FARM Assistance Focus

AgriLIFE EXTENSION
Texas A&M System

1-Line Drip and Micro-Jet Spray Irrigation Illustration for Rio Red Grapefruit in the Lower Rio Grande Valley

Mac Young, Extension
Steven L. Klose, Extension
Greg Kaase, Extension
Shad Nelson, TAMU-Kingsville
Juan Enciso, Extension

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Department of Agricultural Economics,
Texas AgriLife Extension Service (Extension)
Texas A&M University System (TAMU)

farmassistance.tamu.edu

1-line drip and micro-jet spray irrigation systems on Rio Red grapefruit, illustrate potential water application and irrigation costs scenarios.

Irrigation is a vital part of agriculture production in the Lower Rio Grande Valley. For decades, crop diversity and production have been enhanced by the ability to irrigate crops. This in turn has helped spur growth in the area economy. The ongoing needs of irrigated agriculture and a growing regional population have increased the overall demand for water and a need to evaluate water conservation practices. Subsequently, water use demonstrations on irrigated crops, such as 1-line drip and micro-jet spray irrigation, are being conducted. Illustrating the economic viability of site demonstrations allows for an evaluation of the cost-effectiveness 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 AgriLife Extension Service (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 for water consumption by various field, vegetable and citrus crops.

Extension conducts the economic analyses of demonstration results, evaluating the potential impact of adopting alternative water conserving technologies. Extension 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.

Two technology demonstrations associated with the ADI project, 1-line drip and micro-jet spray irrigation systems on Rio Red grapefruit, 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. Initial investment for a 1-line drip system may cost as much as $1,500/acre, and estimates for a micro-jet spray system are $2,500/acre. The following analysis evaluates the potential financial incentives for using 1-line drip and micro-jet spray technologies.

Assumptions

Table 1 provides the basic water use and irrigation cost assumptions for irrigated Rio Red grapefruit in 2007. For the purpose of illustrating the technologies, two demonstration sites were used, including a 16.5-acre site with 1-line drip (Site 4A) and a 6-acre site with micro-jet spray (Site 4B). 2007 crop

Table 1. 1-Line Drip and Micro-Jet Spray Irrigation Application and Cost Infosrmation Per Acre for Rio Red Grapefruit

Demo Site	Irrigation Method	Acre Inches Applied	Variable Irrigation Cost/Acre	System Cost Per Acre/ Year	Total Cost Per Acre Inch	Yield Per Acre (Tons)	Yield Per Acre Inch (Tons)
4A	1-Line Drip	26.57	$107.00	$150.00	$9.67	20.23	.76
4B	Micro-Jet	16.08	$81.00	$250.00	$20.58	25.97	1.62

prices and yields used reflect actual levels received by the producers. Projected 2008-2016 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 two separate demonstration sites located on the same citrus farm. Soil types varied from predominantly Hildalgo sandy clay loam on Site 4A to Hildalgo clay loam on Site 4B and may have affected the quantity of water applied somewhat (26.57 acre inches on Site 4A and 16.08 acre inches on Site 4B). Rainfall and management practices were the same for both sites. The irrigation motor on Site 4A was powered by electricity and the motor on Site 4B was powered by diesel. Moreover, system design issues were not considered part of this analysis, but could have affected water use and yields. As a result, the two are not completely replicated trials and may not be considered a "controlled" experiment for comparison purposes.

The analyses simply provide a case study example illustrating results of two different sites. The expenses of both systems are evenly distributed over the 10-year period ($150/year/acre for the 1-line drip system and $250/year/acre for the micro-jet spray system) with the assumption of no financing costs. For the current analysis, no other major differences were assumed for the two 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 ($100/ton for all years) are demonstrator estimates and expectations. Demonstration findings reflect comparable yields based on management practices and production conditions.

Results

Comprehensive projections, including price and yield risk for 1-line drip and micro-jet spray irrigation are illustrated in Table 2 and Figures 1-2. 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 $2,000/acre over the 10-year period for Site 4A and $2,060 for Site 4B. Average cash costs were $1,840/acre for Site 4A and $1,920/acre for Site 4B. The cost variance largely reflects the $100/acre additional cost for the micro-jet system on Site 4B more than offsetting the higher variable irrigation costs on Site 4A.

Average Net Cash Farm Income (NCFI) was $160/acre for Site 4A followed by $140/acre for Site 4B (Table 2; Figures 1-2). NCFI declines somewhat for both sites from

Table 2. 10-Year Average financial Indicators Per Acre for Rio Red Grapefruit, 1-Line Drip and Micro-Jet Spray Irrigation

		2007-2016 Annual Average			
Demo Site	Irrigation Method	Total Cash Receipts ($1000)	Total Cash Costs ($1000)	Net Cash Farm Income ($1000)	Prob Net Cash Income <0 (%)
4A	1-Line Drip	2.00	1.84	0.16	54.40
4B	Micro-Jet	2.06	1.92	0.14	55.10

The economic incentives for producers to use either irrigation system will likely be determined by the future availability and cost of water.

2007 to 2008. This largely reflects lower projected yields after 2007. Both scenarios reflect significant levels of risk (Figures 1-2). Risk projections indicate a significant chance of negative NCFI (Table 2). Income and risk projections are directly impacted by the conservative $100/ton price assumed by the demonstrator.

Summary

The case study results of 1-line drip and micro-jet spray irrigation for Rio Red grapefruit illustrate possible water application rates and irrigation costs. Actual demonstration results may vary due to two different fuel sources (electricity vs. diesel) and irrigation systems design influencing the amount of irrigation water applied relative to actual need. The demonstration sites reflect profitable use of 1-line drip and micro-jet spray technology in irrigated production of Rio Red grapefruit. However, where previous irrigation technology studies have also shown potential water use and cost savings for some systems, the economic incentives for producers to use either irrigation system will likely be determined by the future availability and cost of water.

Acknowledgements

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Figure 1. Projected Variability in Net Cash Farm Income for Rio Red Grapefruit, 1-Line Drip Irrigation Demonstration

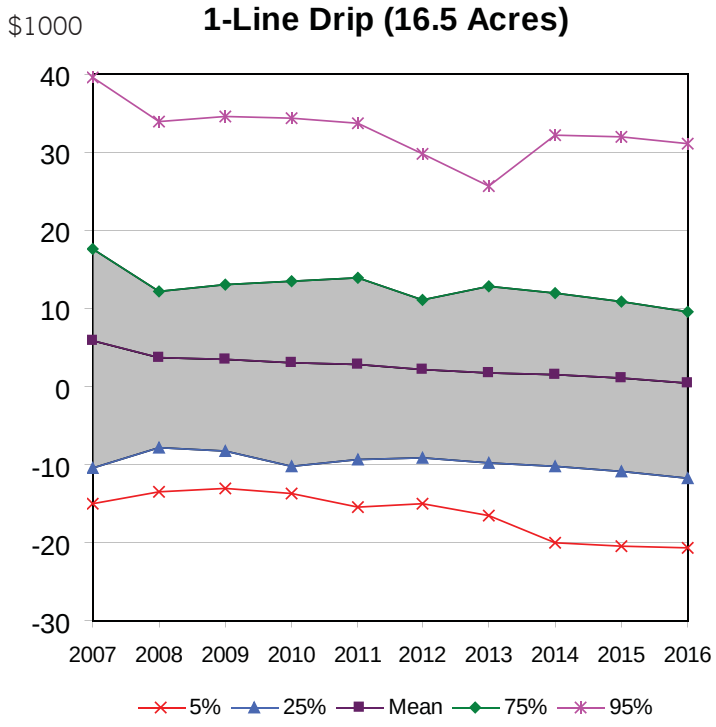
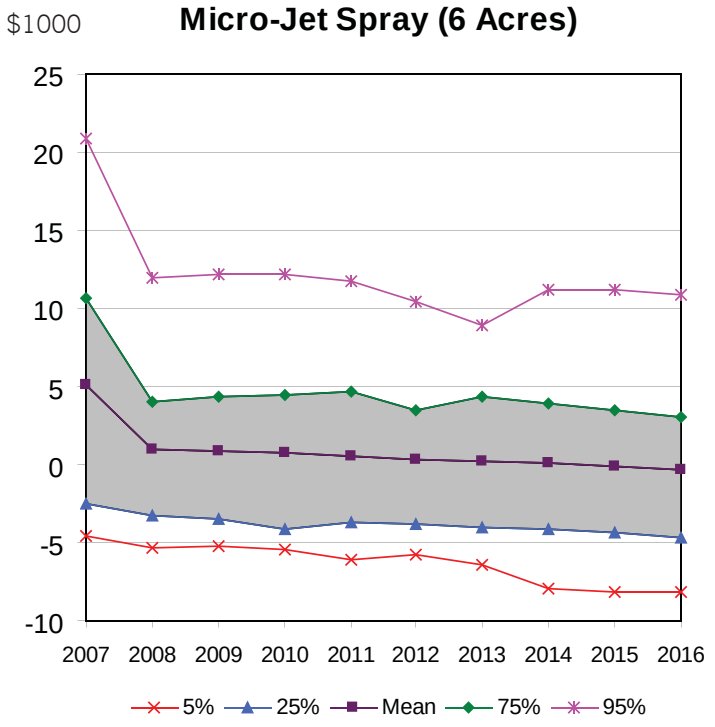


Figure 2. Projected Variability in Net Cash Farm Income for Rio Red Grapefruit, Micro-Jet Irrigation Demonstration



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