FARM Assistance Focus

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Narrow Border Flood and Micro-Jet Spray Irrigation Illustration for Rio Red Grapefruit in the Lower Rio Grande Valley

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Illustrating the economic viability of the site demonstrations allows for an evaluation of the viability of [narrow border flood and micro-jet spray] irrigation methods as efficient water delivery systems.

The overall demand for river water in the Lower Rio Grande Valley is increasing due to population growth in recent years. This increasing demand along with the ongoing needs of irrigated production agriculture has resulted in an interest in evaluating water conservation practices. As a result, water use demonstrations on irrigated crops, such as narrow border flood and micro-jet irrigation, have been established. Illustrating the economic viability of the site demonstrations allows for an evaluation of the viability of these 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, two with narrow border flood and one with micro-jet spray, illustrate potential water application and irrigation costs scenarios in Rio Red grapefruit 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 Rio Red grapefruit 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 cost, if applicable, would add to the total irrigation costs per acre. A micro-jet spray system, for example, could cost as much as $1,000/acre or more. The following analysis evaluates the potential financial incentives for using narrow border flood and micro-jet spray technologies.

Assumptions

Table 1 provides the basic water use and irrigation cost assumptions for Rio Red grapefruit irrigation in 2006. For the purpose of illustrating the narrow border flood and micro-jet technologies, three demonstration sites were used, including a 73-acre site (Site 1A), an 85-acre site (Site 1C) and an 11-acre site (Site 28B2 and 28C). 2006 crop prices and yields used reflect actual levels received by the producers. Projected 2007-2015 prices and yields were held constant at historical 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. Differences in soil types, rainfall and management practices likely affected irrigation water application,

Table 1: Rio Red Grapefruit Narrow Border Flood and Micro-Jet Spray Irrigation Application and Cost Information Per Acre, 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 Cost Per Acre
1A	Narrow Border Flood	73.00	39.02	$100.00	$2.56	20.67	0.53	-
1C	Narrow Border Flood	85.00	23.51	$100.00	$4.25	25.54	1.09	-
28B2 & 28C	Micro-Jet Spray	11.00	32.21	$210.00	$6.50	31.23	0.97	$1,000.00

The demonstration sites reflect profitable use of narrow border flood or micro-jet spray technology in irrigated Rio Red grapefruit production.

Table 2: 10-Year Average Financial Indicators Per Acre for Rio Red Grapefruit, Narrow Border Flood and Micro-Jet Spray 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
1A	Narrow Border Flood	2.76	1.33	1.42	4.70	0.54
1C	Narrow Border Flood	3.51	1.28	2.23	1.00	0.41
28B2 & 28C	Micro-Jet Spray	3.43	1.22	2.22	1.00	0.39

production costs and yields. As a result, the three are not replicated trials and the three combined are not a controlled experiment for comparison purposes.

This comparison is intended to highlight case study examples illustrating results of different sites. The first two sites are irrigated by narrow border flood and the third site by micro-jet spray. The micro-jet spray 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 over the planning horizon 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 micro-jet spray irrigation, are illustrated in Table 2 and Figures 1-3.

Figure 1. Projected Variability in Net Cash Farm Income for Rio Red Grapefruit, Irrigation Demonstration Site 1A.

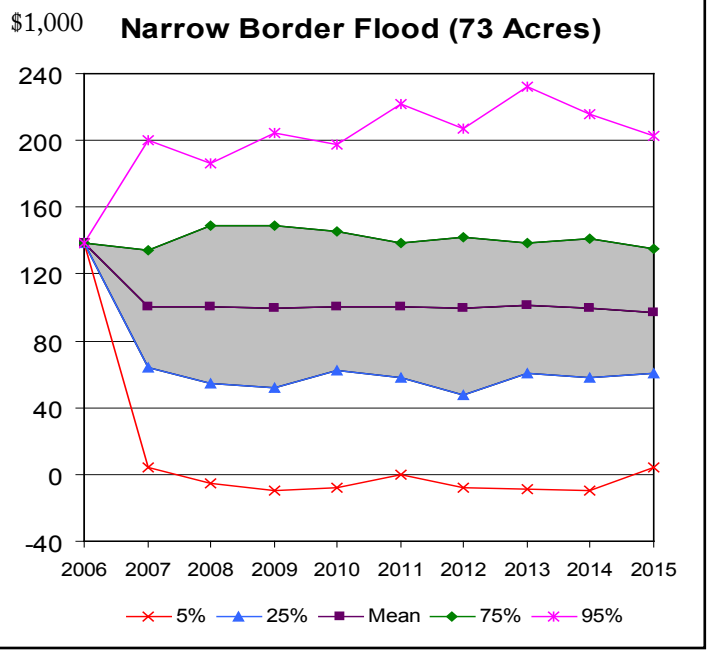


Figure 2. Projected Variability in Net Cash Farm Income for Rio Red Grapefruit, Irrigation Demonstration Site 1C.

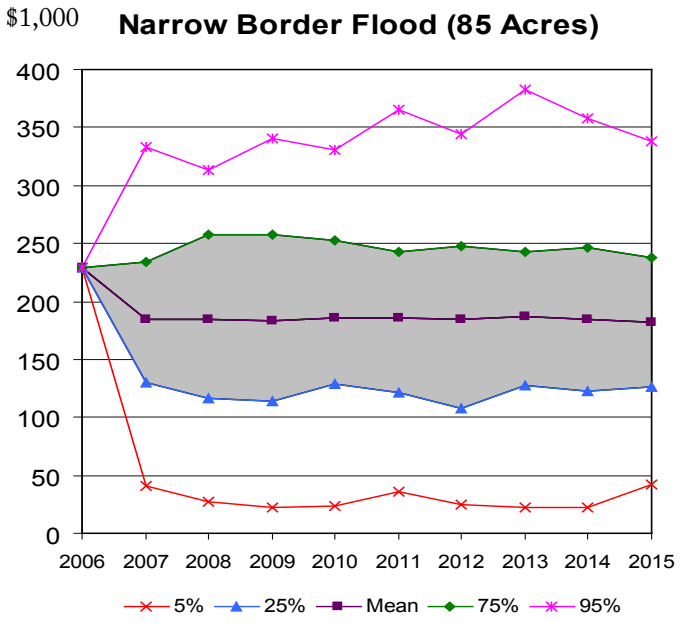


Table 2 presents the average outcomes for selected financial projections, while the graphical presentations illustrate the full range of possibilities for net cash farm income. Cash receipts average $2,760-$3,510/acre over the 10-year period for the three sites. Average cash costs range from $1,220/acre for Site 28B2 & 28C to $1,330/acre for Site 1A.

Average Net Cash Farm Income (NCFI) is the highest for Site 1C at $2,230/acre, closely followed by Site 28B2 & 28C at $2,220/acre and then Site 1A at $1,420/acre (Table 2; Figures 1-3). NCFI declines for all three sites from 2006 to 2007. This largely reflects lower and stable projected prices and yields after 2006. All three scenarios reflect significant levels of risk (Figures 1-3). Risk projections also indicate a 1% or less chance of a negative NCFI for Site 1C and Site 28B2 & 28C, compared to 4.7% for Site 1A (Table 2).

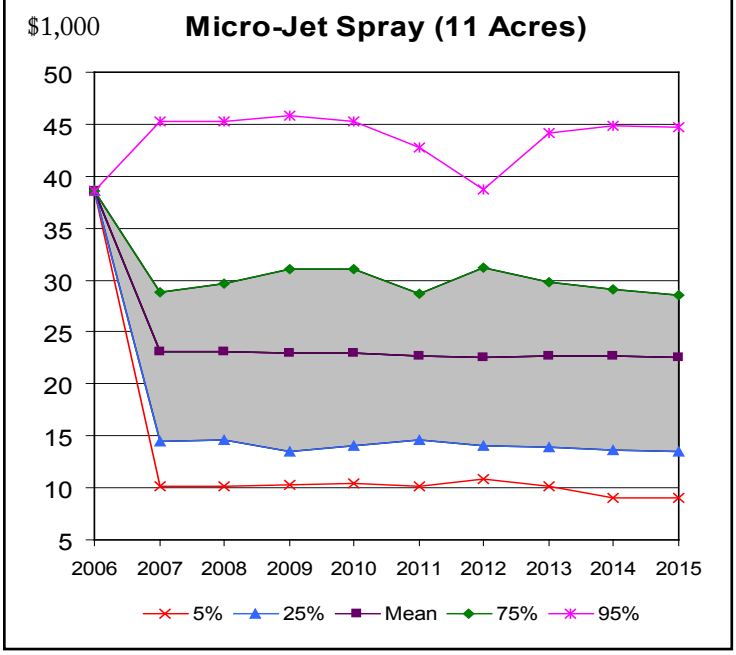
Summary

The case study results of narrow border flood and micro-jet spray irrigation for Rio Red grapefruit illustrate a wide range of possible water application rates and irrigation costs. Demonstration results vary due to differences in yields, locations and management practices. The demonstration sites reflect profitable use of narrow border flood or micro-jet spray technology in irrigated Rio Red grapefruit production. However, where previous studies have shown potential water use and cost savings, the economic incentives for producers to switch to either irrigation system will likely be determined by the future availability and cost of water.

Acknowledgements

Xavier Peries, Texas Cooperative Extension District 12 Extension Associate, and Eddie Esquivel, ADI Project Coordinator with Texas A&M University at Kingsville, are recognized for their data collection and monitoring efforts in the demonstration sites.

Figure 3. Projected Variability in Net Cash Farm Income for Rio Red Grapefruit, Irrigation Demonstration Site 28B2 & 28C.



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