AN INTEGRATED APPROACH TO WATER CONSERVATION FOR AGRICULTURE IN THE TEXAS SOUTHERN HIGH PLAINS

Texas Alliance for Water Conservation Annual Report

February 28, 2006

Texas Alliance for Water Conservation

TAWC

First Annual Report

to the

Texas Water Development Board

from

The Texas Alliance for Water Conservation

'An Integrated Approach to Water Conservation for Agriculture

in the Texas Southern High Plains'

March 28, 2006

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REPORTS BY SPECIFIC TASKS

WATER CONSERVATION DEMONSTRATION PRODUCER BOARD

Elected November 16, 2004
(Original Board of Directors to serve through February, 2007)

Board Member	Term
Eddie Teeter, Chair	1 year
Boyd Jackson, Co-Chair	3 years
Brian Teeple, Secretary	3 years
Keith Phillips	2 years
John Paul Schacht	1 year
Glenn Schur	3 years
Mark Beedy	2 years
Jeff Don Terrell	2 years
Jody Foster	1 year
Rick Kellison (ex officio), Project Director	

The Producer Board of Directors is composed of producer representatives within the focus area of Hale and Floyd Counties and is specifically charged to:

1) Ensure the relevance of this demonstration project to meet its objectives;
2) Help translate the results into community action and awareness;
3) Ensure the credibility and appropriateness of work carried out under this project;
4) Assure compatibility with and sensitivity to producer needs and concerns; and
5) Participate in decisions regarding actions that directly impact producers.

The board elects their chair, chair-elect, and secretary. Individuals serving on this board include representation of, but are not limited to producers cooperating in specific demonstration sites. The Chair serves as a full voting member of the Management Team. The Project Manager serves in an *ex officio* capacity on the Producer Board. Meetings of the Producer Board of Directors are on an as need basis to carry out the responsibilities of the project and occur at least annually in conjunction with the overall Management Team.

TEXAS ALLIANCE FOR WATER CONSERVATION PARTICIPANTS

Texas Tech University
Rick Kellison, Project Director*
Dr. Vivien Gore Allen*
Dr. Matt Baker*
Ms. Lucia Barbato*
Ms. Angela Beikmann,*
Secretary/Accountant
Mr. Philip Brown
Dr. David Doerfert*
Dr. Vernon Lansford*
Dr. Stephan Maas*
Dr. Eduardo Segarra*
Mr. Tom Sell*

Texas Cooperation Extension
Dr. Steven Klose
Mr. Jeff Pate*
Dr. Calvin Trostle*
Mr. Jay Yates*

Texas A&M Experiment Station
Dr. Robert Lascano

High Plains Underground Water Conservation District #1
Mr. Jim Conkwright*
Mr. Scott Orr*

USDA - Natural Resource Conservation Service
Mr. Monty Dollar*

USDA – Agricultural Research Service
Dr. Ted Zobeck
Dr. Verónica Acosta Martínez

Producer Board Chairman
Mr. Eddie Teeter*

Post Doctoral Fellow
Dr. Will Cradduck

Graduate Research Assistants
Rebekka Martin
Nithya Rajan
Swetha Dorbala
Pamela Miller

Student Hourly Wage
Paul Braden

* Indicates Management Team member

'AN INTEGRATED APPROACH TO WATER CONSERVATION FOR AGRICULTURE IN THE TEXAS SOUTHERN HIGH PLAINS'

BACKGROUND

The Texas High Plains currently generates a combined annual economic value of crops and livestock that exceeds $5.6 billion ($1.1 crops; $4.5 livestock; TASS, 2004) but is highly dependent on water from the Ogallala Aquifer. Ground water supplies are declining while costs of energy required to pump water are escalating. Improved irrigation technologies including low energy precision application (LEPA) and sub-surface drip (SDI) irrigation have increased water use efficiencies to over 95% but have not always led to decreased water use. Diversified systems that include both crops and livestock have long been known for complimentary effects that increase productivity. Recent research in the Texas High Plains (Allen et al., 2005) has demonstrated lower irrigated water use, improved soil health (Acosta-Martinez et al., 2004), greater profitability per unit of water invested, and diversified income sources for an integrated crop and livestock system compared with a cotton monoculture. At cotton yields average for the region, profitability was greater for the integrated system than a cotton monoculture.

No single technology will successfully address water conservation. Rather, the approach must be an integration of agricultural systems, best irrigation technologies, improved plant genetics, and management strategies that reduce water demand, optimize water use and value, and maintain an appropriate level of productivity and profitability. Water conservation must become both an individual goal and a community ethic. Educational programs are needed at all levels to raise awareness of the necessity for, the technology to accomplish, and the impact of water conservation on regional stability and economics. As state and global populations increase with an increasing demand for agricultural products, the future of the Texas High Plains, and indeed the State of Texas and the world depends on our ability to protect and appropriately use our water resources. Nowhere is there greater opportunity to demonstrate the implications of successfully meeting these challenges than in the High Plains of west Texas.

A multidisciplinary and multi-university/agency/producer team, coordinated though Texas Tech University, assembled during 2004 to address these issues. In September of 2004 the project *'An Integrated Approach to Water Conservation for Agriculture in the Texas Southern High Plains'* was approved by the Texas Water Development Board and funding was received in February, 2005 to begin work on this demonstration project conducted in Hale and Floyd Counties. A producer Board of Directors was elected to oversee all aspects of this project. Twenty-six producer sites were identified to represent 26 different 'points on a curve' that characterize and compare cropping and livestock grazing system monocultures with an integrated crop/livestock approach to agriculture in this region. The purpose is to understand where and how water conservation can be achieved while maintaining acceptable levels of profitability.

OBJECTIVE

To conserve water in the Texas Southern High Plains while continuing agricultural activities that provide needed productivity and profitability for producers and communities.

REPORT OF YEAR 1

In the first year of any demonstration or research project, the data should be interpreted with caution. As systems are begun and data collection is initiated, there are also many factors that do not function as they will over more time when everything begins a mature system with data gathering techniques well developed. Some data will be missing because there is only a partial years accounting. However, because this project uses existing farming systems that were already functioning, the startup time has been minimized and even in this first year, interesting data are emerging that has meaningful interpretation. It is important to recognize that these data and their interpretations are based on certain assumptions. These assumptions are critical to being able to compare information across the 26 different sites involved in this demonstration project. These assumptions are necessary to avoid differences that would be unique to a particular producer or site that have nothing to do with understanding how these systems function. Thus, these assumptions are elaborated below.

ASSUMPTIONS OF DATA COLLECTION AND INTERPRETATION

1. Although actual depth to water in wells located among the 26 sites varies, a pumping depth of 350 feet is assumed for all irrigation points. The actual depth to water influences costs and energy used to extract water but has nothing to do with the actual functions of the system to which this water is delivered. Thus, a uniform pumping depth is assumed.

2. All input costs and prices received for commodities sold are uniform and representative of the year and the region. Using an individual's actual costs for inputs would reflect the unique opportunities that individual could have for purchasing in bulk or being unable to take advantage of such economies and would thus represent the individual rather than the system. Likewise, prices paid for commodities sold must represent the regional average rather than the individuals skill in marketing his or her products.

3. Irrigation system costs are unique to the type of irrigation system used on the individual system. Thus, drip irrigated sites have an average cost of drip irrigation equipment included in the economic analysis and prorated over the expected average life-time for this equipment. Systems with center pivot irrigation have industry average costs for this technology included in their economic costs and prorated over this expected life-time for this type of equipment. All plots had a variable cost of irrigation of $7.63 per acre inch, regardless of distribution technology.

4. Mechanical operations used by each individual site are recorded as they actually occur and are accounted for. However, the costs of operating this equipment are based on the expected equipment costs for the type of equipment that would normally be used for this particular field operation. This avoids the variations among sites in the types of equipment owned and operated by individuals. The USDA-NASS, 2004 Texas Custom Rates Statistics, Bulletin 263, September 2005 rates were used in calculations.

Economic Assumptions

1. Assumed an electrical pumping plant across all sites for a uniform cost of irrigation water of $7.63 per acre inch.

Electricity Irrigation Costs

Gallons per Minute:	500.0
Pumping Lift (in Feet):	350.0
Discharge Pressure (Percent):	20.0
Pump Efficiency (Percent):	60.0
Motor Efficiency (Percent): Vertical Hollow Shaft Motor (88%) Submersible Motor (80%)	88.0
Electricity Cost per Kilowatt Hour:	$0.12
Pump Horsepower Requirement:	83.3754
Kilowatt Load:	70.6796
Hourly Power Use	8.4816
Cost per Acre Inch of Water:	**$7.63**

Table 1: Electricity Irrigation Costs

2. Fertilizer costs were constant across sites for the same mix.

3. Price of cotton lint revenue is $0.54/lbs. across all sites. (Weighted average of producer field records)

4. Price of cotton seed revenue is $105/ton across all sites. (Price Rick Kellison feels is about average for the area gins)

5. Boll Weevil Assessment is set at: $12 for irrigated acreage
   $ 6 for dryland acreage

6. Crop Insurance is set at: $17.25 for irrigated cotton
   $12.25 for dryland cotton
   $15.00 for corn

7. All field operations were cost out using custom rates from USAD-NASS, 2004 Texas Custom Rates Statistics, Bulletin 263, September 2005; allowing for uniform cost across sites.

8. Ginning was calculated using $1.95/lb of raw cotton with burrs and trash. Bags and ties were calculated using a standard bale weight of 450 lbs. of clean lint at $17.50/bale.

9. Fixed Costs were calculated at: $33.60/ac for Pivot Irrigation
   $75/ac for Drip Irrigation
   $25/ac for Flood Irrigation
   $45/ac cash rent for irrigated Cotton, Milo, Sunflowers, and Grass land
   $75/ac cash rent for irrigated Silage, Corn, and Alfalfa cropland
   $15/ac cash rent for dryland cropland

WEATHER DATA FOR 2005

The 2005 growing season was close to ideal in terms of temperatures and timing of precipitation. The precipitation and temperatures for this area are presented in figure 1 along with the long-term means for this region. While hail events occurred in these counties during 2005, none of the specific sites in this project were measurably affected by such adverse weather events.

Precipitation for 2005, presented in Fig. 1, is the actual mean of precipitation recorded at the 26 sites during 2005 but begins in March when the sites were identified and equipped. Precipitation for Jan. and Feb. are amounts recorded at Halfway, TX; the nearest monitoring site.

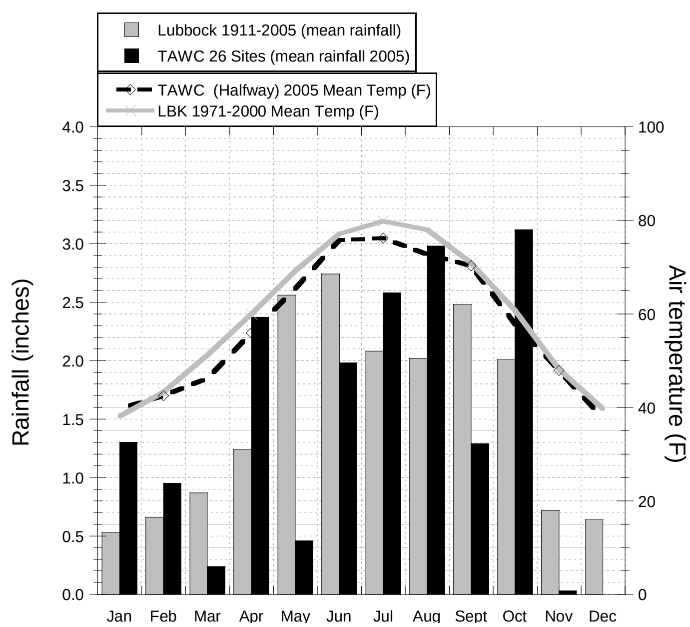


Figure 1. Temperature and precipitation for 2005 in the demonstration area compared with long term averages.

2005 ACTIVITIES

SUPPLEMENTARY GRANTS TO PROJECT

Allen, V. G., C. Green, V. Lansford, C. P. Brown, D. Wester, E. Segarra, and others. 2005. Integrating crops and livestock to sustain agriculture. USDA-SARE $256,252 (Pending)

Allen, V. G. and 8 co-investigators. Integrated Agriculture for Natural Resource Conservation in the Texas High Plains. 2005. USDA-NRCS Conservation Initiative Grants. $1 million (not funded).

DONATIONS TO PROJECT

City Bank, Lubbock, TX. A 2003 GMC Yukon XL. Appraised value $16,500.

Figure 2: Donation of 2003 GMC Yukon XL.

VISITORS TO THE DEMONSTRATION SITE DURING 2005

Date	Visitor(s)	Host(s)	Total
May 11	Stephan Maas and Nithya Rajan	Kellison	2
June 21	NRCS Chief Bruce Knight, et al	Kellison	38
July 12	HPUWCD #1 Board Tour	Kellison	8
Aug. 24	Steve Klose, Jay Yates and Jeff Pate	Kellison	3
Sept. 2	Ted Zobeck and guests	Kellison	4
Sept. 9	Judy Albus and guests	Kellison	5
Sept. 20	Floyd County Ag Tour	Kellison/Trostle/Allen	115
Oct. 13	Comer Tuck, Kraig Gallimore and Valley Project group	Kellison	12
Nov. 1	Don Ethridge	Kellison	1
Nov. 11	Will Cradduck and Jim Crownover	Kellison	2
Total Number of Visitors			**190**

Table 2: Visitors to the Demonstration Site During 2005

PRESENTATIONS MADE DURING 2005

Date	Presentation	Spokesperson
March 1	Radio interview (KRFE)	Allen
March 17	Radio interview	Kellison
May 17	Radio interview (KFLP)	Kellison
July 21	Presentation to Floyd County Ag Comm.	Kellison
August 17	Presentation to South Plains Association of Soil & Water Conservation Districts	Kellison
September 13	Presentation at Floyd County NRCS FY2006 EQIP meeting	Kellison
September 28	Presentation at Floyd County Ag Tour	Kellison/Trostle/Alle n
October 20	Presentation to Houston Livestock and Rodeo group	Allen/Baker
November 3	Cotton Profitability Workshop	Pate/Yates
November 10	Presentation to Regional Water Planning Committee	Kellison
November 16	Television interview (KCBD)	Kellison
November 18	Presentation to CASNR Water Group	Kellison/Doerfert
December 1	Radio interview (KRFE)	Kellison
December 9	Radio interview (AgriTALK – nationally syndicated)	Kellison
December 15	Presentation at Olton Grain Coop Winter Agronomy meeting	Kellison

Table 3: Presentations Made During 2005

PUBLICATIONS

Allen, V. G., C. P. Brown, R. Kellison, E. Segarra, T. Wheeler, P. A. Dotray, J. C. Conkwright, C. J. Green, and V. Acosta-Martinez. 2005. Integrating cotton and beef production to reduce water withdrawal from the Ogallala Aquifer. Agron. J. 97:556-567

Martin, Rebekka. 2005. Economic evaluation of an integrated cropping system with cotton. M.S. Thesis. Texas Tech University, Lubbock.

Wolfshohl, Karl. 2005. Can they save the Ogallala (and the farmer?). Vistas 13(2):17-19.

<u>In press:</u>

Allen, V. G., C. P. Brown, E. Segarra, C. J. Green, T. A. Wheeler , V. Acosta-Martinez, and T. M. Zobeck. 2006. In search of sustainable agricultural systems for the Llano Estacado of the U.S. Southern High Plains. Agric. Ecosystems Environ. (In press, Invited paper).

Allen, V. G., M. T. Baker, E. Segarra and C. P. Brown. 2005. Integrated crop-livestock systems in irrigated, semiarid and arid environments. Agron. J. (Invited paper; in press).

DESCRIPTIONS AND SUMMARY OF RESULTS BY SITE

This project officially began with the announcement of the grant in September, 2004. However, it was February, 2005, before all of the contracts and budgets were finalized and actual field site selection could begin in earnest. By February, 2005, the Producer Board had been named and was functioning and the Management Team had been identified to expedite the decision-making process. Initial steps were taken immediately to advertise and identify individuals to hold the positions of Project Director and Secretary/Accountant. Both positions were filled by June of 2005. By autumn 2005, the FARM Assistance position was also filled.

Working through the Producer Board, 26 sites were identified that include 4,084 acres. Figure 3 shows the location of the 26 sites and Fig. 4 indicates the locations of the monitoring equipment. Personnel with the High Plains Underground Water Conservation District No. 1, under the direction of Scott Orr, began immediately to install and test the site monitoring equipment. This was completed during 2005 and was in place for most of the growing season. It is important to note in interpreting data from Year 1, that this is an incomplete year of data. We have made every effort to locate the information to fill gaps that occur due to the time it took to bring these 26 sites on-line but information in regard to water use is based on estimates as well as actual measurements during this first year and should be interpreted with caution. However, it does provide useful information as we begin this long-term project. It is also important to note that the first year of any project is unlikely to resemble closely any following year because of all the factors involved in start-up and calibration of measurement techniques. This is always the case. As we enter year 2, we are positioned to collect increasingly meaningful data and all sites are complete. We are fortunate that this project makes use of already existing and operating systems; thus, there has been no time delay in establishment of systems.

A second factor that has undoubtedly influenced results observed in year 1 is that 2005 followed a year of abnormally high precipitation. Thus, the 2005 growing season likely was influenced by residual soil moisture. We are now in a period of extended drought. This is precisely why it is crucial to continue this type of real-world demonstration and data collection over a number of years and sets of conditions.

Lastly, all numbers in this report are still being checked and verified. THIS REPORT SHOULD BE CONSIDERED AS FIRST-YEAR DATA ONLY AND SUBJECT TO FURTHER REVISION AND INTERPRETATION.

Twenty-six sites were identified and represent cotton monocultures, crop rotations, forage systems, and integrated crop and livestock systems. They include subsurface drip, center pivot, and furrow irrigation as well as dryland examples. The results of year 1 are summarized below by system type.

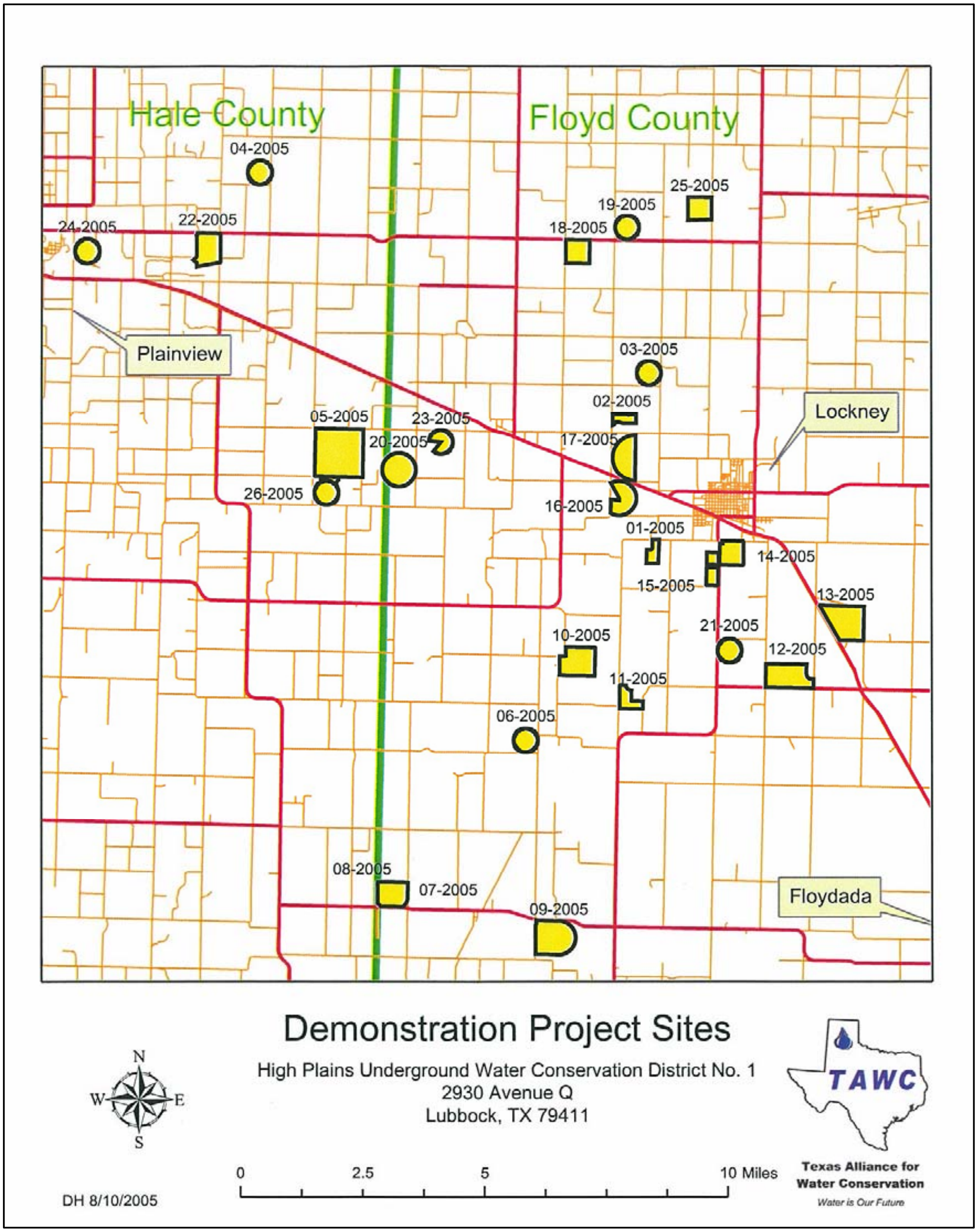


Figure 3. Location of the 26 systems in the demonstration project in Hale and Floyd Counties.

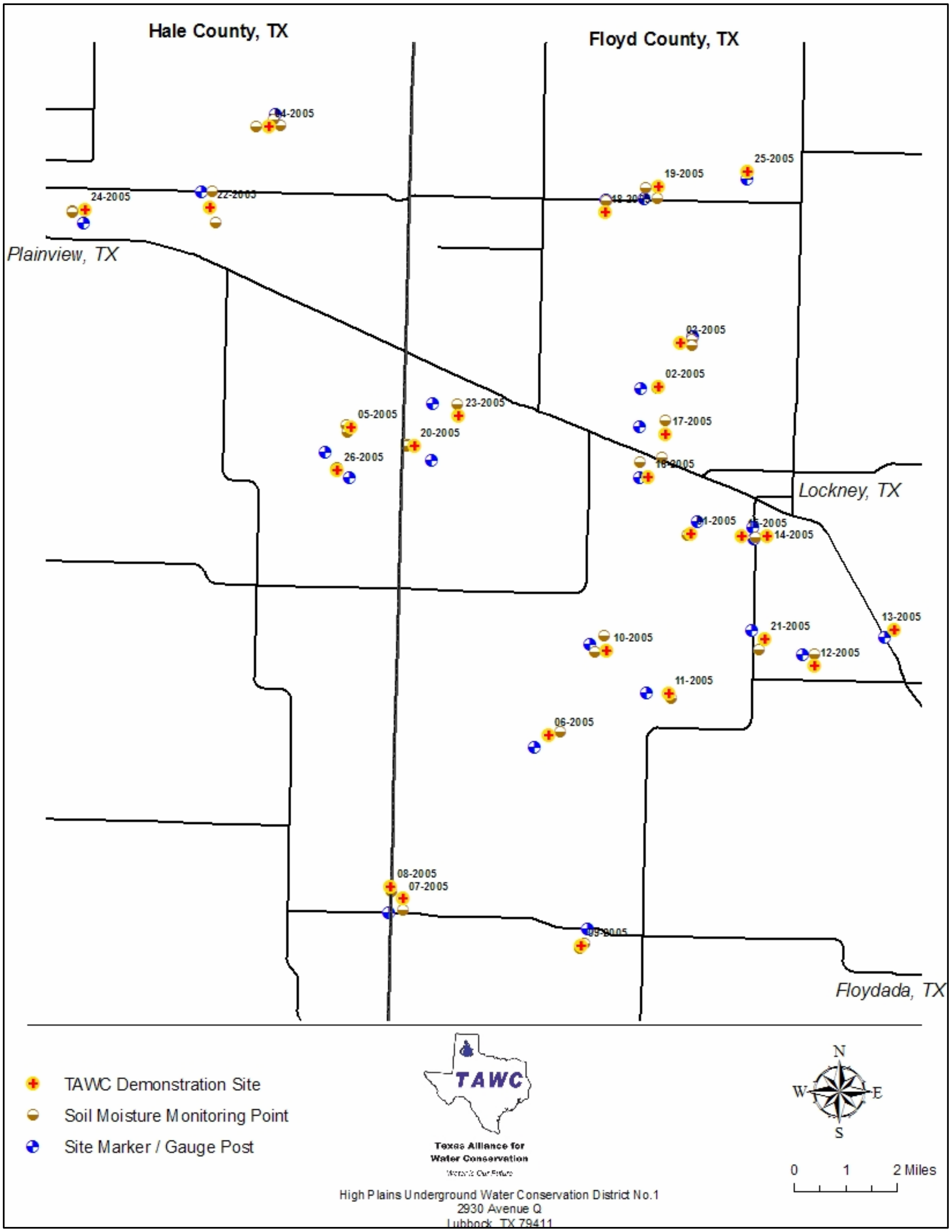


Figure 4. Location of soil moisture monitoring points in each of the 26 sites in the Demonstration Project.

SITE NUMBER 1

<u>Site Description</u>:

Total acres in system: 60.0 acres

Field No. 1:
- **Acres:** 20.75
- **Crop:** Cotton
- **Variety:** FM960BR
- **Yield:**
  - **Lint:** 2024 lb/acre
  - **Seed:** 1.44 tons/acre
- **Value/unit:**
  - **Lint:** $0.54/lb
  - **Seed:** $100/ton

Field No. 2:
- **Acres: 39.25**
- **Crop: Cotton**
- **Variety:** D&PL 444BG/RR
- **Yield:**
  - **Lint:** 1480 lb/acre
  - **Seed:** 1.01 tons/acre

Value/unit:

Lint: $0.54/lb

Seed: $100/ton

Cover crops: None

Livestock: None

Tillage system: Conventional

Row spacing:

- **Field No. 1** 40 inch
- **Field No. 2** 40 inch

Major soil type:

- **Field No. 1**: Estacado clay loam, 1 to 3% slope
- **Field No. 2**: Lofton clay loam, 0 to 1% slope
  Pullman clay loam, 1 to 3% slope

Irrigation

- **Type**: Sub Surface Drip (installed prior to 2004 crop year)
- **Pumping capacity, gal/min**: 475
- **Fuel source**: Electric

Water use:

Total irrigation water applied, inches by crop:	
Field No. 1 (cotton)	11.7
Field No. 2 (cotton)	11.7
Total irrigation water applied, system inches:	**11.7**
Total annual precipitation, inches;	**14.3**
Total water received (irrigation + precipitation):	**26.0**

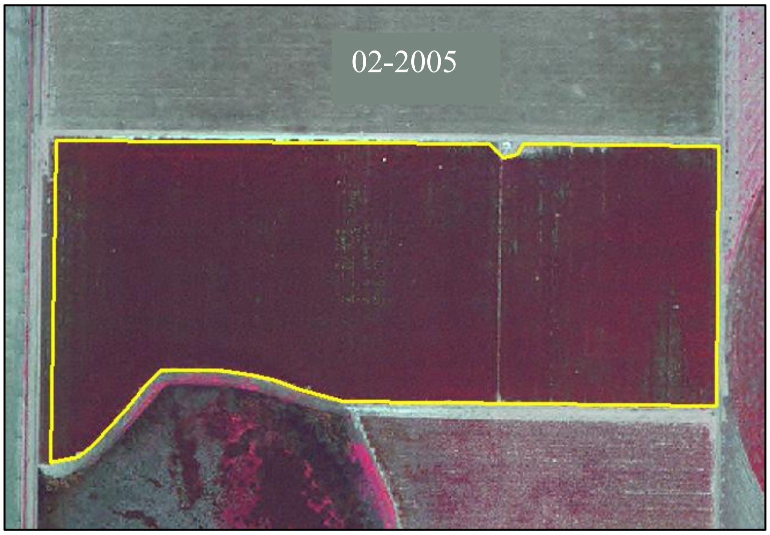
<u>Income and Expense</u>

<u>Projected returns per system acre</u>:	**1,016.58**
<u>Costs per system acre</u>:	
Total variable costs	837.17
Total fixed costs	120.00
Total All costs per system acre	**942.02**
<u>Net returns per system acre</u>:	
Per system acre	**74.56**
Per acre inch of irrigation water	**6.38**

COMMENTS

This site was some of the earliest cotton planted in the area. There was considerable variation in stand based on planting date and variety. The growing season was exceptional and this site had an outstanding yield.

SITE NUMBER 2



Site Description:

Total acres in system: 58.01 acres

Field No. 1:

Acres: 58

Crop: Cotton

Variety: '981 Fibermax' LL

Yield: 1,454.8 lb lint/acre
1.19 tons seed/acre

Value/unit:

Lint: $0.54/lb
Seed: $100/ton

Cover crop: None
Livestock: None
Tillage system: Conventional
Row spacing: 30 inch
Major soil type: Pullman clay loam, 0 to 1% slope
Olton clay loam, 1 to 3% slope

Irrigation

Type: Sub Surface Drip (installed prior to 2004 crop year)
Pumping capacity, gal/min: 360
Number of wells: 2
Fuel source: Electric

Water use:

Total irrigation water applied, inches by crop:

Field No. 1: (cotton)	8.9
Total irrigation water applied, system inches:	**8.9**
Total annual precipitation, inches (March to Dec):	**14.3**
Total water received (irrigation + precipitation):	**23.2**

Income and Expense, $

Projected Returns per System Acre:	**924.43**
Costs per system acre:	
Total variable costs	624.94
Total fixed costs	120.00
Total All costs per system acre	**744.48**
Net returns per system acre,:	
Per system acre	**179.48**
Per acre inch of irrigation water	**20.17**

COMMENTS

This was the second growing season for this field to be irrigated with subsurface drip. The cotton was planted on thirty inch rows with three plants per foot of row. There were no adverse weather conditions and this site had an outstanding yield.

Site Number 3

<u>Site Description</u>:

Total acres in system: 124.84

Field No. 1:

Acres: 63.08
Crop: Grain sorghum;
Variety: 'DeKalb 40Y'
Yield: 45.67 cwt/acre
Value/unit: $3.85

Field No. 2:

Acres: 61.76
Crop: Cotton
Variety: 'Nexgen 1553'
Yield:
- **Lint**: 1,106 lb/acre
- **Seed**: 0.87 tons/acre

Value/unit:
- **Lint**: $0.54/lb
- **Seed**: $100.00

Cover crop: None
Livestock: None in 2005
Tillage system: Conventional

Row spacing:
Field No. 1: 40 inches
Field No. 2: 40 inches
Major soil type:
Field No. 1: Pullman clay loam; 0 to 1% slope
Field No. 2: Pullman clay loam; 0 to 1% slope
Irrigation

Type:	Center Pivot (MESA)
Pumping capacity, gal/min:	450
Number of wells:	2
Fuel source:	1 natural gas; 1 electric

Water use:
Total irrigation water applied, inches by crop

Field No. 1: (grain sorghum)	7.5
Field No. 2: (cotton)	8.8
Total irrigation water applied, system inches:	**8.3**
Total annual precipitation, inches (March to December):	**14.8**
Total water received (irrigation + precipitation):	**23.1**

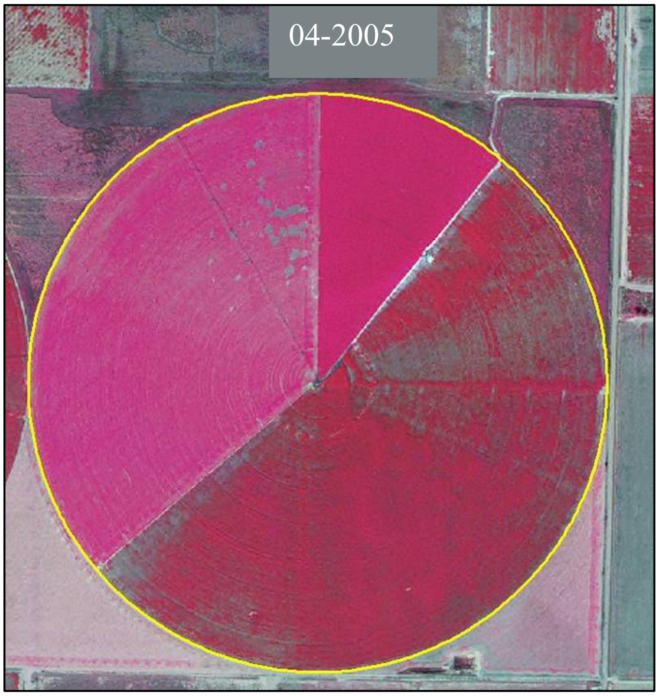
Income and Expense

Gross income per system acre:	**431.77**
Costs per system acre:	
Total variable costs	322.17
Total fixed costs	78.60
Total All costs per system acre	**400.77**
Net returns per system acre:	
Per system acre	**30.99**
Per acre inch of irrigation water	**3.82**

COMMENTS

There were no weather problems at this site in 2005. The grain sorghum was planted to a field that had been in perennial grass for three years. This field had some stand problems due to herbicide carry over. Final stand count on the cotton was four plants per foot.

SITE NUMBER 4



<u>Site Description</u>:

Total acres in system: 123.08 acres

Field No. 1:
- **Acres:** 13.26
- **Crop**: Alfalfa
- **Variety**: 'Pioneer'
- **Yield:** 8.3 tons/acre
- **Value/unit:** $130/ton

Field No. 2
- **Acres**: 65.37
- **Crop**: Cotton
- **Variety:** 'Fibermax 989'
- **Yield:**
  - **Lint:** 1,201.86 lb/acre
  - **Seed:** 0.93 tons/acre
- **Value/unit:**
  - **Lint:** $0.54/lb
  - **Seed:** $100/ton

Field No. 3
- **Acres:** 44.45
- **Crop**: Cotton
- **Variety:** 'PayMaster 2226'

Yield:

Lint: 983.4 lb/acre

Seed: 0.74 tons/acre

Value/unit:

Lint: $0.54/lb

Seed: $100/ton

Cover crop:

Field No. 2; wheat (planted late '05)

Field No. 3; wheat (planted late '05)

Livestock: None in 2005

Tillage system:

Field No. 2: Conventional

Field No. 3: Limit-till

Row spacing:

Field No. 2 40 inch

Field No. 3 40 inch

Major soil type:

Field No. 1: Estacado loam; 1 to 3% slope

Drake soils, 3 to 8% slope

Field No. 2: Pullman clay loam, 0 to 1 % slope

Field No. 3: Pullman clay loam, 0 to 1% slope

Irrigation

Type: Center Pivot (LESA)

Pumping capacity, gal/min: 500

Number of wells: 3

Fuel source: 1 natural gas; 2 electric

Water use:

Total irrigation water applied, inches by crop

Field No. 1: (alfalfa)	10.25
Field No. 2: (cotton)	5.00
Field No. 3: (cotton)	4.75
Total irrigation water applied, system inches:	**5.47**
Total annual precipitation:	**16.8**
Total water received (irrigation + precipitation):	**22.27**

Income and Expense, $

Projected returns per system acre:	**727.99**
Costs per system acre:	
Total variable costs	540.58
Total fixed costs	81.80

Total All costs per system acre	**622.41**

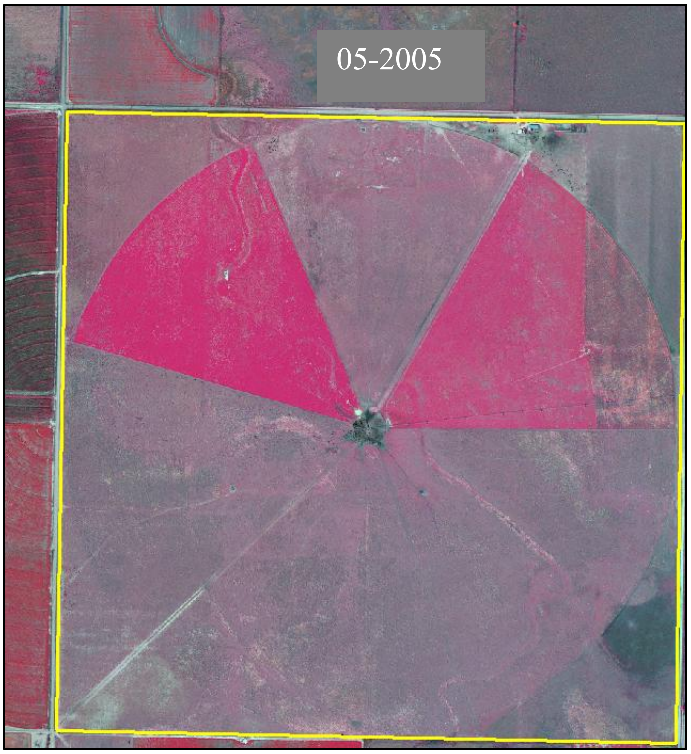
<u>Net returns per system acre</u>:

Per system acre	**105.58**
Per acre inch of irrigation water	**18.22**

COMMENTS

This producer utilized his alfalfa production on his own livestock. He had both conventional and limit-till cotton in 2005. This site had no weather problems.

SITE NUMBER 5



<u>Site Description</u>:

Total acres in system: 630 (503 irrigated; 127 dryland)

Crops:

- **Field No. 1;** Dahl/Kliengrass mixture
- **Field No. 2:** Dahl/Kliengrass mixture
- **Field No. 3;** Former CRP Plains OWB and other short grasses
- **Field No. 4:** Former CRP Plains OWB and other short grasses
- **Field No. 5;** Former CRP Plains OWB and other short grasses
- **Field No. 6:** Dahl/alfalfa mixture
- **Field No. 7:** Former CRP Plains OWB and other short grasses
- **Field No. 8:** Former CRP Plains OWB and other short grasses
- **Field No. 9:** Former CRP Plains OWB and other short grasses
- **Field No. 10:** Former CRP Plains OWB and other short grasses
- **Field No. 11:** Former CRP Plains OWB and other short grasses

Cover crop: NA

Livestock: Commercial Cow-Calf, Angus

- Grazing dates, Julian: 91 to 365
- Number of grazing days: 274
- Acres grazed: 630

Adult animals/day:	183.7
Stocking rate, cows/acre:	0.29
Acres/cow	3.4
Cow days per system:	50,332
Number of calves weaned:	220

Tillage system: None
Row spacing: **NA**
Major soil type: Bippus loam, 0 to 1% slope

Irrigation

Type:	Center Pivot (MESA)
Pumping capacity, **gal/min**:	1100
Number of wells:	4
Fuel source:	electric

Water use:

Total irrigation water applied, inches by crop:	1.23
Total irrigation water applied, system inches:	**1.23**
Total annual precipitation:	**15.1**
Total water received (irrigation + precipitation):	**16.33**

Income and Expense, $

Projected returns per system acre: **284.33**

Costs per system acre:

Total variable costs	90.97
Total fixed costs	30.14
Total All costs per system acre	**121.11**

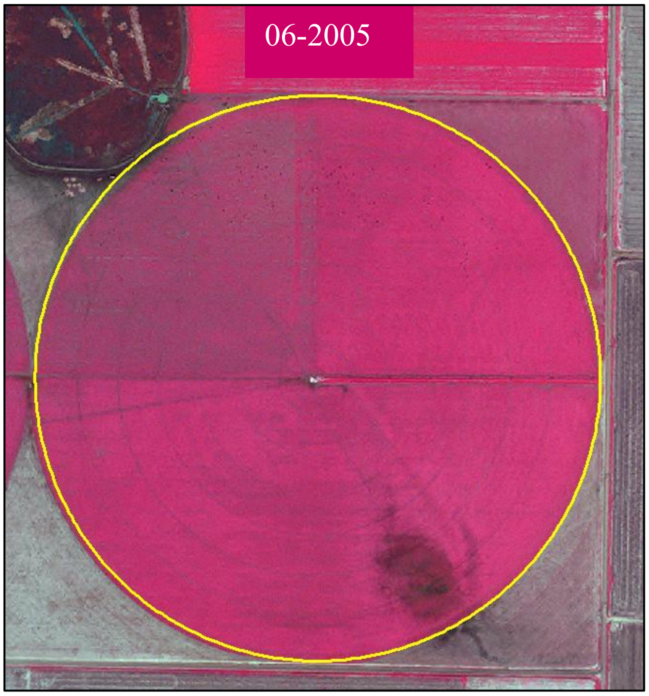
Net returns per system acre:

Per system acre	**163.22**
Per acre inch of irrigation water	**133.22**

COMMENTS

This is a first class commercial Angus cow-calf operation. This producer uses Gardiner Angus bulls and keeps complete production records. He retains ownership in his steer calves and his heifers are sold as bred replacements.

SITE NUMBER 6



Site Description:

Total acres in system: 122.91
Crop:
- **Field No. 1**:
  - **Acres**: 122.91
  - **Crop:** Cotton
  - **Variety**: 'Stoneville 2448'
  - **Yield:**
    - **Lint:** 1,216 lb/acre
    - **Seed:** 0.97 tons/acre
  - **Value/unit**:
    - **Lint:** $0.54/lb
    - **Seed:** $100/ton

Double crop: Wheat for grazing
Variety: 'Weather Master'
Livestock: Stocker steers, mixed breeds

Grazing dates, Julian:	298 to 449 (Oct, 2004 to March 2005)
Number of grazing days:	151
Acres grazed:	123
Steers/day:	
Stocking rate, steer/acre:	0.56
Acres/steer	1.78

Steer days per system:	
Weight in:	452
Weight out:	778
Number of head:	180

Tillage system: Conventional
Row spacing:
Field No. 1 cotton; 40 inch
Major soil type: Pullman clay loam, 0 to 1% slope

Irrigation

Type:	Center Pivot (LESA)
Pumping capacity, gal/min:	500
Number of wells:	4
Fuel source:	natural gas

Water use:

Total irrigation water applied (system inches):	**11.35**
(All irrigation water was applied to cotton)	
Total annual precipitation:	**15.0**
Total water received (irrigation + precipitation):	**26.35**

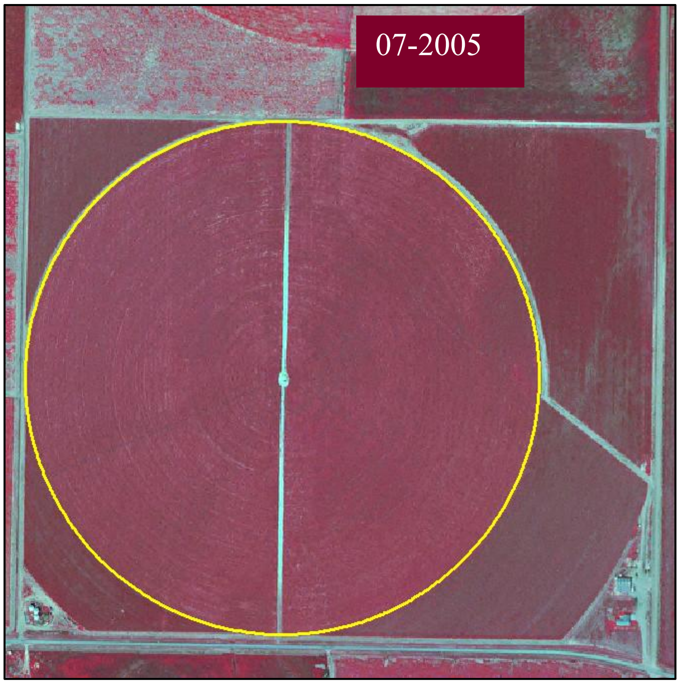
Income and Expense, $

Projected returns per system acre:	**758.20**
Costs per system acre:	
Total variable costs	587.20
Total fixed costs	78.60
Total All costs per system acre	**665.80**
Net returns per system acre:	
Per system acre	**93.13**
Per acre inch of irrigation water	**8.20**

COMMENTS

This site received slight hail damage on June 7th. The balance of the growing season was outstanding. The harvest population was 4.3 plants per foot of row on forty inch rows. Steers were only on system for 15 days.

Site Number 7



<u>Site Description</u>:

Total acres in system: 129.78

Field No. 1:

Acres: 130.1

Crop: Side Oats Grama (harvested for seed; residue baled)

Variety: 'Haskell'

Yield:

Seed: 300 lb/acre

Hay: 3.46 round bales/acre

Value/unit:

Seed: $3.46/lb

Hay: $30/bale

Cover crop: NA

Livestock: None

Tillage system: NA

Row spacing: 40 inch

Major soil type: Pullman clay loam; 0 to 1% slope

Irrigation

Type: Center Pivot (LESA)

Pumping capacity, gal/min: 500

Number of wells: 4

Fuel source: electric

Water use:

Total irrigation water applied (system inches):	**9.84**
Total annual precipitation, inches:	**15.4**
Total water received (irrigation + precipitation):	**25.24**

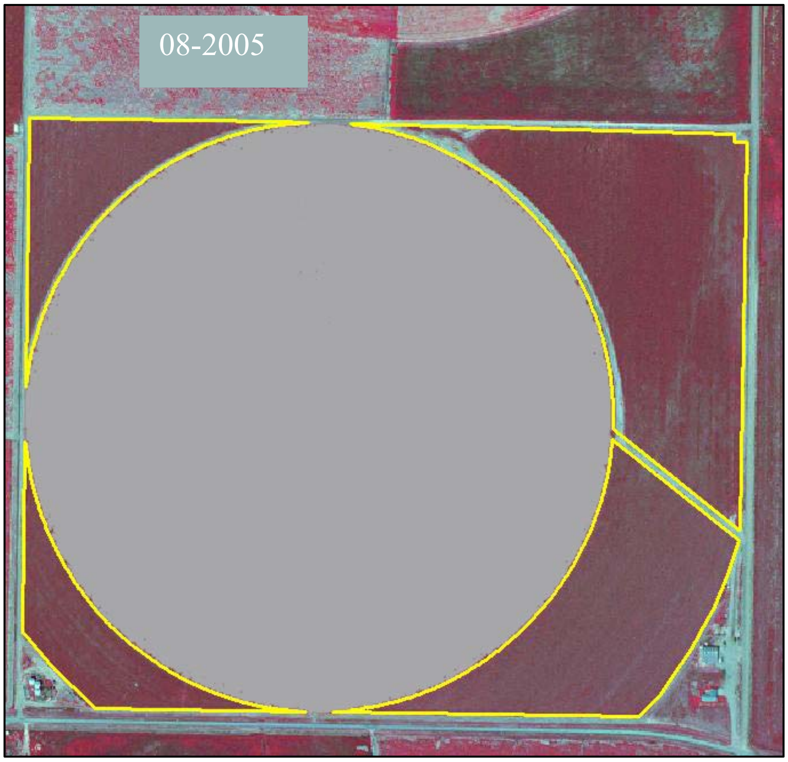
Income and Expense, $

Projected returns per system acre:	**1,229.02**
Costs per system acre:	
Total variable costs	767.37
Total fixed costs	120.00
Total All costs per system acre	**887.37**
Net returns per system acre:	
Per system acre	**341.65**
Per acre inch of irrigation water	**34.72**

COMMENTS

The grass at this site was established eleven years ago and is grown for seed production. After seed harvest the crop residue is bailed and sold to livestock producers. The grass is swathed and allowed to dry in the wind row. The wind row is then combined with the residue wind rowed behind the harvest equipment. This year the grass had a significant hail on June 7th, and high winds and hail in September which adversely affected yield.

SITE NUMBER 8



Site Description:

Total acres in system: 61.79

Field No. 1

Acres:

Crop: Side Oats Grama (grass harvested for seed; residue baled)

Variety: 'Haskell'

Yield:

Seed: 325 lbs/acre

Hay: 3.72 round bales/acre

Value/unit:

Seed: $3.75/lb

Hay: $30/bale

Field No. 2

Acres:

Crop: Side Oats Grama (grass harvested for seed; residue baled)

Variety: 'Haskell'

Yield:

Seed: 325 lbs/acre

Hay: 3.72 round bales/acre

Value/unit:

Seed: $3.75/lb

Hay: $30/bale

Field No. 3

Acres:
Crop: Side Oats Grama (grass harvested for seed; residue baled)
Variety: 'Haskell'
Yield:
Seed: 325 lbs/acre
Hay: 3.72 round bales/acre
Value/unit:
Seed: $3.75/lb
Hay: $30/bale

Field No. 4
Acres:
Crop: Side Oats Grama (grass harvested for seed; residue baled)
Variety: 'Haskell'
Yield:
Seed: 325 lbs/acre
Hay: 3.72 round bales/acre
Value/unit:
Seed: $3.75/lb
Hay: $30/bale

Cover crop: NA
Livestock: None
Tillage system: NA
Row spacing: 40 inch centers
Major soil type: Pullman clay loam; 0 to 1% slope

Irrigation
Type: Sub Surface Drip (SDI); 40 inch centers
Pumping capacity, gal/min: 360
Number of wells: 4
Fuel source: electric

Water use:
Total irrigation water applied (system inches): **11.25**
Total annual precipitation, inches: **15.4**
Total water received (irrigation + precipitation): **26.65**

<u>Income and Expense, $</u>

<u>Projected returns per system acre</u>: **1,328.48**

<u>Costs per system acre</u>:
Total variable costs 833.98
Total fixed costs 78.60
Total All costs per system acre **912.58**

<u>Net returns per system acre</u>:

Per system acre	**415.90**
Per acre inch of irrigation water	**36.97**

COMMENTS

This portion of the farm had been flood irrigated prior to the installation of subsurface drip two years ago. The drip tape is on forty inch centers and was plowed in the furrow bottoms. The grass is managed in the same manor as site 7.

SITE NUMBER 9

Site Description:

Total acres in system: 230.29
Crop:
Field No. 1:
Acres: 94.72
Crop: Pasture
Species: Kleingrass (old CRP), buffalograss mixed;
interseeded with rye.
Varieties: Unknown
Yield: 0.66 tons/acre
Value/unit: $39.38/ton

Field No. 2
Acres: 135.58
Crop: Cotton
Variety: 'FiberMax 989 BR'
Yield:
Lint: 1,394 lb/acre
Seed: 0.85 tons/acre
Value/unit:
Lint: $0.54/lb

Seed: $100/ton

Cover crop: Rye in Field No. 2; (double cropped for grazing)
Variety: 'Elbon' and 'Maton' mixed

Livestock: Stocker steers

Mixed breeds:
Yield per acre: 4.62 cwt
Value/cwt: $88.15
Mexican breeds:
Yield per acre: 4.68 cwt
Value/cwt: $35.00

Grazing:
Day 15 to day 106 (91 days) on Field No. 2 115 head, steers
Day 107 to day 197 (91 days) on Field No. 1, 114 head, steers
Day 198 to day 274 (76 days) on Field No. 1, 390 head, steers

Weight gains:

Group 1: In at 390 lb; out at 792 lbs; Total gain

Per steer	402 lbs
Per group	45,828 lbs

Group 2: In at 375 lbs; out at 495 lbs; Total gain

Per steer	120 lbs
Per group	46,800 lbs

Total pounds of gain per system/year **92,628 lbs**

Tillage system: No-Till (This system has been no-till for nine years.
Has used compost for fertilizer program.)

Row spacing: 40 inch
Major soil type:
Field No. 1; Mixed shallow soils (see map)
Field No. 2: Pullman clay loam; 0 to 1% slope

Irrigation

Type:	Center Pivot (MESA)
Pumping capacity, gal/min:	900
Number of wells:	4
Fuel source:	2 natural gas; 2 diesel

Water use:

Total irrigation water applied, inches by crop	
Field No. 1: (pasture)	1.5
Field No. 2: (cotton)	10.16
Total irrigation water applied (system inches):	**6.5**
Total annual precipitation:	**14.4**

Total water received (irrigation + precipitation): **20.9**

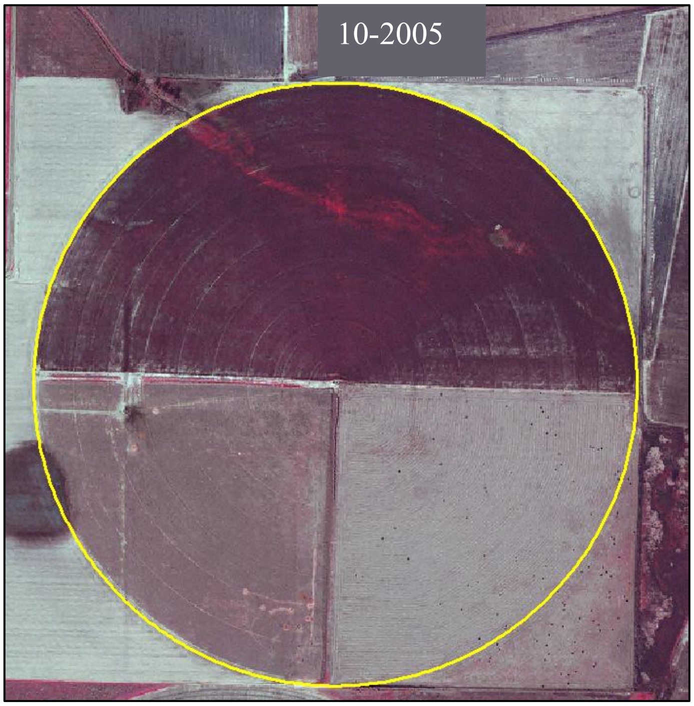
<u>Income and Expense, $</u>

Projected Returns per System Acre:	**756.28**
Costs per system acre:	
Total variable costs	371.58
Total fixed costs	78.60
Total All costs per system acre	**450.98**
Net returns per system acre:	
Per system acre	**306.09**
Per acre inch of irrigation water	**46.39**

COMMENTS

This site has been in a no till program for nine years and has used compost as the primary fertility program. The livestock component is a combination of perennial warm season grass inter seeded in the fall with rye. After cotton harvest rye is no tilled into cotton stalks, grazed, and terminated prior to cotton planting. In 2005 this site experienced a severe hail storm on June 7th.

SITE NUMBER 10



<u>Site Description</u>:

Total acres in system: 210.74

Crops:

Field No. 1:

Acres: 42.07
Crop: Old world bluestem
Variety; 'WW-B. Dahl'
Yield:
Value/unit:

Field No. 2

Acres: 43.60
Crop: Cotton
Variety: FM832LL
Yield:
Lint: 1,566.9 lb/acre
Seed: 1.07 tons/acre
Value/unit:
Lint: $0.54/lb
Seed: $100/ton

Field No. 3

Acres: 41.13

Crop: Old world bluestem
Variety; 'WW-B. Dahl'
Yield:
Value/unit:

Field No. 4
Acres: 41.87
Crop: Bermudagrass
Variety; 'Giant' and 'common' (50/50 mix)
Yield:
Value/unit:

Cover crops: None

Livestock: Registered Cow-Calf, Chiangus and Angus

Tillage system: Conventional (cotton)
Row spacing:
Field No. 2 — 40 inch
Major soil type: Pullman clay loam; 0 to 1% slope

Irrigation
Type: Center Pivot (LESA)
Pumping capacity, gal/min: 800
Number of wells: 2
Fuel source: electric

Water use:
Irrigation applied by field

Field No. 1:	Dahl old world bluestem	6
Field No. 2	Cotton	12
Field No. 3	Dahl old world bluestem	6
Field No. 4	Bermudagrass	10
Total irrigation water applied (system inches):		**8.54**
Total annual precipitation:		**11.1**
Total water received (irrigation + precipitation):		**19.64**

Income and Expense, $

Projected returns per system acre: **414.52**

Costs per system acre:

Total variable costs	190.97
Total fixed costs	69.62
Total All costs per system acre	**260.59**

Net returns per system acre:

Per system acre	**153.93**
Per acre inch of irrigation water	**22.51**

COMMENTS

This site is a combination of perennial warm season grasses and cotton. One fourth of the pivot was planted to grass two years ago, and one half of the pivot was planted to grass this year. This is a registered cow calf producer and he hosts an annual production sale each fall.

SITE NUMBER 11

<u>Site Description</u>:

Total acres in system: 92.45 acres

Field No. 1:
Acres: 45.18
Crop: Cotton
Variety: 'AFD 3511'
Yield:
Lint: 723.81 lb/acre
Seed: 0.58 tons/acre
Value/unit:
Lint: $0.54/lb
Seed: $100/tons

Field No. 2
Acres: 24.40
Crop: Cotton
Variety: 'AFD 3511'
Yield:
Lint: 723.81 lb/acre

Seed: 0.58 tons/acre

Value/unit:

Lint: $0.54/lb

Seed: $100/tons

Field No. 3

Acres: 22.88

Crop: Cotton

Variety: 'AFD 3511'

Yield:

Lint: 723.81 lb/acre

Seed: 0.58 tons/acre

Value/unit:

Lint: $0.54/lb

Seed: $100/tons

Cover crop: None

Livestock: None

Tillage system: Conventional

Row spacing:

Field No. 1 40 inch

Field No. 2 40 inch

Field No. 3 40 inch

Major soil type: Pullman clay loam; 0 to 3% slope

Irrigation

Type: Furrow

Pumping capacity, gal/min: 490

Number of wells: 1

Fuel source: electric

Water use:

Irrigation by field

Field No. 1:	9.2
Field No. 2	9.2
Field No. 3	9.2

Total irrigation water applied (system inches):	**9.2**
Total annual precipitation:	**14.4**
Total water received (irrigation + precipitation):	**21.0**

Income and Expense, $

Projected Returns per System Acre **461.24**

Costs per System Acre:

Total variable costs:	394.56
Total fixed costs	70.00
Total All costs	**464.56**

Net returns per System Acre: **- 3.32**
Net returns per acre inch of irrigation water: **- 0.36**

COMMENTS

This site is composed of three different fields and all were planted to cotton this year. All fields were pre-irrigated and had one in season irrigation. On June 7th this site received a severe hail. The stand was reduced to 2.5 plants per foot of row.

SITE NUMBER 12

Site Description:

Total acres in system: 283.9

Field No. 1:
Acres: 151.2
Crop: Cotton
Variety: 'Paymaster 2266'
Yield:
Lint: 615 lb/acre
Seed: 0.47 tons/acre
Value/unit:
Lint: $0.54/lb
Seed: $100/ton

Field No. 2:
Acres: 132.7
Crop: Forage sorghum
Variety:
Yield:
Value/unit:

Cover crop: Wheat planted after cotton in Field No. 1

Livestock: None
Tillage system: No-Till

Row spacing:		
Field No. 1	40 inches	
Field No. 2	40 inches	
Major soil type:	Pullman clay loam; 0 to 1% slope	
Irrigation		
Type:	Dryland	0

Water use:	
Total irrigation water applied (system inches):	NA
Total annual precipitation:	**12.5**
Total water received (irrigation + precipitation):	**12.5**

Income and Expense, $

Projected returns per system acre:	**198.49**
Costs per system acre:	
Total variable costs	154.50
Total fixed costs	7.99
Total All costs per system acre	**162.49**
Net returns per system acre:	
Per system acre	**36.00**
Per acre inch of irrigation water	**NA**

COMMENTS

One field of this dry land site was planted into standing grain sorghum residue from the previous years crop. The 2005 cotton crop was no till. Field two was planted to hay grazer in 2005 as a cover crop for the 2006 cotton crop. On June 7th this site received some hail damage and the cotton stand was reduced to 2.5 plants per foot of row.

Site Number 13

<u>Site Description</u>:

Total acres in system: 314.22

Field No. 1

Acres: 115.97 acres

Crop: Wheat

Variety:

Yield: 34.49 bu/acre

Value/unit: $2.89/bu

Field No. 2

Acres: 298.24

Crop: Cotton

Variety: HS2326

Yield:

Lint: 601.6 lbs/acre

Seed: 0.45 tons/acre

Value/unit:

Lint: $0.54/lb

Seed: $100/ton

Cover crop: None

Livestock: None

Tillage system: Conventional

Row spacing:

Field No. 1 40 inch

Field No. 2 40 inch

Major soil type:	Pullman clay loam; 0 to 1% slope	
Irrigation		
Type:	Dryland	
Water use:		
Total irrigation water applied (system inches):		NA
Total annual precipitation:		**16.3**
Total water received (irrigation + precipitation):		**16.3**

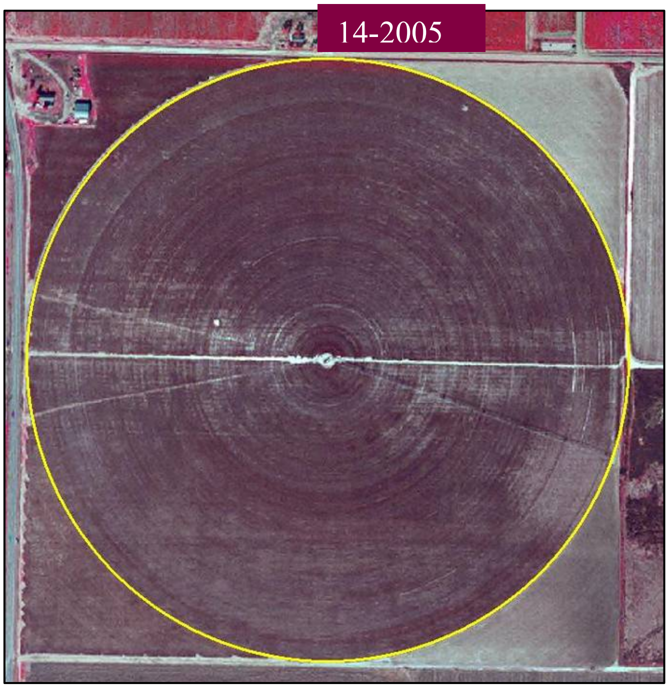
Income and Expense

Projected returns per system acre:	**270.44**
Costs per system acre:	
Total variable costs	**204.46**
Total fixed costs	15.00
Total All costs per system acre	**219.46**
Net returns per system acre:	
Per system acre	**50.98**
Per acre inch of irrigation water	**NA**

COMMENTS

This site is a conventional till dry land cotton farm. The producer is one of the best dry land farmers in the area. The 2005 crop had excellent growing conditions and there were no disease or insect problems.

SITE NUMBER 14



Site Description:

Total acres in system: 124.18

Field No. 1

Acres: 124.18
Crop: Cotton
Variety: 'Fibermax 960'(62.09 acres)
Yield:
Lint: 1,040 lb/acre
Seed: 0.79 tons/acre
Value/unit:
Lint: $0.54/lb
Seed: $100/ton
Variety: 'Paymaster 2266' (62.09 acres)
Yield:
Lint: 969 lb/acre
Seed: 0.73 tons/acre
Value/unit:
Lint: $0.54/lb
Seed: $100/ton

Cover crop:	None
Livestock:	None
Tillage system:	Conventional
Row spacing:	40 inch
Major soil type:	Pullman clay loam; 0 to 1% slope

Irrigation

Type:	Center Pivot
Pumping capacity, gal/min:	300
Number of wells:	3
Fuel source:	electric

Water use:

Total irrigation water applied (system inches):	**6.75**
Total annual precipitation:	**14.0**
Total water received (irrigation + precipitation):	**20.75**

<u>Income and Expense, $</u>

<u>Projected returns per system acre</u>:	**621.43**
<u>Costs per system acre</u>:	
Total variable costs	427.57
Total fixed costs	78.60
Total All costs per system acre	**506.17**
<u>Net returns per system acre</u>:	
Per system acre	**115.25**
Per acre inch of irrigation water	**17.07**

COMMENTS

The 2005 crop got off to a good start and did not receive any adverse weather. Harvest plant population was 3.5 plants per foot of row. There were no problems with disease or insects.

SITE NUMBER 15

Site Description:

Total acres in system: 94.26

Field No. 1:
- **Acres:** 38.18
- **Crop**: Cotton
- **Variety;** 'Paymaster 2326'
- **Yield**:
  - **Lint**: 377.49 lb/acre
  - **Seed:** 0.31 tons/acre
- **Value/unit**:
  - **Lint:** $0.54/lb
  - **Seed:** $100/ton

Field No. 2:
- **Acres:** 56.08
- **Crop**: Cotton
- **Variety:** 'Paymaster 2280'
- **Yield**:
  - **Lint:** 911 lb/acre
  - **Seed**: 0.76 tons/acre

Value/unit:

Lint: $0.54/lb

Seed: $100/ton

Cover crop:	None
Livestock:	None
Tillage system:	Conventional
Field No. 1	40 inch
Field No. 2	40 inch
Major soil type:	Pullman clay loam; 0 to 1% slope

Irrigation

Type:	Furrow
Pumping capacity, gal/min:	290
Number of wells:	1
Fuel source:	natural gas

Water use, inches:

Irrigation by fields:

Field No. 1	4.6
Field No. 2	4.6
Total irrigation water applied (system inches):	**4.6**
Total annual precipitation:	**19.2**
Total water received (irrigation + precipitation):	**25.8**

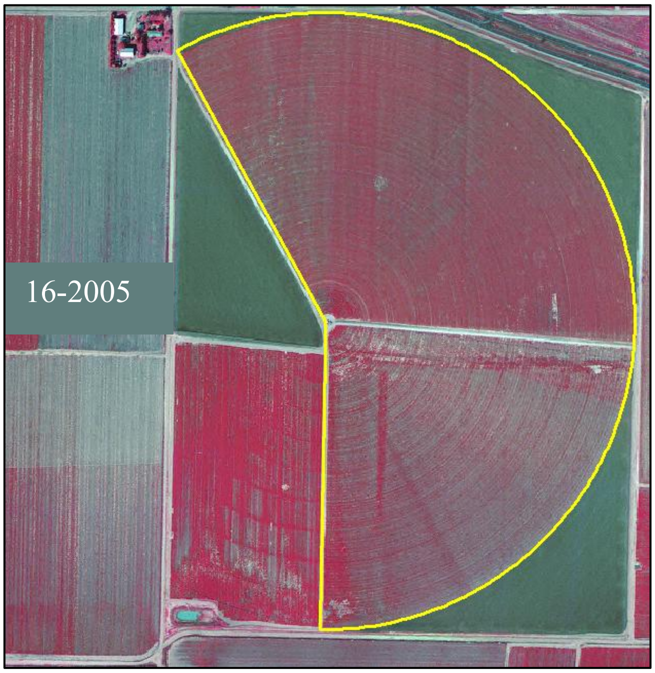
Income and Expense, $

Projected Returns per System Acre:	**517.14**
Costs per system acre:	
Total variable costs	388.35
Total fixed costs	70.00
Total All costs per system acre	**458.35**
Net returns per system acre:	
Per system acre	**58.79**
Per acre inch of irrigation water	**12.78**

COMMENTS

This is a conventional till flood irrigated cotton site. The crop received one in season irrigation. We had a excellent growing season with no adverse weather conditions.

Site Number 16



<u>Site Description</u>:

Total acres in system: 145

Field No. 1

Acres: 145
Crop: Cotton
Variety: FM 958
Yield:
Lint: 1346.58 lb/acre
Seed: 0.95 tons/acre
Value/unit:
Lint: $0.54/lb
Seed: $100/ton

Cover crop: None
Livestock: None
Tillage system: Conventional
Row spacing: 40 inch
Major soil type: Pullman clay loam; 0 to 1% slope

Irrigation
Type: Center Pivot (LESA)

Pumping capacity,gal/min: 600
Number of wells: 3
Fuel source: electric

Water use:

Total irrigation water applied (system inches):	**7.55**
Total annual precipitation:	**16.3**
Total water received (irrigation + precipitation):	**23.85**

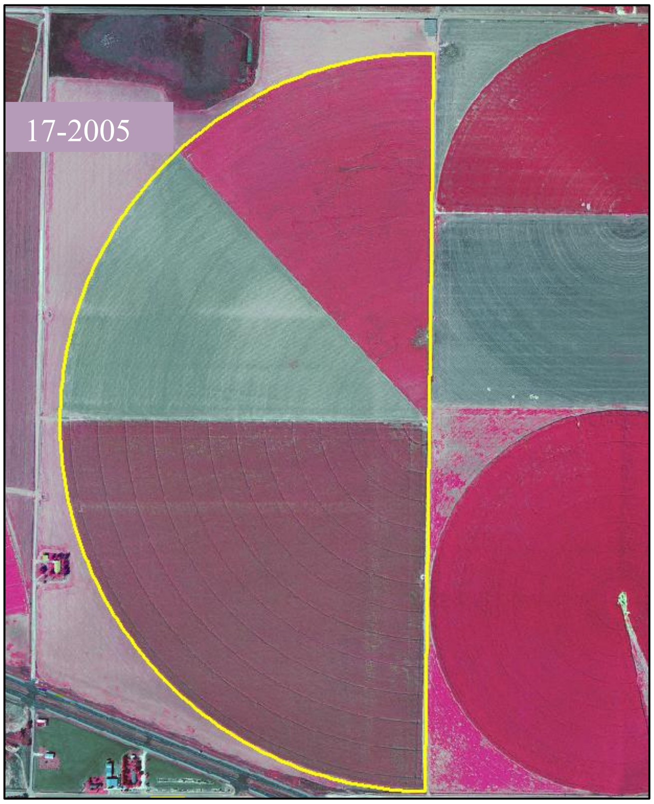
<u>Income and Expense, $</u>

Projected Returns per System Acre:	**821.74**
Costs per system acre:	
Total variable costs	625.78
Total fixed costs	78.60
Total all costs per system acre	**704.35**
Net returns per system acre:	
Per system acre	**117.35**
Per acre inch of irrigation water	**15.54**

COMMENTS

This is a conventional till pivot site planted to cotton in 2005. The harvest population was 4.6 plants per foot of row. There were no weather, disease, or insect problems experienced in this growing season.

Site Number 17



Site Description:

Total acres in system: 222.5

Field No. 1:
- **Acres:** 54.5
- **Crop:** Old world bluestem for hay
- **Species:** 'WW-B. Dahl'
- **Yield:** 5.91 tons/acre
- **Value/unit:** $65/ton

Field No. 2:
- **Acres**: 58.4
- **Crop:** Corn for silage
- **Variety:** 'NC + 1717'
- **Yield:** 31.8 tons/acre
- **Value/unit:** $20.12/ton

Field No. 3:
- **Acres:** 109.6
- **Crop:** Cotton
- **Variety:** 'FiberMax 960 BR2'
- **Yield:**
  - **Lint:** 1658 lb/acre

Seed: 1.21 tons/acre
Value/unit:
Lint: $0.54/lb
Seed: $100/ton

Cover crop: Wheat planted prior to cotton in Field No. 3; wheat is for grazing
Livestock: No
Tillage system: None
Field No. 2
Field No. 3
Row spacing:
Field No. 2 20 inch
Field No. 3 30 inch
Major soil type: Pullman clay loam; 0 to 1% slope

Irrigation
Type: Center Pivot (MESA)
Pumping capacity, gal/min: 900
Number of wells: 8
Fuel source: electric
Water use:
Irrigation applied by field:

Field No. 1	6.94
Field No. 2	15.93
Field No. 3	9.42
Total irrigation water applied (system inches):	**10.52**
Total annual precipitation:	**17.5**
Total water received (irrigation + precipitation):	**28.02**

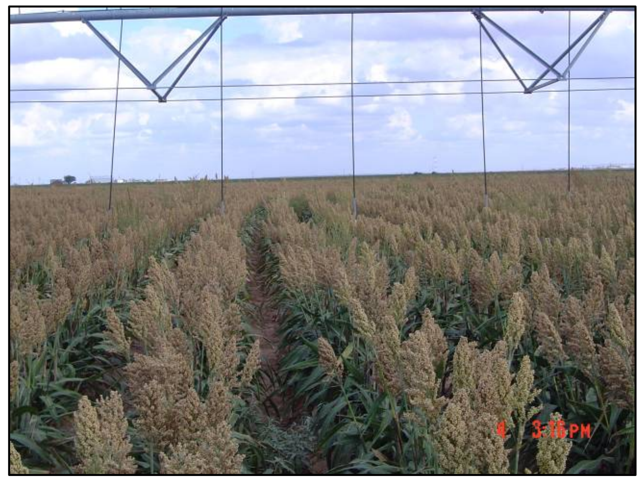
<u>Income and Expense, $</u>

<u>Projected returns per system acre</u>:	**762.52**
<u>Costs per system acre</u>:	
Total variable costs	496.42
Total fixed costs	86.47
Total All costs per system acre	**582.89**
<u>Net returns per system acre</u>:	
Per system acre	**179.63**
Per acre inch of irrigation water	**17.07**

COMMENTS

This is a very intensely managed corn (for silage), cotton and warm season grass site. The corn is harvested and then planted to wheat for cover for next years cotton crop. The cotton is then rotated to corn silage the next year. Grass is cut for hay and may be harvested for seed some years. There were no weather problems in 2005. No livestock were present during 2005.

SITE NUMBER 18



<u>Site Description</u>:

Total acres in system: 122.21

Field No. 1:
- **Acres** 60.67
- **Crop:** Grain sorghum
- **Variety**: 'DeKalb 404'
- **Yield**: 51 cwt/acre
- **Value/unit:** $3.85/cwt

Field No. 2:
- **Acres**: 61.54
- **Crop**: Cotton
- **Variety:** 'AFD 3511 RR'
- **Yield:**
  - **Lint:** 992 lb/acre
  - **Seed:** 0.83 tons/acre
- **Value/unit:**
  - **Lint:** $0.54/lb
  - **Seed:** $100/ton

Cover crop: No
Livestock: None
Tillage system: Conventional
Row spacing:
Field No. 1 40 inch

Field No. 2	40 inch	
Major soil type:	Pullman clay loam; 0 to 1% slope	

Irrigation

Type:	Center Pivot
Pumping capacity, gal/min:	250
Number of wells:	3
Fuel source:	electric

Water use:

Irrigation by Field:

Field No. 1	3.0
Field No. 2	8.75

Total irrigation water applied (system inches):	**5.9**
Total annual precipitation:	**16.5**
Total water received (irrigation + precipitation):	**22.4**

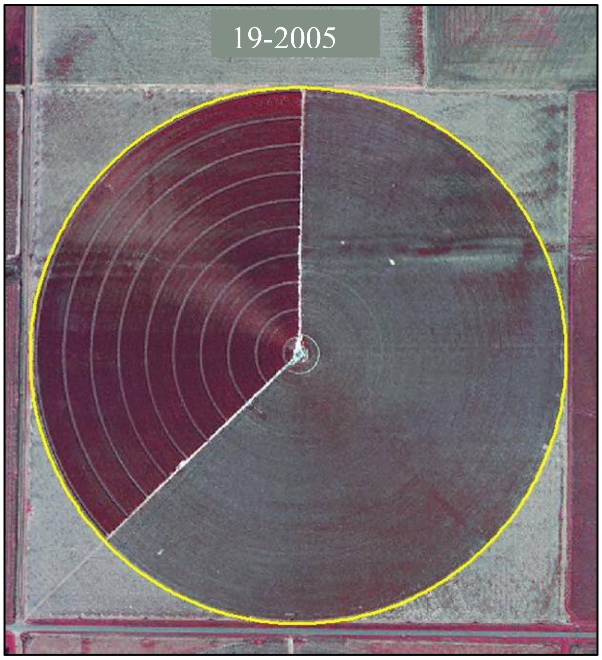
Income and Expense, $

Projected returns per system acre:	**$400.54**
Costs per system acre:	
Total variable costs	310.13
Total fixed costs	78.60
Total All costs per system acre	**388.73**
Net returns per system acre:	
Per system acre	**11.81**
Per acre inch of irrigation water	**2.00**

COMMENTS

At this pivot site there is a very limited amount of water available. One half of the pivot is planted to cotton with the other half planted to grain sorghum. The grain sorghum is planted with the intent that it will probably not be irrigated most years. The cotton is then rotated the following year. We had excellent weather conditions at this site in 2005 with a cotton harvest population of 4 plants per foot of row.

SITE NUMBER 19



Site Description:

Total acres in system: 120.3

Field No. 1:

Acres: 30.1
Crop: Cotton
Variety: 'AFD 3511'
Yield:
  Lint: 948 lb/acre
  Seed: 0.71 tons/acre
Value/unit:
  Lint: $0.54/lb
  Seed: $100/ton

Field No. 2:

Acres: 45.1
Crop: Pearlmillet
Variety:
Yield: 3,876 lb/acre
Value/unit: $0.17/lb

Field No. 3:

Acres 45.1 acres – combined with No. 1 in 2005
Crop: Cotton
Variety: 'AFD 3511'

Yield: (see above)
Value/unit:

Cover crop:	no
Livestock:	None
Tillage system:	Conventional
Row spacing:	
Field No. 1	40 inch
Field No. 2	40 inch
Field No. 3	40 inch
Major soil type:	Pullman clay loam; 0 to 1% slope

Irrigation

Type:	Center Pivot (LEPA)
Pumping capacity, gal/min:	400
Number of wells:	3
Fuel source:	electric

Water use:

Irrigation by field, inches:	
Field No. 1	8.75
Field No. 2	11.5
Field No. 3	8.75
Total irrigation water applied (system inches):	**9.47**
Total annual precipitation:	**13.9**
Total water received (irrigation + precipitation):	**23.37**

Income and Expense, $

Projected returns per system acre:	**611.44**
Costs per system acre:	
Total variable costs	354.06
Total fixed costs	78.60
Total All costs per system acre	**432.66**
Net returns per system acre:	
Per system acre	**178.78**
Per acre inch of irrigation water	**18.28**

COMMENTS

This is a pivot irrigated site with one third planted to millet for seed production and two thirds planted to cotton. The cotton is then rotated behind the millet crop. This site had excellent growing conditions in 2005 with no adverse weather.

SITE NUMBER 20

Site Description:

Total acres in system: 220

Field No. 1:

Acres: 110
Crop: Wheat and forage sorghum silage, double-cropped
Varieties:
Wheat: 'Weather Master'
Forage sorghum: 'DeKalb 5907'
Yield:
Wheat silage: 16.1 tons/acre
Sorghum silage: 26 tons/acre
Value/unit:
Wheat silage: $18.63/ton
Sorghum silage: $20.19/ton

Field No. 2:

Acres: 110
Crop: Corn for silage and triticale planted late '05 for silage
Varieties:
Corn: 'Pioneer 32B29'
Yield:
Corn silage: 30 tons/acre
Value/unit: $20.12/ton

Cover crop: Yes, see above

Livestock: None
Tillage system: Conventional
Row spacing:
Field No. 1:
Forage sorghum: 20 inch
Wheat:
Field No. 2:
Corn: 20 inch
Triticale:

Major soil type: Pullman clay loam; 0 to 1% slope

Irrigation
Type: Center Pivot (LEPA)
Pumping capacity, gal/min: 1,000
Number of wells: 3
Fuel source: electric
Water use:
Irrigation by field:
Field No. 1

Wheat	7.5
Sorghum	15.0

Field No. 2

Corn	20.00
Total irrigation water applied (system inches):	**21.25**
Total annual precipitation:	**15.0**
Total water received (irrigation + precipitation):	**36.25**

Income and Expense, $

Projected returns per system acre:	**714.24**

Costs per system acre:

Total variable costs	672.35
Total fixed costs	108.60
Total All costs per system acre	**780.95**

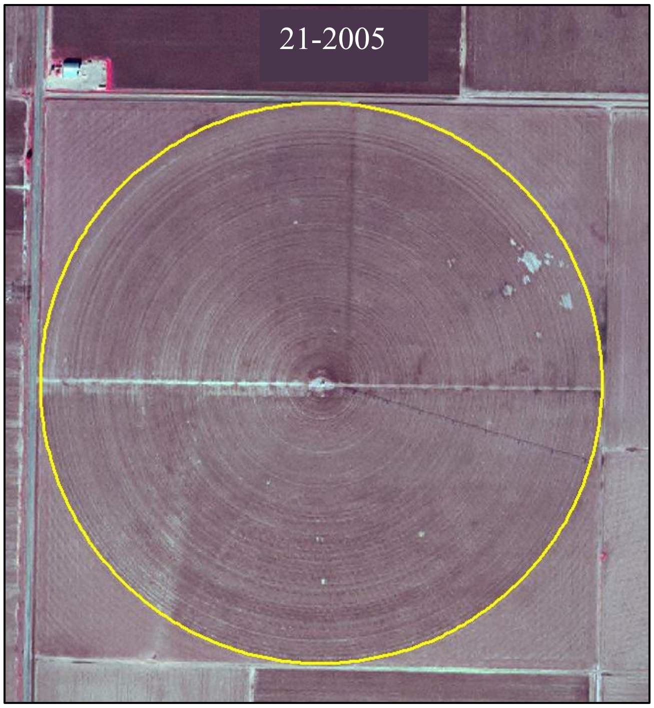
Net returns per system acre:

Per system acre	**-66.71**
Per acre inch of irrigation water	**- 2.96**

COMMENTS

One half of this site was planted to wheat in 2004, harvested for silage and then double cropped to forage sorghum for silage. The other one half of the pivot was planted to corn silage on twenty inch rows. The same dairy is purchasing all three crops. In the future dairy manure will be used as part of the fertility program. This site received no adverse weather conditions in 2005.

SITE NUMBER 21



Site Description:

Total acres in system , 122.67

Field No. 1:

Acres: 61.42
Crop: Cotton
Variety: 'DP 444 BG/RR'
Yield:
Lint: 1,279 lb/acre
Seed: 0.79 tons/acre
Value/unit:
Lint: $0.54/lb
Seed: $100/ton

Field No. 2:

Acres: 61.25
Crop: Cotton
Variety: 'FiberMax 960RRBR'
Yield:
Lint: 1,228.2. lb/acre
Seed: 0.82 ton
Value/unit:

Lint: $0.55/lb
Seed: $105/ton

Cover crop:	Wheat, Field No. 2, late '05
Livestock:	None
Tillage system:	Conventional

Row spacing:

Field No. 1: 40 inches
Field No. 2: 40 inches

Major soil type:	Pullman clay loam

Irrigation

Type:	Center pivot (LEPA)
Pumping capacity, gal/min:	500
Number of wells:	1
Fuel source:	electric

Water use:

Total irrigation water applied, inches by crop:

Field No. 1:	6.75
Field No. 2:	6.75

Total irrigation water applied, System inches:	**6.75**
Total annual precipitation:	**14.8**
Total water received (irrigation + precipitation):	**21.55**

Income and Expense, $

Projected returns per system acre:	**757.28**
Costs per system acre:	
Total variable costs	572.53
Total fixed costs	78.60
Total all costs per system acre	**640.25**
Net returns per system acre:	
Per system acre	**117.04**
Per acre inch of irrigation water	**17.34**

COMMENTS

This conventional-till site was planted to two different varieties of picker cotton. The management and yield was very similar on both varieties. The harvest population was five plants per foot of row. Light hail fell on June 7th with no stand loss. We experienced very good growing conditions for the 2005 growing season.

SITE NUMBER 22

Site Description:

Total acres in system: 147.58

Field No. 1:
Acres: 71.57
Crop: Corn
Variety: 'Pioneer 33 M54'
Yield: 236 bu/acre
Value/unit: $2.89/bu

Field No. 2:
Acres: 76.01
Crop: Cotton
Variety: 'Paymaster 2266'
Yield:
Lint: 1,177 lb/acre
Seed: 0.94 tons/acre
Value/unit:
Lint: $0.54/lb
Seed: $100/ton

Cover crop: None
Livestock: None
Tillage system: Conventional
Row spacing:

Field No. 1	40 inch
Field No. 2	40 inch

Major soil type: Pullman clay loam; 0 to 1% slope

Irrigation

Type:	Center Pivot (LEPA)
Pumping capacity, gal/min:	800
Number of wells:	4
Fuel source:	electric

Water use:

Irrigation by field, inches:

Field No. 1	19.0
Field No. 2	11.8

Total irrigation water applied (system inches):	**15.28**
Total annual precipitation:	**15.1**
Total water received (irrigation + precipitation):	**30.38**

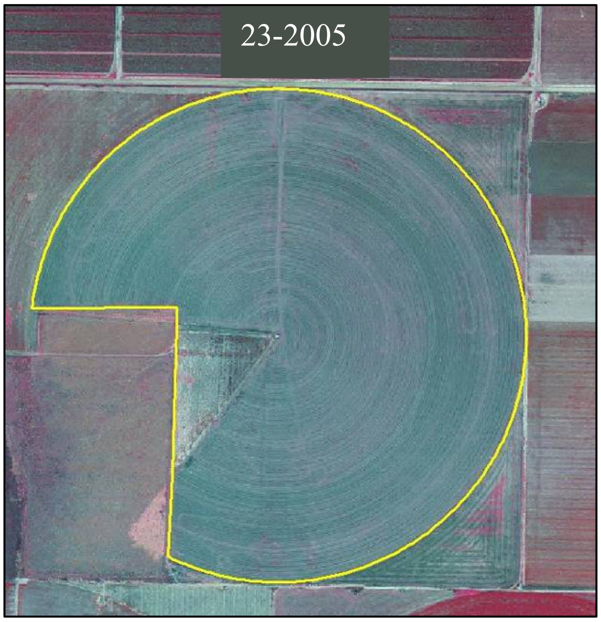
Income and Expense, $

Projected returns per system acre:	**706.62**
Costs per system acre:	
Total variable costs	474.20
Total fixed costs	78.60
Total All costs per system acre	**552.80**
Net returns per system acre:	
Per system acre	**153.82**
Per acre inch of irrigation water	**10.06**

COMMENTS

Approximately thirty percent of the cotton was replanted due to a weak stand. The corn was a white corn variety grown for food corn. There were no serious weather, disease, or insect problems during the 2005 growing season.

SITE NUMBER 23



Site Description:

Total acres in system: 103.10

Field No. 1:

Acres: 51.8
Crop: Cotton, irrigated
Variety: 'Americot 427R'
Yield:
  Lint: 1205 lb /acre
  Seed: 0.87 ton/acre
Value/unit:
  Lint: $0.54/lb
  Seed: $100/ton

Field No. 2:

Acres: 51.3
Crop: Sunflowers, irrigated
Variety: 'Blacks'
Yield: 2,857 lb seed/acre
Value/unit: $0.78/lb

Field No. 3:

Acres: 7 **(check this)**
Crop: Cotton (dryland)
Variety:

Yield:
Value/unit:

Cover crop:	None
Livestock:	None
Tillage system:	Conventional
Row spacing:	
Field No. 1	40 inch
Field No. 2	20 inch
Field No. 3	40 inch
Major soil type:	Pullman clay loam; 0 to 1% slope

Irrigation

Type:	Center Pivot (LESA)
Pumping capacity, gal/min:	800
Number of wells:	2
Fuel source:	natural gas

Water use:

Irrigation by field, inches:

Field No. 1	5.5
Field No. 2	6.0
Field No. 3 (dryland)	0.0
Total irrigation water applied (system inches):	**5.38**
Total annual precipitation:	**12.4**
Total water received (irrigation + precipitation):	**17.78**

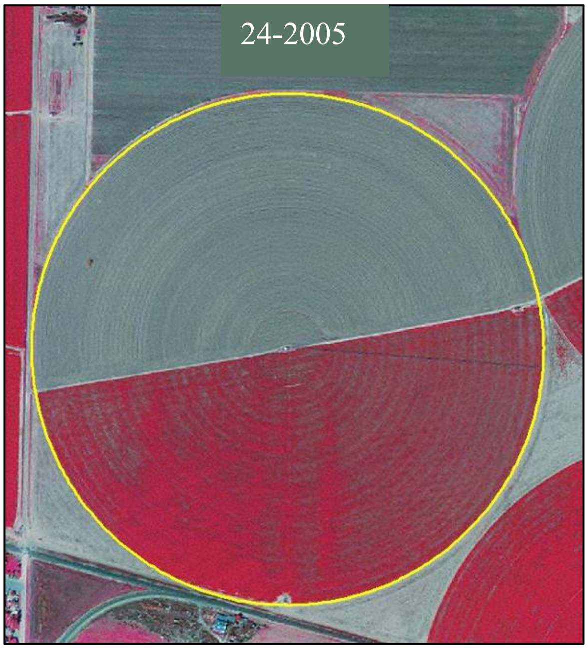
Income and Expense, $

Projected returns per system acre:	**$669.15**
Costs per system acre:	
Total variable costs	324.75
Total fixed costs	78.60
Total all costs per system acre	**403.35**
Net returns per system acre:	
Per system acre	**265.80**
Per acre inch of irrigation water	**46.24**

COMMENTS

The sunflowers were planted on twenty inch centers with a harvest population of one plant per foot of row. Sunflower emergence was very uniform and produced an excellent yield. We had an excellent growing season at this site with no adverse weather in 2005.

Site Number 24



<u>Site Description</u>:

Total acres in system: 129.78

Field No. 1:

Acres: 64.65

Crop: Cotton

Variety: 'Paymaster 2280 BR'

Yield:

Lint: 989 lb/acre

Seed: 0.88 tons/acre

Value/unit:

Lint: $0.54/lb

Seed: $100/ton

Field No. 2

Acres: 64.14

Crop: Corn

Variety: 'Pioneer 33P62'

Yield: 218 bu/acre

Value/unit: $3.48/bu

Cover crop: None

Livestock: None

Tillage system: Conventional

Row spacing:

Field No. 1: Cotton: 30 inch centers
Field No. 2 Corn: 20 inch centers

Major soil type: Pullman clay loam; 0 to1% slope

Irrigation

Type:	Center Pivot (LESA)
Pumping capacity,gal/min:	700
Number of wells:	1
Fuel source:	diesel

Water use:

Irrigation by field, inches:	
Field No. 1	9.35
Field No. 2	20.7
Total irrigation water applied (system inches):	**14.69**
Total annual precipitation:	**15.0**
Total water received (irrigation + precipitation):	**29.69**

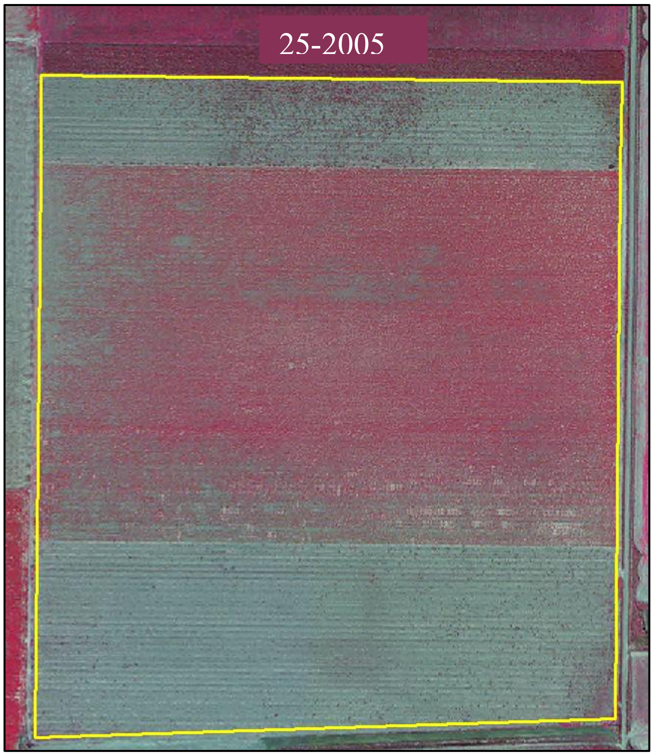
Income and Expense, $

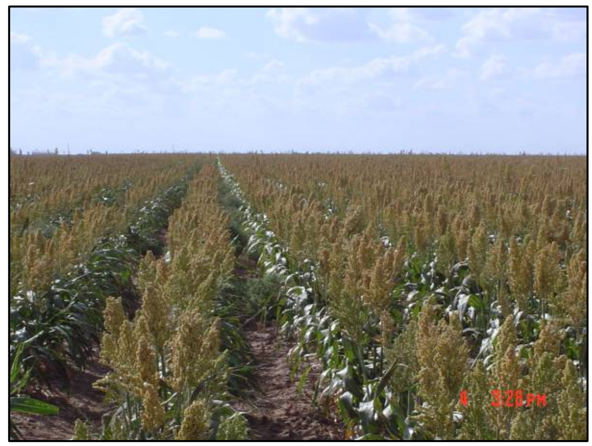
Projected returns per system acre:	**$686.63**
Costs per system acre:	
Total variable costs	455.70
Total fixed costs	93.66
Total All costs per system acre	**549.36**
Net returns per system acre:	
Per system acre	**137.27**
Per acre inch of irrigation water	**9.12**

COMMENTS

The corn at this site was grown for white food corn and was planted on twenty inch centers. The cotton was planted on thirty inch centers with a harvest population of 3.6 plants per food of row. The 2005 growing season was excellent with no adverse weather.

SITE NUMBER 25





Site Description:

Total acres in system: 178.53 acres

Field No. 1:
Acres: 30
Crop: Cotton
Variety: 'Paymaster 2326 RR'
Yield:
Lint: 675.97 lb/acre
Seed: 0.58 tons/acre
Value/unit:
Lint: \$0.54/lb
Seed: \$100/ton

Field No. 2:
Acres: 87.69
Crop: Grain Sorghum
Variety: 'DeKalb 39Y'
Yield: 27.45 cwt/acre
Value/unit: \$3.85/cwt

Field No. 3:
Acres: 60.93

Crop: Cotton
Variety: 'Paymaster 2326 RR'
Yield:
    Lint: 675.97 lb/acre
    Seed: 0.58 tons/acre
Value/unit:
    Lint: $0.54/lb
    Seed: $100/ton

Cover crop:	None
Livestock:	None
Tillage system:	No-till or limit till
Row spacing:	
Field No. 1	40 inch
Field No. 2	40 inch
Field No. 3	40 inch
Major soil type:	Pullman clay loam; 0 to 1% slope

Irrigation
    Type: Dryland

Water use:

Irrigation:	0
Total annual precipitation:	**18.4**
Total water received (irrigation + precipitation):	**18.4**

Income and Expense, $

Projected Returns per System Acre:	**267.30**
Costs per system acre:	
Total variable costs	184.71
Total fixed costs	15.00
Total all costs per system acre:	**199.71**
Net returns per system acre:	
Per system acre	**67.58**
Per acre inch of irrigation water	**NA**

COMMENTS

At this dryland site cotton and grain sorghum are grown in rotation. The cotton is planted in standing grain sorghum stalks. Cotton had a harvest population of 1.7 plants per foot of row on forty inch centers. We had excellent growing conditions in 2005.

Site Number 26

Site Description:

Total acres in system: 123.4

Crops:

Field No. 1:

Acres: 62

Crop: Cotton

Variety: 'Paymaster 2379RR'

Yield:

Lint: 1,213 lb/acre

Seed: 0.93 tons/acre

Value/unit:

Lint: $0.54/lb

Seed: $100/ton

Field No. 2:

Acres: 61.4

Crop: Corn

Variety: 'Pioneer 33P62'

Yield: 228 bu

Value/unit: $3.48

Cover crop: None

Livestock: None

Tillage system: Conventional

Row spacing:

Field No. 1	40 inch
Field No. 2	20 inch
Major soil type:	Bippus loam; 0 to3% slope

Irrigation

Type:	Center Pivot
Pumping capacity, gal/min:	600
Number of wells:	2
Fuel source:	1 electric; 1 diesel

Water use:

Irrigation applied by field, inches:	
Field No. 1	8.5
Field No. 2	12.5
Total irrigation water applied (system inches):	**10.5**
Total annual precipitation:	**12.7**
Total water received (irrigation + precipitation):	**28.1**

Income and Expense, $

Projected returns per system acre:	**770.52**
Costs per system acre:	
Total variable costs	493.34
Total fixed costs	93.53
Total All costs per system acre	**586.87**
Net returns per system acre:	
Per system acre	**183.65**
Per acre inch of irrigation water	**17.51**

COMMENTS

Prior to the current producer purchasing this farm it had been planted to irrigated, perennial warm season grass. The corn at this site was grown for white food corn and was planted on twenty inch centers. Cotton harvest population was four plants per foot of row on forty inch centers. Growing conditions were excellent in 2005.

OVERALL SUMMARY OF YEAR 1

Results of year 1 are summarized in Table 4 for the 26 systems being monitored. It is important to understand that these systems are compared on a basis that equalizes those factors that are not unique to the system and do not influence the systems results. These factors include depth to water, prices paid for fertilizers and pesticides, and other factors that vary among locations but do not reflect the functioning of the particular system. Thus, results of these analyses do not reflect the profitability of the individual site under the specific conditions and marketing opportunities of the individual system. This does, however, allow us to make comparisons among systems that are not biased by individual variability. This allows us to see how the system functions per se.

The 2005 growing season in Hale and Floyd Counties was near ideal in terms of precipitation amount and distribution. Harvest conditions were excellent for the cotton crop. Dryland systems benefited likely from soil moisture stored from the previous high-rainfall year as well as the timely rains that occurred during the growing season.

It will take additional years of data to begin to understand how these systems function over a range of environmental conditions. Several systems were influenced by planting costs incurred in 2005 for crops or forages that will not be harvested or grazed until 2006, thus, influencing the profitability of these systems when only a single year is considered.

Table 4. Summary of results from monitoring 26 producer sites during 2005 (Year 1).

System	Site No.	Acres	Irrigation Type[1]	System inches	$/system acre	$/inch water
Cotton	1	61	SDI	11.7	74.56	6.38
Cotton	2	58	SDI	8.9	179.48	20.17
Cotton	14	125	CP	6.8	115.25	17.07
Cotton	16	145	CP	7.6	117.35	15.54
Cotton	21	123	CP	6.8	117.04	17.34
Cotton	11	95	Fur	9.2	-3.32	0.36
Cotton	15	98	Fur	4.6	58.79	12.78
Cotton/grain sorghum	3	125	CP	8.3	30.99	3.82
Cotton/grain sorghum	18	120	CP	5.9	11.81	2.00
Cotton/grain sorghum	25	179	DL	0.0	67.58	na
Cotton/forage sorghum	12	250	DL	0.0	36.00	na
Cotton/pearlmillet	19	120	CP	9.5	178.78	18.28
Cotton/corn	22	148	CP	15.3	153.82	10.06
Cotton/corn	24	129	CP	14.7	137.27	9.12
Cotton/corn	26	123	CP	5.4	183.65	17.51
Cotton/sunflowers	23	110	CP	5.4	265.80	46.24
Cotton/alfalfa	4	123	CP	5.5	105.58	18.22
Cotton/wheat	13	315	DL	0.0	50.98	na
Cotton/corn silage/grass	17	223	CP	10.5	179.63	17.07
Corn/wheat/sorghum silages	20	220	CP	21.3	-66.71	-2.96
Cotton/wheat/stocker cattle	6	123	CP	11.4	93.13	8.20
Cotton/grass/stocker cattle	9	237	CP	6.5	306.09	46.39
Cotton/grass/cattle	10	175	CP	8.5	153.93	22.51
Forage/beef cow-calf	5	630	CP	1.23	163.22	133.22
Forage/Grass seed	7	61	SDI	11.3	415.90	36.97
Forage/Grass seed	8	130	CP	9.8	341.65	34.72

[1]SDI – Subsurface drip irrigation; CP – center pivot; Fur – furrow irrigation; DL – dryland.

REPORTS BY SPECIFIC TASKS

TASK 1: DEVELOPMENT OF PRODUCER BOARD AND IDENTIFICATION OF DEMONSTRATION SITES

1.1 Identification of Demonstration Sites. Twenty-six individual sites were identified and are described in the information included above. These sites were described in concept by the Management Team. The Producer Advisory Board took this information and identified potential sites to be examined in depth. From this list, the final twenty-six sites were identified and were agreed on by the Producer Board and the Management Team. All twenty-six sites are now operational.

1.2 Producer Advisory Board. At a meeting in Lockney, Texas on November 16, 2005, the Producer Board of Directors was formed. They selected the title of Water Conservation Demonstration Producer Board (WCDPB) for this group and have elected a chair, vice-chair, and secretary. This WCDPB is composed of nine members; 3 members with 3-year terms, 3 members with 2-year terms, and 3 members with 1-year terms. The WCDPB will be involved in site selection for the demonstration components and in decisions that directly impact producers. The WCDPB is specifically charged to: 1) ensure the relevance of this demonstration project to meet its objectives; 2) to help translate the results into community action and awareness; 3) ensure the credibility and appropriateness of work carried out under this project; 4) assure compatibility with and sensitivity to producer needs and concerns; and 5) participate in decisions regarding actions that directly impact producers. This board will be composed of individuals who will elect their chair. Individuals serving on this board will include representation of, but not be limited to cooperating producers. The Project Manager will serve in an *ex officio* capacity on the WCDPB. Meetings of the WCDPB will be on an as need basis to carry out the responsibilities of the project and will occur at least annually in conjunction with the Management Team. A complete list of the members of the WCDPB is attached.

1.3 Site Selection. As described above, we identified an array of demonstration sites that range from dryland to fully irrigated systems. Type of irrigation systems include subsurface drip, center-pivot, LEPA, and furrow irrigation systems. These sites demonstrate individual monoculture cropping systems including cotton, corn, sorghum, sunflowers, native grass seed, and other crops. They demonstrate livestock systems including stocker beef cattle and cow-calf systems. Sites were identified that exemplified an integrated approach to combining both crops and livestock into systems that diversify income and capture benefits of crop/livestock rotations. Each of these sites are being evaluated for total water use, economic return to water investment, overall profitability and productivity, alternative economic opportunities including wildlife habitat and carbon sequestration, and impact of the system that they exemplify on natural resource use and protection including soil heath and stability, energy use, and potential impact on water and air quality.

TASK 2: PROJECT ADMINISTRATION AND SUPPORT

2.1 Project Director. Mr. Ricky Kellison (Lockney, TX) was hired as full-time project manager and is charged with overall administration and coordination of the project. Work of all individuals involved in the project is coordinated through the Project Manager. Responsibilities include insuring that data is obtained in a timely fashion and provided to the central data collection point for analysis and summary, insuring that all reports are prepared to meet deadlines, and pursuing and facilitating additional funding opportunities. A grant was submitted for consideration for funding to the USDA-NRCS CIG program in 2005 but was not funded. A second grant has been submitted to the USDA-SARE program for funding specifically for the parallel research component at New Deal, TX and is currently in review. If funded, this will provide for complimentary data to be collected between the research and demonstration projects. A grant proposal will be developed and again submitted to the USDA-NRCS CIG program in 2006. Other sources of funding are being pursued.

Mr. Kellison works directly with the producer/cooperators, the scientist cooperators, the TWDB, and the public to facilitate communication and insure appropriate flow of information.

I assumed the position of Project Director on April 1, 2005. Some of my first duties were to work closely with the Producer Board who selected the 21 producers and 26 sites for the 2005 crop year. A CIG grant proposal prepared by Vivien Allen, Monty Dollar, Tom Sell, Vernon Lansford and myself was submitted to the USDA-NRCS.

During the first year I have had the opportunity to give several site tours to various individuals and groups. On June 8th Kraig Gallimore and Kate McAfee (TWDB), Dr. Vernon Lansford and Dr. David Doerfert (TTU) met with the Producer Board and visited our sites. On June 21st we were honored to have Chief Bruce Knight, Lawrence Clark, Dr. Larry Butler, Mickey Black, Monty Dollar (USDA-NRCS), Comer Tuck (TWDB), and thirty-three other guests visit four sites. We hosted the board of directors for the High Plains Underground Water Conservation District No. 1 on July 12th. The ADI group attended our Producer Board and Management Team meetings on October 13th and toured the majority of our sites. I have hosted approximately twelve other tours this first year.

This first year has given me the opportunity to give several presentations explaining TAWC. Presentations were made to the Floyd County Farm Tour, Congressional aids from Washington D.C., The Regional Water Planning Committee, The CASNR Water Center, South Plains Association of Texas Soil and Water Conservation Districts and the Olton CO-OP. I have given four radio and one television interviews.

Our Management Team has met on the second Thursday of each month and the interest and attendance has been great. Our Producer Board has met at least ever quarter and have been dedicated to the project. I continue to visit the sites on a regular basis taking pictures and field notes.

In my opinion the highlight for our first year came on September 20, 2005 when the TAWC project was showcased for the Floyd County Farm Tour. Senator Robert Duncan attended the tour and made our noon presentation. We had over one hundred guest who attended this event.

2.2 Secretary/book keeper (three-quarter time position). Ms. Angela Beikmann was hired in May, 2005 to fill this position. Responsibilities include keeping the master sets of financial records for the entire project including all subcontractors. She also has responsibilities for billing, handling all correspondence, providing telephone coordination for project communication with the public, assists in preparation of reports, including quarterly and annual reports provided to the TWDB, keeps minutes of all Management Team meetings, and other records and tasks as needed to support the Project Manager and members of the team.

Organization of files and procedures were established to ensure accurate recording and reporting of all expenses for the project, including TTU's master account and sub accounts as well as subcontractors' accounts. Each TTU account continues to be reconciled on a monthly basis; subcontractors' accounts are reconciled quarterly.

A budget planning meeting was held in August 2005, at which time first fiscal year expenditures and projected expenses for fiscal year 2 were discussed with each task leader. It was determined that no formal budget amendment was necessary at that time.

Upon the completion of Fiscal Year 1 (August 31, 2005), expenditure and cost sharing information was obtained, calculated and reported to TWDB. Appropriate steps were taken to set up the accounting records and files for Fiscal Year 2. A sub account was established for the database team.

Communication of all financial information with TTU accountant, Boyd Milner, is ongoing. This includes all expenditure information that he needs to compile reimbursement requests for submission to TWDB.

Ongoing communication is also maintained with TTU Office of Research Services regarding budget funding of the TTU accounts and amending the annual subcontracts.

Attendance at nine monthly Management Team meetings includes recording meeting minutes at each. All meeting minutes have been transcribed, and are organized and physically stored in a binder.

Meeting minutes were also recorded at the budget planning meeting and are stored in a binder with other project budget information.

Two "Quarterly Project Report by Task" reports have been compiled by me and submitted to TWDB. Copies of all 3 quarterly reports are stored in a binder with other historic documents important to the TAWC project.

Daily administrative tasks include correspondence through print, telephone and e-mail; completing various clerical documents such as purchase orders, cost transfers, travel vouchers, reimbursement requests and payroll paperwork; and any other duties as requested and/or assigned.

2.3 Data Manager/Processor. The database team began project activities on July 5, 2005. The Database Team consists of Lucia Barbato, Kiran Masapari, Paul Braden and Swetha Dorbala. The proposed activities involve database design and web pages development. The resulting database will enable integration within a future Geographic Information System. The Database Team is part of the GIS Team and works closely with all team members.

For the period from July 5th through December 31st, 2005 the following milestones were completed:

- Ten user need assessment interviews were conducted.
- Created Microsoft Access database of user needs assessment interviews
- Completed Draft Needs Assessment Report
- Completed Prototype database design to support the crop, livestock, economic and climate research areas. .
- Completed Final User Needs Assessment and Analysis Report
- Completed Draft Production Database Design and Data Dictionary for TAWC research area
- Completed Draft Production Database Design and Data Dictionary for New Deal area
- Completed Draft SQL database and table schema diagram for TAWC
- Completed Draft SQL database and table schema diagram for New Deal
- Hired a .NET web programmer November 1st, 2005
- Developed draft home page and initiate web functionality for New Deal database
- Distribute the User Needs Assessment and Analysis Report via FTP.
- Obtained sample data for the New Deal area and initiated data entry into the SQL database
- Initial test of web functions to enter, modify, and delete records
- Documented initial set up of the ASP.Net environment and Framework

2.4 Graduate Research Assistants. In addition to specifically allocated GRA's described below, a GRA has been hired in the department of Agricultural Education and Communications to assist with the responsibilities outlined under Task 6. Additionally, a Post Doctorial Fellow as been hired to assist with the responsibilities outlined under Task 8 and to evaluate the landscape characteristics of each of the demonstration sites for potential for wildlife habitat and the income that this could generate as an inherent part of the system.

2.5 Undergraduate hourly wage students. These funds are being used to hire student to participate in the project to provide the needed labor required by the various project tasks.

2.6 Office equipment and supplies, travel, expendable supplies, subcontract services. Office equipment required by the Program Manager, secretary/bookkeeper, the data manager, and the FARM-Assistance Program Manager has been acquired. This includes computers and other office equipment and office supplies required to carry out their responsibilities.

Sub-contractual services required for analysis of samples for soil fertility and plant analysis and expendable supplies including laboratory supplies consumed in the process of sample analysis are acquired within this task category as needed.

2.7 Facilities and Administration. Texas Tech University (TTU) agreed to a 10% Facilities and Administrative (F&A) cost rate on the project entitled "An Integrated Approach to Water Conservation for Agriculture in the Texas Southern High Plains." Because the "facilities" to be utilized for this project consist mainly of land not owned or operated by TTU, the costs associated with them were waived acknowledging the fact that TTU will contribute to the project costs for equipment use/depreciation, for the operation and maintenance costs associated with faculty offices, laboratories, classrooms, and other facilities utilized by the project and for costs associated with library utilization, if any. Sixteen percent of the 26% Administrative rate was also contributed to the project, leaving 10% to partially reimburse project-related expenses borne by TTU.

The administrative component of TTU's federally negotiated Facilities and Administrative cost rate was proportioned as follows:

General Administration – 6.24% (consists of the Office of the President, the Office of the General Counsel, and the offices of payroll, purchasing, and travel)

Departmental Administration – 14.82% (consists of dean's and departmental office personnel who contributed to, but are not paid by, the project, including the dean, department chairman, secretaries, clerks, technicians, etc.)

Sponsored Project Administration – 4.94% (consists of the Offices of Research Services and Sponsored Programs Accounting and Reporting)

Prorating the 10% charged to this project would equate to:

General Administration = 2.4%

Departmental Administration = 5.7%

Sponsored Project Administration = 1.9%

TTU requested that project vouchers be submitted pursuant to this categorization of administrative expenses. To require more detail would only serve to increase costs for the university.

TASK 3: FARM ASSISTANCE PROGRAM - STEVEN KLOSE (TCE) AND JEFF PATE (FARM ASSISTANCE)

Year 1 project progress regarding task 3 in the overall project scope of work has occurred in several areas ranging from collaborating in project coordination and data organization to data collection and communication, as well as, providing additional services to the area producers in conjunction with the TAWC project. A brief summary of specific activities and results follows:

Project Collaboration. A primary activity of initiating the FARM Assistance task included collaborating with the entire project management team and coordinating the FARM Assistance analysis process into the overall project concepts, goals, and objectives. The assessment and communication of individual producer's financial viability remains crucial to the evaluation and demonstration of water conserving practices. Through TCE participation in management team meetings and other planning sessions, collaboration activities include early development of project plans, conceptualizing data organization and needs, and contributions to promotional activities and materials. TCE faculty contributed to the successful Floyd County Field Day highlighting the project objectives and demonstration sites for the local producers and other industry leaders.

Staffing. The initial efforts of the TCE subcontract focused on staffing needs. TCE faculty conducted a position search and interview process and hired Jeff Pate to provide FARM Assistance analytical services to project participants, as well as evaluate site demonstrations and coordinate economic evaluation activities with project partners.

Farm Field Records. Considerable progress was made in planning and coordinating data collection with project partners in Agricultural Economics at Texas Tech (Vernon Lansford). Considering the overlap of data needs in our individual tasks, together we developed plans for what data to collect, how it will be collected, and how our two tasks will handle data sharing. Further progress was made in communicating and coordinating database needs with the project database team. TCE assisted many of the project participants individually with the completion of their individual site demonstration records (farm field records). TCE faculty has completed the collection, organization, and sharing of site records for most of the site demonstrations.

FARM Assistance Strategic Analysis Service. Given the late start (especially in staffing the TCE-FARM Assistance position) in year 1 and the critical need to coordinate and assist with the collection of individual farm field records, the formal FARM Assistance service for demonstration participants is just beginning to materialize. Participants' schedules prior to the 2005 crop harvest also prevented much commitment on their part to initiate the process. As is typical with the FARM Assistance service, participants need re-assurance that the process does not require an overwhelming commitment of time or data. An assurance of their confidentiality is also needed to secure their cooperation and commitment. To help provide some of these assurances and serve as an example, Eddie Teeter (chairman of the producer advisory board) volunteered early. TCE faculty completed his whole farm strategic analysis, and subsequently other participants are beginning to commit. To secure cooperation TCE has promoted the service through numerous phone calls, e-mails, and personal visit contacts with project participants.

In addition to individual analysis, FARM Assistance staff has developed a model farm operation that depicts much of the production in the demonstration area. While confidentiality will limit some of the analysis results to averages across demonstrations, the model farm can be used to more explicitly illustrate financial impacts of water conservation practices on a viable whole farm or family operation.

Other Activities. In response to soaring energy prices, specifically the cost of irrigation fuel, FARM Assistance faculty along with other TCE faculty conducted a cotton profitability workshop for producers in the demonstration area targeting 2006 production decisions. The offering of this educational program in conjunction with the TAWC project highlighted the project's ability to remain attentive to the current and changing needs of local producers. While water conservation remains the focal point of the entire TAWC project this event recognized and met the local producers' need for immediate information regarding the changing dynamics of irrigated agriculture in the region.

TASK 4: ECONOMIC ANALYSES - EDUARDO SEGARRA AND VERNON LANSFORD (TTU)

Objective. The economic assessment will evolve over time with the integration of the demonstration project; allowing baseline data to be developed for both economic and agronomic data sets. A joint effort between the Texas Cooperative Extension (TCE), Texas A&M University and the Department of Agricultural and Applied Economics (AAEC) at Texas Tech University will develop and maintain detailed records of inputs and production (costs and returns) on each farm production scenario using TCE's FARM-Assistance program. These records will provide the base data for future economic studies to determine the economic impact of observed technologies for producers and water utilization.

Achievements.

(1) Producer field record books were developed and distributed to producers. These records are now being compiled and enterprise budgets for each site are being developed. Through this first round of budget development, refinement of the producer field record books will be necessary for Year 2. Currently, 19 site records have been processed and enterprise budgets developed for each system. These numbers are rough as producers get use to keeping records and we learn all the data requirements needed to convert these records to system budgets. In Year 2, better measures of water applied will be available as the full season will be monitored. Better record keeping of producers on band and type of pesticides and harvest aids will enable a more accurate reflection of

costs. For example, there are many different glyphosate-based herbicides on the market. They come in different strengths and price can vary widely. Without brand names or cost, we have to assume a common product which may be cheaper or more expensive than the product the producer applied. Thus, we have to do a better job of educating the producers of the value of the record keeping and end products of their efforts.

(2) Rebekka Martin was hired as a graduate student to investigate the use of farm level simulations models that would be appropriate for use in this project. She initially started with CroPMan, and ended up with WinEPIC. Ms. Martin demonstrated the modeling technology on the New Deal Research data of Dr. Vivien Allen. She had excellent results in validating the model to actual field conditions of replicated research data. However, it was clear from her work that the more appropriate model would be APEX. All three models are maintained by the Texas Agricultural Experiment Station, Temple, TX. APEX allows for more flexibility and multiple field interactions than the two previous models used by Ms. Martin. Ms. Martin has since graduated and a new graduate student has not been identified.

TASK 5: PLANT WATER USE AND WATER USE EFFICIENCY (S. MAAS AND R. LASCANO)

The objective of this task is to estimate the actual amount of water used by crop, grassland, and pasture vegetation in the growth process. This quantity is called the daily crop water use (CWU), and can be accumulated over the growing season to estimate the total water used in growing a crop, grassland, or pasture. CWU does not include water lost from the field through soil evaporation, runoff, or deep percolation. CWU can be compared to the water applied to the field, either through irrigation and/or precipitation, to estimate the efficiency of water application in producing a crop.

In this task, daily CWU was estimated in a four-step process. In Step 1, Landsat-5 images containing the study region were analyzed to determine ground cover (GC) in each study field. GC is indicative of the amount of living vegetation in a field. Five Landsat images (Table 5) were used in 2005 for this analysis. In Step 2, the remotely sensed GC values for each field were used in a mathematical model to simulate the GC of the vegetation on each day of the growing season. Daily weather data used in running the model simulations were obtained from the West Texas Mesonet station at Plainview. In Step 3, potential evapotranspiration (PET) was estimated for each day of the growing season from the Plainview weather data. In the final step, PET was multiplied by GC for each day of the growing season to determine daily CWU for each field in the project. Details of this procedure have been described by Maas et al. (2004, 2005).

10 May 2005
13 July 2005
30 August 2005
1 October 2005
17 October 2005

Table 5: Landsat 5 overpass dates

Examples of estimated daily CWU for selected fields in the project are presented in Figures 5 through 7. Figure 5 compares daily CWU for two cotton fields (Field 2 and Field 22). Cotton in Field 2 was irrigated using drip irrigation, while cotton in Field 22 was irrigated using center-pivot irrigation. The difference in crop growth and water use between the two fields may be related to the type of irrigation, or the amount of irrigation applied to each field. Maximum values of CWU at mid-season were approximately 6 mm/day for Field 2, and approximately 4 mm/day for Field 22.

Figure 6 compares daily CWU for a dryland cotton field during the growing season (Field 25-2) and a field planted to irrigated alfalfa (Field 4-1). A relatively small amount of water was lost from the cotton field. Maximum values of CWU at mid-season were approximately 2.5 mm/day for this field. In stark contrast, water use by the alfalfa in Field 4-1 approached approximately 80% of potential values in late spring, or around 8 mm/day. The abrupt decline in daily CWU for Field 4-1 at around day 280 was probably the result of cutting the alfalfa crop.

Figure 7 shows results for two of the improved pastures in the project. Field 8 was planted to sideoats-grama, while Field 5-1 contained a mix of grasses. The vegetation in Field 8 appears to have reached a maximum in growth earlier in the season than the grasses in Field 5-1. After around day 200, the daily water use of the two fields was similar. The vegetation in Field 5-1 may have been cut at around day 260.

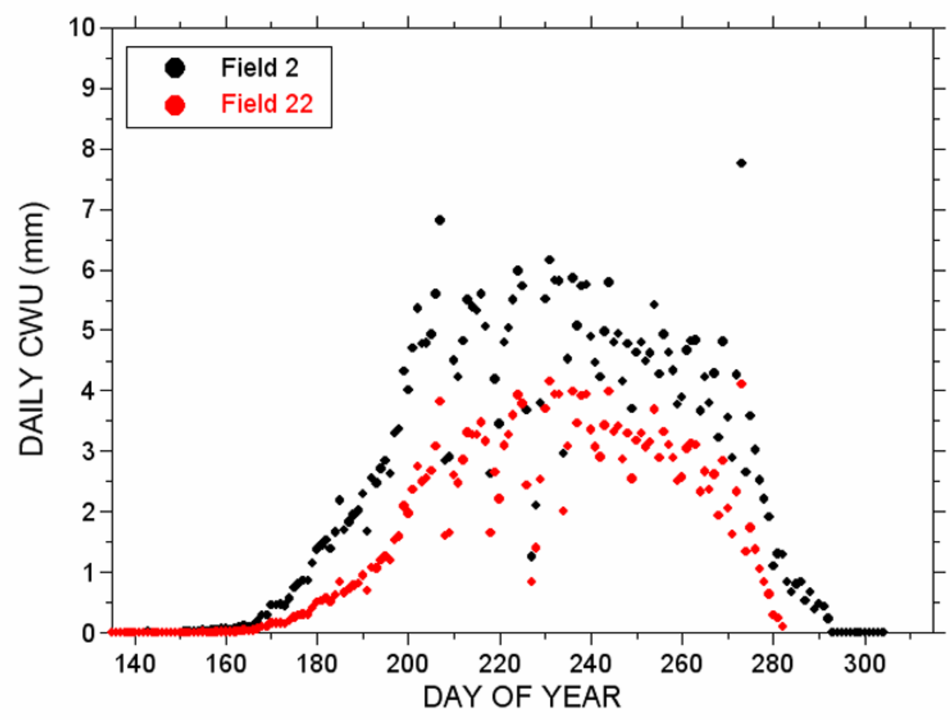


Figure 5: Estimated daily CWU for two cotton fields in the project

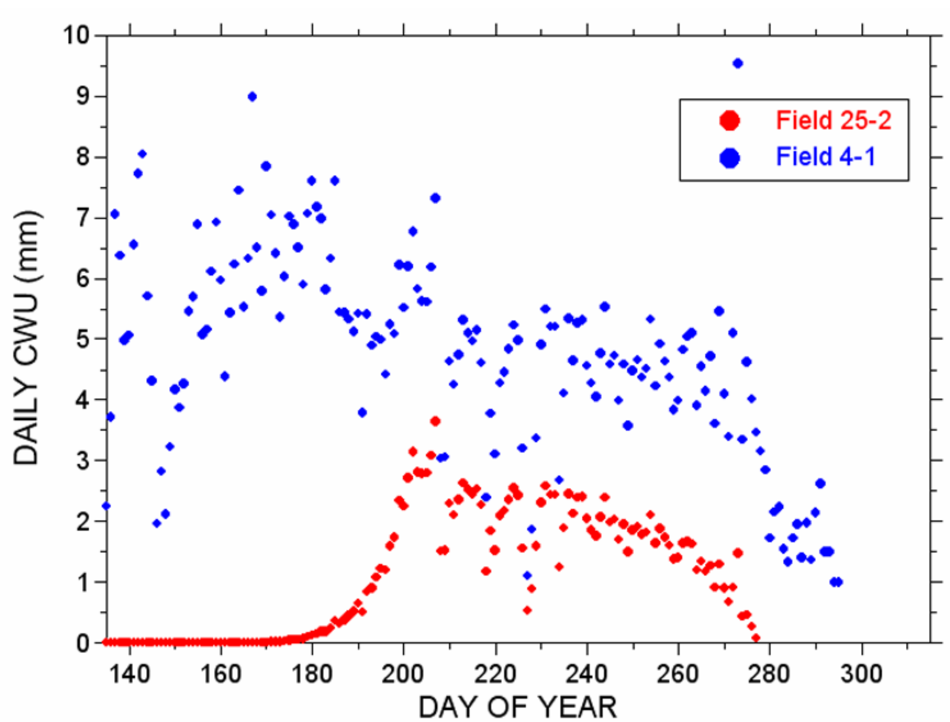


Figure 6: Estimated daily CWU for a dryland cotton field (Field 25-2) and alfalfa (Field 4-1)

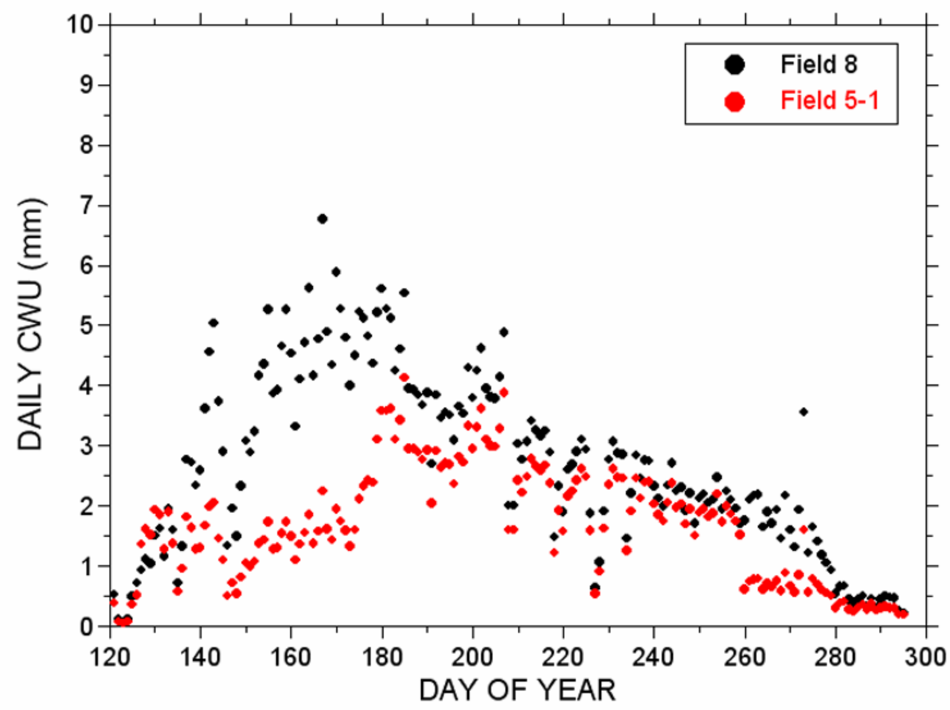


Figure 7: Estimated daily CWU for two pastures. Field 8 was planted to sideoats-grama, while Field 5-1 contained a mix of grasses.

Daily CWU was summed over the period from day 121 (1 May) through day 295 (22 October) for fields in the project to allow comparison of the relative water usage among the various field and forage crops over the same time period. Results of this analysis are presented in Table 6. Total PET for this 175-day period was 1033 mm (40.7 in). Of the fields in the project, Field 4-1 (irrigated alfalfa) exhibited the greatest accumulated CWU (819 mm, or 32.2 in), approaching 80% of the potential value. Accumulated CWU for the other fields was considerably lower. Values for conventionally irrigated (furrow and center-pivot) cotton fields were typically in the range from 10 to 15 inches. Drip-irrigated cotton fields, such as Fields 1 and 2, exhibited values of accumulated CWU of around 16 inches. In comparison, dryland cotton fields (like Fields 12-1 and 13-2) exhibited values of accumulated CWU that were approximately half those of the conventionally irrigated fields. Values for other field crops also tended to vary according to whether they were irrigated or dryland. The overall lowest accumulated CWU (85 mm, or 3.4 in) was attributed to a dryland grain sorghum field (Field 25-1).

Accumulated CWU for the fallow field (Field 25-2) was similar to that of dryland field crops. Improved pastures grown under center-pivot irrigation exhibited values of accumulated CWU similar to those of center-pivot irrigated cotton. While maximum daily CWU was generally less for pastures (compare Figures 5 and 7), the pastures used water over a longer portion of the 175-day period as compared to cotton. CWU for individual pastures will be related to cutting and grazing activity. A number of pastures also exhibited significant CWU before day 121.

In summary, differences in daily and accumulated CWU among the project fields were evident and were related to vegetation type and irrigation. In comparing the relative water use between different types of vegetation (such as field crops and pasture), one must recognize that there are differences in both the daily values of CWU and the length of the period during which the vegetation is using water. These preliminary results on CWU were obtained during a year with above-average rainfall during the first half of the growing season. Results may be different in years with different precipitation characteristics.

References

Maas, S., R. Lascano, D. Cooke, C. Richardson, D. Upchurch, D. Wanjura, D. Krieg, S. Mengel, J. Ko, W. Payne, C. Rush, J. Brightbill, K. Bronson, W. Guo, and S. Rajapakse. 2004. Within-season estimation of evapotranspiration and soil moisture in the High Plains using YieldTracker. Proc., 2004 High Plains Groundwater Resources Conference. Lubbock, TX. p. 219-226.

Maas, S., N. Rajan, J. Duesterhaus, R. Lascano, and J. Ko. 2005. Remote sensing approach for estimating daily crop water use. Proc., 20th Biennial Workshop on Aerial Photography, Videography, and High Resolution Digital Imagery for Resource Assessment. ASPRS, Weslaco, TX. (in press)

TASK 6: COMMUNICATIONS AND OUTREACH - MATT BAKER (TTU)

Individuals/Groups Visiting Project:

Congressional aides, Regional Water Planning Committee, CASNR Water Center Officials, Chief Knight from USDA

Project Presentations:

CASNR Advisory Board, Southern Region – American Association for Agricultural Education, Southwest Farm and Ranch Classic

6.1 To increase awareness, knowledge, and adoption of appropriate technologies, a Farming Systems Research and Extension approach will be implemented including the use of on-farm research demonstrations, where farmers teach farmers and researchers collect real-world data for monitoring purposes. This approach is multi-faceted in nature and crucially important to the success of this demonstration project. To facilitate this process, graduate students, staff, and faculty at Texas Tech will work closely with Texas Cooperative Extension personnel in utilizing participatory methods with the farmer-participants and the project's leadership team in developing a true Community of Practice with water conservation as the major driving force.

Beginning in Year 2 of the project, ½ day workshops will be conducted to update producers on a variety of topics (e.g. Irrigation Management, Forage Management) as well as the latest results from the project. These workshops will create an educational identity to the project that will lead to the creation of a Farmer Field School (FFS). The vision of FFS is to create and deliver a comprehensive educational program where farmers will be brought into the demonstration area extensive training. The farmer participants in the project will provide a portion of the instruction in the Farmer Field School drawing upon peer teaching models and related adoption research.

In addition to the Farmer Field School, an annual field day will be conducted on the demonstration sites to reach an even broader audience of regional producers and the general populace. The field day will include tours, testimonies by the farmer participants, and updated knowledge based upon the monitoring data that will be collected. A full-coverage mass media campaign will be designed, implemented, monitored, and evaluated utilizing both print and electronic media. The center-piece of this campaign will be the development of a web portal that will serve as the general conduit for information regarding the project. It is essential to increase the project's awareness among all stakeholders, including the general population.

A comprehensive public relations campaign is being developed to garner sustained support of this emerging paradigm shift in production systems in the Texas High Plains region. Press releases, public service announcements, logo design, signage in the demonstration region, and feature articles and exposes, designed specifically for newspaper, web-based delivery (including streaming video), radio, and television in both Spanish and English targeting, will be included in the campaign. Phase I efforts will begin on a small scale utilizing various tactics to create local awareness of the project, stimulate interest in the field test area, and build upon existing relationships in the community. The second phase of the campaign (Spring 2006) will focus on the media and producers in the region and will include the launch of the project's web site, including the electronic press kit.

Report 6.1

The 'community of practice' centers around the empowerment and coalescence of the Producer Board who truly direct the project and influence other producers in the region and state.

6.2 Beginning in year 1, the problem statement and situational analysis of the communications campaign will be planned and developed and key audiences identified including external/internal, primary/secondary, end targets/influential intermediates; statement of campaign goals/objectives; project logo; action strategies; communications strategies – key messages, media/activities/events. Survey research will be conducted with farmers and with the general public to garner information that will be used to finalize details of the communication plan.

Phase I of the communications campaign will be implemented to create the aforementioned local interest and awareness (selected press releases, field days, project overview materials, signage in demonstration area). Media training will also be given to the producers to prepare them for possible media contacts. Besides the activities described above, Phase II will include the creation of planning teams for farmer workshops, annual field days, and the future launch of the Farmer Field Schools. Through face-to-face, print, and electronic tools and channels, we strive to develop a knowledge management systems that will serve as a 21st century model for communities of practice.

To ensure that this model is continually refined, a Participatory Rural Appraisal (PRA) will be conducted with producer families in the project during Phase II. This information will be used to ensure the information generated in this project is in a format that facilitates producers' problem solving and decision making processes. Each phase of the communications and outreach program will be presented to and approved by the Management Team and the Producer Board to ensure that efforts and activities remain in line with the project vision and goals.

Report 6.2

The communications and outreach team has been most active during Year 1 with this objective. A project logo, letterhead, project overview, a project overview DVD, and signage have been developed. A 'dark' website is waiting on the analysis and synthesis of Year 1 production, economic, and hydrological data prior to launch (planned for Spring 2006). Photo documentation has been conducted during the growing season of each site, and these photos will be published on the web site to help increase understanding of the activities and results at each site. The team has coordinated the journalistic coverage of the site including a feature article in Texas Tech's Vistas magazine and radio programming by Agri-Talk on FoxTalk radio and KFYO radio Lubbock. The Agri-Talk program included both in-station and on-farm coverage.

Figure 8: Demonstration Site Sign

6.3 Beginning in year 2 and continuing throughout the project, the Farmer Field Schools are initiated as well as Annual Field Day Activities. Curriculum Materials will be developed for the Farmer Field School and Field Day. Activities outlined under 5.2 are continued.

Report 6.3

In an effort to inform area producers, this team has worked closely with Texas Cooperative Extension in conducting the Floyd County Farm Tour, a Cotton Profitability workshop, and upcoming Irrigation Management and Forage Management workshops.

6.4 It is the responsibility of the leader for this activity to submit data and reports as required to provide quarterly and annual reports to the TWDB and to ensure progress of the project.

Report 6.4

Timely quarterly reports and project summaries were provided as requested.

TASK 7: INITIAL FARMER/PRODUCER ASSESSMENT OF OPERATION - CALVIN TROSTLE (TCE)

Support to Producers. Fourteen in-depth phone, personal, and field visits were conducted as part of on-going producer assessments. This included observation of field operations, field irrigation monitoring sites, etc. as we have discussed their current farming and water use practices. Each producer has received an offer to have questions about their farming operation addressed and the information they need to make better management decisions. Feedback has been sent to at least seven producers.

In accord with Task 7 objectives the following examples are shared as a sampling of producers interest and needs for information

1. What crop, forage, livestock, irrigation, and economic information do you need to make improvements in your farming operation?
Selecting better cotton varieties (especially among the new Bollgard/Roundup Ready types).
Specific weed problems in both field crops and grasses.
Better corn silage varieties.
Best forage sorghums for dairies.
How much less water is required for forage sorghum vs. corn silage.
Triticale for dairy silage production.
Best grain sorghum hybrids for dryland.

2. What production practices or diversification have you considered trying in your operation? (With the availability of FARM Assistance producers will have a better opportunity to gauge the economic effects of changes in practices.)
Converting more farm ground on dryland to no-till.
Retaining surface wheat stubble in dryland.
Would like to reduce cotton acreage if suitable economic opportunity is available.
Seeding dryland acreage to permanent pasture ('Spar' bluestem).
Changing cotton varieties to reduce technology fees.
Putting more acreage into winter small grains grazing as long as cattle prices are high.

3. What ideas do you have for reducing water use on your farm that you believe you could incorporate without reducing profitability?
Converting more pivots to LEPA drag hoses.
Want to learn how the water use efficiency of furrow irrigation compares to pivot, and how many years it would take to pay for a 120-acre pivot if I replace flood irrigation.
Converting areas in poor water back to dryland—how much is really being profited by continuing to irrigate at 1.75 gpm/A.
How profitable is late-season irrigation on cotton.
How to reduce irrigation in corn silage.

4. What improvements in irrigation efficiency do you believe you could make in your operation?
Watch the pivots myself (farmer/operator) rather than have hired man do it.

Adjust sprinkler heads closer to the soil surface.
Convert to LEPA.
Drip irrigation (but skepticism that it justifiable economically0

5. What types of crop, livestock, and irrigation demonstrations in the Lockney area would you like to see that might help you consider long-term sustainable options for your operation?
Triticale for silage—varieties.
LEPA vs. conventional center pivot sprinkler irrigation.
Drip irrigation vs. conventional center pivot sprinkler irrigation.
Corn silage hybrids.
Forage sorghum vs. corn silage.
Cotton varieties.

<u>Field Demonstrations.</u>

1) A site has been identified to implement a demonstration of 8 different perennial grasses and evaluate their performance and suitability in the Lockney demonstration area. Because two to the grasses targeted for demonstration were already well past their optimum planting date, this effort is best targeted for early 2006 initial establishment along side existing producer fields where implementation and management can be managed by hand for seeding, irrigation, and harvest. Irrigation levels and fertility evaluations will also be conducted.

2) A sorghum/sudan hybrid trial representing different 32 hybrids (brown midrib, photoperiod sensitive, conventional) was seeded near Lockney in late June. Hybrids were evaluated for yield, lodging, days to maturity, etc. Sorghum/sudan hybrids, being members of the sorghum family are more drought tolerant and water use efficient than corn silage or other row crops. Harvest preliminary yields suggest that photoperiod forages have higher yield but lower forage quality. Harvest occurred late enough that regrowth was insignificant hence only one harvest date.

3) Producers in the area near Legacy Dairy at Plainview have added opportunity to grow contract forages including small grains for silage. Dairies have offered contracts for triticale silage, and producers within the TAWC area have agreed to produce. A two-date seeding trial (mid September, mid October) was seeded with 12 triticale and 4 wheat varieties for one-time silage production. Key questions include yields among different hybrids and the effect of the different planting dates. (Early planting for silage only should be agronomically poor if grazing is not intended.) Because a cooperator could not be found in the TAWC demonstration area (two producers planted all triticale before optimum planting dates), the trial was located at the Texas A&M-Halfway ~10 miles west of demonstration area. A second trial is located in Deaf Smith Co. to address similar needs in that region.

Opportunities to Expand TAWC Objectives.

Project awareness: Commented on project on two different radio programs, answered producers phone calls, and information and the approach that the TAWC project is taking has helped shape at least four other programs and Extension activities in the Texas South Plains.

Leverage of funding:

1) A grant of $2,500 was received from the Texas State NRCS Grazing Lands & Cattle Initiative to assist with expenses in the perennial grass irrigation/variety/fertilization trial to be initiated in 2006 (co-investigator Dr. Larry Redmon, TCE Extension forage specialist, College Station).

2) Received first-year funding from the Texas A&M Ag. Program Cropping Systems Initiative to investigate irrigation, salinity, and forage quality issues in West Texas alfalfa production ($40,000).

Educational Outreach.

A portion of one education program in Hale Co. (Plainview) was devoted to describing the objectives and tasks of the Lockney demo. project. Approximately 130 producers and agribusiness representatives were present. Presentations were made at a TAWC field tour (Sept. 20th) and an additional Floyd Co. livestock/forage program (March).

Existing TCE publications and reports were provided in the TAWC target area to at least nine producers and one ag. finance loan officer.

Support to Overall Project. Activities include attending nine monthly management team meetings and/or producer advisory board meetings. Helped develop TAWC agenda for public meetings in September and the upcoming irrigation workshop for March, 2006.

TASK 8: INTEGRATED CROP/FORAGE/LIVESTOCK SYSTEMS AND ANIMAL PRODUCTION EVALUATION - VIVIEN ALLEN (TTU)

8.1 During Year 1, sites were identified as being legitimate examples of integrated crop/forage/livestock systems that represented the array of conditions that this demonstration project intended to describe. Likewise, sites that contribute to monitoring different animal production systems were identified and the methods for monitoring productivity have been developed and are being tested.

8.2 Livestock operations are being monitored and data is collected required to quantify productivity for use by the economic models and other assessments. The specific measures of productivity differ among locations depending on the type of livestock operation. For instance, a cow-calf operation is primarily assessed by weaning weights of calves, cull rates of cows, calving percentages, and sale of replacement individuals. For the stocker systems, total gain and gain per system are the primary measurements along with documentation of morbidity and mortality. Thus, the appropriate measurements depend upon the specific type of livestock operation but the final analysis is the cost of production against the value of the product(s) produced per unit of water invested and per acre of system.

The integrated crop/forage/livestock systems require particularly intensive monitoring to track cropping and livestock rotations and management strategies. Dr. Will Cradduck was hired in the position of Post Doctorial Fellow to take primary responsibility for developing full descriptions of the integrated systems and how they are managed and how they change over time, as well as documentation of all aspects of productivity on these systems. Dr. Cradduck is also developing the procedures for evaluation all sites for potential habitat for indicator wildlife species including Northern Bobwhite Quail, Ring-necked Pheasant, Lark Bunting, Mule Deer, Pronghorn Antelope, Eastern Cottontail Rabbit, and Black-tailed Prairie Dog. These species are of economic and ecological importance to this region and will contribute to the economic analysis. All sites will be evaluated for 1) Potential as habitat for the above species; 2) Potential to be modified to meet habitat requirements for these species; and 3) actual presence of these species.

Dr. Cradduck is collecting data to ground-truth data collected through satellite imagery for biomass and ground cover within the various vegetation types on the 26 sites. Satellite imagery offers excellent potential for estimating biomass in row crops but is less well validated for forage crops. Furthermore, live vs dormant or dead biomass represents a current bias in the equations developed for estimating biomass from satellite data. Techniques have been examined and tested for their use on the 26 producer sites and were field-tested on the research sites at New Deal. We now have the procedures and protocols and are ready to begin data collection in January that involve physical collection of representative biomass, photographic documentation of visual appearance, density using a graduated backboard, canopy height, and separation of biomass into live/dormant (dead) components. Samples will be dried at 60°C and biomass on a kg/ha basis will be calculated to verify estimates from satellite imagery.

All forage components of all systems in the Demonstration Project must be evaluated for botanical composition to adequately describe the conditions for each system. Dr. Cradduck has investigated various techniques that might be applied to answering this question. A combination of three techniques appear to give the most reliable description and provide a doable approach. These are: 1) a step-point recording of species and bare ground; 2) a visual assessment of botanical composition using the Double DAFOR scale (Abaye et al., 1997); and 3) a visual estimate of percentage grass, legume, broad-leaf weed, and bare-ground.

Dr. Cradduck is conducting on-site meetings with each producer involved with forage and/or livestock to become familiar with these locations and the management systems used. Information generated will be incorporated into the economic analysis described above and will be used in interpreting impacts on nutrient management, water quality, diversification on enterprises, and opportunities to integrate cropping and livestock operations.

TASK 9: EQUIPMENT, SITE INSTRUMENTATION, AND DATA COLLECTION FOR WATER MONITORING, HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT, SCOTT ORR AND JIM CONKWRIGHT

9.1 Equipment Procurement & Installation.

Primary System.
The following equipment has been purchased and installed:
Electromagnetic flow meters
Pressure transducers
Data logging controllers with communication capabilities

Secondary System.
The following equipment had been purchased and installed:
Tipping bucket rain gauges
Temperature Sensors
HPWD Manual read rain gauges

Soil Moisture Site Install.
Neutron probe access sites have been installed at each location. Several locations have multiple probe access sites.

Water Metering & Atmospheric Install.
Primary and secondary systems have been installed at each irrigated site. Non-irrigated sites have been equipped with manual HPWD read rain gauges only. Well water level recorders have not been procured. An Et weather station has been purchased and installed in the operation area.

9.2 Data Collection & Processing.

Data collection and site monitoring. Initial site information consisting of irrigation application method, operational flows and pressures, acres, crop, irrigation well (size, fuel type, number) and soil classifications have been recorded. All farms have been digitally mapped. Sites equipped with electronic sensors are currently collecting data. Data is being transmitted to storage every 24 hours. Soil moisture data is being collected on schedule. Each location equipped with electronic monitoring devices is being visited on a regular basis for calibration and maintenance.

Data Processing. Data files are being stored in a preliminary database. We are in the process of creating a primary database for data storage and sharing.

Due to the initial start time of the project, data recorded by the monitoring equipment is incomplete for Year 1. A predominance of the data recorded during the time period of April – December 2005 can not be used for any study purposes. Complete data products for year 1 consist of soil moisture and precipitation. Data obtained from project cooperators and partial sensor data for year 1 is being utilized for estimated water use efficiency calculations. Project cooperators must provide cropping data each year to complete water use calculations. As of this writing we have not received requested data from all cooperators.

Summary. The installation of equipment at each site has been completed. We currently have an abundance of components warehoused if needed for replacement or for additional sites. The primary and secondary systems are functioning well. We are still undergoing some modifications to equipment firmware in order to streamline the electronic processes regarding data recording.

The PET weather station was installed as a joint venture with the Texas A&M University Agricultural Research and Extension Center in Lubbock and Amarillo. A&M personnel are responsible for maintenance and operation of this site. The data generated by this station has been incorporated into the Texas High Plains Et Network and is available daily at http://txhighplainset.tamu.edu.

District personnel are currently in the process of calculating year 1 water use efficiency estimates. This process will be complete when all producer records revealing planting and harvest dates and associated yields have been received. A report of findings will be made available upon completion of this task.

As this type of project has never been attempted before the demand on personnel and time is tremendous. The development and refinement of data gathering systems on this scale is and will be an ongoing endeavor throughout the first two years. Innovations in this type of monitoring systems are progressing daily.

USDA – NRCS Report: Monty Dollar, Conservation Agronomist, Lubbock, Texas

As the producers' field records for the 2005 crop year become available, continue to evaluate effectiveness of the demonstrated systems and conservation treatments applied to the land. I am using the Wind Erosion Equation (WEQ) to estimate wind erosion and the Revised Universal Soil Loss Equation (RUSLE) to predict long-term average annual soil loss from sheet and rill erosion. I am also utilizing the Soil Conditioning Index (SCI) as a tool to predict the consequences of cropping systems and tillage practices on the trend of soil organic matter as it is a primary indicator of soil quality and an important factor in carbon sequestration and global climate change.

REFERENCES

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TASK AND EXPENSE BUDGET
FIRST FISCAL YEAR

2005-358-014		09/22/04 - 01/31/06
		Expenses
Task Budget	**Task Budget**	**This Period**
1	$ 5,450.00	$ 5,399.16
2	$ 2,667,550.00	$ 222,117.93
3	$ 675,402.00	$ 28,766.29
4	$ 610,565.00	$ 52,409.10
5	$ 371,359.00	$ 42,427.73
6	$ 633,173.00	$ 54,530.50
7	$ 306,020.00	$ 71,502.27
8	$ 334,692.00	$ 44,628.53
9	$ 620,564.00	$ 144,723.49
TOTAL	$ 6,224,775.00	$ 666,505.00

		09/22/04 - 01/31/06
Expense Budget	**Total**	**Expenses**
	Budget	**This Period**
Salary and Wages [1]	$ 2,126,068.00	$ 234,051.35
Fringe[2] (20% of Salary)	$ 288,370.00	$ 28,477.67
Insurance	$ 312,512.00	$ 14,144.81
Tuition and Fees	$ 200,523.00	$ 8,126.78
Travel	$ 155,987.00	$ 15,370.23
Capital Equipment	$ 76,555.00	$ 23,305.17
Expendable Supplies	$ 381,046.00	$ 14,181.41
Subcon	$ 1,741,376.00	$ 252,337.64
Technical/Computer	$ 190,400.00	$ 9,740.00
Communications	$ 365,000.00	$ 25,339.15
Reproduction (incl under comm)		
Overhead	$ 386,938.00	$ 41,430.79
Profit		
TOTAL	$ 6,224,775.00	$ 666,505.00

Table 4: Task and Expense Budget - First Fiscal Year

ACKNOWLEDGEMENTS

Producers of Hale and Floyd County

Mark Beedy
Lanney Bennett
Randy Bennett
Troy Bigham
Lewis (Bubba) Ehrlich
Bernie Ford
Gerald Ford
Jody Foster
Scott Horne
Boyd Jackson
Jimmy Kemp
Brett Marble
Charles Nelson
Keith Phillips
Glenn Schur
Dan Smith
Don Sutterfield
Brian Teeple
Eddie Teeter
Jeff Don Terrell
Aaron Wilson