



# FARM Assistance



*Agri*LIFE EXTENSION

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

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

Irrigation has been a vital part of agriculture production in the Lower Rio Grande Valley for many decades bolstering crop production and the area economy. Along with ongoing needs of irrigated agriculture, a growing regional population has increased the overall demand for water and, subsequently, a need to evaluate water conservation practices. As a result, water use demonstrations on irrigated crops, such as 2-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, 2-line drip and micro-jet spray 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. The initial investment for a 2-line drip system, for example, may cost \$1,000/acre or more. The following analysis evaluates the potential financial incentives for using 2-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 2-line drip and micro-jet technologies, two demonstration sites were used, including a 3-acre site (Site 28B2) and a 8-acre site (Site 28C). 2007 crop prices and yields used reflect actual levels received by the producer. Projected 2008-2016 prices and yields were held constant at expected

Table 1. 1-Line Drip and Micro-Jet Spray Irrigation Application and Cost Information 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)
28B2	2-Line Drip	40.80	\$110.00	\$100.00	\$5.15	29.25	0.72
28C	Micro-Jet	30.80	\$88.56	\$100.00	\$6.12	29.25	0.95

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

on average more than Site 28C. The total irrigation water applied also includes flood irrigations due to tree stress in 2007. The producer flooded the drip site two times (12 inches applied) and the micro-jet site once (6 inches applied). As a result, the two are not completely replicated trials and may not be considered a “controlled” experiment for comparison purposes.

\$150/ton in 2008-2016) 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 2-line drip and micro-jet spray irrigation are illustrated in Table 2 and Figures 1-2.

Demo Site	Irrigation Method	2007-2016 Annual Average				
		Total Cash Receipts (\$1000)	Total Cash Costs (\$1000)	Net Cash Farm Income (\$1000)	Prob Net Cash Income <0 (%)	Avg. Annual Operating Expenses/Receipts
28B2	2-Line Drip	3.32	1.27	2.05	1.00	0.44
28C	Micro-Jet	3.32	1.25	2.08	1.00	0.43

farm. Soil types, rainfall and management practices were the same for both sites. However, differences in water scheduling and underground drainage could have affected total water use. Site 28B2 had a greater water use vs. Site 28C (40.8 vs. 30.8 acre inches) due somewhat to the 2-line drip system typically running overnight for convenience (10-12 hours per watering) compared to a 5-hour watering schedule for the micro-jet system during the day time. Moreover, 28B2 was closer to an underground drain line which could have resulted in the site being drier

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 (\$100/year/acre) 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 (\$120/ton for the 2007 crop and

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 \$3,320/acre over the 10-year period for both sites. Average cash costs were \$1,270/acre for Site 28B2 and \$1,250/acre for Site 28C. The variance reflects the \$21.44/acre difference in water costs based on a \$22/acre foot water price.

Average Net Cash Farm Income (NCFI) was \$2,080/acre for Site 28C followed by \$2,050/acre for Site 28B2

# The demonstration sites reflect profitable use of 2-line drip and micro-jet spray technology in irrigated production of Rio Red grapefruit.

(Table 2; Figures 1-2). NCFI declines somewhat for both sites from 2007 to 2008. This largely reflects lower projected yields after 2007. Both scenarios reflect significant levels of risk (Figures 1-2). Risk projections, however, indicate a minimal chance of negative NCFI (Table 2).

## Summary

The case study results of 2-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 irrigation scheduling and underground drainage differences influencing the amount of irrigation water applied. The demonstration sites reflect profitable use of 2-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 switch to 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, Irrigation Demonstration Site 28B2

### 2-Line Drip (3 Acres)

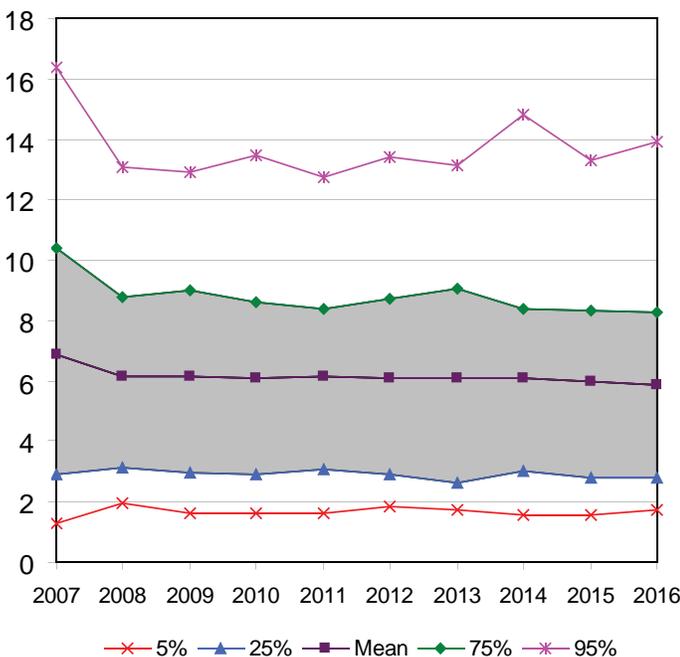
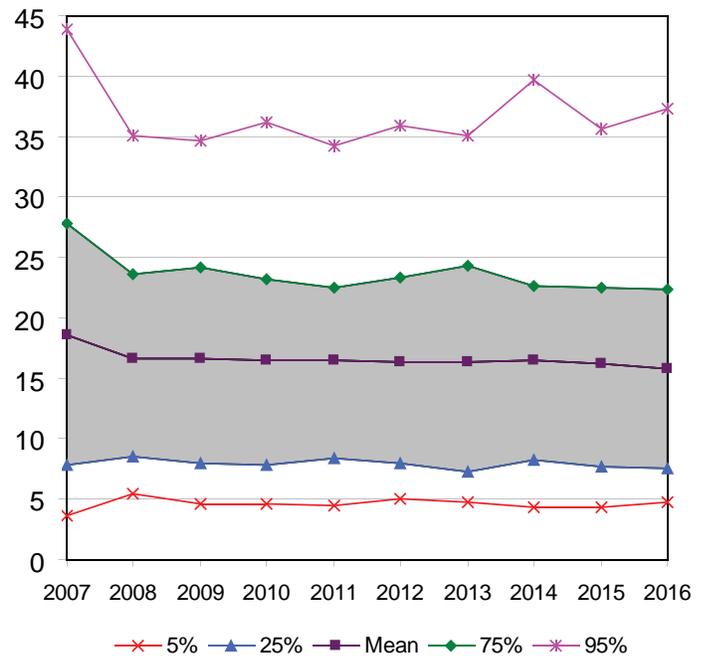


Figure 2. Projected Variability in Net Cash Farm Income for Rio Red Grapefruit, Irrigation Demonstration Site 28C

### Micro-Jet Spray (8 Acres)



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