Evaluating Alternative Irrigation Systems and Water Pricing in Rio Red Grapefruit Production in the Lower Rio Grande Valley

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Abstract:
Irrigation is a vital part of citrus production and the area economy in the Lower Rio Grande Valley. A growing population has increased the demand for water and a need to evaluate conservation practices. This analysis illustrates the financial incentives to conserve water that may exist under volumetric water pricing.

Introduction:
Irrigation is a vital part of citrus production and the area economy in the Lower Rio Grande Valley (Cameron, Hildalgo, Starr and Willacy Counties). This analysis illustrates the financial incentives to conserve water that may exist under volumetric water pricing. 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 has been implemented to demonstrate water conserving practices. Initial demonstrations in Rio Red grapefruit production suggest the possibility of conserving water through the use of drip and micro-jet irrigation instead of the traditional border flood. However, the current abundance of surface water from the Rio Grande and existing pricing structures create little incentive for citrus producers to invest in water conservation.

Local irrigation districts manage and control surface water in the Lower Rio Grande Valley of Texas. Water used by producers is purchased on a "per event basis" rather than by volume. A producer pays a set fee per acre for access to water consumed each time a crop is irrigated regardless of the amount of water applied. This pricing structure provides no financial incentive for individual producers to conserve water. The Agricultural Demonstration Initiative (ADI), established by the Harlingen Irrigation District and Texas Water Development Board, is a demonstration project comparing water conservation technologies and production practices. Illustrating the financial viability of each demonstration is a key part of the project. Volumetric water pricing is also important in evaluating the adoption of water conserving practices and delivery systems.

Data:
The data for this study came from actual Rio Red grapefruit demonstrations conducted in the ADI project. The sites compare the use of 1-line drip, 2-line drip, micro-jet spray and narrow border flood irrigation. The sites were created to be simple demonstrations of irrigation methods, not scientific comparisons. Nevertheless, the data provides an excellent case study for the potential impacts of volumetric water pricing structures.

Methodology:
The methodology used is a ten-year financial simulation of returns to a Rio Red grapefruit enterprise using stochastic commodity prices and yields. Scenarios will compare the financial performance of the Rio Red enterprise under the existing water price structure and a three-fold increase in water costs.

Results:
Alternative irrigation methods such as drip and micro-jet appear to save water. But, these systems require a substantial initial investment that impacts total irrigation costs and enterprise profitability. Demonstration results may have varied somewhat due to different soil types, rainfall, and management practices. However, volumetric water pricing changes the incentives to purchase conserving irrigation systems. The results demonstrate the financial outcomes of different water pricing that would encourage producer investment decisions in water conservation practices.

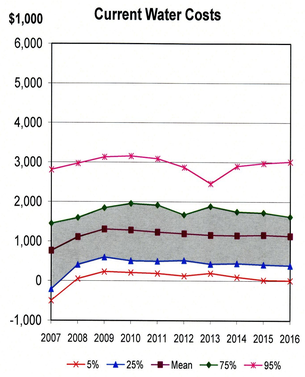
Table 1: Irrigation Application and Cost Information Per Acre for Rio Red Grapefruit, Current (C) and Triple (T) Volumetric Water Pricing

Irrigation Method	Acre Inches Applied	Variable Irrigation Cost/Acre	System Cost Per Acre/Year	Total Irrigation Cost/Acre	Total Costs Per Acre Inch	Yield Per Acre (Tons)	Yield Per Acre Inch (Tons)
1-Line Drip-C	26.57	$107.00	$150	$257.00	$9.67	20.23	0.76
1-Line Drip-T	26.57	$245.00	$150	$395.00	$14.87	20.23	0.76
2-Line Drip-C	40.80	$110.00	$100	$210.00	$5.15	29.25	0.72
2-Line Drip-T	40.80	$259.60	$100	$359.60	$8.81	29.25	0.72
Micro-Jet-C	30.80	$88.56	$100	$188.56	$6.12	29.25	0.95
Micro-Jet-T	30.80	$195.88	$100	$295.88	$9.61	29.25	0.95
Narrow Border Flood-C	40.18	$100.00	$0.00	$100.00	$2.48	16.81	0.42
Narrow Border Flood-T	40.18	$224.00	$0.00	$224.00	$5.57	16.81	0.42

Table 2: 10-Year Average Financial Indicators Per Acre for Rio Red Grapefruit, Current (C) and Triple (T) Volumetric Water Pricing

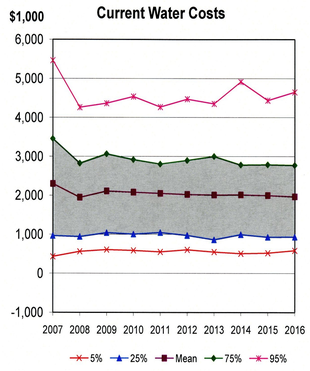
Irrigation Method	Total Cash Receipts/Acre ($1000)	Total Cash Costs/Acre ($1000)	Net Cash Farm Income/Acre ($1000)	Prob Net Cash Income <0 (%)	Avg. Annual Operating Expenses/Receipts
1-Line Drip-C	2.94	1.79	1.15	4.80	0.67
1-Line Drip-T	2.94	1.95	0.99	9.50	0.73
2-Line Drip-C	3.32	1.27	2.05	1.00	0.44
2-Line Drip-T	3.32	1.44	1.88	1.00	0.50
Micro-Jet-C	3.32	1.25	2.07	1.00	0.43
Micro-Jet-T	3.32	1.37	1.95	1.00	0.47
Narrow Border Flood-C	2.69	1.49	1.20	15.70	0.72
Narrow Border Flood-T	2.69	1.63	1.06	17.50	0.79

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



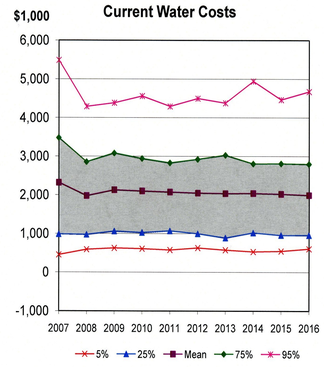
Note: Percentages indicate the probability that Net Farm Income is below the indicated level. The shaded area contains 50% of the projected outcomes.

Figure 2. Projected Variability in Net Cash Farm Income per Acre, Rio Red Grapefruit, 2-Line Drip Irrigation.



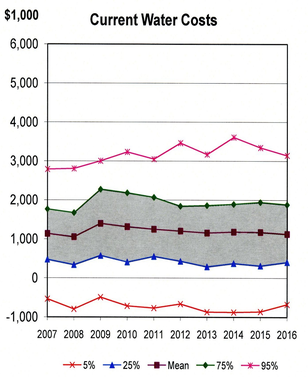
Note: Percentages indicate the probability that Net Farm Income is below the indicated level. The shaded area contains 50% of the projected outcomes.

Figure 3. Projected Variability in Net Cash Farm Income per Acre, Rio Red Grapefruit, Micro-Jet Spray Irrigation.



Note: Percentages indicate the probability that Net Farm Income is below the indicated level. The shaded area contains 50% of the projected outcomes.

Figure 4. Projected Variability in Net Cash Farm Income per Acre, Rio Red Grapefruit, Narrow Border Flood Irrigation.



Note: Percentages indicate the probability that Net Farm Income is below the indicated level. The shaded area contains 50% of the projected outcomes.