FARM Assistance Focus

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New Orchard Establishment: Flood and 1-Line Drip Irrigation Illustration for Rio Red Grapefruit in the Lower Rio Grande Valley

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FARM Assistance Focus 2009-6
July 2009

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The planting or replanting of a citrus orchard is a major business endeavor requiring significant capital investment in land, land leveling, drainage systems, irrigation systems, and trees.

Citrus has been a major horticulture crop in the Lower Rio Grande Valley for decades. Annual production and sales contribute significantly to the overall economy of the region and agriculture industry of the state. In older orchards, quality and quantity of fruit often diminish, eventually necessitating replacement by new, more vigorous trees. Changes in consumer tastes and preferences also influence long-term changes to the types of fruit and varieties planted. Furthermore, urban expansion often leads to orchards being sold for development and new ones being established.

The planting or replanting of a citrus orchard is a major business endeavor requiring significant capital investment in land, land leveling, drainage systems, irrigation systems, and trees. These capital outlays, coupled with expected annual overhead and production expenses, dramatically impact the subsequent profitability, cash flow requirements, and projected investment recovery in a new orchard.

As citrus is a perennial crop and requires water year round, citrus production is a major user of irrigation water from the Rio Grande River. And, with a growing regional population and economy, the overall area demand for water has increased. A need to evaluate water conservation practices is emerging. Analyzing a new orchard site can illustrate the cost-effectiveness of alternative irrigation methods as efficient water delivery systems as well as measure the economic viability of establishing a new orchard.

The Agricultural Water Conservation 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 typical irrigation technologies, flood and 1-line drip on new 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 a grapefruit crop may be watered 12 different occasions at a price of $7/acre 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 1-line drip system, for example, may cost $1,400/acre or more. The following analysis evaluates the potential financial incentives for using flood compared to 1-line drip technologies.

Assumptions

Table 1 provides estimated water use and irrigation cost assumptions for irrigated Rio Red grapefruit in 2009. For the purpose of illustrating the flood and 1-line drip technologies, two 35-acre demonstration sites were assumed. 2009 crop prices ($140/ton) reflect estimated levels received by area producers. Projected 2009-2018 prices were held constant at expected levels. Typical yields by tree age for average management levels in the Lower Rio Grande Valley were used as reported by Texas AgriLife Extension in 2005 (Table 2). Production costs were derived from custom rates and estimates of per acre land rental and overhead charges from citrus 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 assumes two separate

Table 1: Estimated Flood and 1-Line Drip Irrigation Cost Information Per Acre for a New Rio Red Grapefruit Orchard

Irrigation Method	Estimated Irrigation Applied (Acre Inches)	Variable Irrigation Cost/Acre	System Related Costs Per Acre/Year (over 20 Years)	Total Costs Per Acre
Flood	42.00	$165.00	$40.00	$205.00
1-Line Drip	16.08	$122.97	$70.00	$192.97

Table 2: Average Grapefruit Production Per Acre in the Lower Rio Grande Valley

Age (Years)	Management Levels		
	Fair (Tons)	Average (Tons)	Very Good (Tons)
3	1	3	6
4	3	6	10
5	5	9	14
6	7	14	19
7	8	18	23
8	10	20	26
9	11	22	27
10+	12	23	28

Source: Sauls, 2005.

demonstration sites located on the same citrus farm. Soil types, rainfall and management practices were assumed identical for both sites. The initial purchase and planting of trees was assumed to be $1,572/acre. The cost of drain tile for both the flood and 1-line drip sites was assumed to be $600/acre. The $1,400/acre average cost for the 1-line drip system includes the costs of laying header lines. The leveling cost for the flood site was assumed to be $400/acre, and the cost of laying water lines and risers was $400/acre. These installation and establishment costs were assumed expended in the first year with a 6% financing or capital cost per year until all establishment costs are recovered. Except for irrigation costs, all input costs and management practices were assumed to be the same.

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 ($140/ton in 2009-2018) are local producer estimates and expectations. Findings assume comparable yields based on management practices and production conditions.

Results

Comprehensive projections, including price and yield risk for flood and 1-line drip irrigation, are illustrated in Table 3 and Figures 1-2 Table 3 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 increase as trees mature and average $1,600/acre over the 10-year period for both sites. Average cash costs were $2,210/acre for flood and $2,260/acre for 1-line drip. The difference largely reflects higher interest or opportunity costs involved in installing a drip system.

Average net cash farm income (NCFI) was -$610/acre for flood and -$660/acre for the 1-line drip over the 10-year projection (Table 3; Figure 1). NCFI is negative for both sites from 2009 to 2014. This largely reflects no production in 2009-2010 and then increasing yields as trees mature. Both scenarios reflect significant levels of risk. Based on the initial establishment costs and projected annual NCFI, all investment costs (ending cash reserves become positive) would likely not be recovered until the 16th or 17th year for both flood and drip using average yields (Figure 2). Assuming very good yields, there is a potential for recovery of all investment costs in the 11th year.

Summary

The case study results of flood and 1-line drip irrigation for Rio Red grapefruit illustrate the potential initial capital investment, production costs and cost-recovery in a new Rio Red grapefruit orchard. There is not a significant cost or returns difference in flood vs. 1-line drip. Actual results, however, could vary due to establishment costs (land leveling; and drip, drainage, and waterline systems) as well as land ownership arrangements, production costs, and management practices. The results reflect a probable 16-17 year pay-out for both the flood and 1-line drip irrigation systems based on average yields and 2009 dollars. Based on very good yields, pay-out could occur in the 11th year for both systems. Moreover, although 1-line drip irrigation technology reflects potential water use and irrigation cost savings compared to flood, the economic incentives for producers to use 1-line drip or other water saving irrigation systems will likely be determined by the future availability and cost of water, labor, and preferred management practices.

Table 3: 10-Year Average Financial Indicators Per Acre for a New Rio Red Grapefruit Orchard, Flood and 1-Line Drip Irrigation

Irrigation Method	10-Year Average Per Year				
	Total Cash Receipts ($1000)	Total Cash Costs ($1000)	Net Cash Farm Income ($1000)	Prob Net Cash Income <0 (%)	Avg. Annual Operating Expenses/Receipts
Flood	1.60	2.21	-0.61	69.80	1.08
1-Line Drip	1.60	2.26	-0.66	68.90	1.04

The results reflect a probable 16-17 year pay-out for both the flood and 1-line drip irrigation systems based on average yields and 2009 dollars.

Figure 1: Projected Variability in Net Cash Farm Income ($/Acre) for a New Rio Red Grapefruit Orchard.

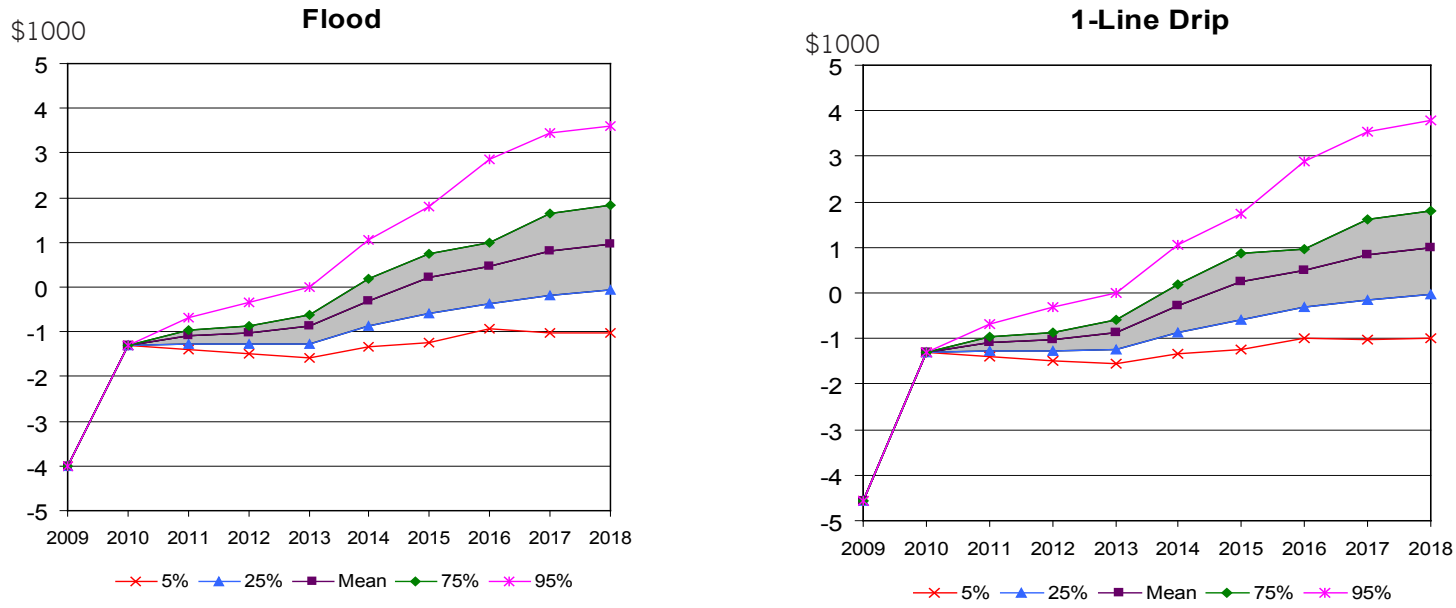
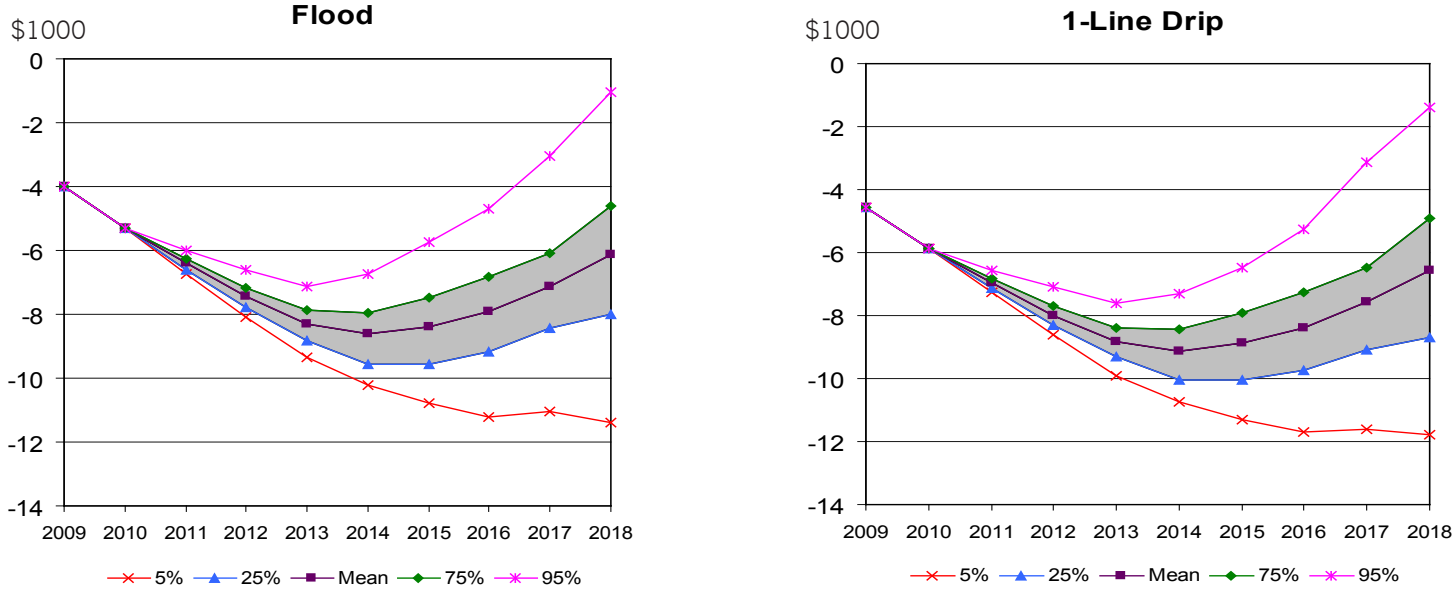


Figure 2: Projected Variability in Ending Cash Reserves ($/Acre) Before Borrowing for a New Rio Red Grapefruit Orchard.



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