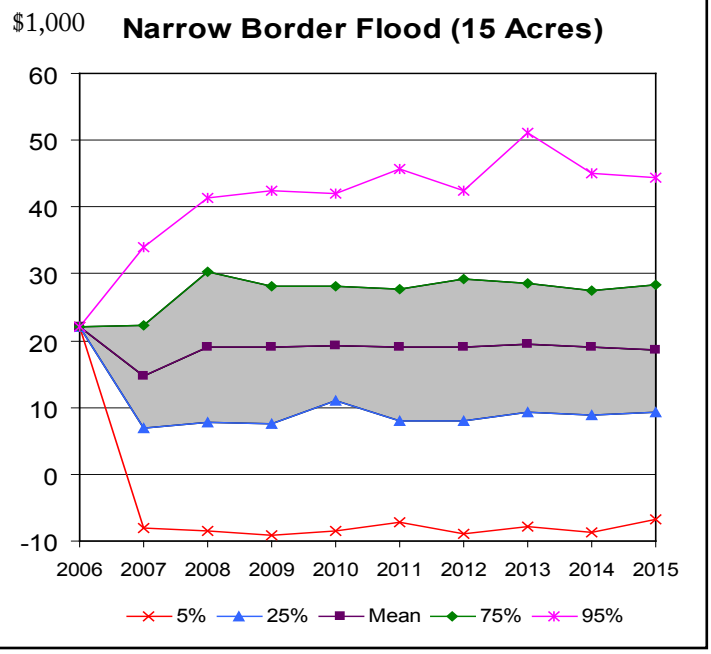
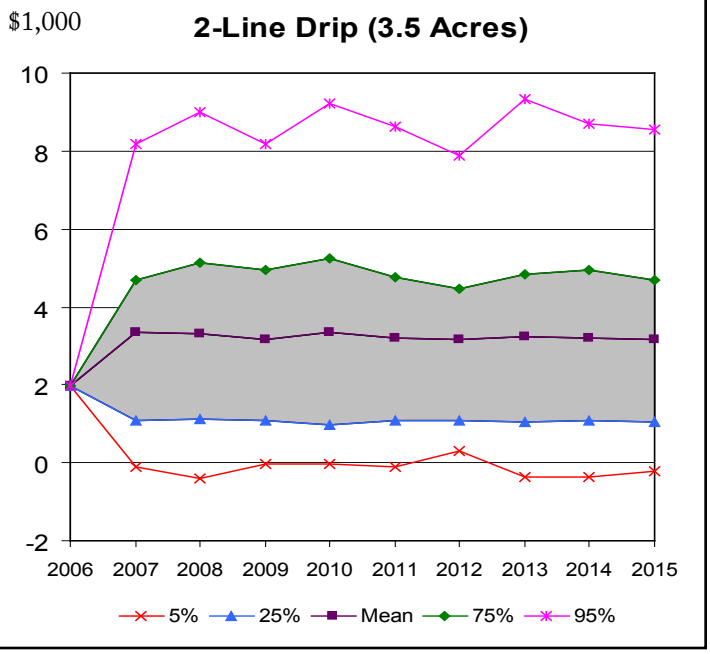


Figure 2. Projected Variability in Net Cash Farm Income for Naval Oranges, Irrigation Demonstration Site 28D1.



presentations illustrate the range of possibilities for total net cash farm income. Cash receipts average $1,850-$2,530/acre over the 10-year period for the three sites. Average cash costs range from $960/acre for Sites 28D1 & 28D2 to $1,270/acre for Site 1B.

Average Net Cash Farm Income (NCFI) is the highest for Site 1B at $1,260/acre followed by Sites 28D2 at $1,120/acre and 28D1 at $890/acre (Table 2; Figures 1-3). NCFI declines for sites 1B and 28D2 from 2006 to 2007. This largely reflects lower and stable projected prices and yields after 2006. Higher expected yields increase NCFI for 28D1 from 2006 to 2007. All three scenarios reflect significant levels of risk (Figures 1-3). Risk projections indicate an 11.4% chance of a negative NCFI for Site 1B, 6.4% for Site 28D1, and 4.8% for Site 28D2 (Table 2).

Summary

The case study results of narrow border flood and 2-line drip irrigation for Valencia, Navel and Marrs oranges illustrate a wide range of possible water application rates and irrigation costs. Demonstration results vary due to differences in crops, yields, locations and management practices. The demonstration sites reflect profitable use of narrow border flood and 2-line drip technology in irrigated production of oranges. However, where previous irrigation technology studies have shown potential water use and cost savings for some systems, the economic incentives for producers to switch to either irrigation system will likely be determined by the future availability and cost of water.

Acknowledgements

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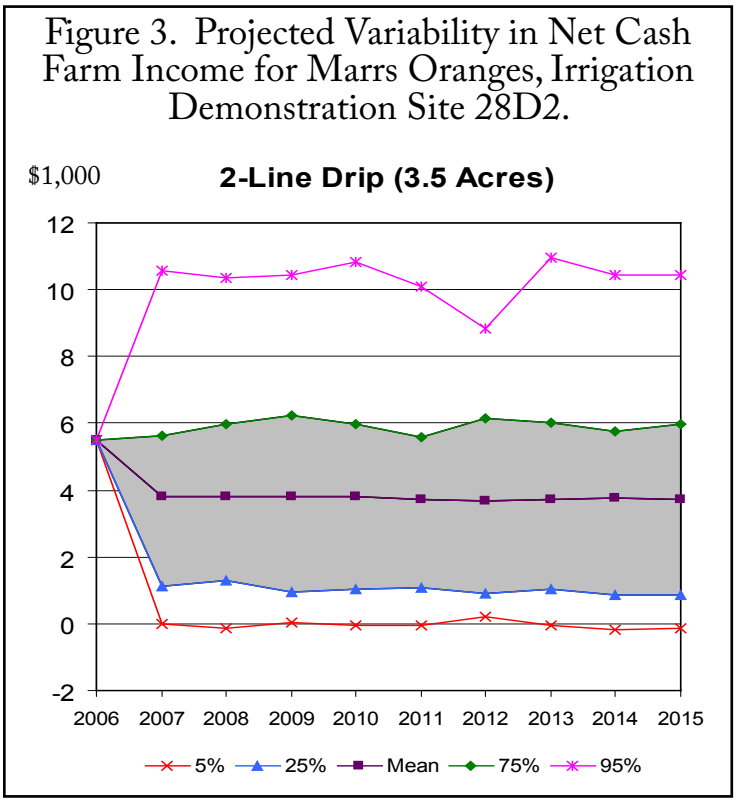
Figure 3. Projected Variability in Net Cash Farm Income for Marrs Oranges, Irrigation Demonstration Site 28D2.



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