An Integrated Approach to Water Conservation

Texas Alliance for Water Conservation
Ogallala Aquifer

- One of the world’s largest aquifers
- Covers approximately 174,000 square miles.
- About 27% of the total irrigated land in US overlies this aquifer.
- Pumping began after Dust Bowl of the 1930’s
- It support nearly 20% of the production of cotton, corn, wheat and cattle and cattle feed in the US
- Texas, New Mexico and Oklahoma produces 7 million head annually or 30% of the nations fed cattle
Ogallala Aquifer

• 85% of the all fresh water around the world is used in production agriculture
• 90% of the fresh water in the High Plains of Texas is used in production agriculture
• It is a finite resource, very little recharge
Declining Resource
Mark Twain once said

"Whiskey is for drinking; water is for fighting over."
Changes in Water Legislation

• Senate Bill 1 (1997)
  – Reemphasized the regional water planning process ~ Groundwater Management Areas (GMA’s)

• Senate Bill 2 (2001)
  – Designated the Texas Water Development Board (TWDB) to coordinate regional water plans.
  – Required (GMA’s) to coordinate with local groundwater conservation districts
  – Groundwater districts must work in tandem with GMA.
Changes in Water Legislation

- House Bill 1763 (2005)
  - Water conservation districts must meet each year to discuss the Desired Future Condition.
  - Groundwater districts set target or cap on extraction~ Desired Future Condition (DFC)
  - GMA’s must submit DFC’s to TWDB by September 1, 2010
  - High Plains Underground Water District No.1 set the DFC @ 50/50
  - The plan will have to be submitted on how to meet the DFC of 50/50 (Pumping restrictions)
Declining Water Resources
Projected Water Demand and Supply
Texas High Plains

Source: Texas Water Development Board 2006
Texas Alliance for Water Conservation

Senator Robert Duncan
Texas Water Development Board
$6.2 Million

Senate Bill 1053

Funded through 2012 by the Texas Water Development Board

‘Water is Our Future’
A Cooperative Venture with the Texas Water Development Board
Project Management Team

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Primary Objectives of Project

- Reduce total water use
- Enhance profitability
- Identify systems that meet objectives 1 & 2
- Understand system behavior
Crops/Livestock (Total 4,500 acres)

- Cotton
- Corn
- Grain Sorghum
- Cotton-Cattle
- Grass-cattle
- Specialty Crops
Irrigation Methods

- Sprinkler
- Sub-surface Drip
- Furrow
- Dryland
Site Monitoring

- Rainfall
- Temperature
- Water applied
- Soil moisture
- Production inputs
- Plant & animal products
- Advanced technologies
- Netirigate
- Smartcrop
- AquaSpy
TAWC Systems, 2005 & 2009
(Percent of total systems)

2005 Systems
- Cotton Monoculture: 27%
- Multi-Cropping: 50%
- Corn Monoculture: 11%
- Grass Seed Monoculture: 8%
- Integrated Crop/Livestock: 4%
- Sunflower Monoculture: 0%

2009 Systems
- Cotton Monoculture: 15%
- Multi-Cropping: 54%
- Grass Seed Monoculture: 8%
- Integrated Crop/Livestock: 15%
- Livestock Only: 4%
- Sunflower Monoculture: 4%
- Corn Monoculture: 0%
Gross Margins

- Fertilizer
- Seed
- Insecticide
- Irrigation fuel cost
- Tillage
- Herbicides
- Harvest Aids
TAWC Irrigation and Gross Margin, 2005-2009
(System mean across sites and years regardless of irrigation system)
TAWC Irrigation and Gross Margin, 2005-2009
(System mean by year across sites regardless of irrigation type)
TAWC Producers, 2005 - 2009
(Percent Producers with Gross Margin > $300 and Irrigation < 15 inches)

50% of Producers have achieved this level with at least one system from 2005-2009

But only 22% of total systems attempted have achieved this level over the period 2005-2009
Cotton Monoculture

- Mean represents all systems across all years 2005-2009

* Mean represents all systems across all years 2005-2009
Corn Monoculture

* Mean represents all systems across all years 2005-2009
Mean represents all systems across all years 2005-2009

* Mean represents all systems across all years 2005-2009
* Mean represents all systems across all years 2005-2009
TAWC Irrigation and Gross Margin, 2005-2009
(System comparison with GM vs Irrigation trend line regardless of irrigation system)

Graph showing the relationship between Gross margin, $ and Irrigation, Inches for Cotton.
TAWC Irrigation and Gross Margin, 2005-2009
(System comparison with GM vs Irrigation trend line regardless of irrigation system)

Multi-Crop
Irrigation Applied to TAWC Sites, 2005-2009
Pivot, subsurface drip and furrow irrigation combined
Cotton

Integrated Crop/Livestock

Gross margin, $

Irrigation, Inches

- Cotton Monoculture
- Integ Crop/Livestock
- Multi-Crop
- Corn Mono
- Grass Seed Mono
TAWC Irrigation and Gross Margin, 2005-2009
(System comparison with GM vs Irrigation trend line regardless of irrigation system )
Measuring Crop Water Use
Estimating Crop Water Use by Remote Sensing
Resource Concerns

Irrigated producers in the Southern High Plains face a multitude of resource challenges

- Rate of extraction from Ogallala Aquifer exceeds recharge
- Increased costs of water application
- Future regulation

- Production management decisions will be based on future water limitations
Resource Based Decision Tool

Objective

- Develop a farm level decision aid which provides an evaluation of enterprise options which maximize net returns per acre based on specific water allocations and/or resource limitation

Some data points

- Water limitations
- Crop acreages
- Yield goals
- Expected prices
- Expected cost of production
Resource Based Decision Tool

Expected outcomes

Provide enterprise options based on

- Water allocation
- Yield per inch of water
- Net returns per acre
- Yield goal

Additional output could recommend fertility requirements (N & P)
Project Accomplishments
(Goals and Opportunities)

Informed Decisions

Specialty Crops and Opportunities

Open Forums

Technologies & New Mgmt. Tools

Outreach & Education
Specific Accomplishments

Original Goals:

- Reduce total water use
- Enhance profitability
- Identify systems that meet objectives 1 & 2
  - Systems identified that meet first two goals
  - A range of alternative systems
  - Environmental costs differ
  - Identified opportunities for improvement
  - Can now design more WUE and profitable systems

Understand system behavior

Water, Economics, Environment

Systems differ.
Project Impact on Producers

“I am more aware of the amount of water that I pump”

“I have made a conscious effort to reduce my water use as a result of the project”

“As a producer I am more open to alternatives that will conserve water”

“Because of implementation of available technologies I have reduced water use on my farm”
Additional Accomplishments

- We have developed a unique partnership among producers, industry, government agencies, academics, and legislators to address critical issues.

- In addition to primary goals, related benefits are emerging and include:

  Understanding of:

  - Carbon balance
  - Energy balance
  - Economic models
  - Improved irrigation scheduling
  - Tools for resource based decisions
  - Impact on wildlife habitats
  - Impact on soil quality and erosion
Future of Project

First 5 Years:

- Because of this project, we:
  - Can design more water use efficient systems
  - Can remain viable in face of future water declines
  - Have new tools and management strategies to conserve water
  - Are more knowledge about environmental consequences
Future of Project

Moving Forward:

- **Future directions – on selected sites:**
  - Limit Cotton to 12 inches irrigation
  - Limit Corn to 15 inches irrigation
  - Water Budget
    - ET Baseline
    - AquaSpy
    - SmartCrop
Implantation Phase

- Added two sites
- Limited irrigation to 12 acre inches
- Limited irrigation to 15 acre inches
- Use the technology and cropping systems that has shown the greatest return for water used
- Strategic irrigation!!!!
Objectives for Strategic Irrigation

- Try to utilize all of the rainfall
- Conservation tillage
- Water budgets
- Utilize Resource management tool
- ET Program
- Aquaspy
- Netirrigate
- Spartcrop sensors
Fertilizing
Moisture measurement by soil probing

Using moisture measurement to aid in ET Base irrigation scheduling
Results from year one

- Applies only 8.14 inches of irrigation on cotton
- Yielded 1156 lbs. of lint replanted on 5/28/2010
- Applied only 9.94 inches of Irrigation on Seed Millet
- Yielded 3450 lbs.
Are your customers irrigating from the seat of their pants?