

## **Economics of Water Technologies in the Lower Rio Grande Valley**

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### **Texas Irrigation Expo 2011**

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### **Agricultural Water Conservation Demonstration Initiative (ADI):**

- A multi-year project to study the maximization of on-farm surface water use efficiency by integration of on-farm application and district delivery systems.
- ADI assists in the implementation of the agricultural water conservation management strategies and efforts on-going in the Lower Rio Grande Valley.



**Texas AgriLife Extension Financial and Risk Management Program (FARM Assistance):**

- Works directly with ADI cooperators in the Lower Rio Grande Valley.
- Evaluates the farm-level financial impacts of water conservation techniques undertaken during the initiative.
- Demonstrates the financial benefits and/or viability associated with each conservation practice.
- Demonstrates the use of the FARM Assistance program as a farm management decision making tool for agricultural producers.



**FARM Assistance Involvement:**

- Since 2005, specialists have worked with 15 producers involving 31 demonstrations sites.
- Crops evaluated include cotton, corn, seed corn, grain sorghum, sugarcane, onions, and citrus.
- Irrigation methods or systems demonstrated and evaluated include furrow, surge, drip, micro-jet, flood, narrow-border flood, pivot, and side-roll.



### **General Economic Results of Demonstrations and Special Studies:**

- Differences in the “economics” for traditional and non-traditional irrigation technologies: surge and drip vs. furrow in field crops; drip, micro-jet spray and narrow border flood vs. flood in citrus.
- Potential for water savings with new technologies; but, under current pricing structures, water savings may or may not always translate into cost savings for producers, especially field crops.
- Economic value of water saving methods under conditions of limited water and/or volume pricing. But, except for citrus, vegetables and onions, results have indicated limited existing economic incentives for most producers to adopt conservation practices at this time.



### **Field Crop Results—A Review of Selected Studies**



**Focus 2007-4: Impact of Volumetric Water Pricing for Cotton  
Comparing Furrow vs. Drip Irrigation in the Lower Rio Grande Valley**

- Scenarios 1 and 2 represent irrigation water costs at \$1/acre inch; Scenarios 3 and 4 represent pricing at \$5/acre inch.
- Demonstration findings suggest no variance in yields (950 lbs/acre) between furrow and drip methods.



**Table 3: Irrigation Application and Cost information for Cotton, Volumetric Pricing, 2006**

Scenario	Irrigation Method	Acre Inches Applied	Cost Per Acre Inch	Water Cost Per Acre	Poly-pipe Per Acre	Irrigation Labor Per Acre	Irrigation Costs Per Acre	Drip System Costs Per Acre/Yr
1	Furrow	20.24	\$1.00	\$20.24	\$7.00	\$12.00	\$39.24	
2	Drip	9.66	\$1.00	\$9.66	\$0.00	\$24.00	\$33.66	\$142.60
3	Furrow	20.24	\$5.00	\$101.20	\$7.00	\$12.00	\$120.20	
4	Drip	9.66	\$5.00	\$48.30	\$0.00	\$24.00	\$72.30	\$142.60

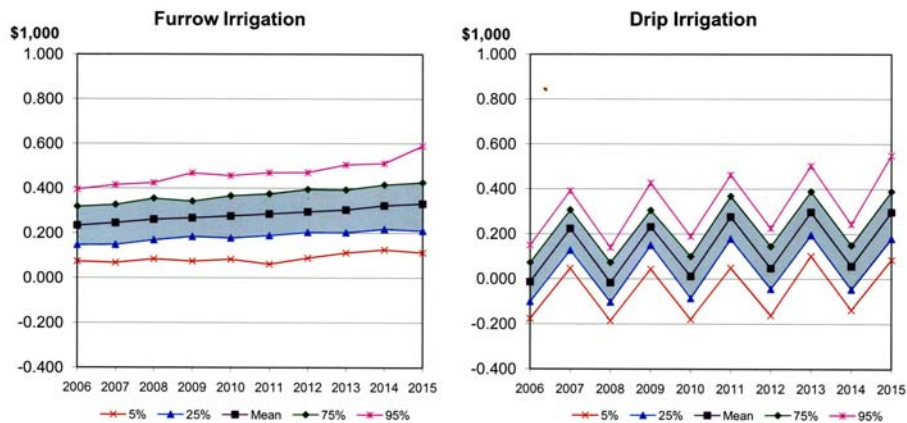


**Table 4: 10-Year Average Per Acre Financial Indicators for Cotton, Volumetric Pricing, 2006**

Scenario	Irrigation Method	Total Cash Receipts	Total Cash Costs	Net Cash Farm Income	Probability Net Cash Income <0 (%)	Average Annual Operating Expense/Receipts
		Per Acre (\$1,000)	Per Acre (\$1,000)	Per Acre (\$1,000)		
1	Furrow	0.79	0.50	0.29	1.00	0.66
2	Drip	0.79	0.61	0.18	22.50	0.84
3	Furrow	0.79	0.58	0.21	3.90	0.76
4	Drip	0.79	0.68	0.11	28.30	0.89



**Figure 3. Projected Variability in Net Cash Farm Income Per Acre for Cotton (1/acre inch).**



**Focus 2007-7: Impact of Volumetric Water Pricing for Seed Corn  
Comparing Surge vs. Furrow Irrigation in the Lower  
Rio Grande Valley**

- Scenarios 1 and 2 represent irrigation water costs at \$1/acre inch;  
Scenarios 3 and 4 represent pricing at \$5/acre inch.
  
- Yields were comparable at 49 bushels per acre for both surge and furrow irrigation.



**Table 5: Irrigation Application and Cost information for Seed Corn, Volumetric Pricing, 2007**

Scenario & Demo Site	Irrigation Method	Cost Per Acre Inch	Acre Inches Applied	Water Cost Per Acre	Polypipe Per Acre	Irrigation Labor Per Acre	Irrigation Costs Per Acre	Surge System Costs Per Acre/Yr
1-41A	Surge	\$1.00	17.32	\$17.32	\$7.00	\$3.00	\$27.32	\$9.23
2-41B	Furrow	\$1.00	23.95	\$23.95	\$7.00	\$3.00	\$33.95	
3-41A	Surge	\$5.00	17.32	\$86.60	\$7.00	\$3.00	\$96.60	\$9.23
4-41B	Furrow	\$5.00	23.95	\$119.75	\$7.00	\$3.00	\$129.75	

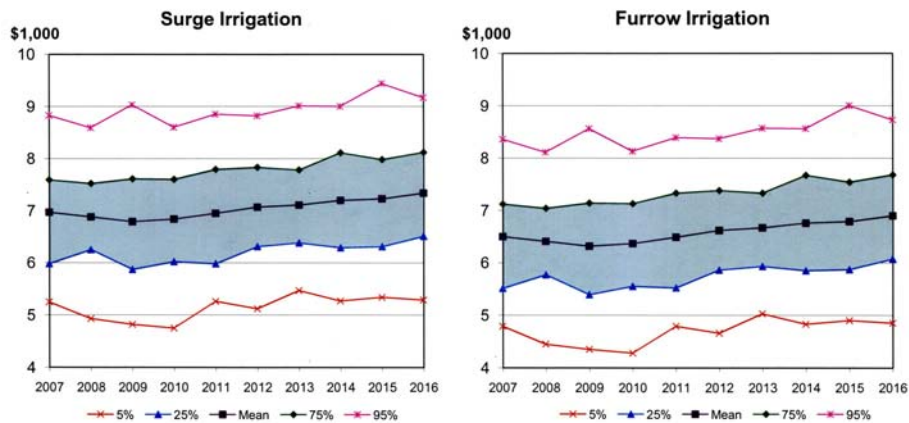


Table 6: 10-Yr Avg. Financial Indicators Per Acre for Seed Corn, Volumetric Pricing, 2007

Scenario & Demo Site	Irrigation Method	Total Cash Receipts (\$1,000)	Total Cash Costs (\$1,000)	Net Cash Farm Income (\$1,000)	Probability Net Cash Income <0 (%)	Average Annual Operating Expense/Receipts
1-41A	Surge	13.01	4.64	8.37	1.00	0.36
2-41B	Furrow	13.01	4.59	8.42	1.00	0.36
3-41A	Surge	13.01	5.97	7.04	1.00	0.46
4-41B	Furrow	13.01	6.43	6.58	1.00	0.50



Figure 4. Projected Variability in Net Cash Farm Income for Seed Corn (\$5/acre inch water cost).



**Focus 2011-2: Furrow Vs. Surge Irrigation in Cotton Assuming Restricted Water Availability in the Lower Rio Grande Valley**

- Water Costs--
  - Scenario 1: \$1.17/acre inch (\$14/acre foot)
  - Scenario 2: \$2.34/acre inch (\$28/acre foot)
  - Scenario 3: \$3.51/acre inch (\$42/acre foot)
  - Scenario 4: \$4.68/acre inch (\$56/acre foot)
  - Scenario 5: \$5.85/acre inch (\$68/acre foot)
  
- Yields were comparable at 1,000 pounds per acre for both surge and furrow irrigation.



**Table 7: Furrow and Surge Irrigation Cost Per Acre for Cotton**

Water Pricing Scenario	Water Price (\$/Ac In)	Water Applied (Ac In)	Furrow					Total Irrigation Costs/Acre
			Water Cost/Acre	Poly-Pipe & Labor Cost/Acre	Variable Irrigation Cost/Acre	Surge Valve Costs/Ac/Yr (Over 10 Years)		
1	1.17	18	\$21.06	\$37.00	\$58.06	N/A	\$58.06	
2	2.34	18	\$42.12	\$37.00	\$79.12	N/A	\$79.12	
3	3.51	18	\$63.18	\$37.00	\$100.18	N/A	\$100.18	
4	4.68	18	\$84.24	\$37.00	\$121.24	N/A	\$121.24	
5	5.85	18	\$105.30	\$37.00	\$142.30	N/A	\$142.30	
Water Pricing Scenario	Water Price (\$/Ac In)	Water Applied (Ac In)	Surge					Total Irrigation Costs/Acre
			Water Cost/Acre	Poly-Pipe & Labor Cost/Acre	Variable Irrigation Cost/Acre	Surge Valve Costs/Ac/Yr (Over 10 Years)		
1	1.17	14	\$16.38	\$37.00	\$53.38	\$9.23	\$62.61	
2	2.34	14	\$32.76	\$37.00	\$69.76	\$9.23	\$78.99	
3	3.51	14	\$49.14	\$37.00	\$86.14	\$9.23	\$95.37	
4	4.68	14	\$65.52	\$37.00	\$102.52	\$9.23	\$111.75	
5	5.85	14	\$81.90	\$37.00	\$118.90	\$9.23	\$128.13	

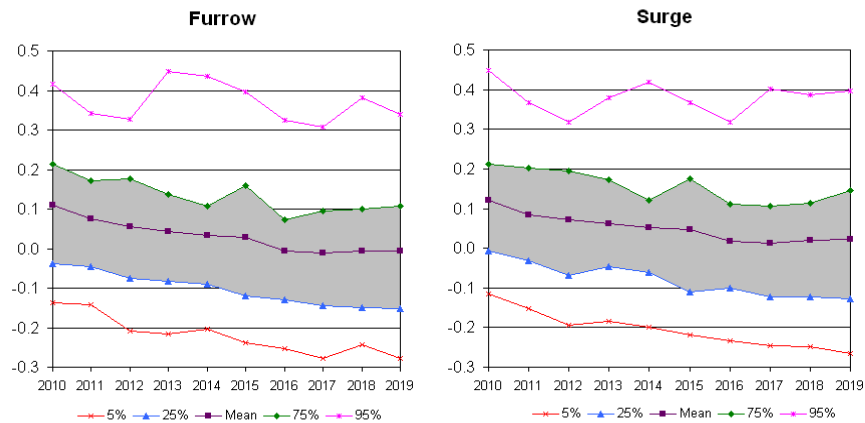


**Table 8: 10-Year Average Financial Indicators for Irrigated Cotton**

Water Pricing Scenario	Water Price (\$/Ac In)	10-Year Averages/Acre					Cumulative 10-Yr Cash Flow/Acre	
		Total Cash Receipts	Total Cash Costs		Net Cash Farm Income		Furrow (\$1000)	Surge (\$1000)
		(\$1000)	Furrow (\$1000)	Surge (\$1000)	Furrow (\$1000)	Surge (\$1000)		
1	1.17	1.020	0.888	0.892	0.132	0.128	1.395	1.353
2	2.34	1.020	0.920	0.916	0.100	0.104	1.058	1.091
3	3.51	1.020	0.953	0.942	0.067	0.078	0.709	0.821
4	4.68	1.020	0.988	0.969	0.032	0.051	0.349	0.544
5	5.85	1.020	1.024	0.996	-0.004	0.024	-0.021	0.262



**Figure 1. Projected Variability in Net Cash Farm Income Per Acre for Furrow vs. Surge Irrigation in Cotton, \$4.68 per Acre Inch Water Price.**



## Citrus Crop Results—A Review of Selected Studies



### ***Focus 2010-4: Assessing Irrigation Methods Based on Grapefruit Pack-Out in the Lower Rio Grande Valley***

- Demonstrations sites not adjacent to one another; 2 growers per irrigation method.
- Yields and pack-out percentages based on 2005-2009 averages.
- Differences in soil types, rainfall and management practices may be significant.



**Table 9: Average 2005-2009 Grapefruit Pack-Out Percentages by Irrigation Method, Lower Rio Grande Valley**

Irrigation Method	Category	Pack-Out Percentages		
		Average	High	Low
Flood	Fancy	43.6	53.1	37.3
	Choice	21.0	19.3	23.6
	Juice	<u>35.4</u>	<u>27.6</u>	<u>39.1</u>
	Total	100.0	100.0	100.0
Border Flood	Fancy	47.3	56.7	41.3
	Choice	23.0	21.2	22.7
	Juice	<u>29.7</u>	<u>22.1</u>	<u>36.0</u>
Drip	Total	100.0	100.0	100.0
	Fancy	45.4	51.9	42.2
	Choice	16.7	11.7	22.6
	Juice	<u>37.9</u>	<u>36.4</u>	<u>35.2</u>
Micro-Jet	Total	100.0	100.0	100.0
	Fancy	46.8	48.1	39.3
	Choice	17.3	13.8	19.4
	Juice	<u>35.9</u>	<u>38.1</u>	<u>41.3</u>
Average	Total	100.0	100.0	100.0
	Fancy	45.8	48.8	43.3
	Choice	19.5	18.3	20.8
	Juice	<u>34.7</u>	<u>32.9</u>	<u>35.9</u>

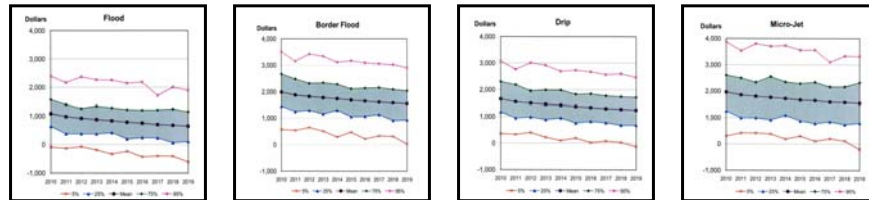


**Table 10: 10-Year Average Per Acre Financial Indicators for Grapefruit, Lower Rio Grande Valley, 2010**

Pack-Out Scenario	10-Year Averages Per Acre			Cumulative 10-Yr Cash Flow/Acre (\$1000)
	Total Cash Receipts (\$1000)	Total Cash Costs (\$1000)	Net Cash Farm Income (\$1000)	
Flood-High	3.28	2.01	1.27	13.87
Flood-Average	2.83	2.01	0.82	9.03
Flood-Low	2.56	2.01	0.55	6.03
Border Flood-High	4.27	2.00	2.27	24.80
Border Flood-Average	3.73	2.00	1.73	18.96
Border Flood-Low	3.36	2.00	1.37	14.96
Drip-High	3.82	2.10	1.72	18.75
Drip-Average	3.51	2.10	1.41	15.40
Drip-Low	3.42	2.10	1.31	14.39
Micro-Jet-High	3.87	2.13	1.73	18.95
Micro-Jet-Average	3.85	2.13	1.71	18.34
Micro-Jet-Low	3.40	2.13	1.27	13.88



Figure 5: Projected variability in Net Cash Farm Income Per Acre for Grapefruit, Average Pack-Out.



***Focus 2010-5: An Evaluation of Flood Irrigation and Compost Use in South Texas Rio Red Grapefruit Production***

- Demonstrations sites adjacent to one another.
- 100 lbs. compost applied per tree per year.
- Yields and irrigation water applied based on 2003-2007 averages.
- No differences in soil types, rainfall and management practices.



**Table 11: Average 2003-2007 Grapefruit Yields & Flood Irrigation Water Applied, Lower Rio Grande Valley**

Year	Yields (Tons/Acre)		Irrigation (Ac. In.)		Rain (Ac. In.)
	No Compost	Compost	No Compost	Compost	
2003	29.2	27.6	24.0	18.0	28.7
2004	29.7	35.6	30.0	24.0	27.6
2005	17.0	19.5	54.0	48.0	17.3
2006	19.0	20.9	48.0	42.0	19.3
2007	23.0	24.9	42.0	36.0	23.6
<b>5-Yr Avg.</b>	23.6	25.7	39.6	33.6	23.3

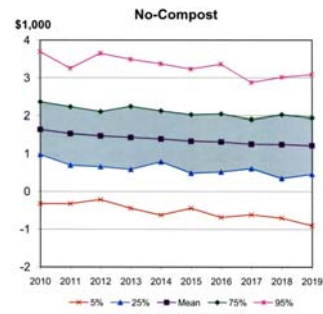


**Table 12: 10-Year Average Per Acre Financial Indicators for Grapefruit, Lower Rio Grande Valley, 2010**

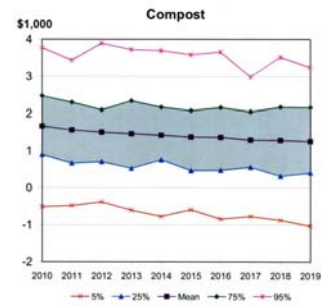
Scenario	10-Year Averages Per Acre			Cumulative
	Total Cash Receipts	Total Cash Costs	Net Cash Farm Income	10-Yr Cash Flow/Acre
	(\$1000)	(\$1000)	(\$1000)	(\$1000)
No Compost	3.37	1.99	1.38	15.11
Compost	3.67	2.25	1.42	15.51



**Figure 6. Projected Variability in Net Cash Farm Income Per Acre for No-Compost Grapefruit, Flood Irrigation.**



**Figure 7. Projected Variability in Net Cash Farm Income Per Acre for Compost Grapefruit, Flood Irrigation.**



**Summary:**

- In field crops, surge vs. furrow offers potential for water savings; but limited incentive to switch at existing water pricing. Conversion to drip would require significantly higher yields per acre.



- Drip vs. furrow in onions is an economically viable alternative.



- In citrus crops, border flood, micro-jet, and drip vs. flood have the potential to conserve water, increase yields and improve fruit quality.



- Water savings may or may not always translate into cost savings for producers.



- Irrigation methods which conserve water have increasing value under conditions of limited water and/or volume pricing. But, except for citrus, vegetables and onions, results have indicated limited existing economic incentives for most producers to adopt conservation practices at this time.



# Financial And Risk Management Assistance Program



*is a planning and analysis tool available to  
Texas farmers and ranchers.*



## What Is FARM Assistance?



- Long-term financial planning tool designed to analyze your business under risk.
- Able to evaluate the future impact of management decisions before a commitment is made.
- One-on-one approach allows for in-depth assessment of your financial picture.
- Provides a comparison of the status quo and proposed changes in your business.



## Is FARM Assistance For You?

### If these questions are on your mind

- Where is my business today?
- How does the performance of my business compare to others?
- Where is my business likely headed if I don't change?
- What are the likely impacts of changes?

**FARM Assistance is a tool for you.**

