Annual Progress Report

For the

Texas Water Development Board

Harlingen Irrigation District CC 1

Maximization of On-Farm Surface Water Use Efficiency by Integration of On-Farm Application and District Delivery Systems

Submitted by:
Harlingen Irrigation District
Cameron County #1
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Harlingen, TX

March, 2008

Table of Contents

Appendices

1. Executive Summary

The Harlingen Irrigation District-Cameron County No. 1, under the auspices of a grant from the Texas Water Development Board, is sponsoring the *Agricultural Water Conservation Demonstration Initiative (ADI),* a multi-year project to conduct a study of the maximization of on-farm surface water use efficiency by integration of on-farm application and district delivery systems. The ten-year project includes participation by Harlingen Irrigation District Cameron County No. 1, Delta Lake Irrigation District, Texas A & M University-Kingsville, USDA-Natural Resources Conservation Service, Rio Farms, Inc, Texas Cooperative Extension Service and agricultural producers in Cameron, Hidalgo and Willacy counties. This Project proposes to assist in the implementation of the agricultural water conservation management strategies, as identified in the Region M Approved Regional Water Plan and the Texas State Water Plan and will further agricultural water conservation in Texas. The project supplements on-going conservation efforts in the Lower Rio Grande Valley

The District has formed an advisory committee consisting of growers, demonstration co-operators, scientists and representatives of grower organizations. The primary responsibilities of this committee are to offer guidance and perspective to the project as a whole. The committee meets on a quarterly basis to discuss the progress and goals of the project. Our hopes are for this committee to become one of the main conduits for disseminating information to the growers of the Rio Grande Valley.

1.1. Advisory Committee Members

Chris Allen – Cooperator
Leonard Simmons – Cooperator
Edward Bauer – Grower
Sam Morrow – Cooperator
Harold Siever - Cooperator
Troy Allen – Delta Lake Irrigation District Manager
Ray Prewitt – Texas Citrus Mutual
Dr.. Shad Nelson – Texas A&M Kingsville
Dr. Juan Enciso – Texas A&M Extension Service
Dr. Al Blair – Axiom-Blair Engineering
Dr. Steven Klose – Texas Cooperative Extension
Enrique Perez – Cameron County Extension
Andy Garza – TSSWCB

2. Introduction

This report contains the annual update and progress made in the Agricultural Demonstration Initiative Project as indicated in the Scope of Work of the Contract between Harlingen Irrigation District – Cameron County No. 1 (HIDCC1 or the District) and the Texas Water Development Board (TWDB). A description of the overall progress, problems encountered delays in the timely completion of work, or change in the deliverables or objectives of the contract are discussed; as well as any corrective actions necessary.

Late in 2006 the advisory committee agreed that to better maintain anonymity of the cooperators information the demonstration sites would be assigned alpha numerical designations rather than be listed by grower name. This was done to help encourage participation by those growers who are reluctant to report yield, water use, and financial information about demonstration sites. From this point forward all demonstration sites will be referred to by site number. The site designation numbers are defined below:
The first digit designates the entity responsible for the site. The second digit designates the grower. The third digit designates the field within the demonstration site. The entity designations are: 0 and 1 Texas A&M University Kingsville Dr. Shad Nelson, 2 and 3 Texas A&M Extension Dr Juan Enciso, 4 and 5 Harlingen Irrigation District.

3. Scope of Work

3.1. Subcontracting Contract Execution

The primary responsibilities for this task were contracted to Axiom-Blair Engineering. The subcontracts with Delta Lake Irrigation District, Texas A&M University Kingsville, Texas Cooperative Extension, and others to provide support and services to perform the work tasks listed below were completed for 2007 and work for the reissue of those contracts for 2008 is underway. This task is scheduled to be complete in March of 2008.

3.2. District and On-Farm Flow Meter Calibration and Demonstration Facilities

Appendix “E” contains a detailed account of the construction activity.

3.3. District Dispatch and Irrigation Delivery Scheduling

No work on this task was performed in 2007.

3.4. On-Farm Flow Measurement Data Collection

Delta Lake Irrigation District has been contracted to perform the task of manual meter information collection. A detailed account of the collection methods and data is located in appendix “A”. This information will be compared with the Harlingen Irrigation District’s automated meter and telemetry system. The telemetry system to monitor deliveries of irrigation water throughout the District was completed in late 2006. We will begin the comparison after the District has had ample time to evaluate its system and is confident in the data it provides. Work on this task will be accelerated in 2008 as Harlingen Irrigation District continues to correct technical issues with the on- farm telemetry system and make the tracking of water delivery data more user friendly.

3.5. District Facilities and Policies Required to Support On-Farm Water Conservation

No work on this task was performed in2007.

3.6. Economic Evaluation of Demonstrated Technologies

A significant component of the demonstration project is the economic evaluation of each on farm technology. The District contracted Texas Cooperative Extension service to perform this task through its FARM Assist program. Economic summaries of each site are included in the Demonstration Site Summary Report for sites that economic analysis has been completed. A more detailed report of the first year’s evaluation, as submitted by Dr. Steven Klose, is located in appendix “B”.

3.7. Demonstration of Internet Based Information Real-Time Flow, Weather, and Water User Accounting System

The bulk of this task is being performed by Axiom-Blair Engineering. The design and launch of the District’s web page occurred in September of 2005. The web page allows us to publish information regarding demonstration sites as well as weather and irrigation water usage. A water order tracking page has been added to the Districts web site and we are working on tying water tickets to on-farm meters.

This past year we developed web pages for our canal riders to give them the ability to monitor specific areas of the irrigation delivery system. These pages were developed to be accessible with the mobile phones issued to the canal rider or through a traditional web browser. These pages contain river level, main canal level, canal flow at all of our metering bridges as well as river pump and re-lift pump flow amounts.

3.8. Drip and Furrow Flood Irrigation in Annual Crops and Multi Year Crops

The majority of this task has been subcontracted to Texas A&M University - Kingsville under the direction of Dr. Shad Nelson. Dr. Nelson and his staff have been working since last spring to establish demonstration sites throughout the Valley. Dr. Nelson has also been working closely with Texas Cooperative Extension Service and Dr. Juan Enciso. Dr. Nelson has been sharing resources and gathering data on sites established by Dr. Enciso. A summary report of all the sites associated with this scope of work is located in appendix D.

3.9. Surge, Automated Surface, and Precision Surface Irrigation

The District has maintained the following demonstration sites throughout the 2007 growing season; 4 surge, 2 surface flood, and 1 subsurface low pressure drip.

A summary of the HID sites is located in Appendix D.

3.10. LESA/LPIC/LEPA Center Pivot Sprinkler Demonstration Sites

Harlingen Irrigation District contracted with Texas Cooperative Extension to maintain and collect data on sprinkler systems in the Rio Grande Valley. The contract allowed for the hiring of one person to maintain and collect data on four demonstration sites. Xavier Peries has been working in this position for the 2007 growing season and will continue through the 2008 growing season. A summary of these sites is provided in Appendix D.

3.11. Automated and Manual On-Farm Measurements Systems

The District has installed a multi-million dollar automated meter and telemetry system that will allow for the monitoring and reporting of all water deliveries in the District. Upon completion of this installation in late 2006 the District began monitoring and reporting flows for evaluation purposes. Real time flow data will be made available to growers on the District's web site. The cost and efficacy of the automated collection of flow data within the District will be compared to the manual collection taking place in the Delta Lake Irrigation District. This evaluation is expected to take place over several years and the results of this evaluation are not expected to be available until the evaluation process is complete.

3.12. Variable Speed Pump Control and Optimization of Delivery of On-Farm Demands

Delta Lake Irrigation District has installed three diesel driven pumps to supply water to a service canal. As part of their revised 2006 contract, Delta Lake Irrigation District will provide the hardware and Harlingen Irrigation District has contracted Axiom-Blair to provide engineering and design for the variable speed and control component of this project. The installation of the variable speed controllers is complete and in the testing phase of the project.

Variable speed controller components installed on the pumps and in the vandal box

3.13. Field Demonstrations of Projects/ Field Days

In May of 2007 the Harlingen Irrigation District hosted representatives of the Rio Grande Basin Initiative for a tour and progress presentation of the project. The presentation consisted of project updates and information from every aspect of the project followed by an introduction and tour of the Flow Meter Calibration Facility.

3.14. Workshops

The Harlingen Irrigation District has conducted two water related workshops throughout the last year. In February of 2007 the District hosted its second Water Management Workshop. The workshop introduced producers to water management requirements for participation in the USDA's EQIP water management payment incentive. Dr. Juan Enciso taught metering methods as well as soil moisture characteristics and plant water requirements. Water metering equipment and soil moisture monitoring devices were demonstrated, along with the proper installation of these devices. ADI personnel participated in the Water Management/Canal Management workshop hosted by TAMES Dr. Guy Fipps. The Flow Meter Calibration Facility was used to demonstrate open channel measuring devices and canal automation.

3.15. Presentations at Water Conservation Meetings

The ADI project holds a quarterly progress meeting at the beginning of each quarter. Reports of progress on the demonstration projects are made by each subcontractor and questions concerning all aspects of the project are discussed. Local growers are invited to attend and encouraged to ask questions and offer insight to the water issues in the Rio Grande Valley.

A Project presentation was made at the Texas Agricultural Industries Association highlighting the demonstration sites and the progress of the Flow Meter Calibration Facility.

The District has published two newsletters highlighting the Agricultural Water Conservation Demonstration Initiative and related topics. This news letter has been distributed to over seven hundred recipients across the state of Texas. Our goal is to publish the newsletter on a quarterly basis and use it as one of the conduits for disseminating information to the growers of the Rio Grande Valley as well as other interested parties across the state.

3.16. Quarterly Progress Report

Harlingen Irrigation District has completed and filed three quarterly progress reports and associated reimbursement requests.

3.17. Program Administrative Work

Harlingen Irrigation District has maintained the accounting records and files for the ADI project. The project's primary administration is handled by Tom McLemore the Project Manager. Together, with the Irrigation District's General Manger Wayne Halbert, we have issued and maintained subcontracts with Texas A&M University - Kingsville, Delta Lake Irrigation District, Texas Cooperative Extension and Axiom-Blair Engineering.

3.18. Report Preparation, Reproduction, and Distribution

The district has completed and filed three quarterly progress reports and the respective reimbursement request. The District has also completed their third annual report, reproduced and filed it with the Texas Water Development Board.

4. Financial Report by Task

TASK	TWDB	TWDB	TWDB	Matching Funds					Source
	Feb 1, '05 Feb 15, 06	Feb 15, 06 Feb 28, 07	MAR 1, 07 Feb 29 08	2003	2004	2005	2006	2007	
A- Project Subcontracting									
Subcontracting Contract Execution	$6,710.00	$3,525.00	$3,000.00						
Total A- Project Subcontracting	**$6,710.00**	**$3,525.00**	**$3,000.00**						
B-Technical Management Support for Demos							$2,799.80		HID
District and On-Farm Flow Meter Cal	$143,528.71	$346,379.15	$88,361.42			$20,000.00		$19,742.61	HID
On-Farm Flow Meas. Data Collection				$123,608.59	$175,842.95	$214,098.25	$108,845.20		HID/BOR
						$115,671.10	$259,496.69		HID/2025
					$4,220.00	$271,839.73	$144,616.13		BOR/2025
	$9,990.62	$14,646.69	$15,908.12		$376,981.31	$17,254.62			NADB
Dist Facilities and Policies	$116.26								
Economic Eval of Demo Tech FARM ASSIST	$1,656.21	$55,526.47	$30,594.40						
Technical Management Support for Demos -Admin	$26,664.82	$31,207.69	$32,257.66						
Total B-Technical Management Support for Demos	**$181,956.62**	**$447,760.00**	**$167,121.60**	**$123,608.59**	**$557,044.26**	**$638,863.70**	**$515,757.82**	**$19,742.61**	
C-Demonstration Projects							$6,214.70	$27,349.00	HID
Demo of Internet Based Information	$14,862.15	$84,856.66	$37,074.11			$3,323.00			ABE
						$2,267.30	$4,250.00		NETAFIM
						$5,283.00			EQIP
On Farm Drip,Flood,and Surge Demo	$44,298.78	$54,027.00	$66,864.01			$24,095.00	$119,086.07	$61,320.55	TAMUK
LESA/LEPA Center Pivot Demo Sites			$13,177.22						
VS Pump Control and Optimization		$7,640.93	$8,608.12				$131,102.31	$7,900.00	DLID
Demonstration Projects - Admin	$19,822.96	$65,615.71	$65,903.81						
Total C-Demonstration Projects	**$78,983.89**	**$212,140.30**	**$191,627.27**			**$34,968.30**	**$260,653.08**	**$96,569.55**	
D- Public Field Days and Demonstrations									HID
Presentations at Water Con. Meetings	$3,161.97	$995.76	$3,418.54						
Total D- Public Field Days and Demonstrations	**$3,161.97**	**$995.76**	**$3,418.54**						
E-Project Administration and Report Prep						$121,498.53	$148.49	$149.00	HID
Program Administrative Work	$57,710.25	$21,461.66	$24,856.29						
Report Prep. Repro. and Distribution	$3,021.58	$1,726.64	$208.63						
Project Administration and Report Prep - Admin	$16,287.98	$21,258.16	$16,128.83						
Total E-Project Administration and Report Prep	**$77,019.81**	**$44,446.46**	**$41,193.75**			**$121,498.53**	**$148.49**	**$149.00**	
Sub total by Year	**$347,832.29**	**$708,867.51**	**$406,361.15**	**$123,608.59**	**$557,044.26**	**$795,330.53**	**$776,559.39**	**$116,461.16**	
Total Matching Funds	**$1,475,983.38**	**$776,559.39**	**$116,461.16**	**$2,369,003.93**					
Project Total by Year	**$1,823,815.67**	**$1,485,426.90**	**$522,822.31**						

Annual Progress Report

For the

Texas Water Development Board - Agricultural Water Conservation Demonstration Initiative Grant

Maximization of On-Farm Surface Water Use Efficiency by Integration of On-Farm Application and District Delivery Systems

On-Farm Flow Measurement Data Collection

Delta Lake Irrigation District

Submitted by
Delta Lake Irrigation District
General Manager:
Troy Allen

Appendix A

Executive Summary

Delta Lake Irrigation District implemented metering in 1998 due to serious drought conditions in the Rio Grande Valley. During August of 1998 the District had less than a day's worth of water in the Districts Reservoirs, with no allocated water left to pump. This made the implementation of meters a fairly easy task.

The District initially purchased 300 plus meters, with a majority of the meters being 10" propeller type meters in aluminum pipe and the others being saddle propeller and vertical propeller. The District agreed to sell the meters to the farmers at 50% of original cost.

In the beginning the meters seem to be accurate as long as they were installed properly. The propeller meter must have a full flowing discharge. The main problems are on installation of the saddle meters if pipe measurement in not accurate, other problems with propeller type meters are accuracy in dirty water, and the ability to easily alter the readings with as little as a string, bag, etc.

At the time Delta Lake implemented metering our loss factor was averaging 28%; 5 year average. In 2000 the District raised the loss factor to 32% then in 2002 raised it again to 40%. The loss factor continued at 40% through 2005.

In 2005 the District relaxed the mandatory metering policy in selected situations. At the start of 2006 we relaxed the metering policy a little more with the loss factor at the end of 2006 down to 32%.

This led us to believe that without an electronic data collector on meters we shouldn't expect to obtain accurate readings. We felt that hiring enough data technicians to keep up accurate readings (3 to 5) daily could cost the District $125,000 to $150,000 annually.

Scope of Work

The ADI Project has enabled us to compare the price of manual meter readings versus automated reading collected by Harlingen.

Delta Lake meters a variety of crops including, but not limited to carrots, onions, watermelons, cabbage, sugar cane, cotton, grain, citrus, and pastures. After collection and tabulation of the data, the numbers can be used to calculate information vital to the efficiency and well being of the water district.

There are a variety of meters that the field technician must become accustomed to reading. Some meters use acre-feet, and some use gallons as their unit of measure. Another challenge faced by the meter reader is to locate the meter, which can vary from field to field.

Another part of our project was for the District to set up a Variable Speed Pump Site. The District has install the pumps and motors for Relict Station No. 45 (the Variable Speed Pump Site), as well as the security fencing and trash rake. This site is equipped with automatic start, shutdown, and remote throttle control. This site is still in testing stage, pump one is up and running, with two and three coming on line soon.

The purpose of automating this site was to get better control of 23 miles of pipeline that delivers water to 5600 plus acres of land. Upon completing the pumps will be controlled on site or remotely. They will also have level sensors that will maintain a predetermined elevation in the pipeline system.

The District spent $131,102.26 for the Pumps, Motors, Security Fence and Trash Rake. For the automation of the site currently we have $7,900.00 invested and have not installed or purchased the meters.

Picture #1-4 are of an onion crop.

#1

#2

#3

#4

Pictures #5-8 are of a grass farm

#5

#6

#7

#8

Pictures #9-12 are of Pump 45 telemetry

#9

#10

#11

#12

Annual Progress Report

For the

Texas Water Development Board - Agricultural Water Conservation Demonstration Initiative Grant

Maximization of On-Farm Surface Water Use Efficiency by Integration of On-Farm Application and District Delivery Systems

Economic Evaluation of Demonstrated Technologies, FARM Assistance Program

FARM Assistance

Helping Agriculture Make Informed Decisions

Submitted by:
Texas Cooperative Extension, FARM Assistance
Dr. Steven Klose
And
Mac Young

February, 2008

AGRICULTURAL DEMONSTRATION INITIATIVE
Texas Cooperative Extension, FARM Assistance Sub-Contract with Harlingen Irrigation
Account # 422460 - Harlingen Irrigation District

Annual Report for the period ending February 15, 2008

Scope of Work Task B.5
Economic Evaluation of Demonstrated Technologies, FARM Assistance Program

Activities and continual progress regarding the FARM Assistance task of the ADI project of the Harlingen Irrigation District revolves around two primary objectives. The first is collaborating with project management team and coordinating the FARM Assistance program into the project concepts, including participation in management team meetings, planning sessions, producer meetings, and contributions to project promotional materials. TCE faculty also supported the overall project effort of recruiting project demonstrators. The second objective is the completion of the economic analysis for project demonstrations. Economic analyses for individual demonstrators range from conducting an evaluation of the site demonstration to providing the complete FARM Assistance strategic analysis service for the demonstration participant. Analyses of the 2007 site demonstrations are included. A summary of the contact, status, and analysis conducted for 2007 demonstrators and potential 2008 demonstrators follows:

2006 Demonstrations

- Sites 41 A&B, 42B & 44A (cotton, surge irrigation)
  Completed irrigation cost analysis—*Surge Irrigation Illustration for Cotton in the Lower Rio Grande Valley*. Farm Assistance *Focus* Series 2007-3, Texas Cooperative Extension, Texas A&M University System. http//:farmassistance.tamu.edu.

- Site 43A-B (cotton, furrow vs. drip irrigation)
  Completed volumetric irrigation cost analysis—*Impact of Volumetric Water Pricing for Cotton Comparing Furrow vs. Drip Irrigation in the Lower Rio Grande Valley*. Farm Assistance *Focus* Series 2007-4, Texas Cooperative Extension, Texas A&M University System. http//:farmassistance.tamu.edu.

- Sites 1A, 1C, & 28B2 & 28C (Rio Red Grapefruit, narrow border flood vs. micro-jet spray)
  Completed irrigation cost analysis—*Narrow Border Flood and Micro-Jet Spray Irrigation Illustration for Rio Red Grapefruit in the Lower Rio Grade Valley*. Farm Assistance *Focus* Series 2007-5, Texas Cooperative Extension, Texas A&M University System. http//:farmassistance.tamu.edu.

- Sites 1B, 28D1, & 28D2 (Valencia, Navel & Marrs Oranges, narrow border flood vs. 2-line drip irrigation)

Completed irrigation cost analysis—*Narrow Border Flood and 2-Line Drip Irrigation Illustration for Valencia, Navel and Marrs Oranges in the Lower Rio Grade Valley*. Farm Assistance *Focus* Series 2007-6, Texas Cooperative Extension, Texas A&M University System. http//:farmassistance.tamu.edu.

- Sites 41A & 41B (Seed Corn, surge vs. furrow irrigation)
  Completed volumetric irrigation cost analysis—*Impact of Volumetric Water Pricing for Seed Corn Comparing Surge vs. Furrow Irrigation in the Lower Rio Grade Valley*. Farm Assistance *Focus* Series 2007-7, Texas Cooperative Extension, Texas A&M University System. http//:farmassistance.tamu.edu.

2007 Demonstrations

- Sites 01A-01E (01A: Rio Red grapefruit, narrow border flood; 01B: Valencia oranges; narrow border flood; 01C: Rio Red grapefruit, narrow border flood)
  Conducted initial data collection, and developed preliminary analysis
  Conducted verification/validation meeting
  Completed and delivered FARM Assistance Strategic Analysis
  Completed demonstration site evaluation (included)

- Sites 02A-02C (02A: Henderson grapefruit, border flood; 02B: Rio Red Grapefruit; micro-jet spray; 02C: Ruby Red grapefruit, drip)
  Conducted initial data collection, and developed preliminary analysis
  Conducted verification/validation meeting
  Completed and delivered FARM Assistance Strategic Analysis
  Completed demonstration site evaluation (included)

- Sites 04A-04B (02A: Rio Red grapefruit, 1-line drip; 02B: Rio Red Grapefruit; micro-jet spray)
  Conducted initial data collection, and developed preliminary analysis
  Conducted verification/validation meeting
  Completed and delivered FARM Assistance Strategic Analysis
  Completed demonstration site evaluation (included)

- Sites 24A (Rio Red grapefruit, every other row border flood)
  Conducted initial data collection, and developed preliminary analysis
  Conducted verification/validation meeting
  Completed and delivered FARM Assistance Strategic Analysis
  Completed demonstration site evaluation (included)

- Sites 28A-28D2 (28A: Valencia oranges, micro-jet spray; 28B1: Marrs oranges, 2-line drip; 28B2: Rio Red grapefruit, 2-line drip; 28C: Rio Red grapefruit, micro-jet spray; 28D1: Navel oranges, 2-line drip; 28D2: Marrs oranges, 2-line drip)
  Conducted initial data collection, and developed preliminary analysis
  Conducted verification/validation meeting
  Completed and delivered FARM Assistance Strategic Analysis

Completed demonstration site evaluation (included)

- Site 41A-41B (41A: seed corn, surge irrigation; 41B: seed corn, furrow irrigation)
  Conducted initial data collection, and developed preliminary analysis
  Conducted verification/validation meeting
  Completed and delivered FARM Assistance Strategic Analysis
  Completed demonstration site evaluation (included)

- Site 42A-42B (42A: grain sorghum, surge; 42B: cotton, surge irrigation)
  Conducted initial data collection, and developed preliminary analysis
  Conducted verification/validation meeting
  Completed and delivered FARM Assistance Strategic Analysis
  Completed demonstration site evaluation (included)

- Site 43A-43B (43A: cotton, furrow irrigation; 43B: cotton, surge irrigation)
  Conducted initial data collection, and developed preliminary analysis
  Conducted verification/validation meeting
  Completed and delivered FARM Assistance Strategic Analysis
  Completed demonstration site evaluation (included)

- Site 44A (soybeans, surge irrigation)
  Conducted initial data collection, and developed preliminary analysis
  Conducted verification/validation meeting
  Completed and delivered FARM Assistance Strategic Analysis
  Completed demonstration site evaluation (included)

- Site 45A (sugar cane, furrow irrigation)
  Conducted initial data collection, and developed preliminary analysis
  Conducted verification/validation meeting
  Completed and delivered FARM Assistance Strategic Analysis
  Completed demonstration site evaluation (included)

2007 New ADI Demonstrators

- Jimmie Steidinger
  Held introductory meeting with cooperator and provided information requirements April 18. Conducted and completed site analysis.

- Fernando Vieto, Sharyland Orchards
  Held introductory meeting with cooperator and provided information requirements May 8. Conducted and completed site analysis.

2008 Scheduled Demonstrators

- Mark Fryer
  Initial data collection meeting scheduled for late February

- Jim Hoffmann
  Initial data collection meeting scheduled for late February

- Jim Pawlik
  Initial data collection meeting scheduled for early March

- Sam Morrow
  Initial data collection meeting scheduled for March

- B S Farms
  Initial data collection meeting scheduled for March

- Leonard Simmons
  Initial data collection meeting scheduled for April

- Jimmie Steidinger
  Initial data collection meeting scheduled for May

- Sharyland Orchards
  Initial data collection meeting scheduled for June or July

- Tom McLemore
  Initial data collection meeting scheduled for September

- Chris Allen
  Initial data collection meeting scheduled for September

2007 Reporting and Other Activities:

- 2006 ADI Annual Grant Report completed February 15.
- April 5 Quarterly ADI Meeting.
- 2006 Economic Summaries completed April 23.
- Attended Rio Grande Basin Initiative tour of HID/ADI flow meter facility May 17.
- May 31, 2007 ADI Quarterly Status Report completed May 25.
- June 21 Quarterly ADI Meeting.
- August 31, 2007 ADI Quarterly Status Report completed September 5.
- September 28 Quarterly ADI Meeting.
- November 30, 2007 ADI Quarterly Status Report completed December 6.
- 2007 ADI Annual Grant Report completed February 15.

FARM Assistance Focus

Texas Cooperative Extension
The Texas A&M University System

Surge Irrigation Illustration for Cotton in the Lower Rio Grande Valley

Mac Young
Steven Klose
Greg Kaase
Melissa Jupe
Jason Morris

FARM Assistance Focus 2007-3

April 2007

Department of Agricultural Economics,
Texas Cooperative Extension
Texas A&M University System

farmassistance.tamu.edu

FARM Assistance

Illustrating the economic viability of the site demonstrations allows for an evaluation of the viability of surge irrigation as an efficient water delivery system.

The overall demand for water in the Lower Rio Grande Valley is being pressured by a substantial population growth in recent years. This increasing demand coupled with the ongoing needs of irrigated production agriculture has spurred an interest in evaluating water conservation practices. As a result, water use demonstrations on irrigated crops, such as surge irrigation, have been established. Illustrating the economic viability of the site demonstrations allows for an evaluation of the viability of surge irrigation as an efficient water delivery system.

The Agricultural Water Demonstration Initiative (ADI) project is a multi-faceted effort among the Texas Water Development Board, the Harlingen Irrigation District, South Texas agricultural producers, Texas Cooperative Extension 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 to water consumption by various field, vegetable, and citrus crops. Texas Cooperative Extension (TCE) conducts the economic analyses of demonstration results, evaluating the potential impact of adopting alternative water conserving technologies. TCE 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.

Three surge valve technology demonstrations in 2006, associated with the ADI project, illustrate potential water application and irrigation costs scenarios in cotton production (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 cotton crop may be watered 4 different occasions at a price of $7 per watering. In this example, a producer would pay approximately $28 in water costs. Labor, surge valve and poly-pipe would add to the total irrigation costs per acre. A surge valve may cost as much as $1,800-$2,200. The following analysis evaluates the potential financial incentives for using surge technology.

Assumptions

Table 1 provides the basic water use and irrigation cost assumptions for cotton surge irrigation. For the purpose of illustrating surge technology in cotton, three demonstration sites were used, including a 38.5-acre site (Site 41A&B), a 94-acre site (Site 42B) and a 38-acre site (Site 44A). Production costs were derived from custom rates and estimates of per acre overhead charges from the three individual cooperators. They 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 producers in the Lower Rio Grande Valley area.

The analysis consists of three separate demonstration sites not located adjacent to one another. Differences in soil types, rainfall and management practices likely affected irrigation water application, production costs and yields. As a result, the three are not replicated trials and the three combined are not a controlled experiment for comparison purposes. This comparison is merely a case study example illustrating results of

Table 1: Cotton Surge Irrigation Application and Cost Information Per Acre

Demo Site	Irrigation Method	Acres	Acre Inches Applied	Irrigation Costs Per Acre	Irrigation Costs Per Acre Inch	Yields Per Acre (lbs)	Yields Per Acre Inch (lbs)	Surge Valve
Site 41A&B	Surge	38.50	25.15	$53.00	$2.11	1,047	41.60	$1,800.00
Site 42B	Surge	94.00	13.42	$48.44	$3.61	929	69.23	$1,800.00
Site 44A	Surge	38.00	13.56	$40.00	$2.95	760	56.00	$2,200.00

All three demonstration sites reflect profitable use of surge valve technology in irrigated cotton production.

Table 2: Financial Indicators Per Acre for Cotton, Surge Irrigation						
Demo Site	Irrigation Method	10-Year Averages Per Year				
		Total Cash Receipts ($1,000)	Total Cash Costs ($1,000)	Net Cash Farm Income ($1,000)	Prob Net Cash Income <0 (%)	Avg Annual Operating Expense/Receipts
Site 41A&B	Surge	0.90	0.57	0.32	1.00	0.65
Site 42B	Surge	0.79	0.59	0.20	1.00	0.75
Site 44A	Surge	0.60	0.46	0.14	11.50	0.79

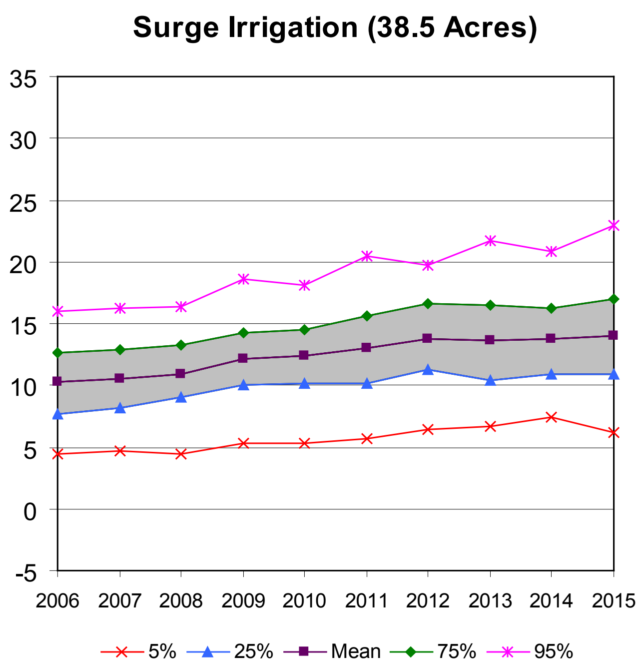
different sites. The first two surge sites assume a surge valve cost of $1800 and the third $2,200. The surge valve expense is evenly distributed over the 10-year period ($180 or $220) with the assumption of no financing costs. For the current analysis, no other major differences were assumed for the surge valve sites.

For each 10-year outlook projection, commodity price trends follow projections provided by the Food and Agricultural Policy Research Institute (FAPRI, at the University of Missouri) with costs adjusted for inflation over the planning horizon. Demonstration findings suggest a range of possible yields based on varying management practices and production conditions.

Results

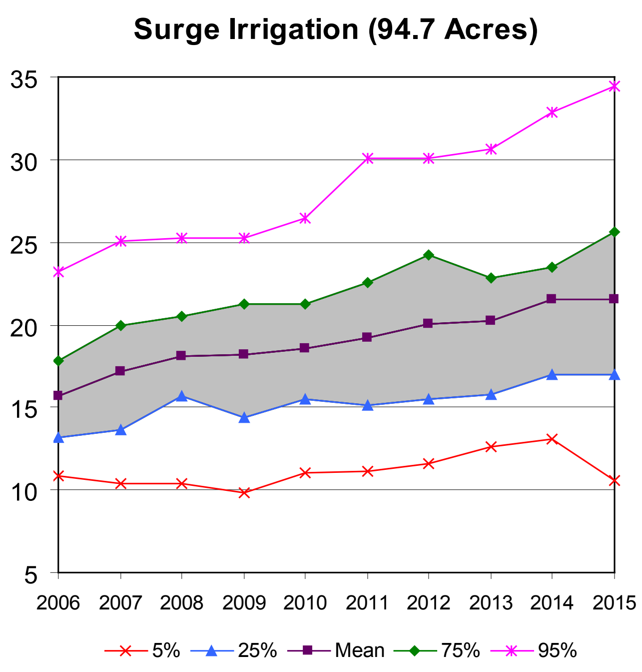
Comprehensive projections, including price and yield risk for surge irrigation, are illustrated in Table 2 and Figures 1-3. Table 2 presents the average

Figure 1. Projected Variability in Net Cash Farm Income for Demonstration Site 41A&B.



Note: Percentages indicate the probability that Net Cash 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 for Demonstration Site 42B.



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

The economic incentives for producers to switch to surge irrigation systems will likely be determined by the future availability and cost of water.

outcomes for selected financial projections, while the graphical presentations illustrate the full range of possibilities for net cash farm income. Cash receipts average $600-$900/acre over the 10-year period for the three sites. Average cash costs range from $460/acre for Site 44A to $590/acre for Site 42B.

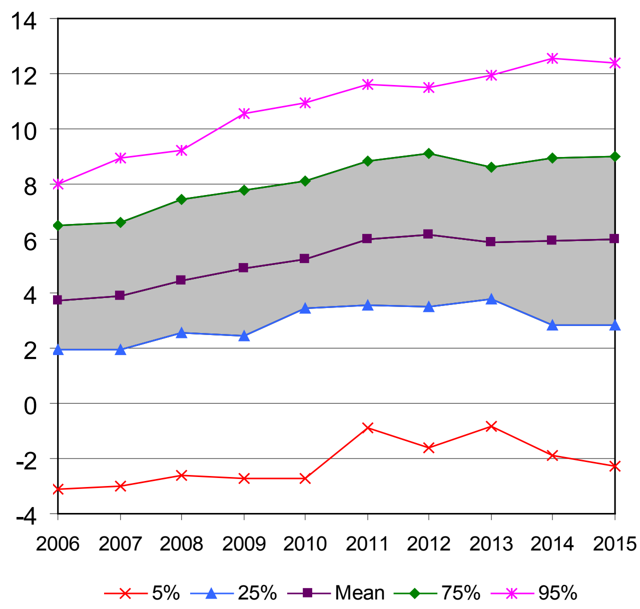
Average Net Cash Farm Income (NCFI) is the highest for Site 41A&B at $320/acre followed by Site 42B at $200/acre and Site 44A $140/acre (Table 2; Figures 1-3). NCFI rises slightly for all sites from 2006 to 2012 before flattening in the later years due to cost inflation outpacing increases in prices and yield. All three surge scenarios reflect significant levels of risk (Figures 1-3). Risk projections also indicate a 1% or less chance of a negative NCFI for Sites 41A&B and 42B, compared to 11.5% for Site 44A (Table 2).

Summary

The case study results of surge irrigation for cotton illustrate a wide range of possible water application rates and irrigation costs. Demonstration results vary due to differences in yields and management practices. All three demonstration sites reflect profitable use of surge valve technology in irrigated cotton production. However, where previous studies have shown potential water use and cost savings, the economic incentives for producers to switch to surge irrigation systems will likely be determined by the future availability and cost of water.

Figure 3. Projected Variability in Net Cash Farm Income for Demonstration Site 44A.

Surge Irrigation (38.0 Acres)



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

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FARM Assistance Focus

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Drought Recovery in South Texas Ranches

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FARM Assistance Focus 2007-2

March 2007

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With renewed optimism [from the rains in late 2006 and early 2007], cattlemen are responding by implementing management strategies to rebuild herds.

Rains in late 2006 and early 2007 over many parts of South Texas somewhat abated drought conditions that had persisted for over a year. With renewed optimism, cattlemen are responding by implementing management strategies to rebuild herds in an attempt to recover from the financial effects of drought. These effects include heavier-than-normal culling of cow herds, supplemental feeding and/or selling calves at lighter weights due to drought reduced forage conditions. Conversely, isolated parts of South Texas have received only minimal levels of precipitation. These producers are likely to have poor forage conditions again in 2007 and, at best, may only be able to maintain the already culled herds. A continued drought situation and a dry spring reducing forage conditions will further increase cash flow and financial concerns of affected producers. For those producers blessed with improving forage conditions, overall recovery from the recent drought will be slowed by previous losses incurred and high-priced herd replacements. Herd rebuilding will likely be over a 2-3 year period as forage conditions improve.

Assumptions

The Financial And Risk Management (FARM) Assistance financial planning model was used to evaluate and illustrate the individual financial impacts of continued drought and drought recovery. Two scenarios, 1) continued drought in 2007 and 2) drought recovery in 2007, were assumed. This study estimates the impact of one more year of drought vs. drought recovery in 2007 on a hypothetical commercial cow-calf ranch in South Texas. The representative ranch is assumed to be 2,000 acres and the basic assumptions and characteristics are given in Table 1. Production costs and estimates for overhead charges were based on typical rates for the region under continued drought and recovery scenarios. Cattle prices were obtained from the Live Oak Livestock Commission Company auction report in Three Rivers, Texas, for February 19, 2007.

The representative ranch was analyzed over a 10 year period. In the continued drought scenario, there is no further herd culling in 2007 and herd rebuilding occurs in 2008-2010. Conversely, in the drought recovery scenario, herd rebuilding occurs in 2007-2009. The base year for the 10-year analysis is 2007 and projections are carried through 2016. The assets, debts, machinery inventory and scheduled equipment replacements for the projection period were the same in both the drought and recovery scenarios. It is assumed the ranch has a $60,000 carryover debt from 2006 in both scenarios. Commodity

Table 1: Representative South Texas Ranch Assumptions

Selected Parameter	Continued Drought	Drought Recovery
Operator Off-Farm Income	$24,000/year	Same
Spouse Off-Farm Income	$35,000/year	Same
Family Living Expense	$30,000	Same
Ownership Tenure	100%	Same
Carryover Debt	$60,000	Same
Herd Size	145 cows, 6 bulls in 2007; 200 cows, 8 bulls by 2010	Same; 200 cows, 8 bulls by 2009
Calf Weaning Rate	85%	Same
Cow Herd Replacement	Bred Cows	Same
Hay Fed/Cow/Year	5.0 tons in 2007, 2.5 tons in 2008 1.5 tons in 2009, 0.9 tons in 2010-2016	2.5 tons in 2007, 1.5 tons in 2008, 0.9 tons in 2009-2016
Protein Cubes Fed/Cow/Year	400 lbs in 2007, 200 lbs in 2008, 100 lbs in 2009-2016	200 lbs in 2007, 100 lbs in 2008-2016
Cow Culling Rate/Year	0.0% in 2007, 2.5% in 2008, 5.0% in 2009, 7.5% 2010-2016	2.5% in 2007, 5.0% in 2008, 7.5% in 2009-2016
Steer Weaning Weights	475 lbs in 2007-2008, 500 lbs in 2009, 525 lbs in 2010-2016	475 lbs in 2007, 500 lbs in 2008, 525 lbs in 2009-2016
Heifer Weaning Weights	425 lbs in 2007-2008, 450 lbs in 2009, 475 lbs in 2010-2016	425 lbs in 2007, 450 lbs in 2008, 475 lbs in 2009-2016
Steer Prices	$1.20/lb in 2007, $1.10/lb in 2008, $1.00/lb in 2009	$1.20/lb in 2007, $1.07/lb in 2008, $0.97/lb in 2009
Heifer Prices	$1.12/lb in 2007, $1.02/lb in 2008, $0.92/lb in 2009	$1.12/lb in 2007, 0.99/lb in 2008, $0.89/lb in 2009
Cull Cow Prices	$0.513/lb	Same
Cull Bull Prices	$0.605/lb	Same
Bred Cow Prices	$1,100/head	Same
Replacement Bull Prices	$2,000/head	Same
Hay Prices	$140/ton in 2007, $120/ton in 2008, $100 ton in 2009-16	Same
Range Cube Prices	$0.135/lb	Same

A continued drought period would severely affect the long-term profitability and financial condition of a ranch in South Texas.

Table 2: Financial Projections - Selected Indicators

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Average
Total Cash Receipts ($1,000)											
Continued Drought in 2007	78.90	76.97	83.77	89.91	92.13	89.12	91.32	95.08	98.54	97.81	89.35
Drought Recovery in 2007	81.72	89.46	95.46	95.34	92.13	89.12	91.32	95.08	98.54	97.81	92.60
Total Cash Costs ($1,000)											
Continued Drought in 2007	150.75	131.13	113.41	102.21	92.20	89.47	87.89	86.34	85.34	85.04	102.38
Drought Recovery in 2007	128.37	115.96	100.60	86.75	84.30	81.97	82.45	83.39	84.46	84.91	93.32
Net Cash Farm Income ($1,000)											
Continued Drought in 2007	-71.85	-54.16	-29.65	-12.29	-0.06	-0.35	3.43	8.74	13.19	12.78	-13.02
Drought Recovery in 2007	-46.65	-26.50	-5.14	8.59	7.84	7.15	8.87	11.69	14.07	12.90	-0.72
Ending Cash Reserves ($1,000)											
Continued Drought in 2007	-46.62	-83.06	-93.34	-86.18	-76.93	-53.94	-27.63	2.39	35.03	75.54	
Drought Recovery in 2007	-22.71	-34.77	-25.08	-1.92	12.18	40.95	71.17	103.43	137.50	176.42	
Real Net Worth ($1,000)											
Continued Drought in 2007	1,867.53	1,862.69	1,859.15	1,852.03	1,858.63	1,867.67	1,916.61	1,967.11	2,020.36	2,059.79	
Drought Recovery in 2007	1,910.09	1,922.85	1,931.97	1,930.15	1,939.54	1,961.19	2,003.25	2,054.36	2,107.33	2,146.21	

price trends follow projections provided by the Food and Agricultural Policy Research Institute (FAPRI, University of Missouri) with costs adjusted for inflation over the planning horizon.

Financial measures are used to quantify and analyze the financial well-being of a farm or ranch. The projected financial position and performance was evaluated across four major categories including liquidity, solvency, profitability, and repayment capacity. Representative measures were chosen for each of these five categories and are presented in tabular and/or graphical format for each scenario. Each measure chosen provides information with respect to the projected variability in the ranches financial position and performance. When taken as a whole, these measures provide insight into the risk bearing ability of the ranch throughout the planning horizon.

Results

A comprehensive projection including price and weaning weight risk for the normal and drought scenarios are illustrated in Table 2 and Figure 1. Table 2 presents the average outcomes for selected financial projections, while Figure 1 illustrates the range of possibilities for ending cash reserves and the probability of having to refinance the operating note. Cash receipts averaged $89,350 over the 10-year period for the continued drought scenario, 3.5% less than the drought recovery scenario. The lower cash receipts in the continued drought scenario reflects smaller herd size and delayed herd rebuilding. Average cash costs were $102,380 for the continued drought conditions, 9.7% higher than with the drought recovery scenario reflecting the higher feeding costs incurred.

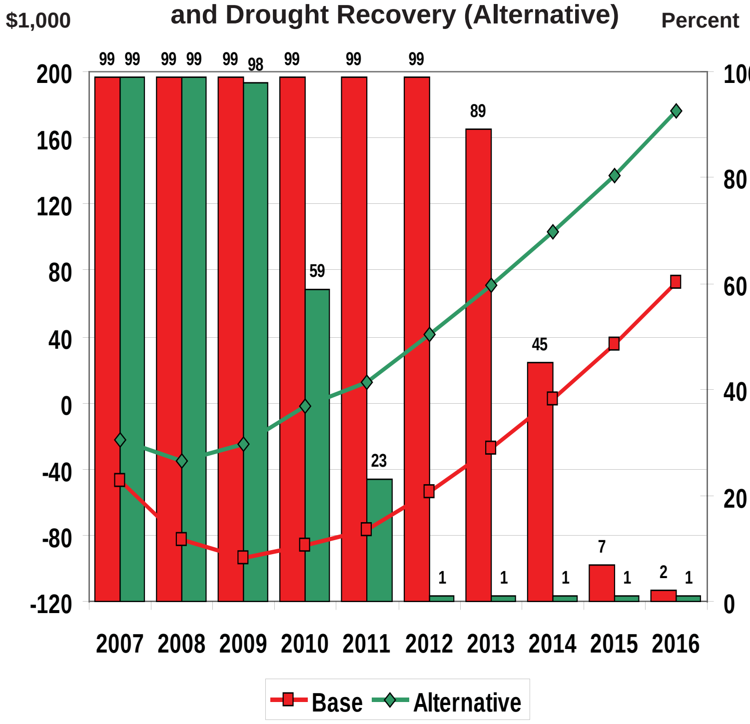
Profitability measures the extent to which a farm or ranch generates income from the use of resources. In the continued drought scenario, profitability of the ranch is more severely impacted over the ten year planning horizon. Net cash farm income (NCFI) is projected to be -$71,850 in 2007, compared to -$46,650 in recovery conditions (Table 2). For 2007-2016, it is expected to average -$13,020 under the continued drought conditions and -$720 in recovery conditions. The negative NCFI under both scenarios during the early years of the projection period is primarily due to the increased feeding costs, reduction in herd size and number of calves sold, and servicing carryover debt.

Liquidity measures the ability of a farm or ranch to meet its short-term financial obligations without disrupting the normal operations of the business. The liquidity of the operation is measured by the ending cash balance (Table 2 and Figure 1). In the continued drought scenario, cash flow problems are projected to persist during the first seven years and cash reserves grow to only $75,540 during the planning horizon. This compares to a growth in cash reserves in the drought recovery scenario to $176,420, a $100,880 difference. Figure 1 illustrates average ending cash balances and risk of cash shortfalls. Between 2007 and 2014, there is significant risk of negative reserves in the continued drought conditions, but, in the recovery scenario, negative reserves are less likely after 2010.

Repayment capacity measures the ability of a borrower to repay debt. Figure 1 further depicts the risk associated with the ending cash balance by showing the probability of refinancing or carryover operating debt. Due

The FARM Assistance program is designed to help individuals to evaluate their business strategies and options.

Figure 2: Ending Cash Reserves and Probability of Having to Refinance Operating Note for Continued Drought (Base) and Drought Recovery (Alternative)



to the $60,000 carryover debt from 2006, both scenarios have a high probability in the early years of the projection period. The probability of carryover debt is 99% or more during 2007-2012 and then declines to 2% by 2016 assuming continued drought conditions. In the drought recovery conditions, the probability of carryover debt is 99% or more in 2007-2008 before declining in subsequent years. A continued drought would clearly impact the ranch's debt servicing ability. Both scenarios assume a return to normal conditions in 2008 and beyond.

Solvency is a comparison of the value of owned assets to the amount of debts owed and real net worth is a measure of the owner's interest or equity adjusted for inflation. Growth in cash reserves and real estate assets translates into a projected increase in real net worth in both scenarios. In continued drought conditions, the operation begins 2007 with a real net worth of $1.95 million which generally increases to $2.06 million by 2016 (Table 2). However, in the drought recovery scenario, real net worth reaches $2.15 million by 2016, about 4.2% higher than the continued drought scenario.

Implications

The projected results clearly show that a continued drought period would severely affect the long-term profitability and financial condition of a ranch in South Texas. In both continued drought and recovery conditions, there are many strategies that a ranch business can implement and each individual rancher should evaluate their options in light of their own individual situation. The FARM Assistance program is designed to help individuals to evaluate their business strategies and options. A prudent manager will implement management strategies, including stocking, culling and/or feeding, to optimize the use of available forage and minimize the long-term financial impact of drought. Management should also consider strategies to implement during good years including maintaining forage, nutritional and financial reserves.

FARM Assistance Focus Series 2007-1, conducted by Kaase, Young, Klose, Paschal, Hanselka and Jupe (February 2007) compares the long term financial impacts of two different drought management strategies (maintain cow herd size vs. reducing herd size). The results of this study indicate different short term impacts, but both strategies have similar long term financial outcomes.. You can read this study in full at http://farmassistance.tamu.edu/publications/focus.

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FARM Assistance Focus

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Long Term Financial Impacts of Drought Management Strategies

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FARM Assistance Focus 2007-1

February 2007

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Livestock ranches and cattlemen in [South Texas] have responded by implementing different management strategies to reduce the effects of low rainfall totals and loss in forage production.

Many South Texas counties have been adversely affected by drought situations since November 2005. Livestock ranches and cattlemen in this area have responded by implementing different management strategies to reduce the effects of low rainfall totals and loss in forage production. To offset the loss in forage during a drought, supplemental feeding is generally increased as well as the culling of cow herds at heavier than normal rates. Since hay shortages have been felt across all of Texas during the 2005-2006 growing season, cattlemen have seen a substantial increase in supplemental feeding expenses. Coupled with culling and herd replacement costs after a drought, livestock ranches are seeing how these management strategies impact their financial well-being.

Assumptions

The Financial And Risk Management (FARM) Assistance financial planning model was used to evaluate and illustrate the individual financial impacts of a prolonged drought on a representative (hypothetical) commercial cow-calf ranching business in South Texas. This study looked at two scenarios commonly utilized during drought situations; purchase feed to keep herd size numbers the same (Scenario 1) and sell cows to reduce herd size by 20% (Scenario 2). The representative ranch chosen was a 2,000 acre ranch located in DeWitt County with the basic assumptions and characteristics given in Table 1. Production costs and estimates for overhead charges were based on typical rates for the region. Cattle prices were obtained from a representative south-central Texas livestock commission report for March 10, 2006. A similar study was conducted by Young, Paschal, Hanselka, Klose, & Jupe (2006) which compared a representative ranch in South Texas during normal rainfall and extended drought situations. In that study, the authors found that in the two-year drought scenario, the profitability of the ranch was severely impacted over the ten year planning horizon. In our study, both scenarios are exposed to the same drought conditions, only management strategies are different.

The representative ranch was analyzed over a 10-year period. In scenario 1 where the cow herd size remained constant and additional feed (hay & supplement) was purchased, a 10% replacement rate was used in each of the 10 years. The base year for the analysis is 2006 and projections are carried through 2015. The assets, debts, machinery complement, and scheduled equipment replacements for the projection period were the same in both of the scenarios. Long-term livestock price trends follow projections provided by the Food and Agricultural Policy Research Institute (FAPRI, University of

Table 1: Representative South Texas Ranch Assumptions

Selected Parameter	Purchase Feed-Maintain Cow Herd Size (Scenario 1)	Sell Cows to Reduce Herd Size (Scenario 2)
Operator Off-Farm Income	$24,000/year	Same
Spouse Off-Farm Income	$35,000/year	Same
Family Living Expense	$30,000	Same
Ownership Tenure	100%	Same
Debt Situation	Low	Same
Initial Herd Size	200 cows, 8 bulls	Same
Calf Weaning Rate	85%	Same
Herd Replacement	Bred Heifers	Same
Supplemental Feeding	Salt/Mineral Blocks	Same
Hay Fed/Cow/yrs 2006-2015	2006 -4.0 tons; 2007 - 2.5 tons; 2008-2015 - 1.2 tons	2006 - 3.5 tons; 2007 - 2.25 tons; 2008-2015 - 1.2 tons
Protein Cubes Fed/Cow/Year	2006 - 400 lbs; 2007 - 300 lbs; 2008 - 200 lbs	2006 - 360 lbs; 2007 - 300 lbs; 2008 - 200 lbs
Cow Culling Rate/Year	10%	20% in 2006; 1-% 2007-2015
Steer Weaning Rates	525 lbs	Same
Heifer Weaning Rates	475 lbs	Same
Steer Prices	$1.25/lb	Same
Heifer Prices	$1.18/lb	Same
Cull Cow Prices	$0.48/lb	Same
Cull Bull Prices	$0.48/lb	Same
Bred Heifer Prices	$855/head	Same
Replacement Bull Prices	$2,500/head	Same
Hay Prices	$135/ton - 2006, $110/ton - 2007, $85/ton - 2008-2016	Same
Range Cube Prices	$0.08/lb	Same

In the years required to rebuild the herd (2007-2010), the profitability advantage is in [maintaining the herd] where average NCFI is $14,497.50 compared to only $3,282.50 for [herd culling].

Table 2: Financial Projections - Selected Indicators

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average
Total Cash Receipts ($1,000)											
Maintain Herd (Scenario 1)	129.02	122.09	114.56	108.94	104.45	101.17	99.32	100.44	103.15	105.43	108.86
Herd Culling (Scenario 2)	139.62	99.55	95.97	96.07	97.97	101.17	99.32	100.44	103.15	105.43	103.87
Total Cash Costs ($1,000)											
Maintain Herd (Scenario 1)	165.53	129.85	89.90	86.53	85.78	86.62	86.13	86.30	86.97	87.60	99.12
Herd Culling (Scenario 2)	134.45	109.20	86.99	87.91	92.33	86.62	86.13	86.30	86.97	87.60	94.45
Net Cash Farm Income ($1,000)											
Maintain Herd (Scenario 1)	-36.51	-7.76	24.67	22.41	18.67	14.56	13.19	14.14	16.18	17.83	9.74
Herd Culling (Scenario 2)	5.18	-9.64	8.98	8.16	5.63	14.56	13.19	14.14	16.18	17.83	9.42
Ending Cash Reserves ($1,000)											
Maintain Herd (Scenario 1)	-2.89	11.40	47.20	85.53	129.53	163.20	196.94	232.03	269.14	307.90	
Herd Culling (Scenario 2)	35.78	43.33	67.10	94.26	126.47	161.05	195.72	231.62	269.37	308.38	
Real Net Worth ($1,000)											
Maintain Herd (Scenario 1)	1,831.37	1848.78	1872.52	1889.87	1896.15	1909.82	1934.20	1974.20	2023.03	2070.90	
Herd Culling (Scenario 2)	1834.42	1851.59	1873.01	1889.26	1895.02	1909.15	1933.90	1974.22	2023.32	2071.30	

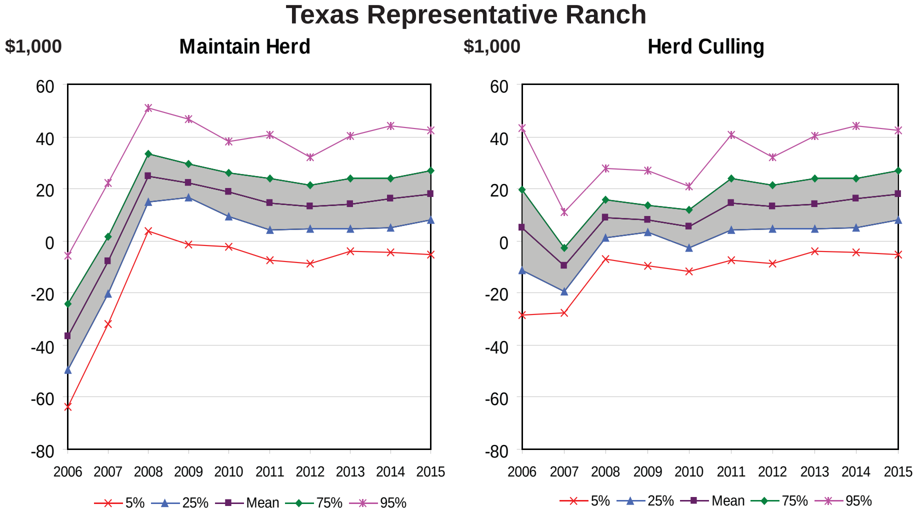
Missouri) with costs adjusted for inflation over the planning horizon.

The projected financial position and performance was evaluated across five major categories including liquidity, solvency, profitability, repayment capacity and financial efficiency. Representative measures were chosen for each of these five categories and are presented in tabular and/or graphical format for each scenario. Each measure chosen provides information with respect to the projected variability in the ranches financial position and performance. When taken as a whole, these measures provide insight into the risk bearing ability of the ranch throughout the planning horizon.

Results

A comprehensive financial projection including price and weaning weight risk of the two different scenarios are illustrated in Table 2 and Figures 1 and 2. Table 2 represents the average outcomes for selected financial projections, while the graphical presentations (Figures 1 & 2) illustrate the range of possibilities for the selected variables. Total cash receipts average $108,860 over the 10-year period for the scenario which looks at maintaining the current cow herd size and buying supplemental feeds, 4.8% more than the scenario which reduces the herd size in 2006. However, if we take a look at the initial year of the projection (2006), we see that total cash receipts for scenario 2 averages $139,620 or 8.2% more in receipts than scenario 1. This reflects the 20% culling of cows in scenario 2 in 2006. From 2007-2010, the total cash receipts are much lower in scenario 2 due to smaller herd size. The lower cash receipts in scenario 2 reflect herd culling in 2006 and then rebuilding the herd in 2007 – 2010. Average cash costs were $165,530 in 2006 for scenario 1 which maintained the current herd size, while average cash cost for scenario 2 in 2006 was $134,446. This is a difference of 23.1% in cash costs in 2006. Looking at the 10 year average, the study found only a 4.9% difference in cash costs, with scenario 1 averaging $99,120 in cash costs and scenario 2 averaging $94,449 in total cash costs.

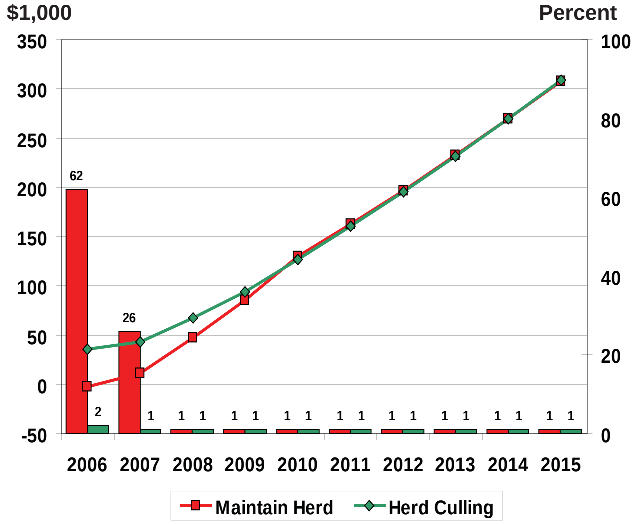
Figure 1. Projected Variability in Net Cash Farm Income for the South Texas Representative Ranch



Although profitability over the ten-year period between the two scenarios is not greatly different, in 2006 there is approximately a $42.000 difference in Net Cash Farm Income between herd culling (scenario 2) and maintaining the herd (scenario 1). Net cash

There is still no clear cut answer on which strategy is the most beneficial to livestock producers long-term.

Figure 2: Ending Cash Reserves and Probability of Having to Refinance Operating Note for the South Texas Ranch



farm income (NCFI) for 2006 is projected to be -$36,510 for the scenario which maintains the current herd size and $5,180 for the herd culling scenario (Table 2, Figure 1). For 2006-2015, NCFI is projected to average $9,740 for scenario 1 and $9,420 for Scenario 2. The negative NCFI in 2006 for scenario 1 is largely due to the increased feeding costs associated with feeding 200 cows, while the NCFI for scenario 2 portrays receipts from culled cows as well as a reduction in feed costs. In the years required to rebuild the herd (2007-2010), the profitability advantage is in scenario 1 where average NCFI is $14,498 compared to only $3,283 for scenario 2, where the herd size is smaller and the ranch is purchasing replacements to rebuild capacity. Over most of the 10 year projection, cash receipts are projected to generally decline along with the projected cattle prices. Figure 1 also illustrates the risk in NCFI, with the range indicating profit levels from approximately -$63,800 to $44,300 for the scenario which maintains the current herd size (scenario 1) and -$28,500 and $44,300 under scenario 2 (culling the herd size). These ranges suggest that there is significant risk of operating losses over the projected period. The shaded area of the graph suggest that the operation is expected to have a 50% chance of realizing a -$49,100 to $27,100 profit level in scenario 1 and -$19,100 to $27,100 in scenario 2.

The liquidity of the ranch is measured by the ending cash balance (Table 2, Figure2). This figure shows the impacts of each of the two scenarios on the risk associated with ending cash balances by pointing out the probability that ending cash will fall below zero, requiring a carryover debt. In scenario 1, average ending cash values are projected to grow from -$2,890 to $307,900 during the ten-year period. This compares to the average ending cash values in scenario 2 which are projected to reach $308,380 by 2015. Figure 2 illustrates average ending cash balances and risk of cash shortfalls. During the first two years of the study, scenario 1 has a 62% and 26% probability of carryover debt, while scenario 2's probability of carryover debt is minimal.

Overall equity and solvency measures are similar between the two scenarios. The Real Net Worth values for both scenarios grow to just over $2 million on average by 2015.

Implications

Some observations that may affect management decisions in future droughts include:

- Current high cattle prices may be masking the effects of drought and high feeding costs
- With the high cattle prices and the hay shortage today, the best management options may not be the same as during cyclic periods of low cattle prices and low or high hay costs
- A producer must weigh the future cost of herd replacement when making decisions to cull and how much to cull
- Ability to "manage" a drought is directly affected by the operation's debt situation.

The projected results of this study further depict why these two strategies of herd management are continually discussed during drought situations. Unfortunately, there is still no clear cut answer on which strategy is the most beneficial to livestock producers long-term. Each individual operation must assess their short and long term goals and decide for themselves on which management strategy would be the most valuable.

Reference

Young, A.M., Paschal, J.C., Hanselka, C.W., Klose, S.L. & Jupe, M. (2006, September). Impact of a Prolonged Drought on South Texas Ranches". Texas Cooperative Extension, Department of Agricultural Economics, Texas A&M University System, FARM Assistance Focus Paper 2006-2.

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Impact of Volumetric Water Pricing for Cotton Comparing Furrow vs. Drip Irrigation in the Lower Rio Grande Valley

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FARM Assistance Focus 2007-4

April 2007

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[The] increasing non-farm consumption [of water], coupled with the demands of irrigated agriculture, has led to an interest in evaluating the potential water savings practices in irrigated farming [in the Lower Rio Grande Valley].

Water conservation is developing into an area-wide issue in the Lower Rio Grande Valley. Population growth in recent years has led to a significant increase in the region's overall demand for water. This increasing non-farm consumption, coupled with the demands of irrigated agriculture, has led to an interest in evaluating the potential of water saving practices in irrigated farming. Water use demonstrations on irrigated crops, such as cotton, have been initiated to address this issue. Historically, agricultural irrigation water has been sold on a "per event" basis rather than volume as is the case for most residential and commercial users. A volumetric pricing structure or water shortages could be in the future for irrigated agriculture in the Lower Rio Grande Valley region. Evaluating the economic viability of furrow vs. drip irrigation in cotton at various potential water rates allows for a more realistic look at the viability of drip irrigation.

The Agricultural Water Demonstration Initiative (ADI) project is a multi-faceted effort between the Texas Water Development Board, the Harlingen Irrigation District, South Texas agricultural producers, Texas Cooperative Extension 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 to water consumption by various field, vegetable and citrus crops.

Texas Cooperative Extension (TCE) is responsible for the economic analyses of demonstration results to evaluate the potential impact of adopting alternative water conserving technologies. TCE 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.

In 2006, a drip technology demonstration associated with the ADI project suggests potential water savings in cotton production (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 cotton crop may be watered 3 different occasions at a price of $7 per watering. In this example, a producer would pay approximately $21 in total water costs. Under current water pricing structures, an initial financial analysis of the drip irrigation technology indicates no financial advantages compared to the furrow irrigation. In fact, the drip scenario is worse off compared to the furrow irrigation due to the $142.60/acre/year average cost for the drip system. The following analysis evaluates the potential financial incentives for drip technology and water savings under hypothetical volumetric water pricing, which is a distinct possibility in the near future or in any time of water shortages.

Assumptions

Table 1 provides the basic water use and irrigation cost assumptions for cotton comparing furrow (38-acre site) and drip (17-acre site) irrigation methods. The drip system was designed with 80" line spacing. For the purpose of presenting comparative costs, two water price levels ($1 and $5) were assumed for the two sites. Non-irrigation production costs were derived from custom rates and estimates of per acre overhead charges typical for the region and were not changed for analysis purposes. The assumptions are intended to make the illustration relevant to a wide range of producers in the Lower Rio Grande Valley area.

The analysis consists of four scenarios—furrow and drip irrigation at $1 and $5 per acre inch costs for irrigation water.

Table 1: Irrigation Application and Cost Information for Cotton, Volumetric Pricing

Scenario	Irrigation Method	Acre Inches Applied	Cost per Acre Inch	Water Cost Per Acre	Polypipe 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

In 2006, a drip technology demonstration associated with the ADI project suggests potential water savings in cotton production.

Table 2: 10-year Average Per Acre Financial Indicators for Cotton, Volumetric Pricing

Scenario	Irrigation Method	Total Cash Receipts ($1,000)	Total Cash Costs ($1,000)	Net Cash Farm Income ($1,000)	Prob Net Cash Income <0 (%)	Avg Annual Operating Expense/Receipts
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

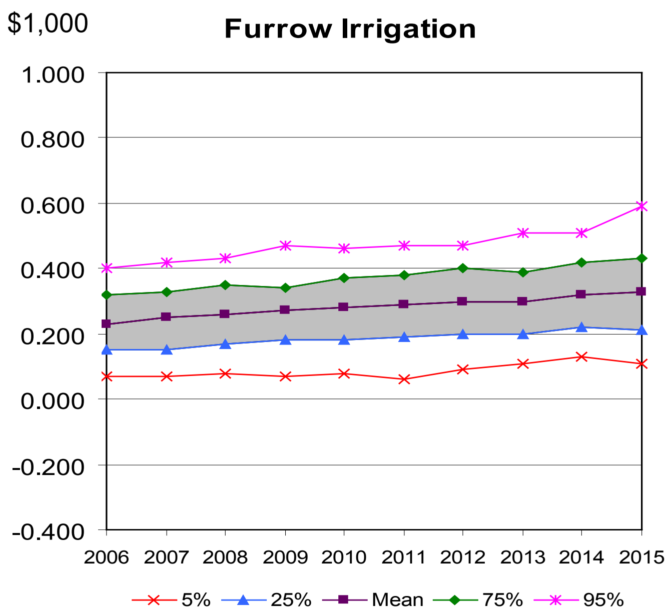
Scenarios 1 and 3 represent basic furrow flood irrigation at a price of $1/acre inch and $5/acre inch, respectively, projected for a 10-year period. Scenarios 2 and 4 represent the purchase and use of drip technology irrigation with the price of water at $1/acre inch and $5/acre inch, respectively. The two drip scenarios assume an average cost of $142.60/acre/year for the system. The drip pump and filter system expense is evenly distributed over the 10-year period at $22.60/acre/year and the drip tape is replaced every two years at $240/acre with the assumption of no financing costs. For the current analysis, no other differences were assumed for the drip scenario. Due to first-time operator issues resulting in moisture stress to the drip site, one flood watering (5.46 acre inches) was applied to the drip site in June 2006.

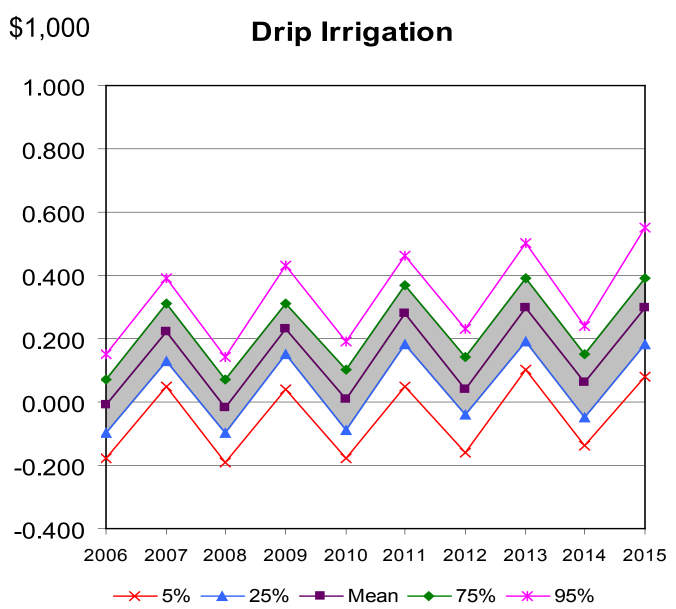
For each 10-year outlook projection, commodity price trends follow projections provided by the Food and Agricultural Policy Research Institute (FAPRI, at the University of Missouri) with costs adjusted for inflation over the planning horizon. Demonstration findings suggest no variance in yields (950 lbs. per acre) between furrow and drip irrigation methods.

Results

A comprehensive projection including price and yield risk for furrow and drip irrigation methods at the $1 and $5 per acre inch water prices are illustrated in Table 2 and Figure 1. Table 2 presents the average outcomes per acre for selected financial projections, while the graphical presentation illustrates the full range of possibilities for net cash farm

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





There is no economic incentive to switch to the new drip technology as the cost of the drip system more than offsets the potential water cost savings.

income for each demonstration site. Cash receipts average $790/acre over the 10-year period for all four scenarios as the case study yields were the same under both irrigation methods. Average cash costs range from $500/acre for Scenario 1 to $680/acre for Scenario 4. Drip irrigation saves approximately 10.58 inches of water, resulting in a $5.58/acre variable cost savings at a price of $1/acre inch or a $47.90/acre savings assuming a $5/acre inch price of water (Table 1). Per acre irrigation cost savings for the drip demonstration sites were partially offset by higher than expected labor cost per acre due to operator issues. Normally, labor costs for a drip system should be less.

Average Net Cash Farm Income (NCFI) is the highest for Scenario 1 (furrow) at $290/acre followed by Scenario 3 (furrow) at $210/acre (Table 2). The lowest per acre NCFI was in the two drip scenarios. The additional average $142.60/acre/year cost for the drip offsets the savings from lower water usage. At the $5 per acre inch water price, the average NCFI for drip was $110/acre or 52% lower than furrow at $210/acre. NCFI rises slightly in all scenarios from 2006 to 2016 but is significantly more erratic in the drip scenarios due to the cost of replacing the drip tape every 2 years (Figure 1). Risk projections indicate a significantly higher chance of a negative NCFI for the two drip scenarios due to the high per acre system costs (Table 2). At the high water price rates in Scenarios 3 and 4, the chance of negative NCFI averages 3.9% for furrow and 28.3% for drip.

Ending cash reserves for a farm site are presented to indicate the potential accumulated (positive or negative) site contribution to a farm's overall cash flow and liquidity picture. Higher NCFI in the furrow scenarios perpetuates more growth in ending cash reserves (Table 3). With $1/acre inch water price, ending cash reserves are expected to grow to $2,850/acre in Scenario 1 and $1,420/acre in Scenario 2 during the projection period. Assuming a $5 per acre inch water price, projections reflected a slower growth in accumulated cash for both furrow and drip irrigation (Table 3).

Summary

The case study results of furrow vs. drip irrigation methods for cotton comparing water application rates and irrigation costs show significant economic implications. At both low and high water prices, there is no economic incentive to switch to the new drip technology as the cost of the drip system more than offsets the potential water cost savings. This one example provides evidence to the idea that a drip irrigation system will have to generate additional revenues through higher yields in addition to any water savings, to be a viable technology investment for cotton production in the region. Additional analysis is needed to further evaluate various drip system designs, potential yields, water savings, and, particularly, labor requirements and costs per acre in row crops.

Table 3: Ending Cash Reserves Per Acre in Year 2015 for Cotton, Volumetric Pricing

Scenario	Irrigation Method	Cost per Acre Inch	Ending Cash Reserves ($1,000)
1	Furrow	$1.00	2.85
2	Drip	$1.00	1.42
3	Furrow	$5.00	2.07
4	Drip	$5.00	1.05

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Narrow Border Flood and Micro-Jet Spray Irrigation Illustration for Rio Red Grapefruit in the Lower Rio Grande Valley

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Illustrating the economic viability of the site demonstrations allows for an evaluation of the viability of [narrow border flood and micro-jet spray] irrigation methods as efficient water delivery systems.

The overall demand for river water in the Lower Rio Grande Valley is increasing due to population growth in recent years. This increasing demand along with the ongoing needs of irrigated production agriculture has resulted in an interest in evaluating water conservation practices. As a result, water use demonstrations on irrigated crops, such as narrow border flood and micro-jet irrigation, have been established. Illustrating the economic viability of the site demonstrations allows for an evaluation of the viability of these 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 Cooperative 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 to water consumption by various field, vegetable and citrus crops.

The Texas Cooperative Extension (TCE) conducts the economic analyses of demonstration results, evaluating the potential impact of adopting alternative water conserving technologies. TCE 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.

Three technology demonstrations associated with the ADI project, two with narrow border flood and one with micro-jet spray, illustrate potential water application and irrigation costs scenarios in Rio Red grapefruit production (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 Rio Red grapefruit 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 cost, if applicable, would add to the total irrigation costs per acre. A micro-jet spray system, for example, could cost as much as $1,000/acre or more. The following analysis evaluates the potential financial incentives for using narrow border flood and micro-jet spray technologies.

Assumptions

Table 1 provides the basic water use and irrigation cost assumptions for Rio Red grapefruit irrigation in 2006. For the purpose of illustrating the narrow border flood and micro-jet technologies, three demonstration sites were used, including a 73-acre site (Site 1A), an 85-acre site (Site 1C) and an 11-acre site (Site 28B2 and 28C). 2006 crop prices and yields used reflect actual levels received by the producers. Projected 2007-2015 prices and yields were held constant at historical 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 three separate demonstration sites not located adjacent to one another. Differences in soil types, rainfall and management practices likely affected irrigation water application,

Table 1: Rio Red Grapefruit Narrow Border Flood and Micro-Jet Spray Irrigation Application and Cost Information Per Acre, 2006

Demo Site	Irrigation Method	Acres	Acre Inches Applied	Irrigation Costs Per Acre	Irrigation Costs Per Acre Inch	Yields Per Acre (Tons)	Yields Per Acre Inch (Tons)	Micro-Jet Spray System Cost Per Acre
1A	Narrow Border Flood	73.00	39.02	$100.00	$2.56	20.67	0.53	-
1C	Narrow Border Flood	85.00	23.51	$100.00	$4.25	25.54	1.09	-
28B2 & 28C	Micro-Jet Spray	11.00	32.21	$210.00	$6.50	31.23	0.97	$1,000.00

The demonstration sites reflect profitable use of narrow border flood or micro-jet spray technology in irrigated Rio Red grapefruit production.

Table 2: 10-Year Average Financial Indicators Per Acre for Rio Red Grapefruit, Narrow Border Flood and Micro-Jet Spray Irrigation						
Demo Site	Irrigation Method	Total Cash Receipts ($1,000)	Total Cash Costs ($1,000)	Net Cash Farm Income ($1,000)	Prob Net Cash Income <0 (%)	Avg Annual Operating Expense/Receipts
1A	Narrow Border Flood	2.76	1.33	1.42	4.70	0.54
1C	Narrow Border Flood	3.51	1.28	2.23	1.00	0.41
28B2 & 28C	Micro-Jet Spray	3.43	1.22	2.22	1.00	0.39

production costs and yields. As a result, the three are not replicated trials and the three combined are not a controlled experiment for comparison purposes.

This comparison is intended to highlight case study examples illustrating results of different sites. The first two sites are irrigated by narrow border flood and the third site by micro-jet spray. The micro-jet spray system expense is 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 three sites.

For each 10-year outlook projection, input prices and overhead cost trends over the planning horizon follow projections provided by the Food and Agricultural Policy Research Institute (FAPRI, at the University of Missouri). Citrus prices used are demonstrator estimates and expectations. Demonstration findings suggest a range of possible yields based on varying management practices and production conditions.

Results

Comprehensive projections, including price and yield risk for narrow border flood and micro-jet spray irrigation, are illustrated in Table 2 and Figures 1-3.

Figure 1. Projected Variability in Net Cash Farm Income for Rio Red Grapefruit, Irrigation Demonstration Site 1A.

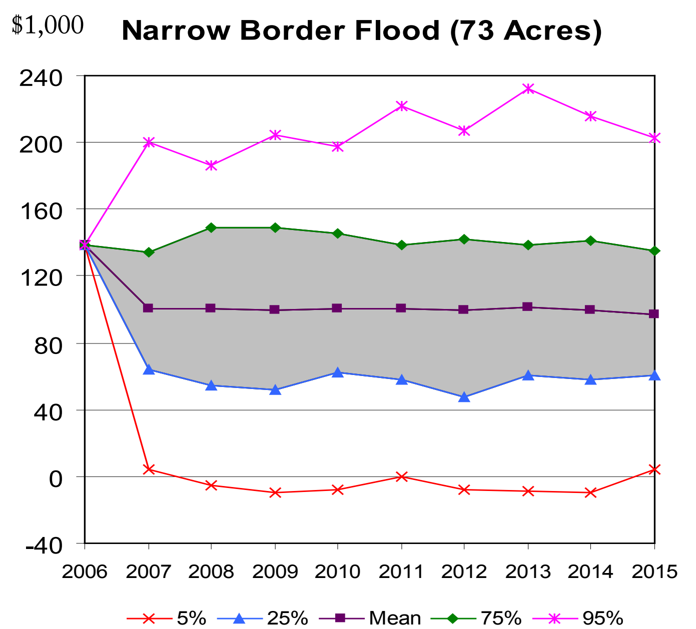


Figure 2. Projected Variability in Net Cash Farm Income for Rio Red Grapefruit, Irrigation Demonstration Site 1C.

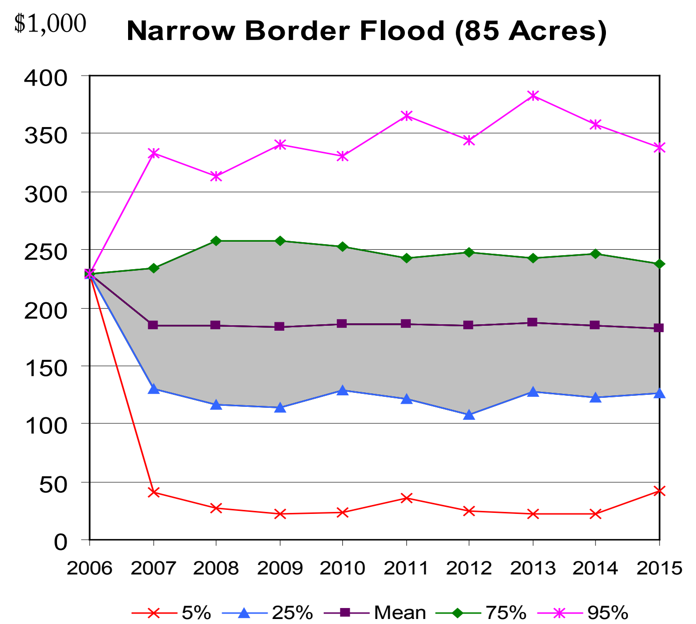


Table 2 presents the average outcomes for selected financial projections, while the graphical presentations illustrate the full range of possibilities for net cash farm income. Cash receipts average $2,760-$3,510/acre over the 10-year period for the three sites. Average cash costs range from $1,220/acre for Site 28B2 & 28C to $1,330/acre for Site 1A.

Average Net Cash Farm Income (NCFI) is the highest for Site 1C at $2,230/acre, closely followed by Site 28B2 & 28C at $2,220/acre and then Site 1A at $1,420/acre (Table 2; Figures 1-3). NCFI declines for all three sites from 2006 to 2007. This largely reflects lower and stable projected prices and yields after 2006. All three scenarios reflect significant levels of risk (Figures 1-3). Risk projections also indicate a 1% or less chance of a negative NCFI for Site 1C and Site 28B2 & 28C, compared to 4.7% for Site 1A (Table 2).

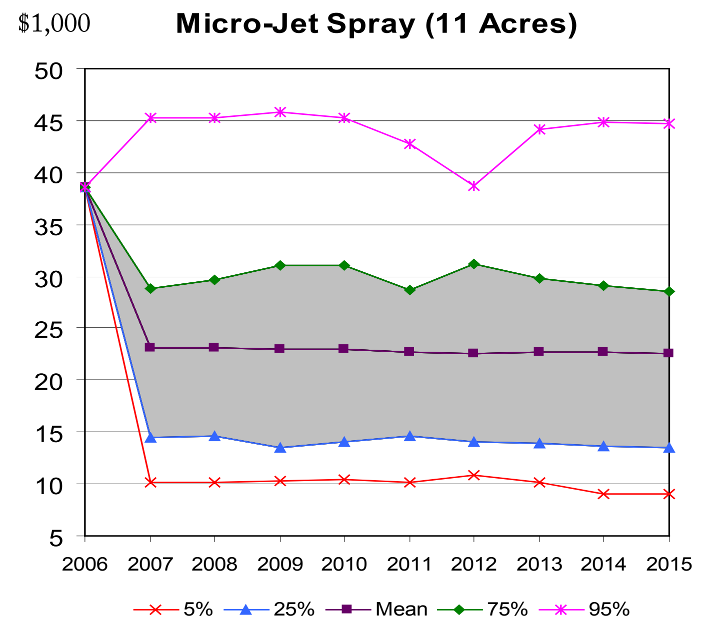
Summary

The case study results of narrow border flood and micro-jet spray irrigation for Rio Red grapefruit illustrate a wide range of possible water application rates and irrigation costs. Demonstration results vary due to differences in yields, locations and management practices. The demonstration sites reflect profitable use of narrow border flood or micro-jet spray technology in irrigated Rio Red grapefruit production. However, where previous studies have shown potential water use and cost savings, the economic incentives for producers to switch to either irrigation system will likely be determined by the future availability and cost of water.

Acknowledgements

Xavier Peries, Texas Cooperative Extension District 12 Extension Associate, and Eddie Esquievel, ADI Project Coordinator with Texas A&M University at Kingsville, are recognized for their data collection and monitoring efforts in the demonstration sites.

Figure 3. Projected Variability in Net Cash Farm Income for Rio Red Grapefruit, Irrigation Demonstration Site 28B2 & 28C.



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Economic Summary: Demonstration Site 1A

The Demonstration Site 1A analysis consists of a 10-year financial outlook (2007-2016) for the 50 acres of Rio Red grapefruit under narrow border flood irrigation. The orchard was assumed to have mature trees. The Rio Red grapefruit price is held constant at $150/ton. 2007 producer costs and overhead charges are producer estimated rates.

Total cash receipts average $2,706/acre over the 10-year period and cash costs average $1,389/acre, including $100/acre irrigation costs. Net cash farm income (NCFI) averages $1,317/acre due largely to the price being held at a constant $150/ton. The risk associated with prices and yields suggests some chance of negative NCFI. In a normal production year, NCFI could range as much as $720/acre to $3,800/acre.

Economic Summary: Demonstration Site 1B

The Demonstration Site 1B analysis consists of a 10-year financial outlook (2007-2016) for the 15 acres of Valencia oranges under narrow border flood irrigation. The orchard was assumed to be six years old. The Valencia orange price is held constant at $150/ton. 2007 production costs and overhead charges are producer estimated rates.

Total cash receipts average $2,522/acre over the 10-year period and cash costs average $1,280/acre, including $100/acre irrigation costs. Net cash farm income (NCFI) averages $1,242/acre due largely to the price being held at a constant $150/ton and increasing yields through 2009 as trees mature. The risk associated with prices and yields suggests a 12.9% chance of negative NCFI. In a normal production year, NCFI could range as much as -$633/acre to $3,467/acre. Reflecting the potential of negative NCFI, the probability of carryover debt is 14% in 2007 and then declines to 2% or less by

Economic Summary: Demonstration Site 1C

The Demonstration Site 1C analysis consists of a 10-year financial outlook (2007-2016) for the 85 acres of Rio Red grapefruit production under narrow border flood irrigation. The orchard was assumed to be 6 years old. The Rio Red grapefruit price is held constant at $150/ton. 2007 production costs and overhead charges are producer estimated rates.

Total cash receipts average $2,676/acre over the 10-year period and cash costs average $1,442/acre, including $100/acre irrigation costs. Net cash farm income (NCFI) averages $1,233/acre due largely to the price being held at a constant $150/ton and increasing yields from maturing trees. The risks associated with prices and yields suggest a 14.3% chance of negative NCFI. In a normal production year, NCFI could range as much as -$766/acre to $3,729/acre. Reflecting the potential of negative NCFI, the probability of carryover debt is 16% in 2007 and then declines to 3% or less by 20

Economic Summary: Demonstration Site 02A

The Demonstration Site 02A analysis consists of a 10-year financial outlook (2007-2016) for the 14 acres of Henderson grapefruit under border flood irrigation. The orchard trees were assumed to have mostly mature trees with some replanted trees reaching maturity over the next three years. The Henderson grapefruit price is held constant at $150/ton. 2007 production costs and overhead charges are producer estimated rates.

Total cash receipts average $2,609/acre over the 10-year period and cash costs average $1,366/acre, including $136/acre variable irrigation costs in 2007. Net cash farm income (NCFI) averages $1,243/acre due largely to the price being held constant at $150/ton. The risk associated with prices and yields suggests some chance of negative NCFI. In a normal production year, NCFI could range as much as -$408/a

Economic Summary: Demonstration Site 02B

The Demonstration Site 02B analysis consists of a 10-year financial outlook (2007-2016) for the 8 acres of Rio Red grapefruit under micro-jet spray irrigation. The orchard trees were assumed to have mostly mature trees with some replanted trees reaching maturity over the next three years. The Rio Red grapefruit price is held constant at $200/ton. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a micro-jet spray system at a cost of $1,800 per acre. The micro-jet spray system expense is evenly distributed ($180/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $3,291/acre over the 10-year period and cash costs average $1,544/acre, including $136/acre irrigation costs in 2007. Net cash farm income (NCFI) averages $1,747/acre due largely to the price being held constant at $200/ton. The risk associated with prices and yields suggests some chance of negative NCFI. In a normal production year, NCFI could range as much as -$931/acre to $3,831/acre. The risk largely reflects the conservative $200/ton price.

Economic Summary: Demonstration Site 02C

The Demonstration Site 02C analysis consists of a 10-year financial outlook (2007-2016) for the 4 acres of Ruby Red grapefruit under drip irrigation. The orchard trees were assumed to have mostly mature trees with some replanted trees reaching maturity over the next three years. The Ruby Red grapefruit price is held constant at $150/ton. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a drip system at a cost of $1,200 per acre. The drip system expense is evenly distributed ($120/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $2,185/acre over the 10-year period and cash costs average $1,495/acre, including $136/acre irrigation costs in 2007. Net cash farm income (NCFI) averages $690/acre due largely to the price being held constant at $150/ton. The risk associated with prices and yields suggests some chance of negative NCFI. In a normal production year, NCFI could range as much as -$930/acre to $2,938/acre. The risk largely reflects the conservative $150/ton price.

Economic Summary: Demonstration Site 04A

The Demonstration Site 04A analysis consists of a 10-year financial outlook (2007-2016) for the 16 acres of Rio Red grapefruit under 1-line drip irrigation. The orchard trees were assumed to have mature trees. The Rio Red grapefruit price is held constant at $100/ton. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a 1-line drip system at a cost of $1,500 per acre. The 1-line drip system expense is evenly distributed ($150/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $2,000/acre over the 10-year period and cash costs average $1,720/acre, including $107/acre irrigation costs in 2007. Net cash farm income (NCFI) averages $280/acre due largely to the price being held constant at $100/ton.. The risk associated with prices and yields suggests some chance of negative NCFI. In a normal production year, NCFI could range as much as -$938/acre to $2,375/acre. The risk largely reflects the conservative $100/ton price.

Economic Summary: Demonstration Site 04B

The Demonstration Site 04B analysis consists of a 10-year financial outlook (2007-2016) for the 9 acres of Rio Red grapefruit under micro-jet spray irrigation. The orchard trees were assumed to have mature trees. The Rio Red grapefruit price is held constant at $100/ton. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a micro-jet spray system at a cost of $2,500 per acre. The micro-jet spray system expense is evenly distributed ($250/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $2,000/acre over the 10-year period and cash costs average $1,800/acre, including $107/acre irrigation costs in 2007. Net cash farm income (NCFI) averages $200/acre due largely to the pricing being held constant at $100/ton. The risk associated with prices and yields suggests some chance of negative NCFI. In a normal production year and mature trees (2011-2015), NCFI could range as much as -$1,000/acre to $2,333/acre. This risk reflects the conservative $100/ton price.

Economic Summary: Demonstration Site 24A

The Demonstration Site 24A analysis consists of a 10-year financial outlook (2007-2016) for the 7 acres of Rio Red grapefruit under border flood (every other row) irrigation. The orchard was assumed to have mature trees. The Rio Red grapefruit price is held constant at $140/ton. 2007 production costs and overhead charges are producer estimates.

Total cash receipts average $3,097/acre over the 10-year period and cash costs average $1,163/acre, including $168/acre variable irrigation costs. Net cash farm income (NCFI) averages $1,934/acre due largely to the price being held at a constant $140/ton. The risks associated with prices and yields suggest little chance of negative NCFI. In a normal production year, NCFI could range as much as $286/acre to $3,857/acre.

Economic Summary: Demonstration Site 28A

The Demonstration Site 28A analysis consists of a 10-year financial outlook (2007-2016) for the 8 acres of Valencia oranges under micro-jet spray irrigation. The orchard trees were assumed to be 4 years old. The Valencia orange price is held constant at $140/ton. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a micro-jet spray system at a cost of $1,000 per acre. The micro-jet spray system expense is evenly distributed ($100/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $2,014/acre over the 10-year period and cash costs average $984/acre, including $55/acre irrigation costs in 2007. Net cash farm income (NCFI) is negative in 2007 reflecting lower levels of production from immature trees. It then increases from $145/acre in 2008 to about $1,440/acre in 2016. The risk associated with prices and yields suggests a minimal chance of negative NCFI after 2009 when the trees reach maturity. In a normal production year and mature trees (2010-2016), NCFI could range as much as $250/acre to $3,750/acre. Due to negative NCFI, the probability of carryover debt is 99% or greater during 2007 and then declines to 1% or less in 2012 as the trees reach maturity and annual production increases.

Economic Summary: Demonstration Site 28B1

The Demonstration Site 28B1 analysis consists of a 10-year financial outlook (2007-2016) for the 5 acres of Marrs under 2-line drip irrigation. The orchard trees were assumed to have mature trees. The Marrs orange price is held constant at $120/ton. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a 2-line drip system at a cost of $1,000 per acre. The 2-line drip system expense is evenly distributed ($100/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $2,036/acre over the 10-year period and cash costs average $1,056/acre, including $110/acre irrigation costs in 2007. Net cash farm income (NCFI) averages $980/acre due largely to the price being held constant at $120/ton. The risk associated with prices and yields suggests a small chance of negative NCFI after 2011 when the trees reach maturity. In a normal production year, NCFI could range as much as -$200/acre to $3,000/acre. Due to negative NCFI, the probability of carryover debt is 12% or less in 2007 and then declines to 1% or less in 2010.

Economic Summary: Demonstration Site 28B2

The Demonstration Site 28B2 analysis consists of a 10-year financial outlook (2007-2016) for the 3 acres of Rio Red grapefruit under 2-line drip irrigation. The orchard was assumed to have mature trees. The Rio Red grapefruit price is held constant at $150/ton. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a 2-line drip system at a cost of $1,000 per acre. The 2-line drip system expense is evenly distributed ($100/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $3,300/acre over the 10-year period and cash costs average $1,190/acre, including $110/acre variable irrigation costs. Net cash farm income (NCFI) averages $2,113/acre due largely to the price being held at a constant $150/ton. The risks associated with prices and yields suggest a minimal chance of negative NCFI. In a normal production year, NCFI could range as much as $633/acre to $5,033/acre.

Economic Summary: Demonstration Site 28C

The Demonstration Site 28C analysis consists of a 10-year financial outlook (2007-2016) for the 8 acres of Rio Red grapefruit under micro-jet spray irrigation. The orchard was assumed to have mature trees. The Rio Red grapefruit price is held constant at $150/ton. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a micro-jet spray system at a cost of $1,000 per acre. The micro-jet spray system expense is evenly distributed ($100/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $3,301/acre over the 10-year period and cash costs average $1,189/acre, including $110/acre variable irrigation costs. Net cash farm income (NCFI) averages $2,112/acre due largely to the price being held at a constant $150/ton. The risks associated with prices and yields suggest a minimal chance of negative NCFI. In a normal production year, NCFI could range as much as $625/acre to $5,000/acre.

Economic Summary: Demonstration Site 28D1

The Demonstration Site 28D1 analysis consists of a 10-year financial outlook (2007-2016) for the 3.5 acres of Navel oranges under 2-line drip irrigation. The orchard was assumed to have mature trees. The early orange price is held constant at $140/ton. 2007 production costs and overhead charges are producer estimates.

The analysis also includes the purchase and use of a 2-line drip system at a cost of $1,000 per acre. The 2-line drip system expense is evenly distributed ($100/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $1,891/acre over the 10-year period and cash costs average $1,054/acre, including $110/acre variable irrigation costs. Net cash farm income (NCFI) averages $837/acre due largely to the price being held at a constant $140/ton. The risks associated with prices and yields suggest some chance of negative NCFI. In a normal production year, NCFI could range as much as -$171/acre to $3,167/acre. Due to negative NCFI, the probability of carryover debt is 10% or less in 2007 and then declines to 1% or less in 2010.

Economic Summary: Demonstration Site 28D2

The Demonstration Site 28D2 analysis consists of a 10-year financial outlook (2007-2016) for the 3.5 acres of Marrs oranges under 2-line drip irrigation. The orchard was assumed to have mature trees. The early orange price is held constant at $120/ton. 2007 production costs and overhead charges are producer estimates.

The analysis also includes the purchase and use of a 2-line drip system at a cost of $1,000 per acre. The 2-line drip system expense is evenly distributed ($100/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $2,037/acre over the 10-year period and cash costs average $1,054/acre, including $110/acre variable irrigation costs. Net cash farm income (NCFI) averages $980/acre due largely to the price being held at a constant $120/ton. The risks associated with prices and yields suggest some chance of negative NCFI. In a normal production year, NCFI could range as much as -$171/acre to $3,114/acre. Due to negative NCFI, the probability of carryover debt is 12% or less in 2007 and then declines to 2% or less in 2009.

Economic Summary: Demonstration Site 41A

The Demonstration Site 41 analysis consists of a 10-year financial outlook (2007-2016) for the 19.5 acres of seed corn production under surge irrigation. It is not assumed the seed corn acreage is rotated annually with another crop. The initial corn price, based on total compensation received by the producer, is $11.53/bu., including marketing loan deficiency payments, if applicable. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a surge valve at a cost of $1,800. The surge valve expense is evenly distributed ($180/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $667/acre over the 10-year period and cash costs average $241/acre, including $31/acre variable irrigation costs. In addition to market receipts, total receipts include direct and counter-cyclical payments paid to base acres. Net cash farm income (NCFI) averages $426/acre over the 10-year period. The risk associated with prices and yields suggests a minimal chance of negative NCFI. In a normal production year, NCFI could range as much as $103/acre plus or minus the average expected NCFI for the site.

Economic Summary: Demonstration Site 41B

The Demonstration Site 41B analysis consists of a 10-year financial outlook (2007-2016) for the 19.5 acres of seed corn production under furrow irrigation. It is not assumed the seed corn acreage is rotated annually with another crop. The initial corn price, based on the total compensation received by the producer, is $11.53/bu., including marketing loan deficiency payments. 2007 production costs and overhead charges are producer estimated rates.

Total cash receipts average $667/acre over the 10-year period and cash costs average $232/acre, including $31/acre variable irrigation costs. In addition to market receipts, total receipts include direct and counter-cyclical payments paid to base acres. Net cash farm income (NCFI) averages $435/acre over the 10-year period. The risk associated with prices and yields suggests a minimal chance of negative NCFI. In a normal production year, NCFI could range as much as $103/acre plus or minus the average expected NCFI for the site.

Economic Summary: Demonstration Sites 42A

The Demonstration Site 42A analysis consists of a 10-year financial outlook (2007-2016) for the 84 acres of grain sorghum production under surge irrigation with poly-pipe. It is assumed the grain sorghum acreage is not rotated annually. The initial grain sorghum price is $6.50/cwt., including marketing loan deficiency payments, if applicable. 2007 production costs and overhead charges are producer estimated rates.

The analysis assumes a $1,800 cost for a surge valve. The surge valve expense is evenly distributed ($180/year) over the 10-year period with the assumption of no financing cost.

Total crop receipts average $403/acre initially. In addition to market receipts, total receipts include direct and counter-cyclical payments paid to base acres. Cash costs, including $49/acre variable irrigation costs, average $344/acre. Net cash farm income (NCFI) averages $59/acre over the 10-year period. The risk associated with prices and yields suggests that, in a normal production year, NCFI could range as much as $119/acre to $179/acre plus or minus the average expected NCFI.

Economic Summary: Demonstration Sites 42B

The Demonstration Site 42B analysis consists of a 10-year financial outlook (2007-2016) for the 66 acres of cotton production under surge irrigation with poly-pipe. It is assumed the cotton acreage is not rotated annually. The initial cotton price is $.53/lb., including marketing loan deficiency payments, if applicable. 2007 production costs and overhead charges are producer estimated rates.

The analysis assumes a $1,800 cost for a surge valve. The surge valve expense is evenly distributed (180/year) over the 10-year period with the assumption of no financing cost.

Total crop receipts average $822/acre initially. In addition to market receipts, total receipts include direct and counter-cyclical payments paid to base acres. Cash costs, including $45/acre variable irrigation costs, averages $692/acre. Net cash farm income (NCFI) averages $130/acre over the 10-year period. The risk associated with prices and yields suggests that, in a normal production year, NCFI could range as much as $152/acre to $182/acre plus or minus the average expected NCFI.

Economic Summary: Demonstration Sites 43A

The Demonstration Site 43A analysis consists of a 10-year financial outlook (2007-2016) for the 38 acres of furrow with poly-pipe cotton production. It is not assumed the cotton acreage is rotated annually with another crop. The initial cotton price is $.55/lb., including marketing loan deficiency payments. 2007 production costs and overhead charges are producer estimated rates.

Total cash receipts average about $560/acre acre. In addition to market receipts, total receipts include direct and counter-cyclical payments paid to base acres. Cash costs, including $43/acre variable irrigation costs, average $340/acre acre for the furrow irrigation. Net cash farm income (NCFI) for the furrow plot averages $220/acre. The risk associated with prices and yields suggests that, in a normal production year, NCFI could range as much as $211/acre plus or minus the average expected NCFI.

Economic Summary: Demonstration Sites 43B

The Demonstration Site 43B analysis consists of a 10-year financial outlook (2007-2016) for the 17 acres of drip cotton production. It is not assumed the cotton acreage is rotated annually with another crop. The initial cotton price is $.55/lb., including marketing loan deficiency payments. 2007 production costs and overhead charges are producer estimated rates. The drip system costs on average $143/acre/year.

Total cash receipts average about $560/acre acre. In addition to market receipts, total receipts include direct and counter-cyclical payments paid to base acres. Due primarily to the required replacement of drip tape every two years, cash costs, including $43/acre variable irrigation costs, average $460/acre acre for the drip. Peak cash cost years occur in years where drip tape is replaced. Net cash farm income (NCFI) for the drip plot averages $100/acre. The risk associated with prices and yields suggests that, in a normal production year, NCFI is projected to be highly volatile with a high probability of being negative.

Economic Summary: Demonstration Site 44A

The Demonstration Site 44A analysis consists of a 10-year financial outlook (2007-2016) for the 38 acres of soybeans production under surge irrigation with poly-pipe. It is not assumed the soybeans acreage is rotated annually with another crop. The initial soybean price is $8.75/bu., including marketing loan deficiency payments, if applicable. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a surge valve at a cost of $2,200. The surge valve expense is evenly distributed ($220/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $391/acre over the 10-year period and cash costs average just under $291/acre, including $40/acre variable irrigation costs. In addition to market receipts, total receipts include direct and counter-cyclical payments paid to base acres. Net cash farm income (NCFI) decreases throughout the 10-year period from $181/acre in 2007 to $77/acre in 2016. The risks associated with prices and yields suggest some chances of negative NCFI. In a normal production year, NCFI could range as much as $132/acre plus or minus the average expected NCFI for the site.

Economic Summary: Demonstration Site 45

The Demonstration Site 45 analysis consists of a 10-year financial outlook (2007-2016) for the 37.5 acres of sugarcane production under furrow irrigation with poly-pipe. The actual demonstration was conducted on a second year (first ratoon) field of sugarcane. The initial outright purchase of sugarcane grinding rights ($800/acre) with no financing is included. For the 10-year outlook projection, the sugarcane price is based on the producer's estimate of future prices and these are $20/ton in 2007, $18.50/ton in 2008, and $17 per ton throughout the remaining analysis period. 2007 production costs and overhead charges are producer estimated rates.

Total cash receipts average just over $933/acre initially and decline as the productive capacity of the sugarcane diminishes until the fifth year when the land is idle. Cash costs, including $56/acre in variable irrigation costs, also reflect the sugarcane production cycle, requiring roughly $317/acre in the initial year and approximately $129/acre in the idle year. Average net cash farm income (NCFI) generally follows the sugarcane production cycle producing $616/acre profit in the initial year. It averages approximately $366/acre per year for the ten-year period. The risk associated with prices and yields suggests that, in a normal production year, NCFI could range as much as $560/acre plus or minus the average expected NCFI.

On-Farm Drip and Furrow Flood Irrigation in Annual and Multi-Year Crops

ADI

Annual Report

2007

Submitted by
Texas A&M University-Kingsville, Citrus Center

Dr. Shad Nelson,
Heriberto Esquivel

and

Texas A&M Extension Service, Weslaco, TX
Dr. Juan Enciso

TABLE OF CONTENTS

Drip, Microjet and Furrow Flood Irrigation in Annual and Multi Year Crops:

Texas A&M University-Kingsville and Texas A&M Extension Service have teamed together to establish various water conservation demonstration sites throughout the Lower Rio Grande Valley (LRGV). The project managers (Dr. Shad Nelson, TAMU-Kingsville and Dr. Juan Enciso, TAES, Weslaco) have made contact with 20 growers/collaborators in the Valley to monitor on farm irrigation at different demonstration sites. These sites encompass a variety of crops including, but not limited to young and mature citrus (grapefruit, orange and tangerine), onions, sugarcane, and cotton. Irrigation practices to grow these crops are flood, polypipe furrow/flood, bordered flood, drip, and microjet spray.

Current aim this past year has been to establish contact with collaborators/growers in the LRGV willing to work with us to monitor water use and crop production over a long period of time. This work was initiated in late spring to early summer 2005 where initial cooperation was challenging among growers in the Valley. After several months of developing relationships of trust with Valley growers that informal discussion resulted in more firm collaborative commitments. By the end of 2006 we had 14 committed growers as willing participants to collaborate with us in on farm water conservation demonstration sites. Many of these sites have more than one cropping system for monitoring.

Our initial goals for demonstration sites is not to redirect the water management practices of the growers, so that we can establish a "baseline" data base that represent water use in the Valley. The baseline data will be used to evaluate water consumption per cropping system and irrigation method. It is projected that this collection of baseline data will continue through Project Year 4 (2008). To assist in monitoring water use and crop water consumption each site has been (or is in process of being) equipped with soil moisture sensors with real-time automatic data logging units. On-site rain gauges are also (or will be) supplied and attached to data logging equipment for determination of annual rainfall and for verification of when irrigation events occurred versus rain events.

These 3 years of data will be compiled and compared with all irrigation methods currently used in the Lower Rio Grande Valley. Publications and future comparisons will include bordered flood vs. traditional and traditional vs new alternative irrigation methods, i.e., microjet, drip irrigation, dual drip irrigation and stress irrigation methods. Comparing yields with each type of irrigation may also be compared utilizing On-farm projections supplied by ADI.

Current Collaborators:

The following is a list of current collaborators, the types of crops monitored during the fall 2007 and spring 2008 period. The list also covers the type of soil moisture sensing equipment and rain gauge systems in place. Depths of 6", 12', and 24", soil moisture sensors will be placed within the soil profile or bed. Current collaborators under the direction of Dr. S. Nelson and Eddie Esquivel- Project Coordinator) and Dr. J. Enciso (and science technician Xavier Peries) are listed below.

Field Sites under direction of Dr. Nelson & Eddie Esquivel:

ID ref #01 **4 cropping sites**

-01a for block ref. Rio Red (narrow borders), 73 acres
-01b for block ref. Valencia (flood); 15 acres
-01c for block ref. Rio Red (narrow borders), 85 acres
-01f for block ref. Onion 2007 Yellow var. (Drip), 32 acres
Installed: 2 ECHO probe locations; one rain gauge, 3- WatchDog Data loggers with 3 sensors per site

ID ref #02 **3 cropping sites**

- 02a for block ref. Rio Red (microjet), Henderson grapefruit (narrow borders), 14 acres
- 02b for block ref. Rio Red (narrow borders), 5 acres
- 02c for block ref. Ruby Red (drip), 4 acres Installed: 2 ECHO probe locations; one rain gauge, need to install one location with

Installed WatchDog data logger and Watermark sensors, also installed new 10” water meter with one 3” meter on drip location.

ID ref #03 **1 cropping sites**

- 03a for block ref. Rio Red grapefruit, (traditional flood), 41.3 acres

Installed: ECHO probe in Rio Reds; rain gauge and new Irrometer Watermark monitor with digital readout along with watermark sensors.

ID ref #04 **2 cropping sites**

- 04a for block ref. Rio Red grapefruit (Drip), Marrs orange, Pineapple orange, Tangerine, 86 acres
- 04b for block ref. Rio Red (Micro-jet), Marrs orange, 30 acres

Installed: 2 ECHO probe locations; 2 WatchDog datalogger w/ Watermark sensor; one rain gauge

ID ref #05 **1 cropping sites**

- 05a for block ref. White Onions-74 acres, yellow onions (Subsurface drip irrigation)

Installed: 1 ECHO probe locations; one WatchDog Rain Logger; one rain gauge

ID ref #06 **2 cropping sites**

- 06a for block ref. Rio Red Grapefruit (Drip/Microjet Irrigation), 1.1 acres
- 06b for block ref. Rio Red Grapefruit (Traditional Flood), 1.0 acre

Installed: 1 ECHO probe locations; one WatchDog Rain Logger; one rain gauge

ID ref #07 **1 cropping sites**

- 07a for block ref. Rio Red Grapefruit (Traditional Flood), 7.3 acres

Installed: Irrometer Watermark monitor with temperature probe; one WatchDog Rain Logger; Multiple Irrometer Suction Lysimeter tubes (12”, 24”, and 36”)

Field Sites under direction of Dr. Juan Enciso and Xavier Peires:

ID ref #021 **2 cropping sites**

-021a for block ref. (2006 Cotton), 3.5 acres
-021b for block ref. Grain Tank (2006 Cotton), 100 acres
-021d for block ref. Rio Red grapefruit, 18 acres, border flood

ID ref #022 **1 cropping sites**

-022a for block ref. Honeydews Spring 2006, 3 acres

ID ref #023 **1 cropping sites**

-023a for block ref. Oranges MJ (2005-2008), 13.4 acres

ID ref #024

-024a for block ref. Rio Red grapefruit (2005-2008), 7 acres **1 cropping sites**

ID ref #025

-025a for block ref. (Onion 2005-2006), 56 acres **1 cropping sites**

ID ref #026

-026a for block ref. (onion 2005-2006), 15.7 acres **1 cropping sites**

ID ref #027 **1 cropping sites**

-027a for block ref. Irrigation Scheduling SDI Onions 2005-2006, 0.65 acres

ID ref #028 **4 cropping sites**

-028a for block ref. 68 (MJ, Valencia orange), 8 acres
-028b for block ref. 73 (Dual drip, Rio Red Grapefruit), 8 acres
-028c for block ref. 74 (MJ, Rio Red Grapefruits), 8 acres
-028d for block ref. 76 (Drip Oranges), 7 acres

ID ref #029 **1 cropping sites**

-029a for block ref. Low Pressure irrigation SDI - Cotton 2005-2006, 2.6 acres

ID ref #031 **3 cropping sites**

-031a for block Rio Red grapefruit, 9.4 acre, dual drip line
-031b for block Rio Red grapefruit, 5 acre, border flood
-031c for block Rio Red grapefruit, 10 acre, border flood

ID ref #032 **1 cropping sites**

-032a for block Sugarcane 12-10, 64 acre, furrow flood

ID ref #034 **1 cropping sites**

-034a for block Rio Red grapefruit, 9.4 acre, traditional flood

ID ref #035 **1 cropping sites**

-035a for block St. Augustine Turf , *Floratan*, 86 acre, side-roll sprinklers

Project Plans for the Demonstration Sites for Mar 2007-Feb 2008:

1. All sites require metering devices. This project year will focus on accurate metering of water. Improvement in how metering data is collected will be discussed with the collaborators listed below. Many growers have this equipment, but improvement in data collection and accuracy is needed.

2. All sites require rain gauge metering devices. Continue focusing on installing automatic rain collection at each site.

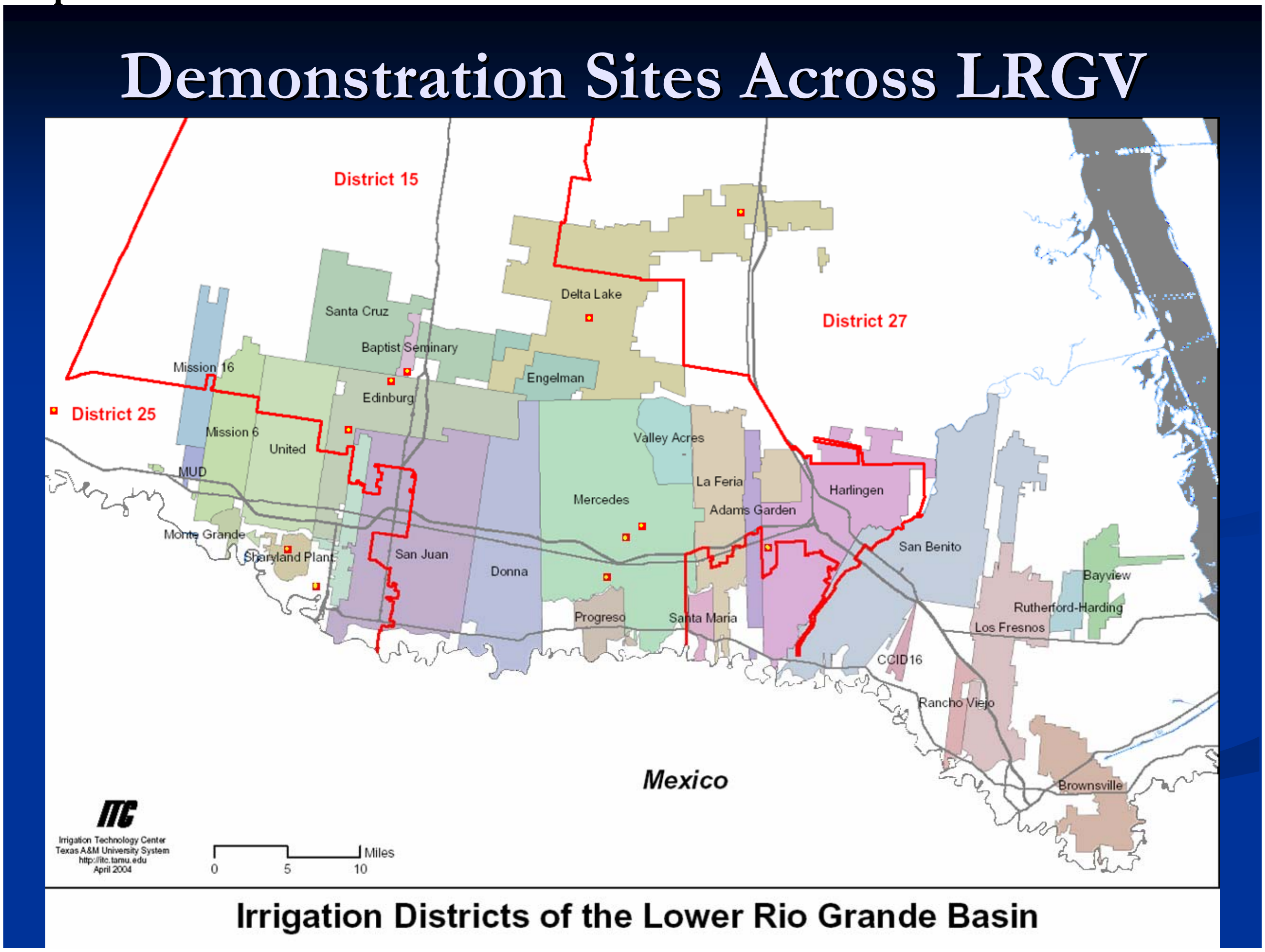
3. Soil moisture sensing devices will collect data for the purpose of evaluating to what depth irrigation water is moving within different cropping systems and soil types. These soil moisture sensors will also serve as a means of determining when irrigation events occurred and will be used to validate or check against rainfall and water metering data.

4. Total irrigation and rainfall distribution will be used at the end of the growing season and compiled with harvest data to determine water use efficiency (WUE) and irrigation use efficiency (IUE) for citrus and annual crops in the Valley.

5. Concentrate on publications concerning outcomes of alternative irrigation methods vs traditional flood irrigation.

Reporting: A total of two quarterly formal reports were turned into the Harlingen Irrigation District (HID) in May and September 2007 detailing work accomplishments. One informal quarterly report summary was provided to HID.

Map of Demonstration Sites for ADI:



Above: Red dots indicate current collaborators throughout the Lower Rio Grande Valley.

Soil Moisture Determination:

Decagon $ECH_2O^{®}$ probesEC-10 and EM-50 Data logger and Irrometer Watermark sensor and data logger are installed two weeks after initial planting on ADI collaborator #05 from Willacy County.

Above: Decagon data loggers support 5 sensor placement locations (right) and 7 sensors 5 watermark, one temperature, and one irrigation sensor installed in drip irrigated onion bed at ADI collaborator # 5's farm (left).

Below: Sub-surface irrigation- Diagram of fall onions planted in September 24, 2007 by ADI collaborator #05; raised beds with 7/8"diameter, single drip tape located bed center 2" below surface. Soil moisture sensors placed bed center (6", 12", and 24", plus temperature probe and irrigation monitor.

ADI Collaborator #01, Hidalgo County:

Block 217/217A Stress Demonstration 2007

Objectives: To study deficit irrigation using Rio Red grapefruit mature trees, same soil type. Using the 12” sensor readings for irrigation times of 50-60 kPa and 70-80 kPa on the display of the WatchDog data loggers will be trigger points for irrigation.
Irrigation amounts should remain same as previous crop for each block.
Yields will be compared in reference to water usage. Block 217A will receive the 50-60 kPa and Block 217 will receive the 70-80 kPa for the 2007/2008 crop season.

Collaborator #02, Hidalgo County:

Installation of new meters; 3” inline turbine meter and 10” Siemens Real Time meter installed April 23, 2007.

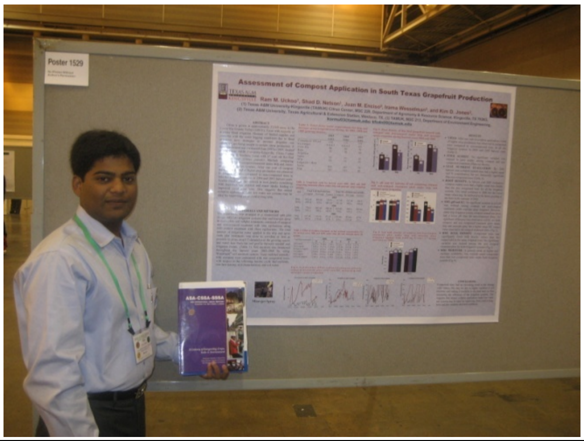
Above: Dr. Shad Nelson, Texas A&M University-Kingsville poses with 3” installation. **Below:** Harlingen Irrigation District technician, Richard Keating, and Eddie Esquivel of TAMUK install Siemens transit time meter.

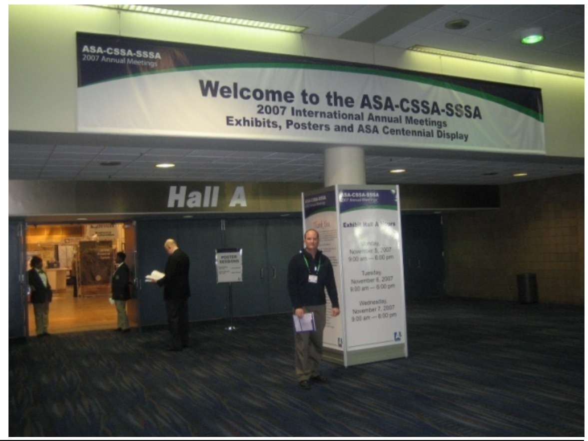
Equipment installation on ADI Collaborator Sites:

Below: Irrometer data logger and watermark sensors were installed on June 5, 2007 next to Decagon ECH_20 soil water monitoring equipment on Collaborator #03's farm to help facilitate soil moisture readings for farmer.

ASA-CSSA-SSSA 2007 International Annual Meeting, New Orleans, Louisiana:

As members of the American Society of Agronomy/ Crop Science Society of America/ and Soil Science Society of America, Dr. Shad Nelson and Rammohon Uckoo presented a poster on Assessment of Compost Application in South Texas Grapefruit Production representing activities involving ADI project.

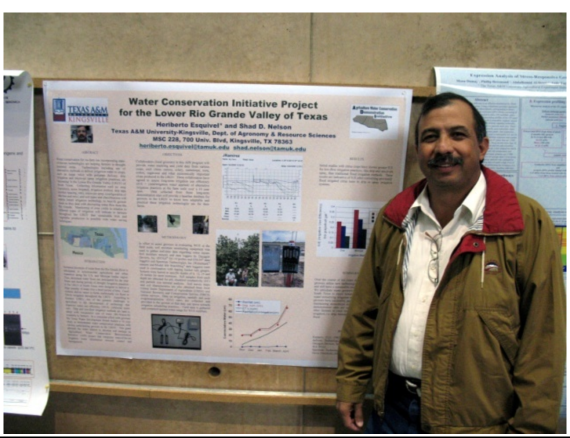


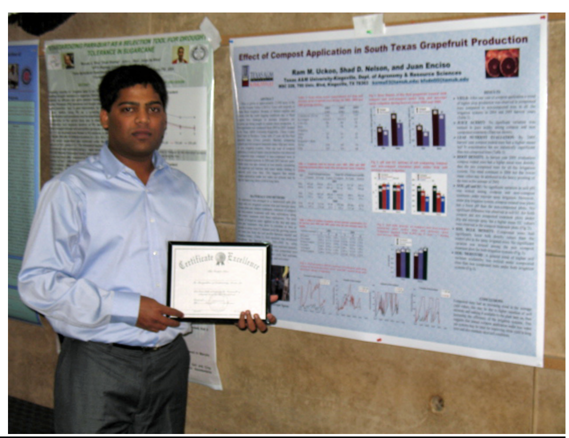


Above: Authors, Dr. Shad Nelson and Ram Uckoo pose proudly in New Orleans.

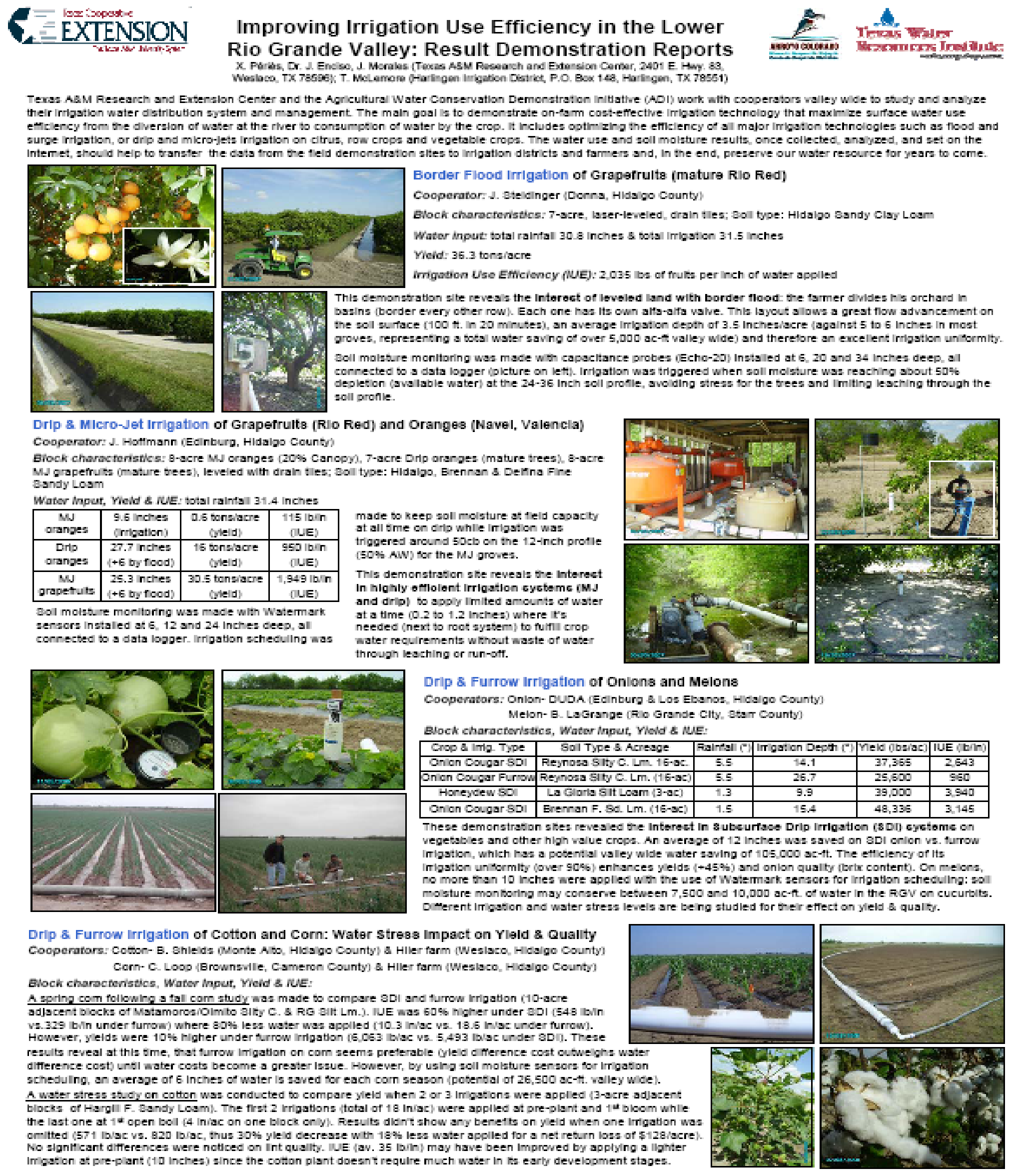
2007 61st Annual Rio Grande Valley Horticultural Society Meeting, Edinburg, TX:

Below: H. Esquivel presents his poster, *Water Conservation Initiative Project for the Lower Rio Grande Valley of Texas* and Rammohon Uckoo stands by his 1st place poster titled- *Effect of Compost Application in South Texas Grapefruit Production*, utilizing drip and microjet irrigation as water conservation techniques. Research was completed on ADI collaborator site #06 and funded by Rio Grande Basin Initiative. Ram is currently attending Texas A&M University working on his Ph.D.





Annual Joint Rio Grande Basin Initiative Meeting, South Padre Island, TX May 14-17, 2007



Improving Irrigation Use Efficiency in the Lower Rio Grande Valley: Result Demonstration Reports

X. Périès, Dr. J. Enciso, J. Morales (Texas A&M Research and Extension Center, 2401 E. Hwy. 83, Weslaco, TX 78596); T. McLemore (Harlingen Irrigation District, P.O. Box 148, Harlingen, TX 78551)

Texas A&M Research and Extension Center and the Agricultural Water Conservation Demonstration Initiative (ADI) work with cooperators valley wide to study and analyze their irrigation water distribution system and management. The main goal is to demonstrate on-farm cost-effective irrigation technology that maximize surface water use efficiency from the diversion of water at the river to consumption of water by the crop. It includes optimizing the efficiency of all major irrigation technologies such as flood and surge irrigation, or drip and micro-jets irrigation on citrus, row crops and vegetable crops. The water use and soil moisture results, once collected, analyzed, and set on the internet, should help to transfer the data from the field demonstration sites to irrigation districts and farmers and, in the end, preserve our water resource for years to come.

Border Flood Irrigation of Grapefruits (mature Rio Red)

Cooperator: J. Steidinger (Donna, Hidalgo County)

Block characteristics: 7-acre, laser-leveled, drain tiles; Soil type: Hidalgo Sandy Clay Loam

Water input: total rainfall 30.8 inches & total irrigation 31.5 inches

Yield: 36.3 tons/acre

Irrigation Use Efficiency (IUE): 2,035 lbs of fruits per inch of water applied

This demonstration site reveals **the interest of leveled land with border flood**: the farmer divides his orchard in basins (border every other row). Each one has its own alfa-alfa valve. This layout allows a great flow advancement on the soil surface (100 ft. in 20 minutes), an average irrigation depth of 3.5 inches/acre (against 5 to 6 inches in most groves, representing a total water saving of over 5,000 ac-ft valley wide) and therefore an excellent irrigation uniformity.

Soil moisture monitoring was made with capacitance probes (Echo-20) installed at 6, 20 and 34 inches deep, all connected to a data logger (picture on left). Irrigation was triggered when soil moisture was reaching about 50% depletion (available water) at the 24-36 inch soil profile, avoiding stress for the trees and limiting leaching through the soil profile.

Drip & Micro-Jet Irrigation of Grapefruits (Rio Red) and Oranges (Navel, Valencia)

Cooperator: J. Hoffmann (Edinburg, Hidalgo County)

Block characteristics: 8-acre MJ oranges (20% Canopy), 7-acre Drip oranges (mature trees), 8-acre MJ grapefruits (mature trees), leveled with drain tiles; Soil type: Hidalgo, Brennan & Delfina Fine Sandy Loam

Water Input, Yield & IUE: total rainfall 31.4 inches

MJ oranges	9.6 inches (irrigation)	8.6 tons/acre (yield)	115 lb/in (IUE)
Drip oranges	27.7 inches (+6 by flood)	16 tons/acre (yield)	950 lb/in (IUE)
MJ grapefruits	25.3 inches (+6 by flood)	30.5 tons/acre (yield)	1,949 lb/in (IUE)

Soil moisture monitoring was made with Watermark sensors installed at 6, 12 and 24 inches deep, all connected to a data logger. Irrigation scheduling was made to keep soil moisture at field capacity at all time on drip while irrigation was triggered around 50cb on the 12-inch profile (50% AW) for the MJ groves.

This demonstration site reveals **the interest in highly efficient irrigation systems (MJ and drip)** to apply limited amounts of water at a time (0.2 to 1.2 inches) where it's needed (next to root system) to fulfill crop water requirements without waste of water through leaching or run-off.

Drip & Furrow Irrigation of Onions and Melons

Cooperators: Onion- DUDA (Edinburg & Los Ebanos, Hidalgo County)
Melon- B. LaGrange (Rio Grande City, Starr County)

Block characteristics, Water Input, Yield & IUE:

Crop & Irrig. Type	Soil Type & Acreage	Rainfall (")	Irrigation Depth (")	Yield (lbs/ac)	IUE (lb/in)
Onion Cougar SDI	Reynosa Silty C. Lm. 16-ac.	5.5	14.1	37,365	2,643
Onion Cougar Furrow	Reynosa Silty C. Lm. (16-ac)	5.5	26.7	25,600	960
Honeydew SDI	La Gloria Silt Loam (3-ac)	1.3	9.9	39,000	3,940
Onion Cougar SDI	Brennan F. Sd. Lm. (16-ac)	1.5	15.4	48,336	3,145

These demonstration sites revealed the **interest in Subsurface Drip Irrigation (SDI) systems** on vegetables and other high value crops. An average of 12 inches was saved on SDI onion vs. furrow irrigation, which has a potential valley wide water saving of 105,000 ac-ft. The efficiency of its irrigation uniformity (over 90%) enhances yields (+45%) and onion quality (brix content). On melons, no more than 10 inches were applied with the use of Watermark sensors for irrigation scheduling: soil moisture monitoring may conserve between 7,500 and 10,000 ac-ft. of water in the RGV on cucurbits. Different irrigation and water stress levels are being studied for their effect on yield & quality.

Drip & Furrow Irrigation of Cotton and Corn: Water Stress Impact on Yield & Quality

Cooperators: Cotton- B. Shields (Monte Alto, Hidalgo County) & Hiler farm (Weslaco, Hidalgo County)
Corn- C. Loop (Brownsville, Cameron County) & Hiler farm (Weslaco, Hidalgo County)

Block characteristics, Water Input, Yield & IUE:

A spring corn following a fall corn study was made to compare SDI and furrow irrigation (10-acre adjacent blocks of Matamoros/Olmito Silty C. & RG Silt Lm.). IUE was 60% higher under SDI (548 lb/in vs.329 lb/in under furrow) where 80% less water was applied (10.3 in/ac vs. 18.6 in/ac under furrow). However, yields were 10% higher under furrow irrigation (6,063 lb/ac vs. 5,493 lb/ac under SDI). These results reveal at this time, that furrow irrigation on corn seems preferable (yield difference cost outweighs water difference cost) until water costs become a greater issue. However, by using soil moisture sensors for irrigation scheduling, an average of 6 inches of water is saved for each corn season (potential of 26,500 ac-ft. valley wide).

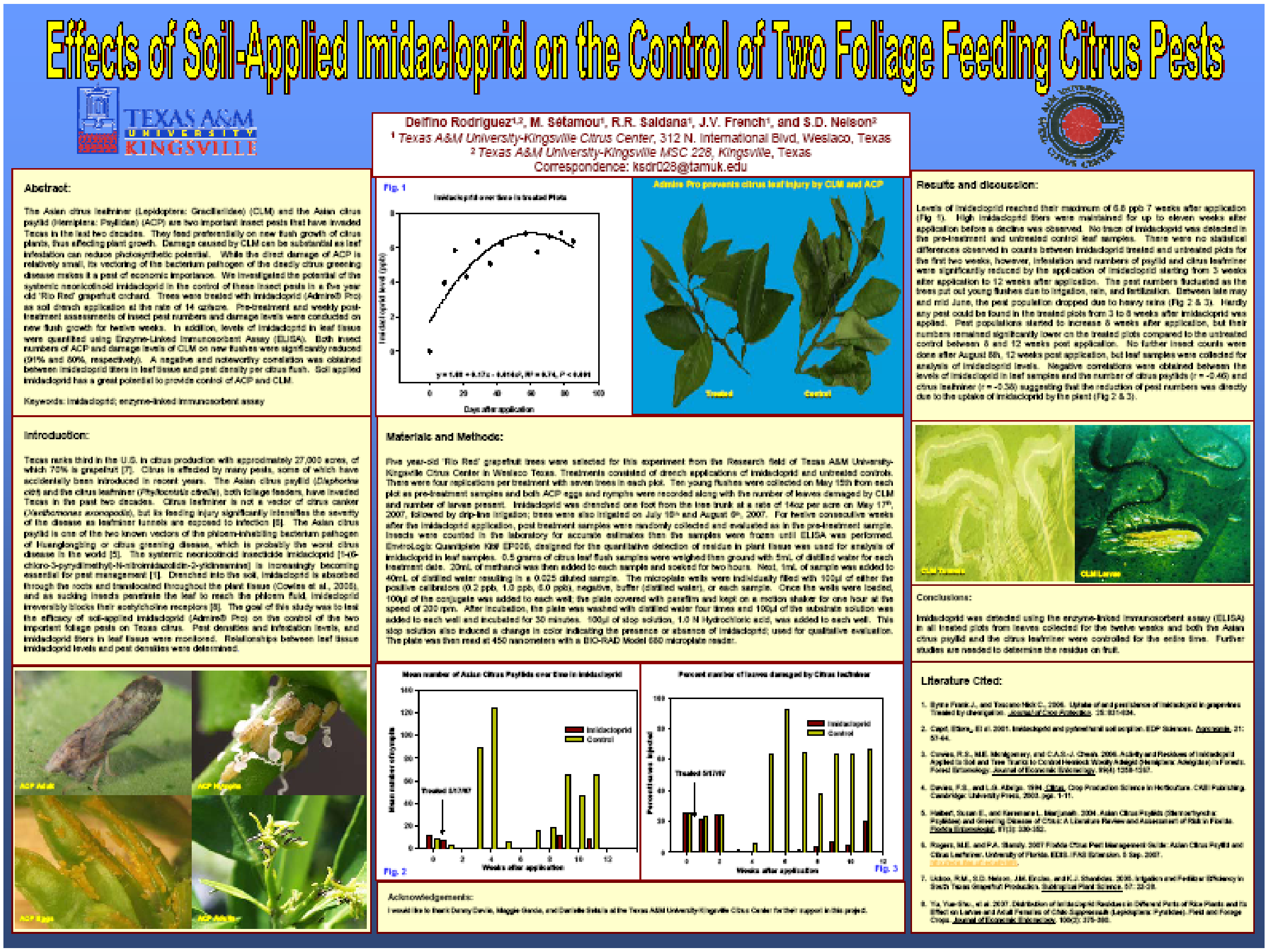
A water stress study on cotton was conducted to compare yield when 2 or 3 irrigations were applied (3-acre adjacent blocks of Hargill F. Sandy Loam). The first 2 irrigations (total of 18 in/ac) were applied at pre-plant and 1st bloom while the last one at 1st open boll (4 in/ac on one block only). Results didn't show any benefits on yield when one irrigation was omitted (571 lb/ac vs. 820 lb/ac, thus 30% yield decrease with 18% less water applied for a net return loss of $128/acre). No significant differences were noticed on lint quality. IUE (av. 35 lb/in) may have been improved by applying a lighter irrigation at pre-plant (10 inches) since the cotton plant doesn't require much water in its early development stages.

Above: X. Peries, J. Enciso, J. Morales and S. Nelson. 2007. Improving Irrigation Use Efficiency in the LRGV: Result Demonstration Reports. Presented at the Annual Joint Rio Grande Basin Initiative meeting. South Padre Island, TX. May 14-17, 2007**.**

Using Flexible Pipe (Poly-Pipe) with Surface Irrigation. Annual Joint Rio Grande Basin Initiative Meeting, South Padre Island, TX May 14-17, 2007

Above: X. Peries, J. Enciso, J. Morales and S. Nelson. 2007. *Using Flexible Pipe (poly-pipe) with Surface Irrigation*. Presented at the Annual Joint Rio Grande Basin Initiative meeting. South Padre Island, TX. May 14-17.

Effects of Soil-Applied Imidacloprid on the Control of Two Foliage Feeding Citrus Pests



Above: Delfino Rodriguez, S.D. Nelson, M. Sètamou, and D. Saldana. 2008. Effects of Soil-Applied Imidacloprid on the Control of Two Foliage Feeding Citrus Pests. Southern Section of American Society of Agronomy. Dallas, TX. Feb. 3-5, 2008. (2nd place poster winner)

Rainfall Totals for East/West Ends of Lower Rio Grande Valley 2005-2007:

Average annual rainfall within the LRGV is approximately 25 inches. This past 2005-2007 year the Valley experience below average rainfall. Below is an example of rainfall for two ends of the LRGV.

Monthly Rain Totals for Harlingen

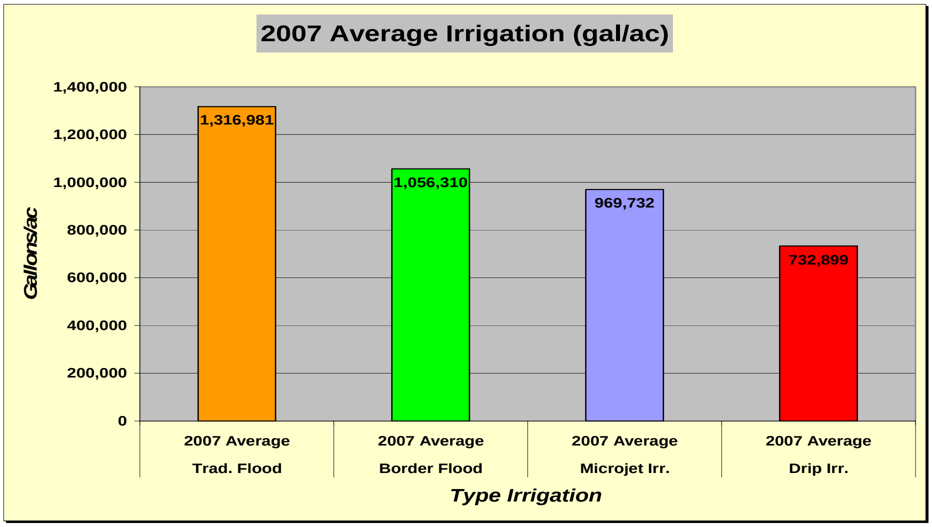
Totals 2005	inch	cumulative	Totals 2006	inch	cumulative	Totals 2007	inch	cumulative
Jan	0.34	0.34	Jan	0.24	0.24	Jan	2.00	2.00
Feb	1.07	1.41	Feb	0.06	0.3	Feb	1.15	3.15
Mar	0.21	1.62	Mar	2.03	2.33	Mar	1.97	5.12
April	0.18	1.8	April	0.04	2.37	April	0.41	5.53
May	1.75	3.55	May	3.16	5.53	May	11.06	16.59
June	0.14	3.69	June	0.46	5.99	June	4.00	20.59
July	4.08	7.77	July	2.41	8.4	July	5.98	26.57
Aug	0.32	8.09	Aug	2.04	10.44	Aug	2.73	29.3
Sept	2.77	10.86	Sept	4.88	15.32	Sept	4.40	33.7
Oct	2.37	13.23	Oct	3.88	19.2	Oct	1.19	34.89
Nov	1.47	14.7	Nov	0.34	19.54	Nov	0.26	35.15
Dec	0.92	15.62	Dec	3.22	22.76	Dec	0.08	35.23
	15.62	Total		22.76	Total		35.23	Total

McAllen TX Monthly Rainfall

Rainfall Totals 2005	inch	cumulative	Rainfall Totals 2006	inch	cumulative	Rainfall Totals 2007	inch	cumulative
Jan	1.02	1.02	Jan	0.08	0.08	Jan	2.42	2.42
Feb	0.96	1.98	Feb	0.13	0.21	Feb	0.26	2.68
Mar	0.4	2.38	Mar	0.55	0.76	Mar	0.58	3.26
April	0.02	2.4	April	0.01	0.77	April	0.58	3.84
May	1.78	4.18	May	0.73	1.5	May	1.23	5.07
June	0.5	4.68	June	0.35	1.85	June	2.02	7.09
July	7.37	12.05	July	3.4	5.25	July	8.96	16.05
Aug	1.85	13.9	Aug	0.76	6.01	Aug	3.04	19.09
Sept	1.08	14.98	Sept	11.22	17.23	Sept	1.77	20.86
Oct	1.34	16.32	Oct	1.73	18.96	Oct	1.18	22.04
Nov	0.4	16.72	Nov	0.1	19.06	Nov	0.28	22.32
Dec	0.48	17.2	Dec	2.73	21.79	Dec	0.00	22.32
	17.2	Total		21.79	Total		22.32	Total

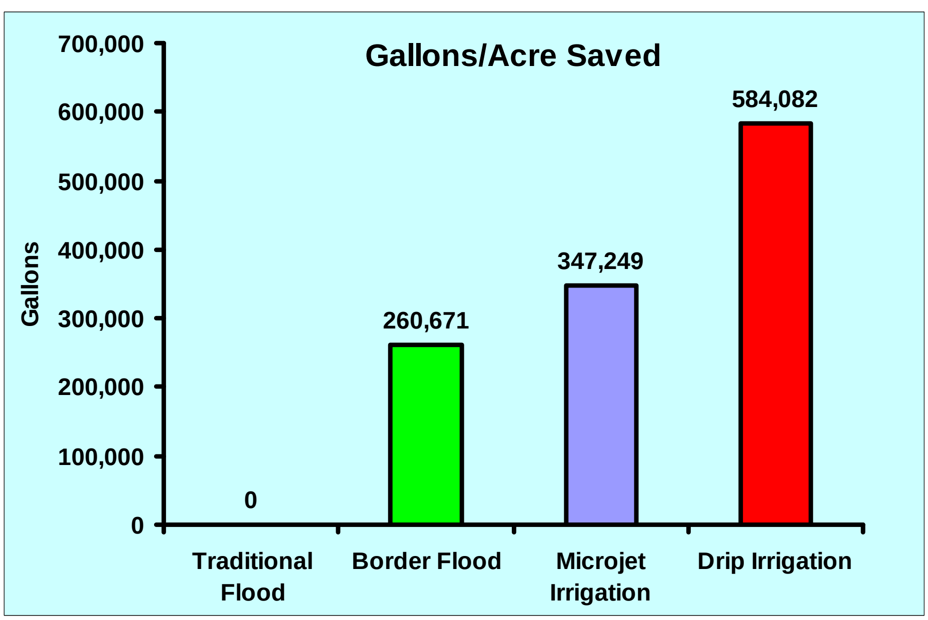
2006-2007 Irrigation Totals:

This year we used on-site information of 2006-2007 harvest years (chart below), with 4 drip sites, 4 microjet sites and 3 traditional flood sites averaged to give irrigation usage of gallons per acre for the Lower Rio Grande Valley.



Water Savings with Alternative Irrigation Methods:

With drip irrigation saving the most water at 584,100 gallons/acre for the ’06-07 season, border flood at 22% savings, microjet at 29% savings and drip irrigation at 49% savings over traditional flood.



ADI exposure to media and other external groups (not using ADI funds):

- Dr. Shad Nelson was interviewed on Channel 6- Morning Show, of Corpus Christi, TX on the goals and importance of water saving techniques used in irrigation of the Rio Grande Valley.
- D. Rodriguez, S.D. Nelson, M. Sètamou, and D. Saldana. 2008. Evaluation of irrigation and chemical efficacy on 2 citrus pests. Southern Section of American Society of Agronomy. Dallas, TX. Feb. 3-5, 2008. (2nd place poster winner).
- S.D. Nelson. Presented "Current and Future Research Plans" at Citrus Advisory Committee Meeting. Weslaco, TX. Aug. 14, 2007.
- S.D. Nelson. Research update on Citrus Related Water Conservation Projects. Texas Citrus Mutual Mid-Year Meeting. TAMUK Citrus Center, Weslaco, TX. Mar. 29, 2007.
- S.D. Nelson. Water Conservation in Citrus & Gardening. Kingsville Rotary Club. Feb. 27, 2007.

- Uckoo, R.M., S.D. Nelson, G.K. Jayaprakasha, and B.S. Patil. 2007. Impact of Low Water Use Systems on Bioactive Flavonoids of Grapefruit. 2nd International Symposium on Human Health Effects of Fruits and Vegetables. Houston, TX. Oct. 9-13.

- Esquivel, H., and S.D. Nelson. 2007. Water conservation initiative project for the Lower Rio Grande Valley of Texas. The 61st Annual Rio Grande Horticultural Society meeting. UT-PanAm, Edinburg, TX. Jan. 30.

Published Abstracts (Chronological Order)

- Enciso, J., J. Morales, B. Wiedenfeld, S.D. Nelson and X. Peries. 2007. Irrigating Onions with Subsurface Drip Irrigation Under Different Stress Levels. 28th Annual Irrigation Association Show. San Diego, CA. Dec. 9-11.

- Nelson, S.D., R.M. Uckoo, H. Esquivel and J.M. Enciso. 2007. Promoting Water Conservation Practices Throughout the Lower Rio Grande Valley of Texas. ASA-CSSA-SSSA Annual Conference. New Orleans, LA. Nov. 4-8.

- Uckoo, R.M., S.D. Nelson, J.M. Enciso, I. Wesselman and K. Jones. 2007. Assessment of Compost Application in South Texas Grapefruit Production. ASA-CSSA-SSSA Annual Conference. New Orleans, LA. Nov. 4-8.

- Uckoo, R.M., S.D. Nelson, and J.M. Enciso. 2007. Effect of compost application in South Texas grapefruit production. The 61st Annual Rio

Grande Horticultural Society meeting. UT-PanAm, Edinburg, TX. Jan. 30. (1st place poster contest winner).

Professional Addresses (Chronological Order)
Vitae: Shad D. Nelson

- J. Enciso, S.D. Nelson, X. Peries, H. Esquivel. 2008. Promoting On-Farm Water Conservation Projects Throughout the Lower Rio Grande Valley. 62nd Annual Meeting of the Rio Grande Valley Horticultural Society. Weslaco, TX. Jan. 30.

- Enciso, J., J. Morales, B. Wiedenfeld, S.D. Nelson and X. Peries. 2007. Irrigating Onions with Subsurface Drip Irrigation Under Different Stress Levels. 28th Annual Irrigation Association Show. San Diego, CA. Dec. 9-11.

- Nelson, S.D., R.M. Uckoo, H. Esquivel and J.M. Enciso. 2007. Promoting Water Conservation Practices Throughout the Lower Rio Grande Valley of Texas. ASA-CSSA-SSSA Annual Conference. New Orleans, LA. Nov. 4-8.

- Uckoo, R.M., S.D. Nelson, J.M. Enciso, I. Wesselman and K. Jones. 2007. Assessment of Compost Application in South Texas Grapefruit Production. ASA-CSSA-SSSA Annual Conference. New Orleans, LA. Nov. 4-8.

- Esquivel, H. and S.D. Nelson. 2007. Agricultural demonstration water conservation initiative (ADI) for the lower Rio Grande Valley of Texas. Rio Grande Basin Initiative meeting. South Padre Island, TX. May 14-17.

- X. Peries, J. Enciso, J. Morales and S. Nelson. 2007. Using Flexible Pipe (poly-pipe) with Surface Irrigation. Presented at the Annual Joint Rio Grande Basin Initiative meeting. South Padre Island, TX. May 14-17.

- X. Peries, J. Enciso, J. Morales and S. Nelson. 2007. Improving Irrigation Use Efficiency in the LRGV: Result Demonstration Reports. Presented at the Annual Joint Rio Grande Basin Initiative meeting. South Padre Island, TX. May 14-17.

Agricultural Extension Publications

- Young, M., S.L. Klose, G. Kasse, S. Nelson, J. Enciso, and M. Jupe. October 2007. Narrow border flood and 2-line drip irrigation illustration for Valencia, Navel and Marrs oranges in the Lower Rio Grande Valley. Texas Cooperative Extension. FARM Assistance Focus 2007-6. pp. 1-3. http://coastalbend.tamu.edu/Extension/Risk%20Management/Focus2007-6.pdf

- Young, M., S.L. Klose, G. Kasse, S. Nelson, J. Enciso, and M. Jupe. August 2007. Narrow border flood and micro-jet spray irrigation illustration for Rio Red grapefruit in the Lower Rio Grande Valley. Texas Cooperative Extension. FARM Assistance Focus 2007-5. pp. 1-3. http://coastalbend.tamu.edu/Extension/Risk%20Management/Focus2007-5.pdf

- Enciso J. Morales, J., B. Wiedenfeld., S. Nelson, and X. Peries. 2007. Irrigating Onions under Subsurface Drip Irrigation under Different Stress Levels. In Proceedings of the Annual International Irrigation Show December 9-11, 2007. San Diego, CA. Irrigation Association Meeting. Pp. 338-352.

Grant Proposals Funded -- Titles

On-Farm Demonstration Projects for Conserving Water with Drip Irrigation in the Lower Rio Grande Valley. Subcontract for: Maximization of On-farm Surface Water Use Efficiency by Integration of On-farm Application and District Delivery Systems. Texas Water Development Board grant. PI: W. Halbert (Harlingen Irrigation District), CoPI: S.D. Nelson (TAMUK), J. Enciso (TAES). Status: Funded. $203,071.00

Additional Funds for 2007:

- USDA/CSREES HIS grant. Title: Effects of Water Stress on the Efficacy of Selected Pesticides in Citrus Pest Management. PI-M. Sètamou. Co-PI: Shad Nelson. Status: Funded. Amount $30,000.

- Rio Grande Basin Initiative Grant. Title: Task 4: On Farm Irrigation System Management: Efficient Irrigation for Water Conservation in the Rio Grande Valley. PI-Shad Nelson. Status: Funded. Amount: $15,000.

Unfunded Proposals for 2007:

- $388,000 Alternative Irrigation Technologies for Sustainable Texas Citrus Production. TAES Cropping Systems Program FY 2008-09 grants. (Proposal written by Shad D. Nelson, but submitted as Co-PI)

- $ 77,000 Alternative Drip and Flood Regulated Deficit Irrigation Practices Aimed at Conserving Water and Sustaining Citrus Yield and Product Quality. Citrus Research Board grants. (not funded 2007, resubmit 2008?)

Proposed Research for 2008:

- $ 25,000 Soil Moisture and Irrigation Timing Impacts on the Efficacy of Temik in Citrus Pest Management and Economic Productivity. Citrus Producers Board grants. (Re-pitching Feb 15, 2008)

- $500,000 USDA/CSREES HSI Education Grants. Funds for undergraduate and graduate research for TAMUK, UT-PanAm and STSC students for Ag-related research experience. (Submitted Feb. 8, 2008.)

Total Funds Spent on ADI Project from Feb. '05 to May '07:

Total funds spent on ADI project (Feb 2005-May 2007)	ADI Funds		TAMUK Funds
Wages	$92,406.46		$74,254.36
Supplies/Equipment	$21,718.38		$25,060.94
Travel Expenses	$6,002.18		$19,770.77
Total	**$120,127.02**		**$119,086.07**
This list does not include any funds donated by TAES- Dr. Juan Enciso such as labor, gas, supplies, travel, etc.			

Total Funds Spent on ADI Project from March '07 to February '08:

Total funds spent on ADI project (March 2007-Feb 2008)	ADI Funds		TAMUK Funds
Wages	$46,851.72		$42,786.00
Supplies/Equipment	$3,451.76		$7,736.55
Travel Expenses	$2,672.21		$10,798.02
Total	**$52,975.69**		**$61,320.57**
This list does not include any funds donated by TAES- Dr. Juan Enciso such as labor, gas, supplies, travel, etc.			

Travel Costs to ADI	**$$ Spent**	**Quarter**
Travel Expenditures Quarter 1- March-May '07	437.2	mar-may07
Travel Expenditures Quarter 2- June-Aug '07	755.59	jun-aug 07
Travel Expenditures Quarter 3- Sept-Nov '07	712.32	sept-nov 07
Travel Expenditures Quarter 4 -Dec-Feb '07	767.1	dec07-feb08
Total Travel Expenditures Annual Report	**2672.21**	**3/07-2/08**
Supply Costs to ADI	**$$ Spent**	**Quarter**
Supplies Expenses Quarter 1- March-May '07	0	mar-may07
Supplies Expenses Quarter 2- June-Aug '07	2617.94	jun-aug 07
Supplies Expenses Quarter 3- Sept-Nov '07	377.82	sept-nov 07
Supplies Expenses Quarter 4 -Dec-Feb '07	456.00	dec07-feb08
Total Supplies Expenses Annual Report	**3451.76**	**3/07-2/08**
Personnel Costs to ADI	**$$ Spent**	**Quarter**
Eddie Esquivel (tot: 3451.30/mo)	10353.9	mar-may07
Eddie Esquivel (tot: 3451.30/mo)	10353.9	jun-aug 07
Eddie Esquivel (tot: 4357.32/mo)	13071.96	sept-nov 07
Eddie Esquivel (tot: 4357.32/mo)	13071.96	dec07-feb08
	46851.72	**3/07-2/08**

ADI Funds				
Items Purchased				Total ($)
AMS, Inc	Bulk Density Core Sampler			**$512.94**
soil moisture equipment	Irrometer Co., Inc.			**$2,105.00**
Quality Cables USA Inc	USB to IrDA adapter			**$60.82**
Davis instruments corp	4 rain gauges			**$317.00**
Spectrum Tech, Inc	2rain guages, cables, rainlogger			**$456.00**
ADI paid personnel				Total ($)
Eddie Esquivel (tot: 3451.30/mo)	(sal: $2570.25, fringes:$881.05)/mo			$10,353.90
Eddie Esquivel (tot: 3451.30/mo)	(sal: $2570.25, fringes:$881.05)/mo			$10,353.90
Eddie Esquivel (tot: 4357.32/mo)	(sal: $3330, fringe+med:$1027.32)/mo			$13,071.96
Eddie Esquivel (tot: 4357.32/mo)	(sal: $3330, fringe+med:$1027.32)/mo			$13,071.96
				$46,851.72

Additional Matching Funds brought to ADI Projects during Year 3:

TAMUK Sources Additional Matching Funds	Total ($)
TAMUK personnel contributions	
USDA-HSI grant Undergrad Labor	$5,814.00
Dr. Nelson 0.20 yearly effort paid by TAMUK	$18,814.00
RGBI grant funds grad student labor	$10,082.00
TAMUK-URC grant-Monte Alto site grad labor	$8,076.00
Total personnel costs by TAMUK funds	**$42,786.00**
TAMUK travel expenditures	
TAMUK-URC grant funds-Monte Alto site	$728.31
USDA-HSI grant funds	$3,691.45
RGBI grant funds	$459.26
Dept Truck Mileage Useage/Gas	$5,919.00
Total travel costs by TAMUK funds	**$10,798.02**
TAMUK equipment & supplies expenditures	
RGBI grant funds	$4,246.35
USDA-HSI grant funds	$3,490.20
Total equipment/supply costs by TAMUK funds	**$7,736.55**

Other donated sources:

1. **Salaries** for Xavier Périès, Juan Ramirez and Dr. Juan Enciso at Texas Agricultural Experiment Station, Weslaco, TX. These people are currently collecting data for this project without monetary reimbursement. Dollar amount unknown, but substantial. Dr. Kim Jones and Irama Wesselman from the Dept. of Environmental Engineering at TAMUK contributed their paid time to consult and analyze soil moisture data.

2. **$5,919.** Mileage for Department of Agronomy & Resource Science truck donated and paid by departmental annual budget. With approximately 32 trips to the Lower Rio Grande Valley per year and approximately 380 miles per trip visiting ADI collaborators, this equates to approximately 12,200 miles driven during project Year 3 from Feb 2007 to Feb 2008. At 48.5 cents/mile this equals $5,919.00 in gas and maintenance associated with the truck that is not assessed against the ADI budget.

Current Assessment Questions for ADI projects under TAMUK:

1. ***How is the data being collected and how is it being stored?***

   Data from soil moisture sensing equipment and rain gauges at the afore-mentioned sites are being handled by Dr. Nelson's group and Dr. Enciso's staff (Xavier Peires) working on this project: and. Dr. Nelson's group handles 7 locations, while Dr. Enciso's group handles 13 locations. The data is collected in the field, stored temporarily on a laptop computer or Personal Digital Assistant (PDA), and then transferred to another computer at the research station/lab in Kingsville or Weslaco.

2. ***How will the data be made available to other growers?***

   Data downloaded will be delivered to Harlingen Irrigation District and Tom McLemore to make the data available on the hidcc1.org website, where soil moisture monitoring and rainfall data will be collected for growers to see.

   ADI Collaborators will provide us with harvest, fertility, and input data respective to their ADI demonstration site. This information will be made available on the hidcc1.org website.

3. ***What are the ultimate goals of data collection?***

   We anticipate correlating water use from various irrigation systems with current irrigation practices used by growers. Initially soil moisture monitoring with evaluate where and to what depth water is moving within the soil profile. Also, correlate ET demand and crop water use (where in the rooting zone is water being taken), so that in the near future we can grasp better how much of the soil profile needs to be recharged during each irrigation cycle under drip, microjet, furrow, and flood irrigation practices. This work will be examined in relationship to soil type and location within the Lower Rio Grande Valley (LRGV).

   Data collection and dissemination of information to area farmers is the main issue of reaching as many farmers as possible. Field demonstrations, morning meetings with locals or the best means of sharing data and yields associated with water savings in the near future is a priority by ADI staff and technicians.

4. ***What is the plan for 2008?***

   Collect basic bulk density figures for each collaborator cropping site for evaluation of water percolation.

   Continue relationship with established collaborators and install purchased soil moisture monitoring equipment, rain gauges and most importantly focus on accurate water metering (supplying meters to collaborators, if needed).

   Monitor soil quality parameters under low-water use irrigation systems over time. Such as, evaluation of soil salinity increases under drip or microjet irrigation vs. flood in the Lower Rio Grande Valley.

   Establish the baseline irrigation needs for growers involved in demonstration sites, and evaluate water and irrigation use efficiency from these locations.

   Begin to publish demonstration site evaluations and findings with considerations to water savings and yields.

Harlingen Irrigation District Agricultural Water Conservation Demonstration Initiative

HID, TAMUK, TCE Combined

Demonstration Site Summaries

For the 2007 Growing Season

rict CC 1

Table of Contents

Site summary introduction

The following pages contain summaries of the demonstration sites maintained by all entities involved in the Agricultural Water Conservation Demonstration Initiative. Each site is designated by a site number, these site designations were developed to maintain the anonymity of the producers involved in the program. The first digit is the entity responsible for gathering data from the site, the second digit is the producer, and the third digit is a letter designating the field within the site. Site numbers beginning with "0" or "1" are maintained by Texas A&M University-Kingsville under the direction of Dr. Shad Nelson. Site numbers beginning with "2" or "3" are maintained by Texas A&M Extension Center under the direction of Dr. Juan Enciso. The sites beginning with "4" or "5" are maintained by Harlingen Irrigation District under the direction of Danny Allen. The economic summaries are provided by Texas A&M Extension FARM Assistance under the direction of Dr. Steven Klose and Mac Young

1. Site: #01A – 2007-08

Site Description:

Acres: 73.0
Soil type: clay loam 0-6 inches, sandy clay loam 6-36 inches
Field characteristics: 15' x 24' spacing (115 trees/Acre)
Crop variety: Rio Red grapefruit
Harvest season: May 06-May 07
Irrigation district: None-Class B water owner

Irrigation system:

Narrow bordered flood, polypipe
Fertilizer applied: 600 lbs/ac 12-24-12, late April '06; 500 lbs/A 12-24-12, early Dec '06; 10 gal/A 20-0-0-40 late July and early Sept.'06; 8 gal/A 20-0-0-40 early Nov. 2006
Sensor information: Soil moisture: Decagon data logger EM-50, ECHO-10 probes, Probes set at 6", 12", and 24" depths; ECRN-50 Rain gauge. 10 inch Turbine-type flow meter

Irrigation schedule and amounts:

Total irrigation: **??** **ac-ft/ac** or ?? **ac-in/ac** in ?? irrigation events

Total rainfall: **??**

Total water input: **??** inches/acre

Irrigation method:

Farmer uses 12" concrete outlet valve and attaches turbine meter to valve and poly-pipe. Farmer waters only directly under the canopy (root zone) by using raised berms in between rows (Grapefruit). Farmer reforms raised berms after each harvest in order to channel water at a faster rate to the end of the bed as a potential water conserving irrigation method for flood irrigating mature citrus.

Observations made during the crop season:

Heavy rainfall during months of September and October of 2007.

Yield:

Not available at reporting

Water use summary:

Not available at reporting

Economic Summary: Demonstration Site 1A

The Demonstration Site 1A analysis consists of a 10-year financial outlook (2007-2016) for the 50 acres of Rio Red grapefruit under narrow border flood irrigation. The orchard was assumed to have mature trees. The Rio Red grapefruit price is held constant at $150/ton. 2007 producer costs and overhead charges are producer estimated rates.

Total cash receipts average $2,706/acre over the 10-year period and cash costs average $1,389/acre, including $100/acre irrigation costs. Net cash farm income (NCFI) averages

$1,317/acre due largely to the price being held at a constant $150/ton. The risk associated with prices and yields suggests some chance of negative NCFI. In a normal production year, NCFI could range as much as $720/acre to $3,800/acre.

2. Site: #01B – 2007-08

Site Description:
Acres: 15.0
Soil type: clay loam 0-18 inches, loam 18-36 inches
Crop variety: Valencia oranges
Field characteristics: 15’ x 23’ spacing (124 trees/Acre)
Irrigation district: None-Class B water owner

Irrigation system:

Narrow border flood, polypipe
Irrigation method: Farmer uses 12” concrete outlet valve and attaches turbine meter to valve and poly-pipe. Farmer waters only directly under the canopy (root zone) by using berms in between rows (Valencia).

Fertilizer applied:

500 lbs/A 12-24-12 Early May ’06; then several 5 gal/A applications of 20-0-0-40 throughout growing season (May, June, July 2006) and 7 gal/A N32 (Nov 2006)
Sensor information: No soil moisture sensors for Valencia orchards.
Turbine-type flow meter

Irrigation schedule and amounts:

Total irrigation Not available at reporting

Total rainfall: 29.3 in. for 2007
Total water input: Not available at reporting

Irrigation method:

Farmer uses 12” concrete outlet valve and attaches turbine meter to valve and poly-pipe. Farmer waters only directly under the canopy (root zone) by using raised berms in between rows (Oranges/Grapefruit). Farmer reforms raised berms after each harvest in order to channel water at a faster rate to the end of the bed as a potential water conserving irrigation method for flood irrigating mature citrus.

Observations made during the crop season:

Valencia oranges are located in same irrigation block as Rio red grapefruit site #01C with similar soil characteristics.

Yield:

Not available at reporting

Water use summary:

Not available at reporting

Economic Summary: Demonstration Site 01B

The Demonstration Site 1B analysis consists of a 10-year financial outlook (2007-2016) for the 15 acres of Valencia oranges under narrow border flood irrigation. The orchard was assumed to be six years old. The Valencia orange price is held constant at $150/ton. 2007 production costs and overhead charges are producer estimated rates.

Total cash receipts average $2,522/acre over the 10-year period and cash costs average $1,280/acre, including $100/acre irrigation costs. Net cash farm income (NCFI) averages $1,242/acre due largely to the price being held at a constant $150/ton and increasing yields through 2009 as trees mature. The risk associated with prices and yields suggests a 12.9% chance of negative NCFI. In a normal production year, NCFI could range as much as -$633/acre to $3,467/acre. Reflecting the potential of negative NCFI, the probability of carryover debt is 14% in 2007 and then declines to 2% or less by

3. Site: #01C- 2007-08

Site Description:

Acres: 85.0
Soil type: clay loam 0-18 inches, loam 18-36 inches
Crop variety: Rio Red grapefruit
Harvest season: May 06-May 07
Field characteristics: 15’ x 24’ spacing (115 trees/Acre)
Irrigation district: None-Class B water owner

Irrigation system:

Narrow bordered flood, polypipe

Fertilizer applied:

500 lbs/A 12-24-12 Early May ’06; then several applications of 20-0-0-40 5 gal/A throughout growing season (May, June, July 2006) and 7 gal/A N32 (Nov 2006)
Sensor information: Soil moisture: Decagon data logger EM-50, ECHO-10 probes, Probes set at 6”, 12”, and 24” depths; and Davis Instruments Rain gauge located on adjacent Site #01C. Watchdog datalogger and Watermark sensors placed at same depths.
Turbine-type flow meter

Irrigation schedule and amounts:

Total irrigation: Not available at reporting

Total rainfall: 29.32” inches(**2007-08)**
Total water input: Not available at reporting

Irrigation method:

Farmer uses 12” concrete outlet valve and attaches turbine meter to valve and poly-pipe. Farmer waters only directly under the canopy (root zone) by using raised berms in between rows (Grapefruit). Farmer reforms raised berms after each harvest in order to channel water at a faster rate to the end of the bed as a potential water conserving irrigation method for flood irrigating mature citrus.

Observations made during the crop season:

Yield: (2007-08)

Not available at reporting

Water use summary:

Not available at reporting

Economic Summary: Demonstration Site 1C

The Demonstration Site 1C analysis consists of a 10-year financial outlook (2007-2016) for the 85 acres of Rio Red grapefruit production under narrow border flood irrigation. The orchard was assumed to be 6 years old. The Rio Red grapefruit price is held constant at $150/ton. 2007 production costs and overhead charges are producer estimated rates.

Total cash receipts average $2,676/acre over the 10-year period and cash costs average $1,442/acre, including $100/acre irrigation costs. Net cash farm income (NCFI) averages $1,233/acre due largely to the price being held at a constant $150/ton and increasing yields from maturing trees. The risks associated with prices and yields suggest a 14.3% chance of negative NCFI. In a normal production year, NCFI could range as much as -$766/acre to $3,729/acre. Reflecting the potential of negative NCFI, the probability of carryover debt is 16% in 2007 and then declines to 3% or less by 20

4. Site: # 01E – 2007-08

Site Description:

Acres: 32.0
Soil characteristics: Rio Grande silt loam, Loam at 6”, 12” and 24” depths.
Crop variety: Yellow (Cougar var.)
Irrigation district: None-Class B water owner
Field characteristics: Onions planted mid Oct ’07, March harvest prediction.
48 inch beds, 80 inch center-to-center;
6 onion lines per bed

Irrigation system:

Furrow Irrigated

Fertilizer applied:

unknown

Soil moisture sensors:

6”, 12” and 24” depths, watermark sensors and watchdog data logger for easy viewing of real time readings.

Irrigation schedule and amounts:

Total irrigation Not available at reporting

Total rainfall: 2.4 inches (Oct. ‘07 to Feb. 15, 2008)
Total water input Not available at reporting

Irrigation method:

Furrow irrigated by polypipe from 10” irrigation header

Observations made during the crop season:

Yield:

Not available at reporting

Water use summary:

Not available at reporting

5. Site: # 02A – 2007-08

Site Description:

Acres: 14.0
Soil characteristics: sandy clay loam 0-24 inches, sandy clay 24-36 inches
Crop variety: Henderson grapefruit
Irrigation district: United
Field characteristics: 15’ x 24’ spacing (115 trees/Acre)

Irrigation system:

Narrow bordered flood

Fertilizer applied:

Granular - 300lbs/ac 34-0-0-12 Fall; 150lbs/ac 34-0-0-12 Spring
Sensor information: Soil moisture: Decagon data logger EM-50, ECHO-10 probes, Watermark data logger and watermark sensor probes also set at 6, 12, 24 and depths;

Irrigation schedule and amounts:

Total irrigation: Not available at report time

Total rainfall: 23.02” for 2007 year

Total water input: Not available at report time

Irrigation method:

Watered every 4 to 5 weeks during the summer months; approx. 240 gal/week per tree. Farmer reforms raised berms between rows to channel water at a faster rate to the end of the bed. Farmer uses 12” concrete outlet valve and we installed a 10-inch pipe with Siemens Transit-time meter in March 2007.

Yield:

Not available at report time

Water use summary:

Not available at report time

Economic Summary:

The Demonstration Site 02A analysis consists of a 10-year financial outlook (2007-2016) for the 14 acres of Henderson grapefruit under border flood irrigation. The orchard trees were assumed to have mostly mature trees with some replanted trees reaching maturity over the next three years. The Henderson grapefruit price is held constant at $150/ton. 2007 production costs and overhead charges are producer estimated rates.

Total cash receipts average $2,609/acre over the 10-year period and cash costs average $1,366/acre, including $136/acre variable irrigation costs in 2007. Net cash farm income (NCFI) averages $1,243/acre due largely to the price being held constant at $150/ton. The risk associated with prices and yields suggests some chance of negative NCFI. In a normal production year, NCFI could range as much as -$408/a

6. Site: # 02B – 2007-08

Site Description:

Acres: 5.0
Soil characteristics: sandy clay loam 0-36”
Crop variety: Rio Red grapefruit
Irrigation district: United
Field characteristics: 15’ x 24’ spacing (115 trees/Acre)

Irrigation system:

Microjet spray

Fertilizer applied:

Granular -300lbs/ac 34-0-0-12 Fall; 150lbs/ac 34-0-0-12 Spring

Soil moisture sensor monitoring:

Decagon data logger EM-50, ECHO-10 probes, Probes set at 6, 12, 24 and 36 inch depths; Watchdog Data logger and 6”, 12” and 24” watermark soil moisture sensors, Davis Instruments Rain gauge.
Water meter: 2 inch turbine meter installed at end of season, March 2007.

Irrigation schedule and amounts:

Total irrigation: Not available at report time

Total rainfall: 23.02” for 2007 year

Total water input: Not available at report time

Observations made during the crop season:

Heavy rains during August and September 2007.

Yield:

Not available at report time

Water use summary:

Not available at report time

Economic Summary: Demonstration Site 02B

The Demonstration Site 02B analysis consists of a 10-year financial outlook (2007-2016) for the 8 acres of Rio Red grapefruit under micro-jet spray irrigation. The orchard trees were assumed to have mostly mature trees with some replanted trees reaching maturity over the next three years. The Rio Red grapefruit price is held constant at $200/ton. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a micro-jet spray system at a cost of $1,800 per acre. The micro-jet spray system expense is evenly distributed ($180/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $3,291/acre over the 10-year period and cash costs average $1,544/acre, including $136/acre irrigation costs in 2007. Net cash farm income (NCFI) averages $1,747/acre due largely to the price being held constant at $200/ton. The risk associated with prices and yields suggests some chance of negative NCFI. In a normal production year, NCFI could range as much as -$931/acre to $3,831/acre. The risk largely reflects the conservative $200/ton price.

7. Site: # 02C – 2007-08

Site Description:

Acres: 4.0
Soil characteristics: sandy clay loam 0-36 inches
Crop variety: Rio Red grapefruit
Irrigation district: United

Irrigation system:

Drip Irrigation
Field characteristics: 15' x 24' spacing (115 trees/Acre)

Fertilizer applied:

Granular -300lbs/ac 34-0-0-12 Fall; 150lbs/ac 34-0-0-12 Spring

Soil moisture sensor monitoring:

No data sensor equipment installed, soil profile contains hard limestone and caliche deposits not allowing installation of watermark sensors on this block.

Irrigation schedule and amounts:

Total irrigation: Not available at report time

Total rainfall: 23.02" for 2007 year

Total water input: Not available at report time

Observations made during the crop season:

This site is newly established and not completely equipped. The site will be completely operational for the 2007 crop year. Recently installed 2 inch water meter in June '07 to determine water delivered to drip irrigated acreage.
Note: Attempted to install soil moisture sensing equipment. Due to a heavy layer of thick caliche; no equipment was installed.

Yield:

Not available at report time

Water use summary:

Not available at report time

Economic Summary: Demonstration Site 02C

The Demonstration Site 02C analysis consists of a 10-year financial outlook (2007-2016) for the 4 acres of Ruby Red grapefruit under drip irrigation. The orchard trees were assumed to have mostly mature trees with some replanted trees reaching maturity over the next three years. The Ruby Red grapefruit price is held constant at $150/ton. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a drip system at a cost of $1,200 per acre. The drip system expense is evenly distributed ($120/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $2,185/acre over the 10-year period and cash costs average $1,495/acre, including $136/acre irrigation costs in 2007. Net cash farm income (NCFI) averages $690/acre due largely to the price being held constant at $150/ton. The risk associated with prices and yields suggests some chance of negative NCFI. In a normal production year, NCFI could range as much as -$930/acre to $2,938/acre. The risk largely reflects the conservative $150/ton price.

8. Site # 03 A -2007-2008

Site Description:

Acres: 41.3
Soil characteristics: Sandy clay loam 0-36 inches
Crop variety: Rio Red grapefruit
Irrigation district: Harlingen 1

Irrigation system:

Conventional Flood
Field characteristics: 15’ x 24’ spacing (115 trees/Acre)

Fertilizer applied:

Ammonium Sulfate (21-0-0); Applied: Jan-06, 588 lbs Mar-07, 622 lbs
Temik pesticide applied in Mar-07; 45 lbs/ac

Soil moisture sensor monitoring:

Decagon data logger EM-50, ECHO-10 probes, Probes set at 6, 12, and 24 inch depths; Irrometer Watermark Data logger and Watermark soil moisture sensors at same depths; Davis Instruments Rain gauge.
Water meter: None.

Irrigation schedule and amounts:

Total irrigation: Not available at report time

Total rainfall: 21.0 inches

Total water input: Not available at report time

Irrigation method:

Conventional Flood
In process of obtaining current water usage numbers from irrigation district and grower.

Observations made during the crop season:

This site is set up with high mounted (30”) freeze protection watering system. This system could be set up as drip or micro jet irrigation in the future.

Yield:

Not available at report time

Water use summary:

Not available at report time

9. Site # 04 A – 2007-2008

Site Description:

Acres: 16.5
Soil characteristics: sandy clay loam 0-24 inches, clay 24-36 inches
Crop variety: Rio Red grapefruit
Irrigation district: Hidalgo 1

Irrigation system:

Drip Irrigation
Field characteristics: 15' x 24' spacing (115 trees/Acre)
Fertilizer applied: 20 gal./ac. 7-21-0 & 5 gal./ac N-32
Soil moisture sensor monitoring: Decagon data logger EM-50, ECHO-10 probes at 6, 12 and 24 inches under center of tree canopy and within 6 inches of drip line, Tipping bucket rain gauge.
Water meter: grower has own meters

Irrigation schedule and amounts:

Total irrigation: Not available at report time

Total rainfall: 34.13 inches

Total water input: Not available at report time

Irrigation method:

Single line Drip system

Observations made during the crop season:

Minimal sheep nose effect on grapefruit was noticed on 2006 crop.
Sandy clay loam found to a depth of 24"; at 36" levels found clay soils.
Installed Watermark sensors at 6, 12, 24 inches deep under canopy and 12 inch deep at tree drip line with Watch Dog data logger for grower to use visual readings to aid in soil moisture indication.

Yield:

Total: 334 tons or 20.24 tons/Ac; 159.75 tons #1's and 47.92 tons #2's, 111.82 tons juice /shrink

Water use summary:

Irrigation use efficiency (IUE): 15.3 **lbs/inch per tree** applied by irrigation
Water use efficiency (WUE): 6.0 **lbs/inch per tree** (irrigation + rainfall)

Economic Summary: Demonstration Site 04A

The Demonstration Site 04A analysis consists of a 10-year financial outlook (2007-2016) for the 16 acres of Rio Red grapefruit under 1-line drip irrigation. The orchard trees were assumed to have mature trees. The Rio Red grapefruit price is held constant at $100/ton. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a 1-line drip system at a cost of $1,500 per acre. The 1-line drip system expense is evenly distributed ($150/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $2,000/acre over the 10-year period and cash costs average $1,720/acre, including $107/acre irrigation costs in 2007. Net cash farm income (NCFI) averages $280/acre due largely to the price being held constant at $100/ton.. The risk associated with prices and yields suggests some chance of negative NCFI. In a normal production year, NCFI could range as much as -$938/acre to $2,375/acre. The risk largely reflects the conservative $100/ton price.

10. Site # 04 B - 2007-2008

Site Description:

Acres: 30
Soil characteristics: clay loam, 0-6 inches, clay, 6 -36 inches
Crop variety: Rio Red grapefruit
Irrigation district: Hidalgo 1

Irrigation system:

Microjet spray
Field characteristics: 15' x 24' spacing (115 trees/Acre)
Fertilizer applied: 20 gal./ac. 7-21-0 & 5 gal./ac N-32

Soil moisture sensor monitoring:

Decagon data logger EM-50, ECHO-10 probes at 6, 12 and 24 inches under center of tree canopy and within 6 inches of drip line, Tipping bucket rain gauge. Water meter: grower has own meters

Irrigation schedule and amounts:

No current water usage numbers at this time.

Total irrigation: Not available at report time

Total rainfall: 16.7 inches

Total water input: Not available at report time

Irrigation method:

Microjet spray system. Single riser with 360 degree rotation spray emitter placed at the middle between trees to minimize spray on tree trunk.

Observations made during the crop season:

Observed dry conditions at drip line (edge of canopy) for both drip and microjet sites unless there was measurable rainfall.

Yield:

Not available at report time.

Water use summary:

Not available at report time

Economic Summary: Demonstration Site 04B

The Demonstration Site 04B analysis consists of a 10-year financial outlook (2007-2016) for the 9 acres of Rio Red grapefruit under micro-jet spray irrigation. The orchard trees were assumed to have mature trees. The Rio Red grapefruit price is held constant at $100/ton. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a micro-jet spray system at a cost of $2,500 per acre. The micro-jet spray system expense is evenly distributed ($250/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $2,000/acre over the 10-year period and cash costs average $1,800/acre, including $107/acre irrigation costs in 2007. Net cash farm income (NCFI) averages $200/acre due largely to the pricing being held constant at $100/ton. The risk associated with prices and yields suggests some chance of negative NCFI. In a normal production year and mature trees (2011-2015), NCFI could range as much as -$1,000/acre to $2,333/acre. This risk reflects the conservative $100/ton price.

11. Site: # 05C – 2007-08

Site Description:

Acres: 74.0
Soil characteristics: sandy clay loam
Crop variety: White Onion
Irrigation district: Delta Lake

Irrigation system:

Sub-surface drip
Field characteristics: Onions planted early Oct '07, and should harvest mid Mar '08
60 inch beds,18" emitter spacing with 6 onion lines per bed, rows spaced 7 inches apart.

Fertilizer applied:

Unknown

Soil moisture monitoring:

Decagon data logger EM-50, ECHO-10 probes, Probes set at depths 6-, 12-, and 24-inch bed center, and 6- and 12-inches at edge of bed;

Irrigation schedule and amounts:

Total irrigation: Not available at report time

Total rainfall: 6.93 inches (Oct. thru March)

Total water input: Not available at report time

Irrigation method:

Drip tape buried center of bed, 4 to 6 inches deep, 7/8 inch tape at low flow rate of 0.24 gph. Irrigation scheduling was not based on soil moisture monitoring but by grower experience. Irrigated using a portable sand filter/ pump combination and metered each time.

Yield:

Not available at report time

12. Site: #06A - 2007-08

Site Description:

Acres: 1.1 Soil characteristics: silty clay loam 0-36 inches
Crop variety: Rio Red grapefruit
Harvest season: Jan 06-Mar '07
Irrigation district: Hidalgo Cameron 9

Irrigation system:

Traditional Flood
Field characteristics: 16' x 25' spacing (105 trees/Acre)
Fertilizer applied: 1 lb Nitrogen/tree/yr 21-0-0
Soil moisture sensor monitoring: Watch Dog data logger, Watermark soil moisture sensors, Sensors set at 6", 12", and 24" and 36" depths;
Rain gauge: WatchDog datalogger
Water meter: 1" turbine-type flow meter

Irrigation schedule and amounts:

Total irrigation: Not available at report time

Total rainfall: 23.61 inches

Total water input: Not available at report time

Irrigation method:

Flood with 10" inline turbine meter

Observations made during the crop season:

Decided to return this plot back to traditional flood to reinvigorate citrus trees.

Yield:

Total: Drip 19.0 tons/Ac; 55% fresh pack and 45% juice marketable fruit
Total: Spray 20.0 tons/Ac; 54% fresh pack and 46% juice marketable fruit

Water use summary:

Not available at report time

13. Site: #06B – 2007-08

Site Description:

Acres: 1.0 (flood)
Soil characteristics: silty clay loam 0-36 inches
Crop variety: Rio Red grapefruit
Irrigation district: Hidalgo Cameron 9

Irrigation system:

Flood, conventional
Field characteristics: 15' x 24' spacing (115 trees/Acre)
Fertilizer applied: 1 lb Nitrogen/tree/yr 21-0-0
Soil moisture sensor monitoring: Watch Dog data logger, Watermark soil moisture sensors, Sensors set at 6", 12", and 24" and 36" depths;
Rain gauge: WatchDog data logger
Water meter: 10" turbine-type flow meter

Irrigation schedule and amounts:

Irrigation performed using grower experience and estimations from Etc, typically irrigated at every 4-5 week intervals depending upon rainfall amount

Total irrigation: Not available at report time

Total rainfall: 23.61 inches

Total water input: Not available at report time

Irrigation method:

Traditional flood irrigation of field with 4 rows of citrus trees per field irrigated area

Observations made during the crop season:

Pruning caused decline in yields during years 2005-2006.

Yield:

Total: Drip 19.0 tons/Ac; 55% fresh pack and 45% juice marketable fruit
Total: Spray 20.0 tons/Ac; 54% fresh pack and 46% juice marketable fruit

Water use summary:

Not available at report time

14. Site: #06C – 2007-08

Site Description:

Acres: 7.3 (flood)
Block N-O1
Soil characteristics: sandy clay loam
Crop variety: Rio Red grapefruit , 5 years old
Irrigation district: Hidalgo Cameron 9

Irrigation system:

Flood, conventional
Field characteristics: 15' x 24' spacing (121trees/Acre)
Fertilizer applied: ???
Soil moisture sensor monitoring: Watch Dog data logger, Watermark soil moisture, Lysimeter tube collectors, sensors, Sensors set at 6", 12", and 24" and 36" depths;
Rain gauge: WatchDog datalogger
Water meter: 10" turbine-type flow meter

Irrigation schedule and amounts:

Irrigation performed using grower experience and estimations from Etc, typically irrigated at every 4-5 week intervals depending upon rainfall amount

Total irrigation: Not available at report time

Total rainfall: 23.61 inches

Total water input: Not available at report time

Irrigation method:

Traditional flood irrigation of field with 4 rows of citrus trees per field irrigated area

Yield:

Not available at report time

Water use summary: ??

Not available at report time

15. Site #21C - 2007-08

Site Description:

Acres: 35.5
Soil type: Sandy Loam (from 0 to 24-inch depth)
Crop Variety: Cotton FM 832 (P 03/03/07; H 08/15/07)

Irrigation system:

furrow (by poly-pipe)
Field characteristics: 40-inch beds; 825 foot-long rows; 59,500 plants/acre
Fertilizer applied: total NPK 67-33-0 (side dressing) type 20-10-0-4 (30gal/ac)

Sensor and flow meter information:

Watermark and Echo-20 probes (12, 24 & 36-inch depth) connected to data loggers
Portable flow meter

Irrigation schedule and amounts:

Total irrigation of 18.3 inches/acre in 2 events (from 1st bloom stage)
Total rainfall of 17.5 inches/acre
Total water input of 35.8 inches/acre

Irrigation method:

Irrigation scheduling was not based on soil moisture; water was running until it reached the end of the furrows; water was provided by the district (pipeline)

Observations made during the crop season:

The cotton crop was never under serious water stress that season

Yield:

2,828 lbs/acre (1.9 bale/acre based on 478 lbs/bale)

Water use summary:

IUE: 155 lbs/inch of water applied by irrigation
WUE: 79 lbs/inch of water received (irrigation + rainfall)

16. Site #21D – 2007-2008

Site Description:

Acres: 18.0
Soil type: Sandy Loam (0-12-inch depth) and Sandy Clay Loam (12-24-inch depth)
Crop Variety: Rio Red Grapefruits (planted in 1988)

Irrigation system:

Border flood (with poly-pipe)
Field characteristics: 116 trees/acre; no ground cover

Fertilizer applied:

Total NPK 126-0-32
Type 28-0-7 (450lbs/acre)

Sensor and flow meter information:

(6, 12 & 24-inch depth) sensors connected to data logger;Portable flow meter

Irrigation schedule and amounts:

Total irrigation of 22.5 inches/acre (Jan-Dec ’07) in 5 events
Total rainfall of 22.0 inch/acre (Jan-Dec ’07)
Total water input of 42.5 inches/acre

Irrigation method:

Irrigation scheduling was not based on soil moisture; each pan was flooded until water covered the opposite end from the poly-pipe; water was provided by the district (pipeline)

Observations made during the crop season:

No flow or very little flow was noticed at the drain outlet after each irrigation event. The ground water was at 7 feet deep for a pH of 7.1 and an EC of 2,496ppm (year average). Irrigation events usually occurred when horizon profiles ranged between 0 and 50% AW; therefore, no water stress was noticeable

Yield:

40,000 lbs/acre (for season 2006-07)

17. Site #:21E-2007-08

Site Description:

Acres: 3.0
Soil type: Sandy Loam (from 0 to 24-inch depth)
Crop Variety: Sorghum Pioneer 84G62
(P 02/20/07; H 06/14/07)

Irrigation system:

furrow (by poly-pipe)

Field characteristics:

40-inch beds; 900 foot-long rows; 82,300 plants/acre

Fertilizer applied:

total NPK 45-22-0 (side dressing) type 20-10-0-4 (20gal/ac)

Sensor and flow meter information:

Watermark sensors (6, 12 & 24-inch depth) connected to data logger
Portable flow meter

Irrigation schedule and amounts:

Total irrigation of 6.4 inches/acre in 1 event (stage 4: final leaf visible in whorl)
Total rainfall of 7.6 inches/acre (local rain gauge)
Total water input of 14.0 inches/acre

Irrigation method:

Irrigation scheduling was not based on soil moisture; water was running until it reached the end of the furrows; water was provided by the district (pipeline)

Observations made during the crop season:

The 12-inch profile never went under water stress unlike the upper and lower profiles (serious water stress during 2 weeks around soft and hard dough with less than 0%AW)

Yield:

4,577 lbs/acre (with 14% grain moisture)

Water use summary:

IUE: 720 lbs/inch of water applied by irrigation
WUE: 327 lbs/inch of water received (irrigation + rainfall)

18. Site #23A – 2007-08

Site Description:

Acres: 10.0
Soil type: Sandy Clay Loam (12 and 36-inch depth) and Sandy Clay (24-inch depth)
Crop Variety: Valencia Oranges (Planted 1999)
Irrigation system: Micro-Jets (1 sprinkler/tree)
Field characteristics: population of 115 trees/acre, bare ground
Fertilizer applied: not known

Sensor and flow meter information:

Watermark (12, 24 -inch depth) and irrigation sensors connected to data logger
Water meter installed on one drip line

Irrigation schedule and amounts:

Total irrigation of 2.2 inches/acre (Apr'06-Mar'07)
Total rainfall of 18.5 inches/acre (Apr'06-Mar'07)
Total water input of 20.7 inches/acre

Irrigation method:

Irrigation scheduling was not based on soil moisture; each pan was flooded until water covered the opposite end from the poly-pipe; water was provided by the district (pipeline) into a reservoir

Observations made during the crop season:

No irrigation between June 2006 and March 2007 (problems with pump); sensors replaced at 6, 12 and 24-inch depth in December 2006

Yield:

20,100 lbs/acre (for season 2006-2007)

Water use summary:

IUE: 4,651 lbs/inch of water applied by irrigation
WUE: 746 lbs/inch of water received (irrigation + rainfall)

19. Site #:24A – 2007-08

Site Description:

Acres: 7.0
Soil type: Sandy Clay Loam (up to 24-inch depth) and Clay Loam (below 30-inch depth)
Crop Variety: Rio Red Grapefruits (Planted 1993)

Irrigation system:

Bordered flood

Field characteristics:

Population of 140 trees/acre, laser leveled bare ground

Fertilizer applied:

500 lbs/ac of ammonium sulfate at early bloom, and more (unknown)

Sensor and flow meter information:

Echo-20 probes (2-10, 16-24, 30-38 & 44-52-inch depth)
Portable flow meter

Irrigation schedule and amounts:

Total irrigation of 28.0 inches/acre (in 8 events: Feb'07-Jan'08)
Total rainfall of 24.6 inches/acre (Feb'07-Jan'08)
Total water input of 52.6 inches/acre

Irrigation method:

There is a border every other row and each pan is irrigated by one alfa-alfa valve (connected to canal: water provided by the district) until water fills in at the opposite side. Since the grower has a capacity of two heads, he opens four valves at a time (four pans). The design of his system allows him to apply about 3.5 inch for each irrigation. Water advances on the laser leveled ground 100 feet within 20 minutes. Irrigation scheduling was not based on soil moisture.
Observations made during the crop season:
Irrigation events usually occurred when 0-24" horizon profile had about 0% AW while lower profiles were anywhere from FC to 50% AW

Yield:

21,800 lbs/acre (for season 2006-2007)

Water use summary:

IUE: 2,305 lbs/inch of water applied by irrigation
WUE: 1,165 lbs/inch of water received (irrigation + rainfall)

Economic Summary:

The Demonstration Site 24A analysis consists of a 10-year financial outlook (2007-2016) for the 7 acres of Rio Red grapefruit under border flood (every other row) irrigation. The orchard was assumed to have mature trees. The Rio Red grapefruit price is held constant at $140/ton. 2007 production costs and overhead charges are producer estimates.

Total cash receipts average $3,097/acre over the 10-year period and cash costs average $1,163/acre, including $168/acre variable irrigation costs. Net cash farm income (NCFI) averages $1,934/acre due largely to the price being held at a constant $140/ton. The risks associated with prices and yields suggest little chance of negative NCFI. In a normal production year, NCFI could range as much as $286/acre to $3,857/acre.

20. Site #28A – 2007-08

Site Description:

Acres: 8.0
Soil type: Sandy Loam (up to 30-inch depth)
Crop Variety: Valencia Oranges (Planted 2003)

Irrigation system:

Micro-Jets (1 sprinkler/tree)
Field characteristics: population of 115 trees/acre; bare ground, drain tiles

Fertilizer applied:

Total NPK 14-0-0 (fertigation) type 9-0-0-12 (13gal/ac)

Sensor and flow meter information:

Watermark (6, 18 & 24-inch depth) and irrigation sensors connected to data logger
Water meter installed at the pump house

Irrigation schedule and amounts:

Total irrigation of 16.0 inches/acre (Apr'07-Mar'08)
Total rainfall of 20.3 inch/acre (Apr'07-Mar'08)
Total water input of 36.3 inches/acre

Irrigation method:

Irrigation scheduling was based on soil moisture and an average of 0.7 inch/acre was applied each time (total of 22 applications); water was provided by the district (pipeline) into a reservoir (sand media filtration and pump system)

Observations made during the crop season:

Irrigation is triggered when 0-12" profile is at 0% AW or less while the 24" profile ranges between FC and 50%AW

Yield:

1,000 lbs/ace (for season 2006-2007)

Economic Summary: Demonstration Site 28A

The Demonstration Site 28A analysis consists of a 10-year financial outlook (2007-2016) for the 8 acres of Valencia oranges under micro-jet spray irrigation. The orchard trees were assumed to be 4 years old. The Valencia orange price is held constant at $140/ton. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a micro-jet spray system at a cost of $1,000 per acre. The micro-jet spray system expense is evenly distributed ($100/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $2,014/acre over the 10-year period and cash costs average $984/acre, including $55/acre irrigation costs in 2007. Net cash farm income (NCFI) is negative in 2007 reflecting lower levels of production from immature trees. It then increases from $145/acre in 2008 to about $1,440/acre in 2016. The risk associated with prices and yields suggests a minimal chance of negative NCFI after 2009 when the trees reach maturity. In a normal production year and mature trees (2010-2016), NCFI could range as much as $250/acre to $3,750/acre. Due to negative NCFI, the probability of carryover debt is 99% or greater during 2007 and then declines to 1% or less in 2012 as the trees reach maturity and annual production increases.

21. Site #:28B -2007-08

Site Description:

Acres: 3.3
Soil type: Sandy Loam (up to 30-inch depth)
Crop Variety: Rio Red Grapefruits (Planted 1992)

Irrigation system:

Flood converted to drip in August 2006 (surface double line 30-inch emitter)

Field characteristics:

Population of 116 trees/acre; bare ground

Fertilizer applied:

Total NPK 72-26-26 (fertigation) type 5-26-3-3 (9gal/acre), 28-0-0-5 (16 gal), 9-0-0-12 (3 gal) and 6-0-12 (17 gal)

Sensor and flow meter information:

Watermark (6, 18 & 24-inch depth) and irrigation sensors connected to data logger
Water meter installed at the pump house

Irrigation schedule and amounts:

Total irrigation of 40.8 inches/acre (Feb'07-Jan'08), including 2 flood irrigations (12 inches total)
Total rainfall of 20.3 inches/acre (Feb'07-Jan'08)
Total water input of 61.1 inches/acre

Irrigation method:

Irrigation scheduling was based on soil moisture and an average of 0.7 inch/acre was applied each time; water was provided by the district (pipeline) into a reservoir (sand media filtration and pump system)

Observations made during the crop season:

Irrigation triggering occurred to ensure that 12-inch profile was kept with a moisture level between 0 and 50% AW

Yield:

62,400 lbs/acre (for season 2006-2007)

Economic Summary: Demonstration Site 28B1

The Demonstration Site 28B1 analysis consists of a 10-year financial outlook (2007-2016) for the 5 acres of Marrs under 2-line drip irrigation. The orchard trees were assumed to have mature trees. The Marrs orange price is held constant at $120/ton. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a 2-line drip system at a cost of $1,000 per acre. The 2-line drip system expense is evenly distributed ($100/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $2,036/acre over the 10-year period and cash costs average $1,056/acre, including $110/acre irrigation costs in 2007. Net cash farm income (NCFI) averages $980/acre due largely to the price being held constant at $120/ton. The risk associated with prices and yields suggests a small chance of negative NCFI after 2011 when the trees reach maturity. In a normal production year, NCFI could range as much as -$200/acre to $3,000/acre. Due to negative NCFI, the probability of carryover debt is 12% or less in 2007 and then declines to 1% or less in 2010.

Economic Summary: Demonstration Site 28B2

The Demonstration Site 28B2 analysis consists of a 10-year financial outlook (2007-2016) for the 3 acres of Rio Red grapefruit under 2-line drip irrigation. The orchard was assumed to have mature trees. The Rio Red grapefruit price is held constant at $150/ton. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a 2-line drip system at a cost of $1,000 per acre. The 2-line drip system expense is evenly distributed ($100/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $3,300/acre over the 10-year period and cash costs average $1,190/acre, including $110/acre variable irrigation costs. Net cash farm income (NCFI) averages $2,113/acre due largely to the price being held at a constant $150/ton. The risks associated with prices and yields suggest a minimal chance of negative NCFI. In a normal production year, NCFI could range as much as $633/acre to $5,033/acre

22. Site #:28C – 2007-08

Site Description:

Acres: 8.0
Soil type: Sandy Loam (up to 30-inch depth)
Crop Variety: Rio Red Grapefruits (Planted 1992)

Irrigation system:

Micro-Jets (1 sprinkler/tree)

Field characteristics:

Population of 116 trees/acre; bare ground

Fertilizer applied:

Total NPK 161-53-17 (fertigation) type 7-21-0 (6gal/acre), 28-0-0-5 (41 gal), 9-0-0-12 (10 gal), 5-34-0-4 (13 gal) and 6-0- 12 (13 gal)

Sensor and flow meter information:

Watermark (6, 18 & 24-inch depth) and irrigation sensors connected to data logger
Water meter installed at the pump house

Irrigation schedule and amounts:

Total irrigation of 30.8 inches/acre (Feb'07-Jan'08), including 6 inches by flood
Total rainfall of 20.3 inches/acre (Feb'07-Jan'08)
Total water input of 51.1 inches/acre

Irrigation method:

Irrigation scheduling was based on soil moisture and an average of 0.7 inch/acre was applied each time by Micro-Jet; water was provided by the district (pipeline) into a reservoir (sand media filtration and pump system)

Observations made during the crop season:

Soil moisture levels never reached 0%AW during the season, on the 0-24" profile

Yield:

62,400 lbs/acre (for season 2006-2007)

Economic Summary: Demonstration Site 28C

The Demonstration Site 28C analysis consists of a 10-year financial outlook (2007-2016) for the 8 acres of Rio Red grapefruit under micro-jet spray irrigation. The orchard was assumed to have mature trees. The Rio Red grapefruit price is held constant at $150/ton. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a micro-jet spray system at a cost of $1,000 per acre. The micro-jet spray system expense is evenly distributed ($100/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $3,301/acre over the 10-year period and cash costs average $1,189/acre, including $110/acre variable irrigation costs. Net cash farm income (NCFI) averages $2,112/acre due largely to the price being held at a constant $150/ton. The risks associated with prices and yields suggest a minimal chance of negative NCFI. In a normal production year, NCFI could range as much as $625/acre to $5,000/acre.

23. Site #:28D – 2007

Site Description:

Acres: 7.0
Soil type: Sandy Loam (up to 30-inch depth)
Crop Variety: Marrs and Navel (Planted 1991)

Irrigation system:

Drip (surface double line 30-inch emitter)

Field characteristics:

Population of 115 trees/acre; bare ground

Fertilizer applied:

Total NPK 132-65-54 (fertigation) type 7-21-0 (9gal/acre), 28-0-0-5 (29 gal), 6-0-12 (37 gal) and 5-26-3-3 (14 gal)

Sensor and flow meter information:

Watermark (6, 18 & 24-inch depth) and irrigation sensors connected to data logger
Water meter installed at the pump house

Irrigation schedule and amounts:

Total irrigation of 32.7 inches/acre (Jan'07-Dec'07)
Total rainfall of 21.9 inches/acre (Jan'07-Dec'07)
Total water input of 54.6 inches/acre

Irrigation method:

Irrigation scheduling was based on soil moisture and an average of 0.9 inch/acre was applied each time; water was provided by the district (pipeline) into a reservoir (sand media filtration and pump system)

Observations made during the crop season:

Soil moisture levels never reached 0%AW during the season, on the 0-24" profile

Yield:

35,800 lbs/acre vs. 26,000 lbs/acre (for season 2006-2007)

Water use summary:

IUE: 1,100 lbs/inch of water applied by irrigation
WUE: 656 lbs/inch of water received (irrigation + rainfall)

Economic Summary: Demonstration Site 28D

The Demonstration Site 28D1 analysis consists of a 10-year financial outlook (2007-2016) for the 3.5 acres of Navel oranges under 2-line drip irrigation. The orchard was assumed to have mature trees. The early orange price is held constant at $140/ton. 2007 production costs and overhead charges are producer estimates.

The analysis also includes the purchase and use of a 2-line drip system at a cost of $1,000 per acre. The 2-line drip system expense is evenly distributed ($100/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $1,891/acre over the 10-year period and cash costs average $1,054/acre, including $110/acre variable irrigation costs. Net cash farm income (NCFI) averages $837/acre due largely to the price being held at a constant $140/ton. The risks associated with prices and yields suggest some chance of negative NCFI. In a normal production year, NCFI could range as much as -$171/acre to $3,167/acre. Due to negative NCFI, the probability of carryover debt is 10% or less in 2007 and then declines to 1% or less in 2010.

The Demonstration Site 28D2 analysis consists of a 10-year financial outlook (2007-2016) for the 3.5 acres of Marrs oranges under 2-line drip irrigation. The orchard was assumed to have mature trees. The early orange price is held constant at $120/ton. 2007 production costs and overhead charges are producer estimates.

The analysis also includes the purchase and use of a 2-line drip system at a cost of $1,000 per acre. The 2-line drip system expense is evenly distributed ($100/acre/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $2,037/acre over the 10-year period and cash costs average $1,054/acre, including $110/acre variable irrigation costs. Net cash farm income (NCFI) averages $980/acre due largely to the price being held at a constant $120/ton. The risks associated with prices and yields suggest some chance of negative NCFI. In a normal production year, NCFI could range as much as -$171/acre to $3,114/acre. Due to negative NCFI, the probability of carryover debt is 12% or less in 2007 and then declines to 2% or less in 2009.

24. Site #30A – 2007-08

Site Description:

Acres: 30.0
Soil type: Sandy Loam
Crop Variety: Pasture Bermuda grass (Tifton 85)

Irrigation system:

625-foot center pivot (MESA) with 62 rotating spray applicators and a terminal gun

Fertilizer applied:

250 lbs/acre of Nitrogen

Objectives:

Evaluate the Distribution Uniformity (DU) and estimate the irrigation cost of the center pivot

Material and Methods:

- Layout of 2 lines of 26 catch cans (quart size), parallel to center pivot spans, every 25 feet (measuring wheel) to capture and measure (graduated cylinder) irrigation depth (ml converted into inches/acre)
- Measurement of weather conditions (wind, temperature, evaporation rate) with a specific device
- Estimation of the flow rate at the pivot (water meter) and at the applicators (gpm)
- Measurement of the advancement speed of the terminal center pivot wheel (feet/min) with a stop watch

Results:

- The estimated flow rate measured at the center pivot (40 psi) is 447 gpm with an average 7.2 gpm per spray applicator
- The center pivot run for 4 complete cycles per irrigation at a 50% speed setting (25 hours/cycle, resulting in 2.82 feet/min for the outer drive advancement speed). An average irrigation depth of 0.76 inch/acre was measured for 1 cycle. Therefore, 3 inches are applied per irrigation.
- The DU based on the volumes collected was 76.3% while the Uniformity Coefficient (UC) was 85.8% under the present weather conditions (North wind of 0-5mph, Temp. 40-50°F)

Conclusion & Economic Summary:

- UC and DU could be improved by checking, adjusting, or replacing some sprinklers where heavier or lighter volumes were collected. The ending gun nozzle didn’t have enough pressure either.

Based on electric energy cost of $0.15/Kwh, pressure at the pump (40 psi), and lift (12 feet), the energy cost to run this center pivot is estimated around $2.23/acre-inch

25. Site #30B – 2007-08

Site Description:

Acres: 30.6
Soil type: Sandy Loam
Crop Variety: Pasture Bermuda grass (Tifton 85)

Irrigation system:

625-foot center pivot (MESA) with 62 rotating spray applicators and a terminal gun

Fertilizer applied:

250 lbs/acre of Nitrogen

Objectives:

Evaluate the Distribution Uniformity (DU) and estimate the irrigation cost of the center pivot

Material and Methods:

- Layout of 2 lines of 26 catch cans (quart size), parallel to center pivot spans, every 25 feet (measuring wheel) to capture and measure (graduated cylinder) irrigation depth (ml converted into inches/acre)
- Measurement of weather conditions (wind, temperature, evaporation rate) with a specific device
- Estimation of the flow rate at the pivot (water meter) and at the applicators (gpm)
- Measurement of the advancement speed of the terminal center pivot wheel (feet/min) with a stop watch

Results:

- The estimated flow rate measured at the center pivot (pressure 30 psi) is 290 gpm with an average 2.3 gpm per spray applicator
- The center pivot run for 4 complete cycles per irrigation at a 50% speed setting (22 hours/cycle, resulting in 3.45 feet/min for the outer drive advancement speed). An average irrigation depth of 0.42 inch/acre was measured for 1 cycle. Therefore, 1.66 inch is applied per irrigation
- The DU based on the volumes collected was 75.6% while the Uniformity Coefficient (UC) was 82.0% under the present weather conditions (South wind of 5-12mph, Temp. 57-69°F)

Conclusion & Economic Summary:

- UC and DU could be improved by checking, adjusting, or replacing some sprinklers where heavier volumes were collected based on electric energy cost of $0.15/Kwh, pressure at the pump (43 PSI), and lift (13 feet), the energy cost to run this center pivot is estimated around $2.39/acre-inch.

26. Site #:31A – 2007-08

Site Description:

Acres: 9.4
Soil type: Sandy Loam (up to 24-inch depth)

Crop Variety:

Rio Red Grapefruits

Irrigation system:

Drip (surface single line; 4-feet drip emitter; flow 1GPH)

Field characteristics:

116 trees/acre; no ground cover

Fertilizer applied:

Total NPK 132-65-54 (fertigation)
Type 7-21-0 (9gal/acre), 28-0-0-5 (29 gal), 6-0-12 (37 gal) and 5-26-3-3 (14 gal)

Sensor and flow meter information:

Watermark (6, 18 & 24-inch depth) and irrigation sensors connected to data logger
Water meter installed at the pump house

Irrigation schedule and amounts:

Total irrigation of 43.0 inches/acre (Feb'07-Jan'08)
Total rainfall of 24.2 inches/acre (Feb'07-Jan'08)
Total water input of 67.2 inches/acre

Irrigation method:

Irrigation scheduling was not based on soil moisture. Instead, automatic irrigation occurs whenever the canal is full. Water was provided by the district (canal)

Observations made during the crop season:

Soil moisture levels were not really reliable for this season (clogging or leaks) until the grower changed completely the drippers, the emitters, and the filtration system in November 2007

Yield:

36,000 lbs/acre (for season 2007-2008)

Economic summary:

IUE: 837 lbs/inch of water applied by irrigation
WUE: 536 lbs/inch of water received (irrigation + rainfall)

27. Site #:31B – 2007-08

Site Description:

Acres: 5.0

Soil type:

Sandy Clay (6 & 24-inch depth) and Clay (12-inch depth)

Crop Variety:

Rio Red Grapefruits

Irrigation system:

Border flood (with poly-pipe)

Field characteristics:

116 trees/acre; no ground cover

Fertilizer applied:

Total NPK 132-65-54 (fertigation) type 7-21-0 (9gal/acre), 28-0-0-5 (29 gal), 6-0-12 (37 gal) and 5-26-3-3 (14 gal)

Sensor and flow meter information:

Watermark (6, 12 & 24-inch depth) sensors with manual readings (3 times a week)
Portable flow meter

Irrigation schedule and amounts:

Total irrigation of 54.7 inches/acre (Feb'07-Jan'08) in 5 events
Total rainfall of 34.9 inches/acre (Feb'07-Jan'08)
Total water input of 89.6 inches/acre

Irrigation method:

Irrigation scheduling was not based on soil moisture. Each pan was flooded until water covered the opposite end from the poly-pipe. Water was provided by the district (pipeline)

Observations made during the crop season:

Soil moisture levels were showing that irrigation events occurred when the whole profile (6-24") had 0% or less AW, therefore the trees may have suffered from water stress. The water meter will need to be checked for accuracy

Yield:

. 27,000 lbs/acre (for season 2006-07)

28. Site #:31C – 2007-08

Site Description:

Acres: 10.0

Soil type:

Sandy Clay Loam (up to 24-inch depth)

Crop Variety:

Rio Red Grapefruits

Irrigation system:

Border flood (with open earthen ditch)
Field characteristics: 116 trees/acre; no ground cover

Fertilizer applied:

Total NPK 132-65-54 (fertigation) type 7-21-0 (9gal/acre), 28-0-0-5 (29 gal), 6-0-12 (37 gal) and 5-26-3-3 (14 gal)

Sensor and flow meter information:

Watermark (6, 12 & 24-inch depth) sensors with manual readings (3 times a week)
Portable flow meter

Irrigation schedule and amounts:

Total irrigation of 12.1 inches/acre (Feb'07-Jan'08) in 5 events
Total rainfall of 34.9 inches/acre (Feb'07-Jan'08)
Total water input of 47.0 inches/acre

Irrigation method:

Irrigation scheduling was not based on soil moisture. Each pan was flooded until water covered the opposite end from the open ditch. Water was provided by the district (pipeline)

Observations made during the crop season:

Soil moisture levels were generally drying faster than site 31b; this may have been caused by excessive cracking of the soil surface (higher clay level) which tends to break the contact between the sensor and the soil, allowing air to deplete the area faster. The water meter will need to be checked for accuracy

Yield:

42,000 lbs/acre (for season 2006-07)

Site #:32A – 2007-08

Site Description:
Acres: 64.0

Soil type:

Sandy Clay Loam (from 0 to 40-inch depth)

Crop Variety:

Sugar Cane 12-10 (P 11/01/06)

Irrigation system:

Furrow (by poly-pipe)

Field characteristics:

60-inch beds; 1,030 foot-long rows; 3 to 4 stocks/ linear foot at planting; drain tiles

Fertilizer applied:

Total NPK 22-104-0 (side dressing) Type 11-52-0 (200lbs/acre)

Sensor and flow meter information:

Echo-20 probes (2-10, 8-16, 20-28 & 32-40-inch depth) connected to data logger
Portable flow meter

Irrigation schedule and amounts:

Total irrigation of 28.1 inches/acre (since November ’06) in 6 events
Total rainfall of 30.5 inches/acre (since November ‘06)
Total water input of 58.6 inches/acre

Irrigation method:

Irrigation scheduling was not based on soil moisture; water was running until it reached the end of the furrows; water was provided by the district (pipeline)

Observations made during the crop season:

The whole profile never went under water stress thanks to the large amounts of rainfall received on a regular basis

Yield:

4.9 tons of sugar (or 9,800 lbs) per acre
41.9 tons of cane (or 83,800 lbs) per acre

Water use summary:

IUE of 349 lbs of sugar or 2,985 lbs of cane/inch of water applied by irrigation
WUE of 163 lbs of sugar or 1,397 lbs of cane/inch of water received by rain AND irrigation

29. Site #:33A – 2007

Site Description:

Acres: 45.5
Soil type: Clay (from 0 to 36-inch depth)
Crop Variety: Sorghum DK3707 (P 03/03/07; H 07/22/07)

Irrigation system:

Furrow (by poly-pipe)

Field characteristics:

40-inch beds; 1,280 foot-long rows; 95,000 plants/acre

Fertilizer applied:

Total NPK 80-30-0 (side dressing)

Sensor and flow meter information:

Watermark sensors (6, 12 & 24-inch depth) for manual readings (once a week)
Portable flow meter

Irrigation schedule and amounts:

Total irrigation of 10.0 inches/acre in 2 events (stage 6: half bloom and 8: hard dough)
Total rainfall of 19.5 inches/acre
Total water input of 29.5 inches/acre

Irrigation method:

Irrigation scheduling was based on soil moisture; water was running until it reached the end of the furrows; water was provided by the district (pipeline from a resaca)

Observations made during the crop season:

The 12-inch profile went under water stress around half bloom while the lower profile was always at field capacity (100% AW) or wetter. The large amounts of rainfall that occurred from June through July delayed the harvest operations (soil to wet to enter in the field) and affected the grain yield and quality

Yield:

4,500 lbs/acre

Water use summary:

IUE: 448 lbs/inch of water applied by irrigation
WUE: 152 lbs/inch of water received (irrigation + rainfall)

30. Site #:34A – 2007

Site Description:

Acres: 9.4
Soil type: Sandy Clay Loam (0 to 24-inch depth)
Crop Variety: Rio Red Grapefruits (Planted 1990)

Irrigation system:

Border flood (with poly-pipe)

Field characteristics:

116 trees/acre, with ground cover

Fertilizer applied:

Total NPK 125-0-0 (side dressing) type 21-0-0

Sensor and flow meter information:

Watermark (6, 12 & 24-inch depth) sensors with manual readings (3 times a week)
Portable flow meter

Irrigation schedule and amounts:

Total irrigation of 32.0 inches/acre (Feb'07-Jan'08) in 8 events
Total rainfall of 25.0 inches/acre (Feb'07-Jan'08)
Total water input of 57.0 inches/acre

Irrigation method:

Irrigation scheduling was based on soil moisture. Each area connected to a WM station was flooded independently, based on the readings, until water covered the opposite end from the poly-pipe. Water was provided by the district (pipeline)

Observations made during the crop season:

Soil moisture levels were showing that irrigation events occurred when the 12-inch profile was reaching approximately 50% AW

Yield:

Not available at report time

31. Site #:35A – 2007

Site Description:

Acres: 86.0
Soil type: Harlingen Clay (from 0 to 24-inch depth)
Crop Variety: St Augustine Floratan turf grass (H 10/09/07)

Irrigation system:

1,280 feet-long side-roll sprinklers (40-foot ramps)

Fertilizer applied:

Total NPK 800-100-300 (side dressing) type 4-1-2

Objectives:

Evaluate the Distribution Uniformity (DU) and estimate the irrigation cost of the side-roll sprinkler system

Material and Methods:

- Layout of 2 sets of 24 catch cans (quart size), parallel and on both sides of the irrigation line, by sprinkler 6 and 24, every 15 feet (measuring wheel) to capture and measure (graduated cylinder) irrigation depth (ml converted into inches/acre)
- Measurement of weather conditions (wind, temperature, evaporation rate) with a specific device
- Estimation of the flow rate at the hydrant and at the sprinklers (GPM)

Results:

- The estimated flow rate for the irrigation line containing 31 sprinkler heads (pressure 30-33 PSI) is 250 GPM with an average 8.1 GPM per spray applicator
- An average irrigation depth of 0.80 inch/acre was measured for a complete irrigation cycle (2 sets of 2 hours, 45 feet apart).
- The DU based on the volumes collected was 60.0% while the Uniformity Coefficient (UC) was 72.5% under the present weather conditions (South-East wind of 3-10mph, Temp. 74-78°F)

Sensor and flow meter information:

Watermark sensors (6, 12 & 24-inch depth) connected to data logger
Flow estimated (no meter)

Irrigation schedule and amounts:

Total irrigation of 7.2 inches/acre in 6 events (August’07-January’08)
Total rainfall of 10.1 inches/acre (August’07-January’08) from a local rain gauge
Total water input of 17.3 inches/acre (August’07-January’08)

Irrigation method:

Irrigation scheduling was based on soil moisture; each irrigation set lasts 2 hours before the ramp is moved 40-50 feet away for the following irrigation cycle; water was provided by the district (pipeline)

Observations made during the crop season:

The 12-inch profile never went under water stress unlike the upper and lower profiles (serious water stress during 2 weeks around soft and hard dough with less than 0%AW)

Yield:

70 pallets/acre/harvest (twice a year)

Conclusion & Economic summary:

IUE: 9.7 pallets/inch of water applied by irrigation (based on one harvest)
WUE: 4.3 pallets/inch of water received (irrigation + rainfall; based on one harvest)

Based on Diesel energy cost of $2.89/gallon, a pressure of 40PSI at the pump, and a lift of 7 feet (from the pipeline to the sprinkler heads), its costs about $3.26/acre-inch of water applied

32. Site # 41, Field 41A and 41B Spring 2007

Site Description:

The 39 acre field was planted in seed corn and divided into three equal sections, utilizing surge irrigation in the center section of the field. The soil type is Harlingen Clay (HA). The field has a slope of .0005' to the West and the same slope to the North.

Sensor Installation:

One row located 50 rows from the North side was selected for installing a Watermark 900M monitor to record data for the furrow irrigation section. One other site 75' north of the field turnout (center) was used to collect data for the surge irrigation section. The sensor sites were located 150' inside of the east turn row. Each sensor site consisted of a soil temperature probe set at a 9" depth, and soil moisture sensors buried at 6", 12", and 24". Portable McCrometer flow meters were used to measure the amount of water applied at the north turnout and at the center turnout.

Irrigation Schedule:

Date	Water Applied per Acre 41 A Surge	Water applied per acre 41 B Flood
3/12	5.47"	8.14"
4/26/07	7.6"	6.68"
5/21/07	4.25"	9.13"
Sub-total	17.32"	23.95"

Rainfall, monthly

March				1.59"
April				.59"
May				4.21"
June				3.47"
		Sub-total		9.86"
Total	41 A	27.18"	41 B	33.81"

Irrigation Method:

The surge controller was programmed to complete the irrigation cycle in 24 hours with the first alternation to occur at the 5 hour interval. The cooperator used 18” diameter polypipe. The surge controller was programmed to alternate 3 cycles in a 24-hour period. The row length is 1280’.

Observations:

The surge technology allows the grower to select alternation intervals at will; the shorter the interval, the greater the water savings. It is difficult to prevent the polypipe from tearing during the multiple inflate/deflate cycles. Selecting only three alternations in a 24-hour set insured a timely irrigation event and a minimum number of cycles with the consequence of applying 27% less water.
The Watermark 900M monitor performed well, logging the measurements as programmed thus providing continuous readings allowing the user to view the soil moisture trends.

Economic Summary: Demonstration Site 41A

The Demonstration Site 41 analysis consists of a 10-year financial outlook (2007-2016) for the 19.5 acres of seed corn production under surge irrigation. It is not assumed the seed corn acreage is rotated annually with another crop. The initial corn price, based on total compensation received by the producer, is $11.53/bu., including marketing loan deficiency payments, if applicable. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a surge valve at a cost of $1,800. The surge valve expense is evenly distributed ($180/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $667/acre over the 10-year period and cash costs average $241/acre, including $31/acre variable irrigation costs. In addition to market receipts, total receipts include direct and counter-cyclical payments paid to base acres. Net cash farm income (NCFI) averages $426/acre over the 10-year period. The risk associated with prices and yields suggests a minimal chance of negative NCFI. In a normal production year, NCFI could range as much as $103/acre plus or minus the average expected NCFI for the site.

Economic Summary: Demonstration Site 41B

The Demonstration Site 41B analysis consists of a 10-year financial outlook (2007-2016) for the 19.5 acres of seed corn production under furrow irrigation. It is not assumed the seed corn acreage is rotated annually with another crop. The initial corn price, based on the total compensation received by the producer, is $11.53/bu., including marketing loan deficiency payments. 2007 production costs and overhead charges are producer estimated rates.

Total cash receipts average $667/acre over the 10-year period and cash costs average $232/acre, including $31/acre variable irrigation costs. In addition to market receipts, total receipts include direct and counter-cyclical payments paid to base acres. Net cash farm income (NCFI) averages $435/acre over the 10-year period. The risk associated with prices and yields suggests a minimal chance of negative NCFI. In a normal production year, NCFI could range as much as $103/acre plus or minus the average expected NCFI for the site.

33. Site # 42, Field 42A Spring 2007

Site Description:

The 66 acre field was planted in cotton. Furrow irrigation technology was used with 21” polypipe. The soil type at both sensor sites is Laredo Silty Clay Loam (LAA).

Sensor Installation:

Two sensor sites were placed on the 50th row from the Western edge of the field, each on the same row. The southern site was 150’ inside the field whereas the northern site was 200’ inside the field. Watermark soil moisture sensors were buried at 6”, 12”, and 24” depths at each site and a soil moisture probe was buried at a 9” depth. Watermark monitors were used to continuously collect the readings at each site.

Irrigation Schedule:

Date	Irrigation Method	Amount of Water Applied, per Acre
5/12	Surge	.224
5/25	Surge	.269
6/14	Surge	.614
5/30	Rain	2.6”

Irrigation Method:

The cooperator used 21” poly-pipe to Surge irrigate the field.

Observations:

The LAA soil type offers excellent soil moisture holding capacity while allowing the plant roots to penetrate deeply into the soil. The parallel soil moisture curves illustrate the uniform rate of change from the 6” depth to the 24” depth. Other soil types such as Harlingen clay do not display such uniform soil moisture change, the 24” depths rarely see any change in soil moisture after the initial irrigation. The Watermark sensors and monitor provide useful soil moisture information with uniform, not abrupt, trends which allows the cooperator to schedule irrigation events.

Economic Analysis:

The Demonstration Site 42A analysis consists of a 10-year financial outlook (2007-2016) for the 66 acres of cotton production under surge irrigation with poly-pipe. It is assumed the cotton acreage is not rotated annually. The initial cotton price is $.53/lb., including marketing loan deficiency payments, if applicable. 2007 production costs and overhead charges are producer estimated rates.

The analysis assumes a $1,800 cost for a surge valve. The surge valve expense is evenly distributed (180/year) over the 10-year period with the assumption of no financing cost.

Total crop receipts average $822/acre initially. In addition to market receipts, total receipts include direct and counter-cyclical payments paid to base acres. Cash costs, including $45/acre variable irrigation costs, averages $692/acre. Net cash farm income (NCFI) averages $130/acre over the 10-year period. The risk associated with prices and yields suggests that, in a normal production year, NCFI could range as much as $152/acre to $182/acre plus or minus the average expected NCFI.

34. Site # 43, field 43A and 43B Spring 2007

Site Description:

The site 43A is a 17 acre field which was planted in cotton. Site 43B is a 39 acre field which was also planted in cotton. The irrigation technology in 43A is Low Pressure Drip irrigation, 43B is conventional flood irrigation and the soil type is Harlingen Clay. Field slope is approximately .0005' from the North and .0003' to the East.

Sensor Installation:

Each field had one sensor site which utilized a Watermark 900M data logger with 3 watermark soil moisture sensors and one soil temperature probe. The data loggers were set to record soil moisture readings every 15 minutes. The soil moisture sensors were buried at 6", 12", and 24" deep along the outside shoulders of each bed away from the furrow where the drip tape was buried.

Irrigation Schedule:

LPS DRIP, Field 43A		FURROW, Field 43B	
Date	Water Applied	Date	Water Applied
5/8/07	.43"	5/19/07	7.13"
6/8/07	2.8"	6/16/07	6.2"
	3.23"		**13.33"**

Rainfall, monthly

March	1.91"	June	3.89"
April	.48"	July	11.94"
May	4.3"	August	2.99"

Total rainfall March, 1, 2007 – August 31, 2007 **25.51"**

Irrigation Method:

The Low Pressure Drip (LPS) irrigation system is designed to operate with a head pressure of 3 p.s.i.. This system was initially operated with gravity flow at approximately 1.5 – 2 p.s.i., but was later pressurized to 3.5 p.s.i..
The drip tape was placed approximately 3" deep in every other furrow. The row spacing was 40", thus the drip tape spacing was 80" and the row length is 1260'.

Observations:

The drip irrigated field soil moisture levels were remarkably steady until late May when the rains began. The May spike in 6” depth readings indicate no response to either irrigation or rainfall events. The sensor wasn’t operating properly. The flood irrigated field shows normal fluctuations of soil moisture with the irrigation events being well timed.

Economic Summary: Demonstration Sites 43A & 43B

The Demonstration Site 43A analysis consists of a 10-year financial outlook (2007-2016) for the 38 acres of furrow with poly-pipe cotton production. It is not assumed the cotton acreage is rotated annually with another crop. The initial cotton price is $.55/lb., including marketing loan deficiency payments. 2007 production costs and overhead charges are producer estimated rates.

Total cash receipts average about $560/acre acre. In addition to market receipts, total receipts include direct and counter-cyclical payments paid to base acres. Cash costs, including $43/acre variable irrigation costs, average $340/acre acre for the furrow irrigation. Net cash farm income (NCFI) for the furrow plot averages $220/acre. The risk associated with prices and yields suggests that, in a normal production year, NCFI could range as much as $211/acre plus or minus the average expected NCFI.

The Demonstration Site 43B analysis consists of a 10-year financial outlook (2007-2016) for the 17 acres of drip cotton production. It is not assumed the cotton acreage is rotated annually with another crop. The initial cotton price is $.55/lb., including marketing loan deficiency payments. 2007 production costs and overhead charges are producer estimated rates. The drip system costs on average $143/acre/year.

Total cash receipts average about $560/acre acre. In addition to market receipts, total receipts include direct and counter-cyclical payments paid to base acres. Due primarily to the required replacement of drip tape every two years, cash costs, including $43/acre variable irrigation costs, average $460/acre acre for the drip. Peak cash cost years occur in years where drip tape is replaced. Net cash farm income (NCFI) for the drip plot averages $100/acre. The risk associated with prices and yields suggests that, in a normal production year, NCFI is projected to be highly volatile with a high probability of being negative.

35. Site # 44, field 44A Spring 2006

Site Description:

The site is a 38 acre field which was planted in soybeans. The irrigation method is furrow irrigation with poly-pipe and the soil type is mainly Harlingen Clay. Field slope is approximately .0005' from the North and .00025' to the East.

Sensor Installation:

One furrow was selected in the center of the field with a sensor site 150' inside of the Southern turn row. Watermark soil moisture sensors were buried at a depth of 6", 12", and 24". A soil temperature probe was buried at a depth of 9". A Watermark monitor was used to continuously collect readings. The rain gauge at pump house 27 was used to collect the rainfall events.

Irrigation Schedule:

Date		Amount of Water Applied
4/2/07		3.8"
5/12/07		3.4"
	Total	7.2"

Rainfall

Date		Amount
3/07		1.9"
4/07		.48"
5/07		4.3"
6/07		3.9"
7/07		11.9"
	Total	22.48"

Irrigation Method:

The field was furrow irrigated utilizing surge irrigation and 18" poly-pipe.

Yield:

46 bu/ acre

Observations:

The soybeans were planted and subsequently watered up on 4/2/07. Harlingen clay expands when wet and shrinks when dry. Once the soil has been saturated, it forms cracks when it dries. Once soil contact is broken with the soil moisture sensor due to a saturation – drying cycle, the soil moisture sensor's ability to maintain contact with the soil is compromised. The soybean plant forms an aggressive root structure. When removing the soil moisture sensor located 24” deep, I noticed a ¼” diameter root had followed the hole down to the sensor depth. The soil moisture levels were actively changing at all depths; however, there was enough rainfall to maintain an ample supply of available water from the middle of May onward.

Economic Summary: Demonstration Site 44A

The Demonstration Site 44A analysis consists of a 10-year financial outlook (2007-2016) for the 38 acres of soybeans production under surge irrigation with poly-pipe. It is not assumed the soybeans acreage is rotated annually with another crop. The initial soybean price is $8.75/bu., including marketing loan deficiency payments, if applicable. 2007 production costs and overhead charges are producer estimated rates.

The analysis also includes the purchase and use of a surge valve at a cost of $2,200. The surge valve expense is evenly distributed ($220/year) over the 10-year period with the assumption of no financing costs.

Total cash receipts average $391/acre over the 10-year period and cash costs average just under $291/acre, including $40/acre variable irrigation costs. In addition to market receipts, total receipts include direct and counter-cyclical payments paid to base acres. Net cash farm income (NCFI) decreases throughout the 10-year period from $181/acre in 2007 to $77/acre in 2016. The risks associated with prices and yields suggest some chances of negative NCFI. In a normal production year, NCFI could range as much as $132/acre plus or minus the average expected NCFI for the site.

36. Site # 45, field 45A 2006

Site Description:

The site is a 36.7 acre field in first year Sugar Cane. The irrigation technology is furrow irrigation with poly-pipe and the soil type is Harlingen Clay. Field slope is approximately .0005’ from the North and .0003’ to the East.

Sensor Installation:

Water mark sensors were placed at depths of 6” 18” and 24” in two places in the field.

Irrigation Schedule:

Date	Amount of water applied ac-in.
8/5/2006	8.16
4/25/2007	2.77
5/10/2007	1.90
6/21/2007	2.39
8/16/2007	1.94
9/17/2007	1.99
10/18/2007	2.22
Total	**21.38 ac-in.**

Rainfall, monthly

March	1.91”	June	3.89”
April	.48”	July	11.94”
May	4.3”	August	2.99”

Total rainfall March, 1, 2007 – August 31, 2007 **25.51”**

Irrigation Method:

The field was furrow irrigated using 18” polypipe with size “A” holes from two field turnouts. One turnout is located at the NW corner and the other is along the NE side. Although a flume was installed to measure tail water, there was no measurable loss.

Economic Summary: Demonstration Site 45

The Demonstration Site 45 analysis consists of a 10-year financial outlook (2007-2016) for the 37.5 acres of sugarcane production under furrow irrigation with poly-pipe. The actual demonstration was conducted on a second year (first ratoon) field of sugarcane. The initial outright purchase of sugarcane grinding rights ($800/acre) with no financing is included. For the 10-year outlook projection, the sugarcane price is based on the producer's estimate of future prices and these are $20/ton in 2007, $18.50/ton in 2008, and $17 per ton throughout the remaining analysis period. 2007 production costs and overhead charges are producer estimated rates.

Total cash receipts average just over $933/acre initially and decline as the productive capacity of the sugarcane diminishes until the fifth year when the land is idle. Cash costs, including $56/acre in variable irrigation costs, also reflect the sugarcane production cycle, requiring roughly $317/acre in the initial year and approximately $129/acre in the idle year. Average net cash farm income (NCFI) generally follows the sugarcane production cycle producing $616/acre profit in the initial year. It averages approximately $366/acre per year for the ten-year period. The risk associated with prices and yields suggests that, in a normal production year, NCFI could range as much as $560/acre plus or minus the average expected NCFI.

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37. **Site # 45, field 45B 2007**

Site Description:

The site is a 72 acre field in first year Sugar Cane. The irrigation technology is furrow irrigation and the soil type is Harlingen Clay. Field slope is approximately .0005’ from the North and .0003’ to the East.

Sensor Installation:

One sensor site was chosen at the southwest corner on the 10th row, approximately 100’ inside the field. Watermark soil moisture sensors were buried at 6”, 12” and 24” depths. A soil temperature probe was placed at a depth of 9”. A Watermark 900M monitor was used to continuously record the soil moisture and temperature readings.

Irrigation Schedule:

Date	Amount of water applied ac-in.
4/25/2007	13.28
5/10/2007	6.46
6/21/2007	6.07
8/18/2007	7.33
9/17/2007	5.65
10/18/2007	6.69
Total	**45.47**

Rainfall, monthly

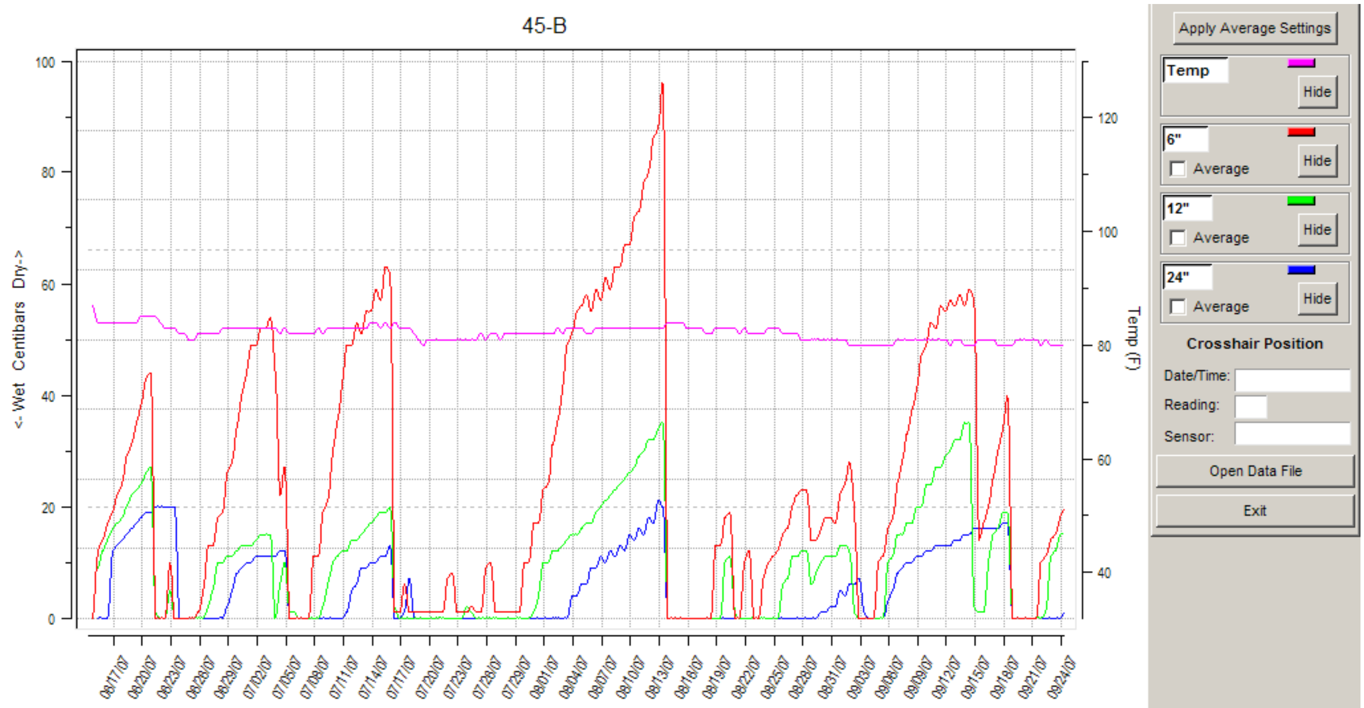
March	1.91”	June	3.89”
April	.48”	July	11.94”
May	4.3”	August	2.99”

Total rainfall March, 1, 2007 – August 31, 2007 **25.51”**

Irrigation Method:

The field was furrow irrigated using an open ditch and 2” siphon tubes.

Observations:



The 12” and 24” depth soil moisture readings indicate that the soil was very wet to saturated throughout the 6/15/07 through 7/21/07 interval. The 6” depth readings indicate soil cracking and subsequent erroneous readings. Although the soil moisture levels are very high, it is interesting to note how close the 24” and 12” curves are. The soil moisture levels at the 24” depth change in magnitude almost as much as the 12” depth. The 24” depth curve lags behind the 12” curve by a few days. The sugar cane is drawing soil moisture from the entire profile and not progressively less as the depth increases. The field has not been harvested as of 2/5/08.

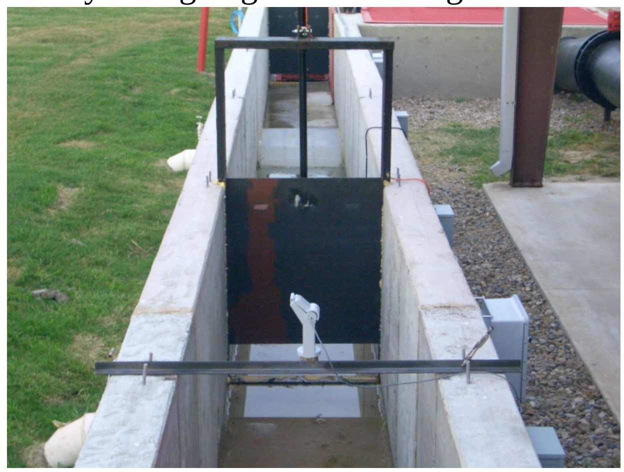
Appendix E

Flow Meter Calibration Facility

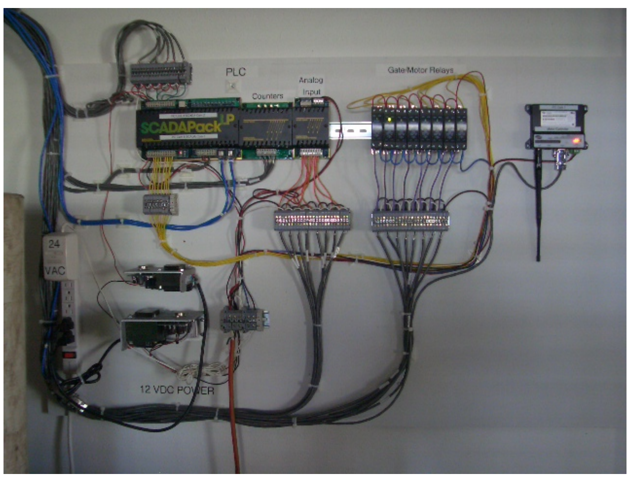
Table of Contents

Control and Automation

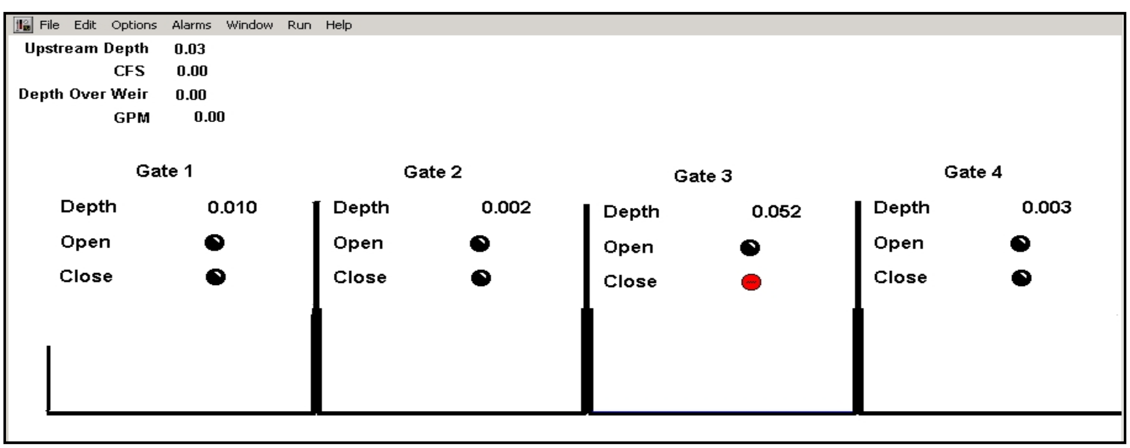
There have been many upgrades to the Flow Meter Calibration Facility in 2007. After the completion of the construction phase we concentrated on the automation of the facility. We began with the flume/open canal by designing automated gates and controllers. These four gates are used to control the water level in each reach of the canal. They can be controlled in local manual mode and remote computer control. In Auto mode the canal is monitored with four acoustic level transmitters which are constantly feeding water level information to a SCADA pack located in the lab. The SCADA pack is programmed to maintain a level throughout the canal. When the volume of water to the canal is increased the gates react and open. Along with the gates, four discharge pipes were installed (one per reach) in the flume to simulate field turn outs. When these turnouts are opened the automated gates react to maintain a constant level in the canal. This manual/automated canal is used for canal rider training and teaching the basics of canal management. The SCADA system that controls the auto-gate is used to demonstrate the use of PLC's in canal automation.



Auto Gate and Acoustic Level Transmitter



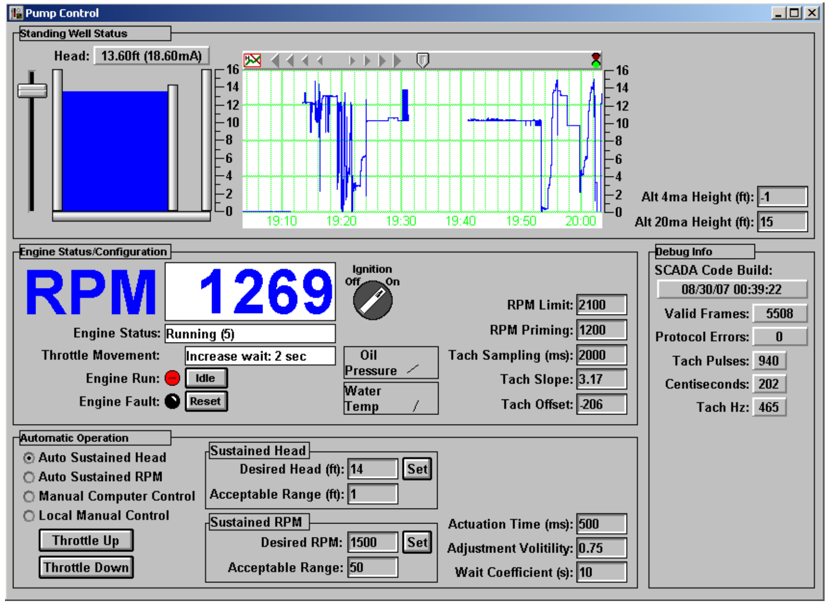
Auto Gate SCADA PLC



AutoGate control page

Pump Control

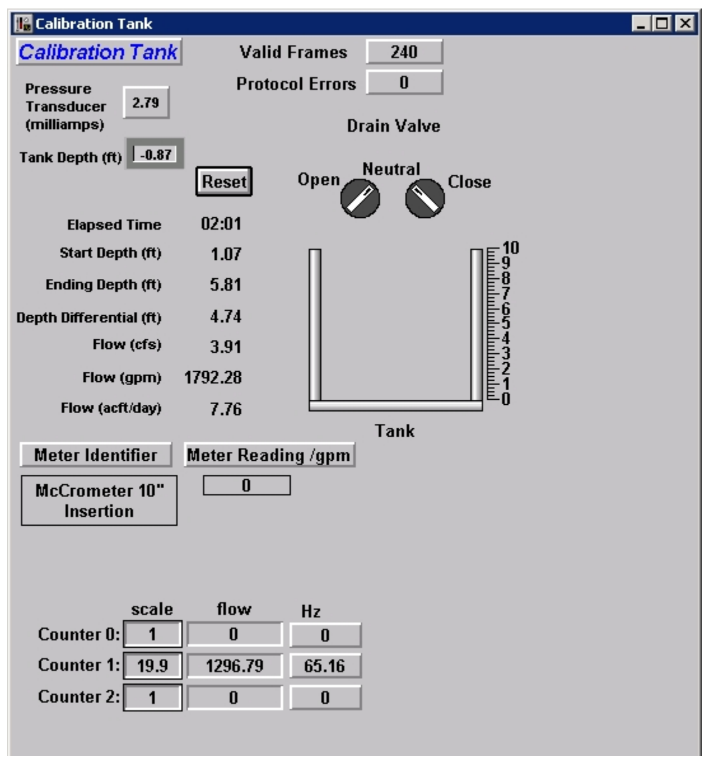
To better control flow through the calibration facility we developed and installed a variable speed controller for the supply pump motor. The controller consist of a SCADA pack, throttle controller, acoustic level transmitter (to monitor water level in the constant head tank), and various other components to support the system. The variable speed pump is controlled from the master control computer, located in the lab, using LookOut software and code developed by Axiom Blair Engineering. From this pc the pump can be started, stopped, placed in auto (constant head or constant rpm), and controlled manually. The installation of the variable speed components allowed us to troubleshoot and improve design of the variable speed controller installation at Delta Lake Irrigation District.



Pump control page in LookOut

Calibration Tank

The calibration tank was equipped with a level transducer and air control valves to control and monitor flow into and out of the tank. Software was written to enable us to control the fill and discharge of water from the lab. LookOut is used to run multiple flow tests through the FMC and determine actual flows through a particular meter installed in the closed pipe system. As the flow test is performed LookOut records all data to an Excel file to be analyzed at a later time.



Calibration Tank page in LookOut

Closed Pipe Manifold

The Manifold was upgraded to allow for the installation of 10” meters used in aluminum pipe. Lengths of 10” aluminum pipe were placed into the manifold using adapters, and slip joints were used to enable easier installation of meters.

10” meter in aluminum pipe

A length of clear PVC pipe was placed in the 12” section of the manifold to illustrate/demonstrate the problem associated with debris in the irrigation water. A propeller meter was installed along with a transit time meter to demonstrate the advantages and disadvantages of both meters. This configuration is also used to demonstrate the calibration process.

Two catch basins were added to the discharge of the manifold to allow for the calibration of riser insertion meters. These catch basins are typical of the irrigation turn outs in HID. With this configuration we can now calibrate 15”, 12” and 14” propeller meters used throughout HID as well as many other districts in the Rio Grande Valley.

Catch Basins and Installed Flow Meter

Open Channel Flume

Electrical service and data collection cables were added to the open channel canal. The data cables terminate at the lab signal patch panel allowing us to configure the canal with many different measurement and logging devices and patch them into the master control computer.

The open channel canal has been fitted with several measurement devices along with the automated gates. The first being a sharp crested weir. This weir is monitored by the canal automation software with an acoustic level transmitter. The flow measurement is displayed in the lab on the LookOut automation process. This measurement is essential when calibrating other flumes such as the circular flume used for tail water measurement in the demonstration sites.

A SonTek Argonaut SW was donated to the project and is installed in the third reach of the canal. This device is used to monitor flows and to demonstrate the many alternatives to open channel flow measurement. The flow data is displayed in the lab using the FMC PC.

Argonaut SW

A Rubicon Gate was also donated and is used to demonstrate alternatives to open channel flow measurement as well as automatic gate control alternatives.

Rubicon Gate

Lab and Meeting Room

The Lab was upgraded with a large LCD display as part of the master control computer. This display enables the viewing of the calibration process and demonstration items from the class room. The calss room has been out fitted with a projector and screen. These devices have been used quite frequently during quarterly progress meeitngs and other meetings through out the year.

Annual Progress Report for 2007

March 1, 2007 through February 28, 2008

for Work Under

Maximization of On-Farm Surface
Water Use Efficiency by Integration of On-Farm
Application and District Delivery Systems

Texas Water Development Board
Agricultural Water Conservation
Demonstration Initiative Grant

Submitted to:

Harlingen Irrigation District
Cameron County No. 1
Harlingen, Texas

March 14, 2008

AXIOM-BLAIR
ENGINEERING

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Austin, Texas 78715
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Table of Contents

1. Introduction and Overview

This report contains the annual progress report for the Agricultural Demonstration Initiative Project as indicated in the Scope of Work contained in the contract between Harlingen Irrigation District – Cameron County No. 1 (HIDCC1 or the District) and Axiom-Blair Engineering, L.P. (ABE). A description of the overall progress, description of any problems encountered that have any effect on the study, delay of the timely completion of work or change in the deliverables or objectives of the contract are discussed, as well as any corrective actions necessary.

During the year 2007, ABE was tasked to provide the following general support to the project:

- Subcontracting Contract Execution: The Subcontractor will assist the District in preparing and executing the subcontracts with Delta Lake Irrigation District, Texas A&M University Kingsville, and others to provide support and services to the District on the primary contract.
- District and On-Farm Flow Meter Calibration and Demonstration Facility: The Subcontractor will provide civil engineering services to: 1) diagram the flow meter pipe and placement layout; 2) diagram the test canal configuration depicting weir and test gate locations and layout; and 3) PLC programming; and 4) other technical support as necessary to conclude the design and implementation of the facility.
- Demonstration of Internet Based Information Real-Time Flow, Weather, and Water User Accounting System: The Subcontractor will assist the District in finalizing the development of the real-time flow, weather, and water user information system (RTIS), with computer programming services to extend the current SCADA software to display flow rate and other information from the District's secondary On-farm flow measurement telemetry system, and incorporate portions of the existing water use accounting system into the internet display application. The Subcontractor will also develop new RTIS software to collect real-time rainfall measurements at five telemetry sites along with software to collect weather station information at two of those sites, for display within the current Internet display application. The two weather station sites will be incorporated into two of the existing primary telemetry sites. The District shall make the District's water user accounting system and any programming consultant for the system available to the Subcontractor and such programming consultant may be retained by the Subcontractor for the purposes of providing the necessary software interface between the water user accounting system and the RTIS. The Subcontractor will assist the District in documenting the features and capabilities of the RTIS.

- Technical Support: The Subcontractor will provide engineering and other technical support to the District, as directed, regarding efforts to sustain the primary contract task or support other subcontract activities.
- Variable Speed Pump Control and Optimization of Delivery of On-Farm Demands: The Subcontractor will provide assistance to Delta Lake Irrigation District (DLID) in the design, implementation, and purchase of the pump controller/PLC to use with DLID pump equipment to demonstrate the use of internal combustion engines in matching the quantity of water diverted from the district canal for meeting irrigation demands. A technical workshop and the associated training materials will be prepared for training district managers in the proper design, installation, and cost of installing and operating variable speed drives, and the associated pumping and pipeline systems.

The following sections address the specific Scope of Work between the District and ABE, and the work completed on each task during March 2007 through February 2008.

2. Scope of Work

The Task Descriptions and work provided for each Task is discussed below.

2.1 Subcontracting Contract Execution

2.1.1 Task 1 Description

The Subcontractor will assist the District in preparing and executing the subcontracts with Delta Lake Irrigation District, Texas A&M University Kingsville, Texas Cooperative Extension, and others to provide support and services to perform the work task.

2.1.2 Work Completed

The subcontracts for Delta Lake Irrigation District, Texas A & M University Kingsville, Texas Cooperative Extension, and others were completed. Contract modification work requested by TWDB has been completed.

2.2 District and On-Farm Flow Meter and Demonstration Facilities

2.2.1 Task 2 Description

The Subcontractor will provide civil engineering services for the design of the facilities, including but not limited to preparing site plan drawings, pump and piping system layout, open channel flow measurement system, pump and remote control specifications, construction bid and contracting documents, and preparation of environmental summary reports for submittal by the District to Texas Historical Commission, Texas Parks and Wildlife Department, and the US Army Corps of Engineers.

2.2.2 Work Completed

A Flow Meter Calibration and Demonstration Facility was constructed in 2006 and early 2007. The work completed during 2007 included the wiring of the SCADA control system for the open channel flume, flow meter manifold system, and calibration tank. Figure 1 shows the SCADA PLC and control system and Figure 2 shows the FMC Computer Control System and Patch Panel. Figure 3 shows the software developed to operate the calibration tank.

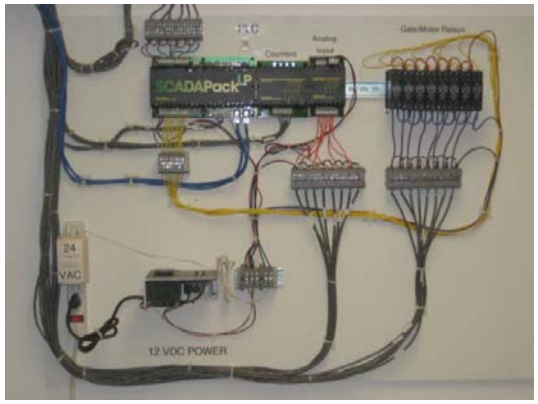

Figure 1 – FMC SCADA System

Figure 2 – FMC Computer Control System and Patch Panel

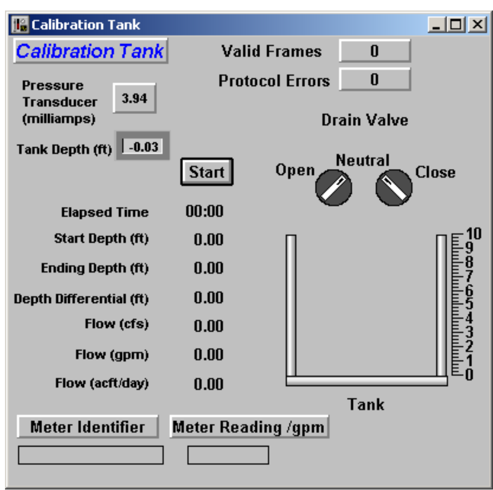

Figure 3 – Flow Calibration Tank Software Interface

2.3 Demonstration of Internet Based Information and Real-Time Flow, Weather and Water User Information (RTIS)

2.3.1 Task 3 Description

The Subcontractor shall assist the District in developing the real-time flow, weather, and water user information system (RTIS), including computer programming services such as those necessary to develop the software to display specific District information from the District's existing flow measurement telemetry system and existing water use accounting system on the internet. The Subcontractor shall develop the necessary software to collect real-time rainfall data from five locations selected by the district and co-located at existing flow measurement telemetry nodes and display such rainfall data on the District's web site. The Subcontractor will assist the District in preparing a document that defines the features and capabilities of the RTIS, and the Subcontractor shall use this document in developing the RTIS software. The Subcontractor shall make use of the District's water user accounting system and any programming consultant for the system and such programming consultant shall be retained by the Subcontractor for the purposes of providing the necessary software interface between the water user accounting system and the RTIS.

2.3.2 Work Completed

The primary work in 2007 included the development of a Web based data base program to facilitate input of information collected at each of the on-farm demonstration sites. Figure 4 shows the software map that can be used to select the demonstration site for which data will be entered. Figure 5 shows a graph of some of the data input for a specific demonstration site.

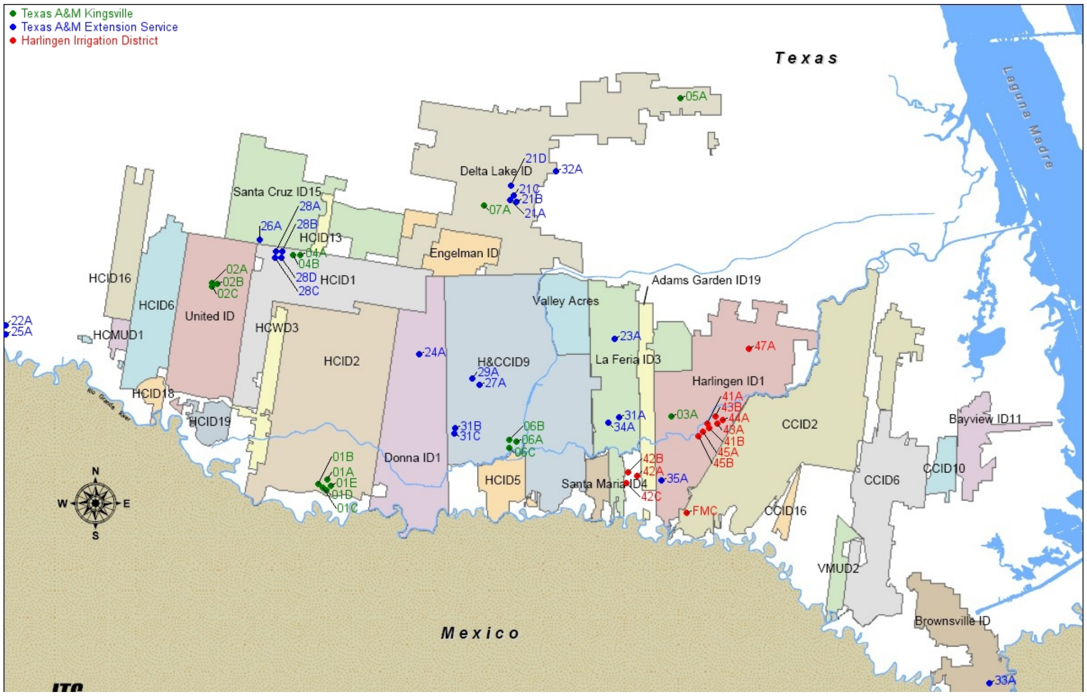

Figure 4 – Web-Based Data Input for Locations of Demonstration Sites

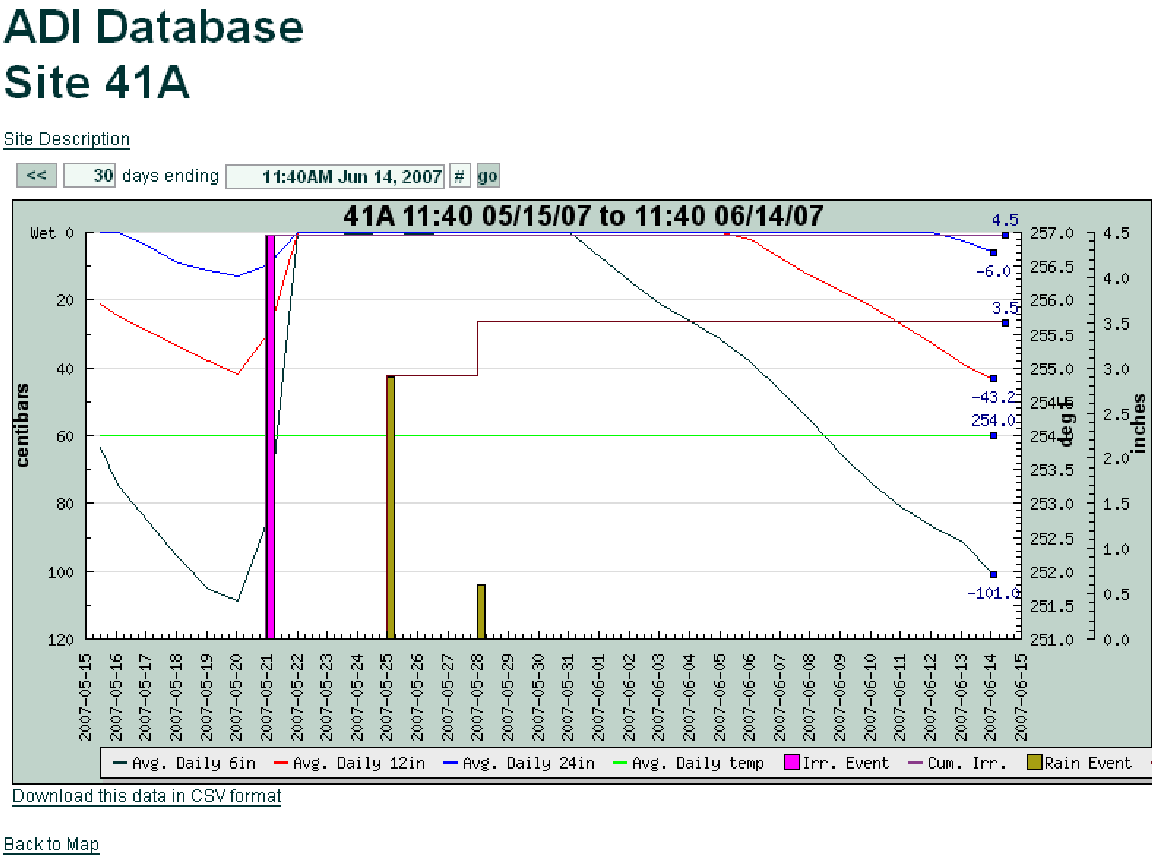

Figure 5 – Web-Based Data Input for Locations of Demonstration Sites

2.4 On-Farm Demonstration of Surge and Center Pivot Irrigation Systems

2.4.1 Task 4 Description

The Subcontractor shall provide technical assistance to the District, as requested in writing by the District, in the design and specification of any surge or center pivot irrigation systems used for demonstration projects and assist the District in developing the type of data and methods of data collection need for determining the irrigation efficiency and other water use data of the demonstration project.

2.4.2 Work Completed

No requests for support under this task were made during 2007.

2.5 Variable Speed Pump Control and Optimization of Delivery of On-Farm Demands

2.5.1 Task 4 Description

The Subcontractor will provide assistance to Delta Lake Irrigation District (DLID) in the design, implementation, and purchase of the pump controller/PLC to use with DLID pump equipment to demonstrate the use of internal combustion engines in matching the quantity of water diverted from the district canal for meeting irrigation demands. A technical workshop and the associated training materials will be prepared for training district managers in the proper design, installation, and cost of installing and operating variable speed drives, and the associated pumping and pipeline systems.

2.5.2 Work Completed

Work in 2007 primarily consisted of specification and purchase of equipment necessary to remotely control the variable speed diesel pump installed at the FMC Facility and Relift Plant No. 45 in Delta Lake Irrigation District. Both systems are installed and operational. The work included the assembly of a Control Microsystems PLC controller and the associated wiring and control hardware necessary for the remote start and remote control of the speed of the engine. Figure 6 shows the FMC variable speed pump and Figure 7 shows software interface used to operate the variable speed pump. Figure 8 shows the panel that was used to provide variables speed control for the three pumps shown in Figure 9.

Figure 6 – Variable Speed Pump

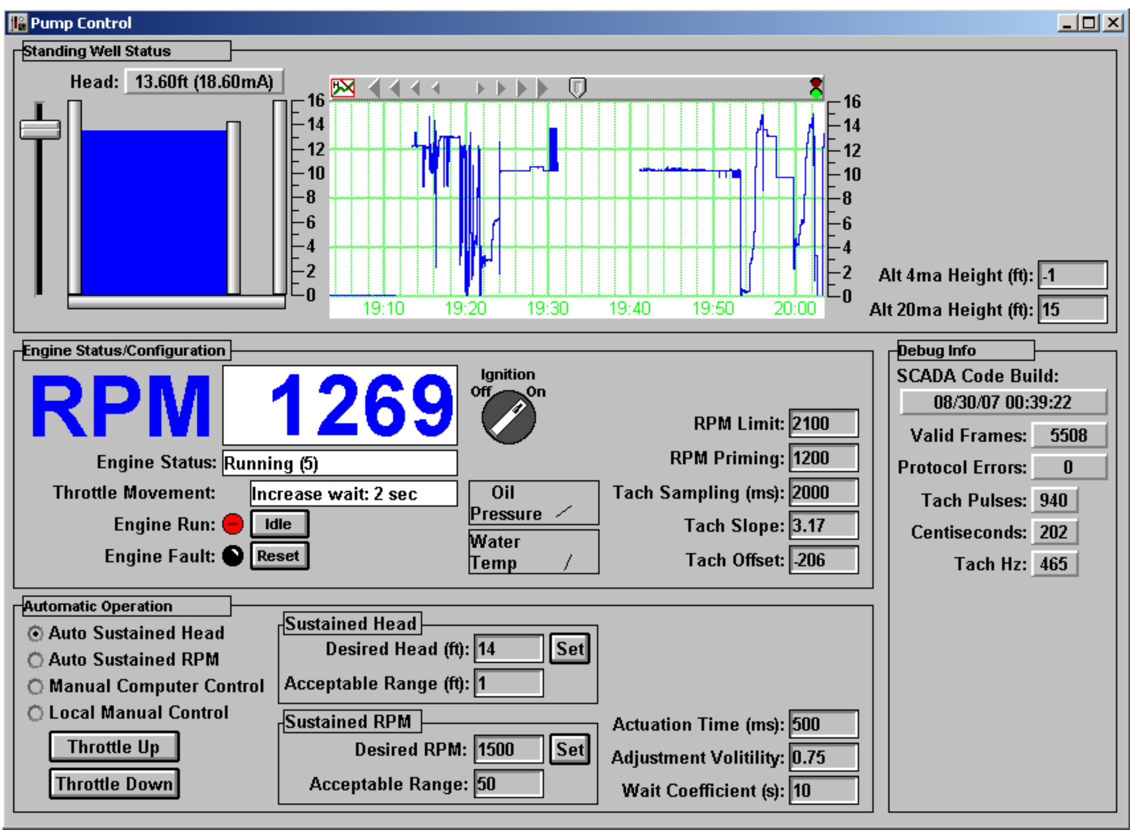

Figure 7 – Software Interface for Variable Speed Pump Controller

Figure 8 – Delta Lake Irrigation District – Variable Speed Controller

Figure 9 – Delta lake Irrigation District – Variable Speed Pumps