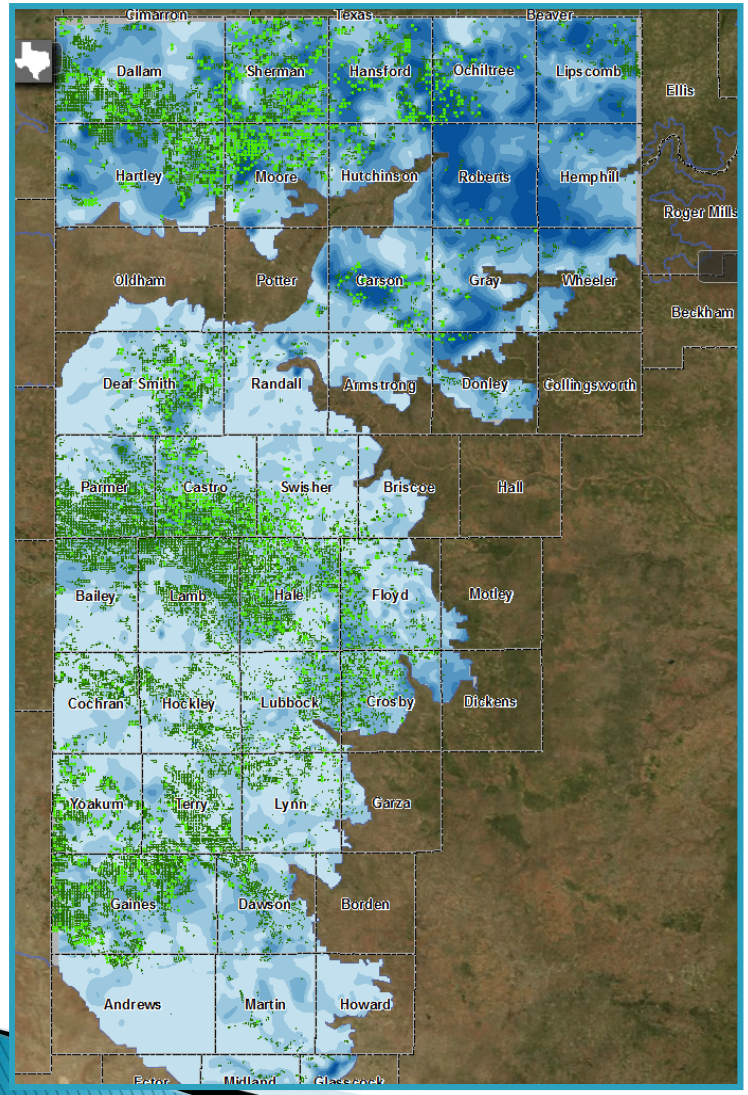
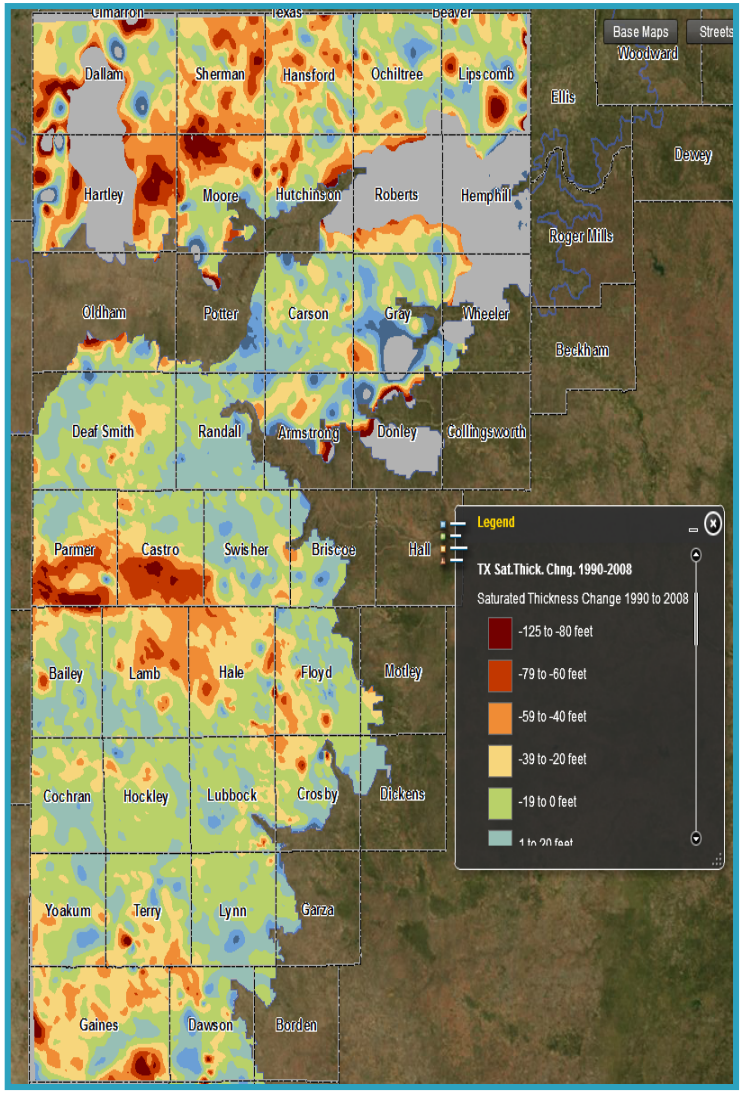
Texas Alliance for Water Conservation

Rick Kellison, Project Director

TEXAS TECH UNIVERSITY
College *of* Agricultural Sciences
& Natural Resources

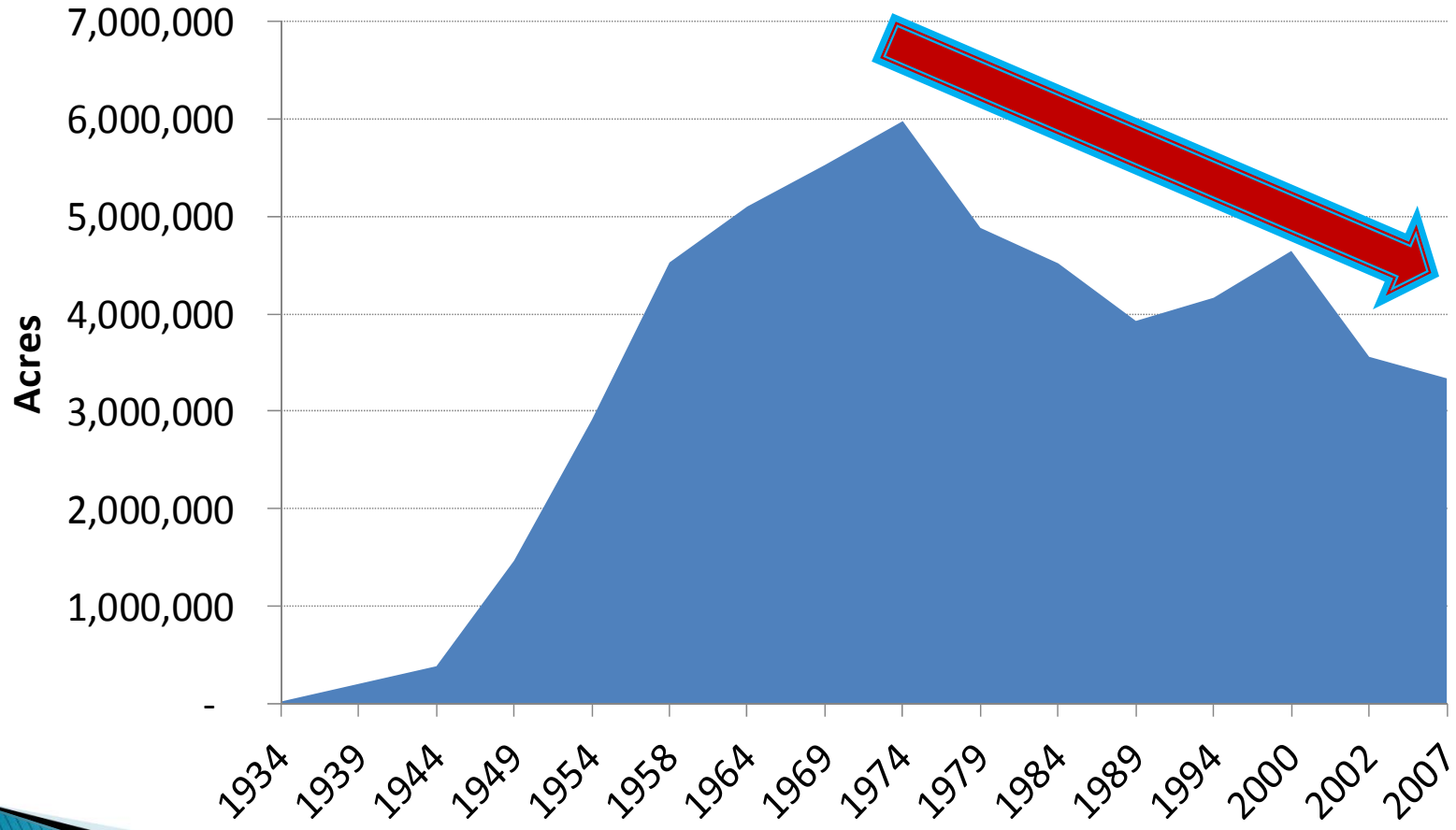
Declining Water Resources



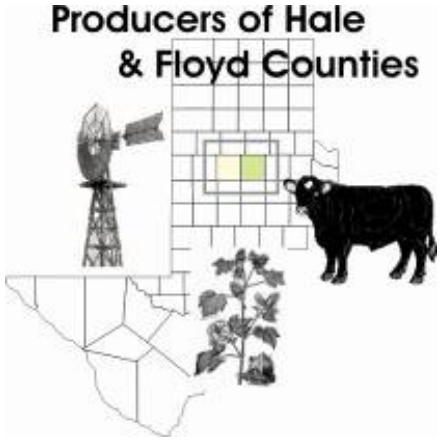


Texas High Plains Irrigation

(Ag Census) – all crops



A Cooperative Venture with the Texas Water Development Board



Texas Tech University

USDA
NRCS & ARS

HPWD
High Plains
Underground Water
Conservation District

FARM Assistance
Planning Solutions

TEXAS A&M AGRILIFE RESEARCH

TEXAS A&M AGRILIFE EXTENSION

Primary Objectives of Project

- Demonstrate how to reduce total water use
- Demonstrate how to enhance profitability
- Identify effective crop and irrigation systems
- Impact producer decision-making

Crops/Livestock (Total 4,700 acres)

Cotton
Monocultures

Corn
Cotton

Grain Sorghum
Cotton

Cotton-Cattle

Grass-cattle

Specialty Crops

Irrigation Methods

Sprinkler

Furrow

Sub-surface Drip

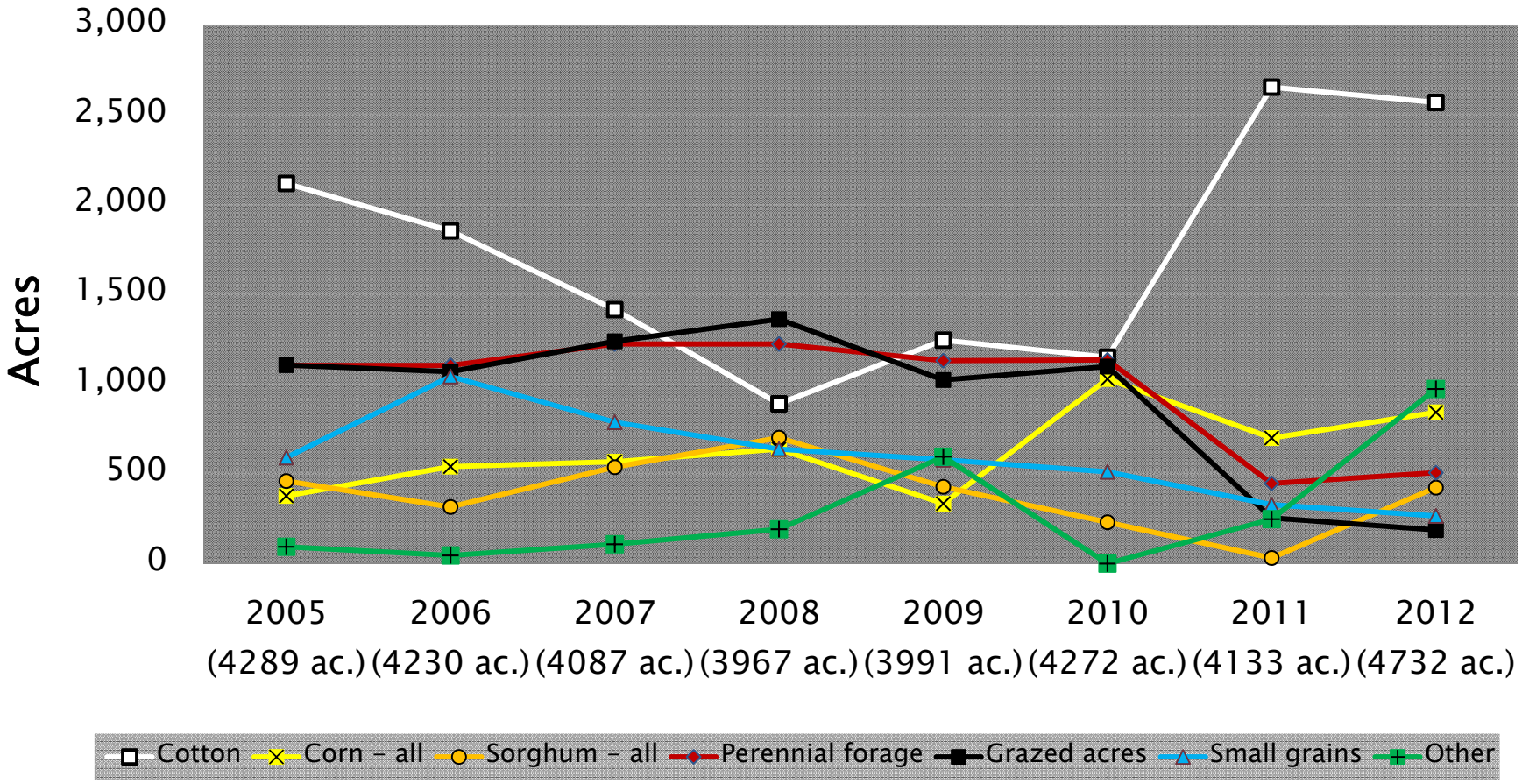
Dryland

Site Monitoring

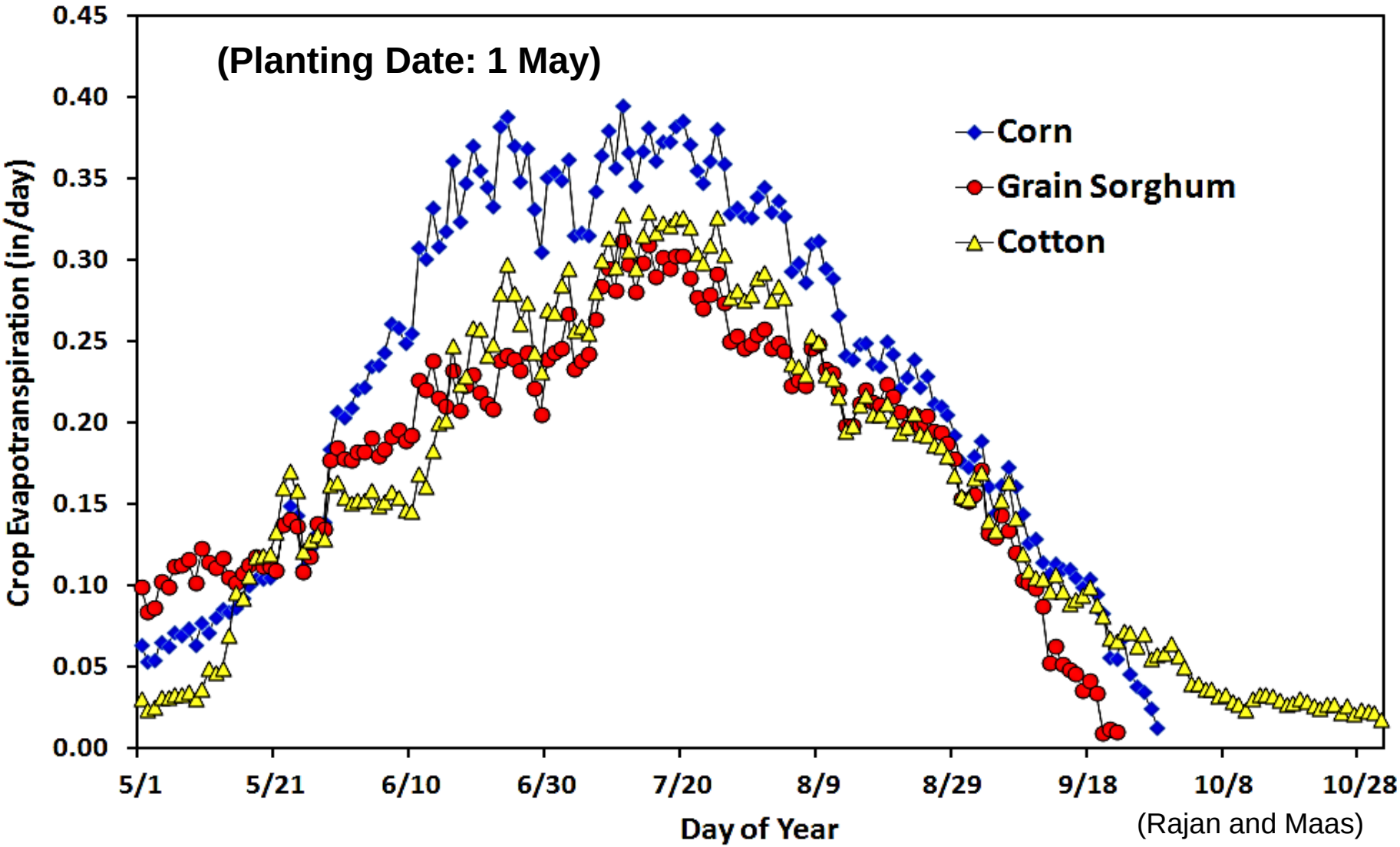
- Rainfall
- Temperature
- Water applied
  - Netirrigate ®
  - PivoTrac ®
- Soil moisture
  - AquaSpy®
  - Field Connect ®
- Production inputs
- Plant & animal yields
- Economic analysis

Crops/Forages/Livestock Grown

TAWC Sites 2005-2012

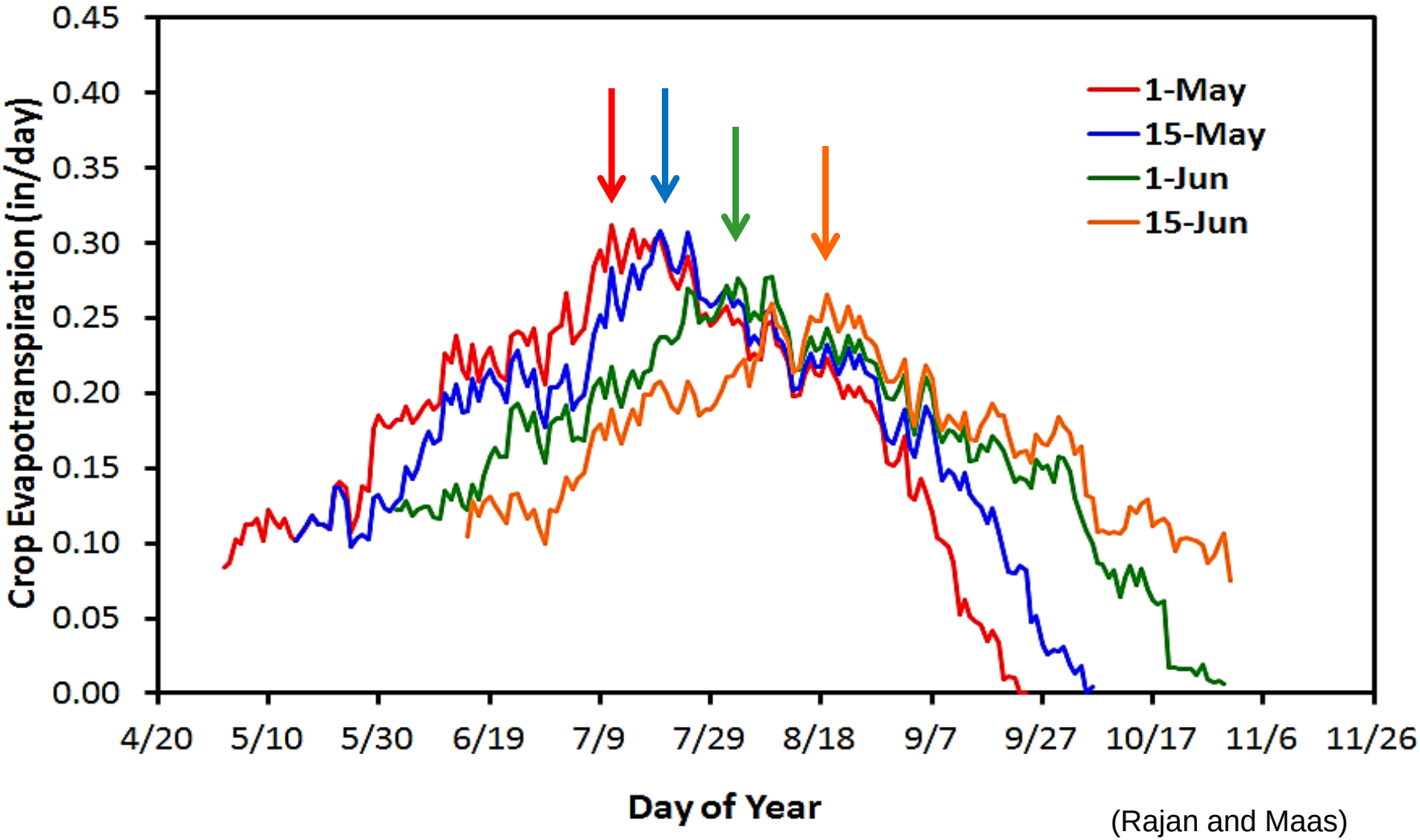


Crop Evapotranspiration Long-term Average (1997-2011)



(Rajan and Maas)

Sorghum Evapotranspiration Long-term Average (1997-2011)



(Rajan and Maas)

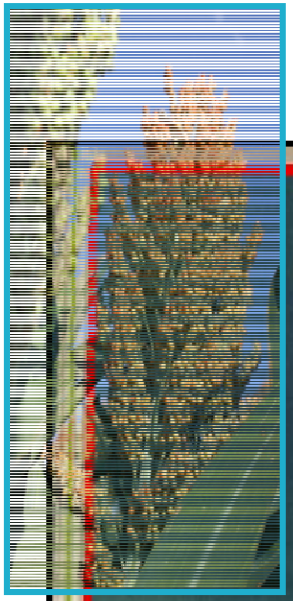
TAWC Grain Sorghum, Cotton, and Corn Sites in Floyd and Hale County, Texas

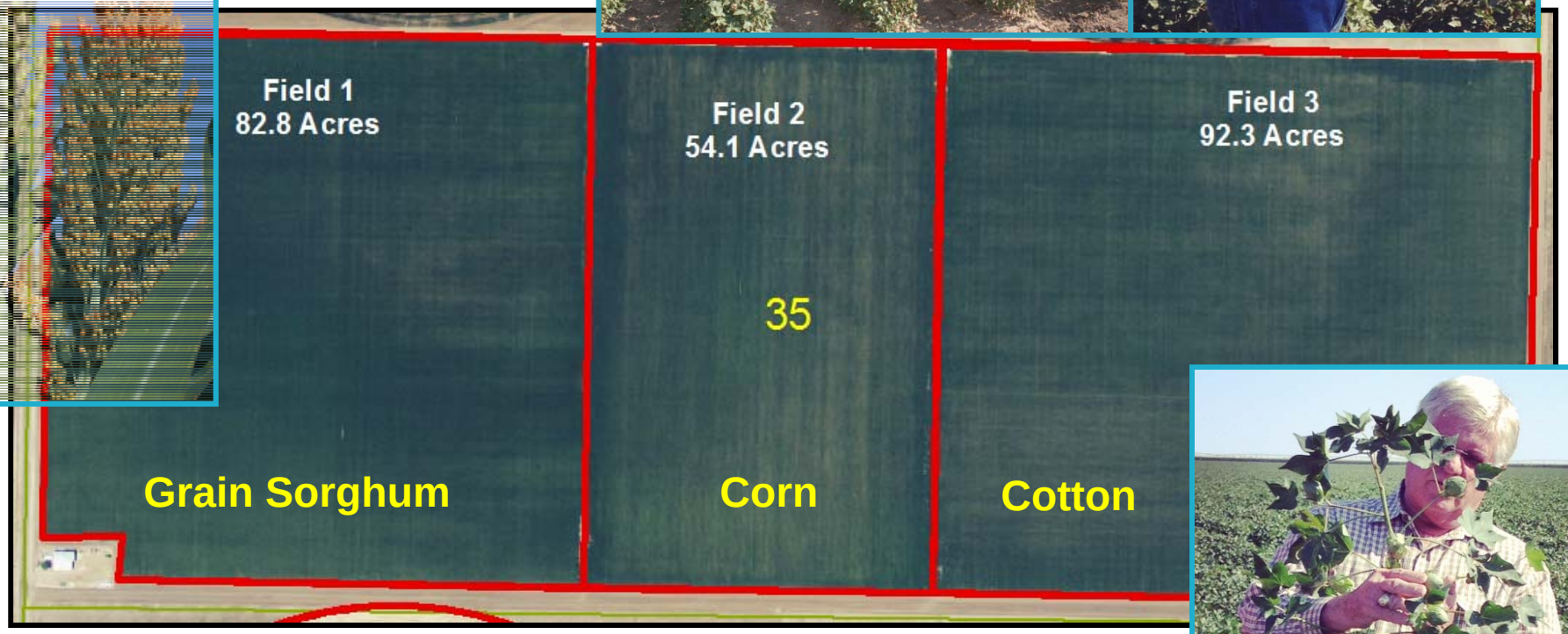
2005-2011

Crop	Yield /acre	Inch/acre	Yield/inch	Profit/acre	Profit/inch
Sorghum (bu)	115	7.9	14.5	248.30	31.40
Corn (bu)	214	17.4	12.3	479.40	27.60
Cotton (lbs)	1275	11.9	99.6	336.50	26.30

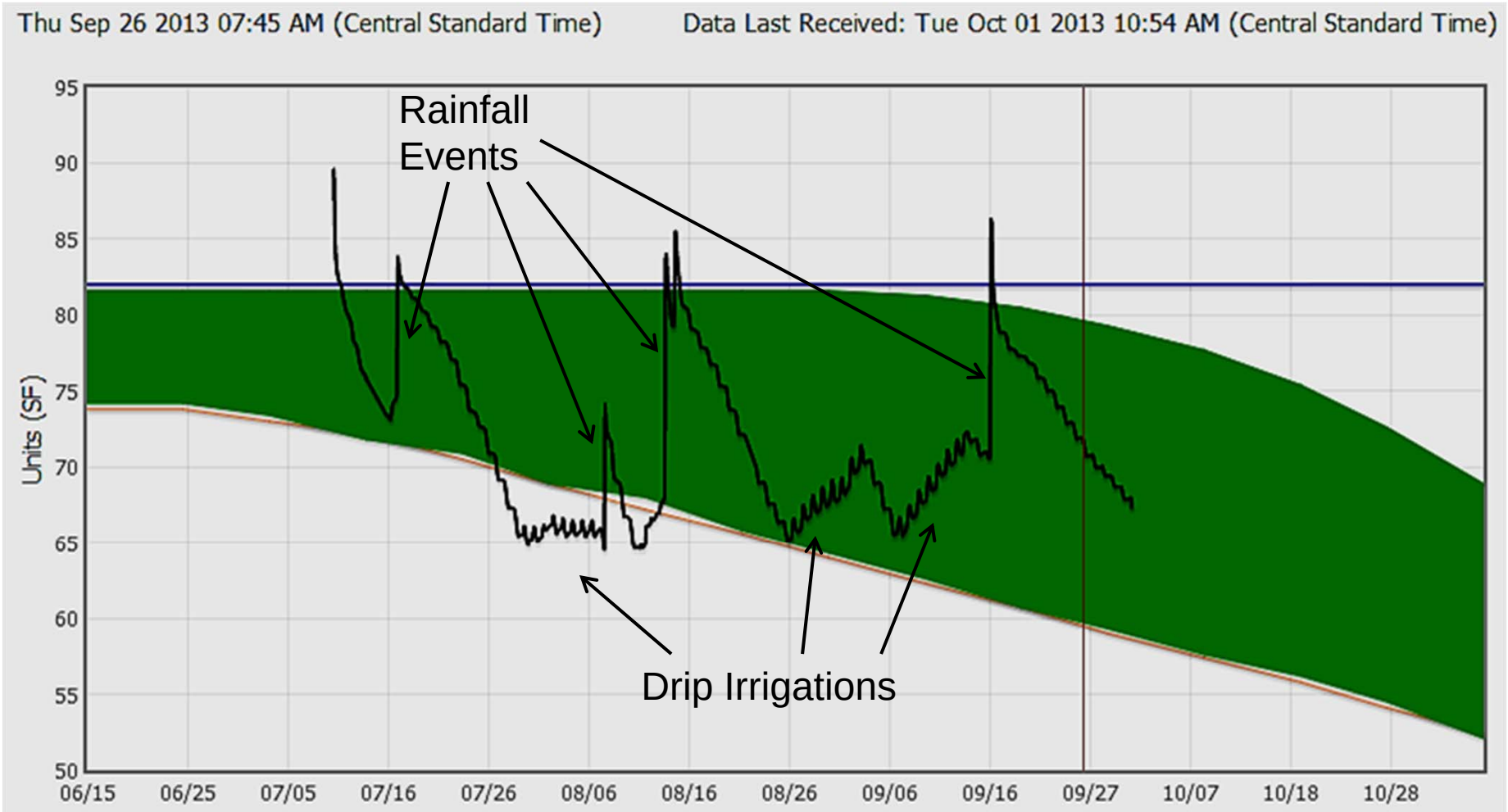
***** Profit is defined as total revenue per acre less all field level cash Expenses. Within this data, profit does not reflect fixed expenses.

Field Walks
2013

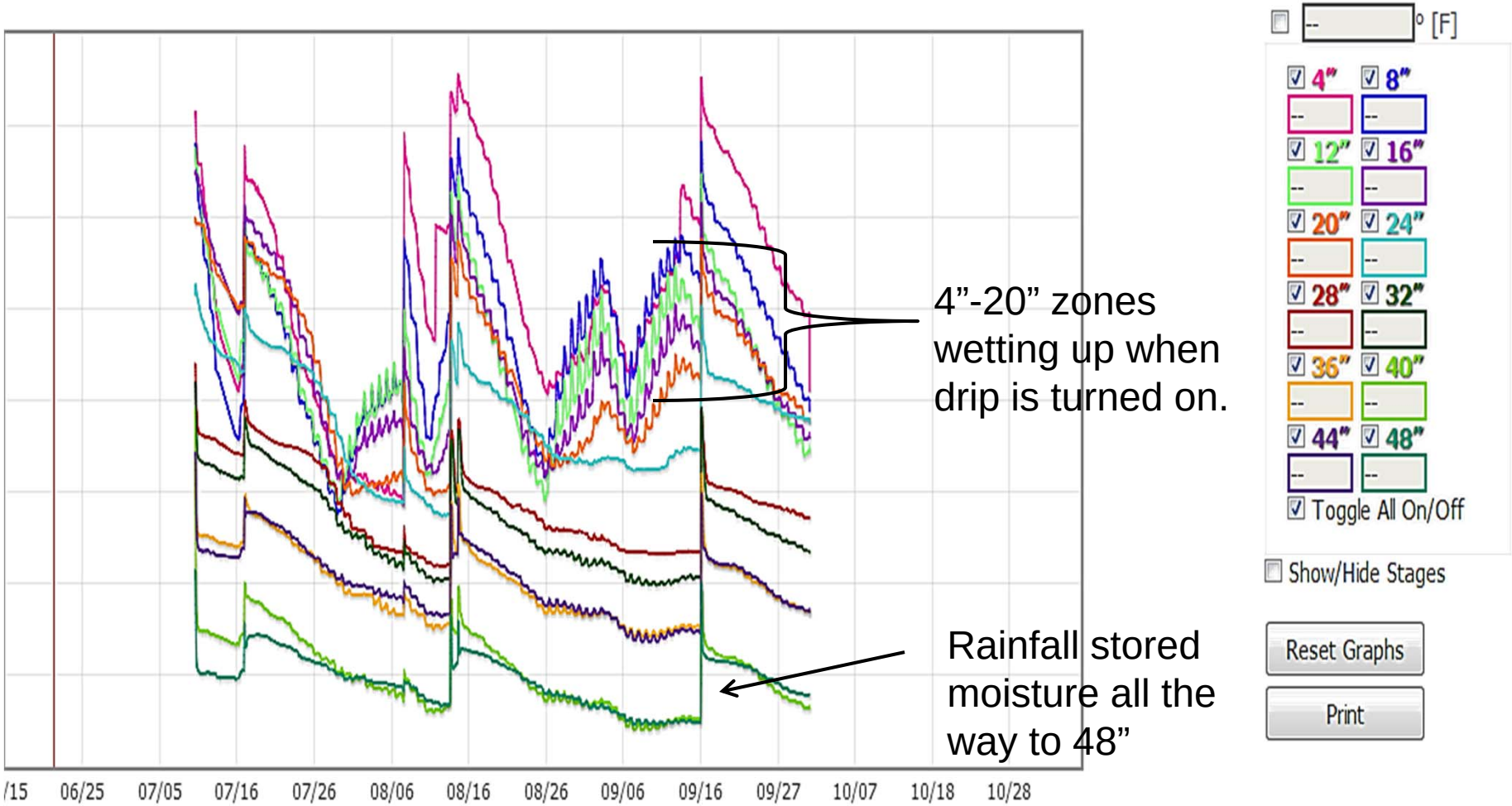




Summary Graph



Sensor Graph



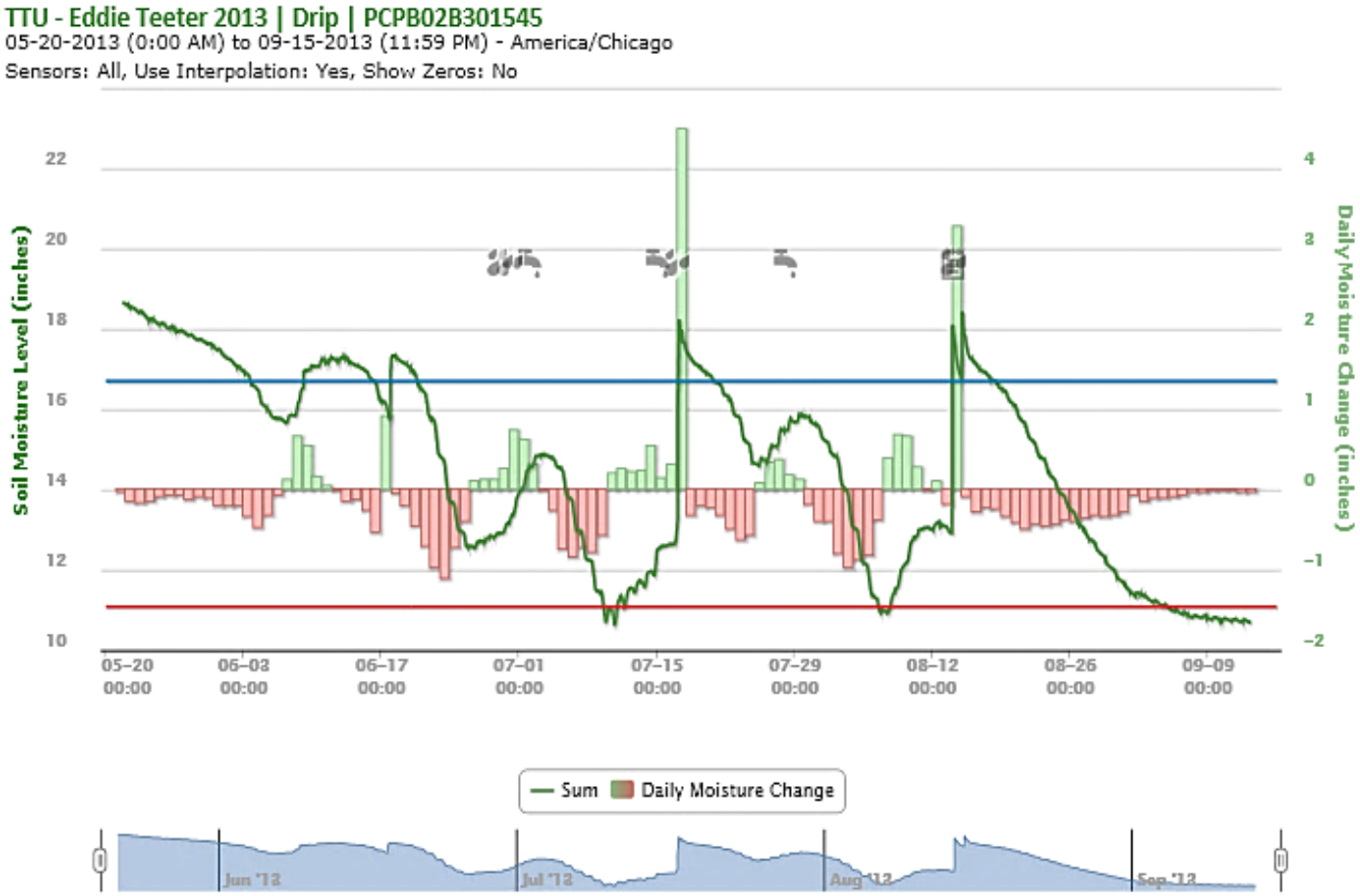
Eddie Teeter

Drip – Grain Grain Sorghum

- Pioneer 86G32
- 82.8 acres produced 8816 pounds/acre
- Total water supply = 9.3 inches irrigation and 13.4 inches rain =22.7 inches
- Water use efficiency = 411 lbs/inch

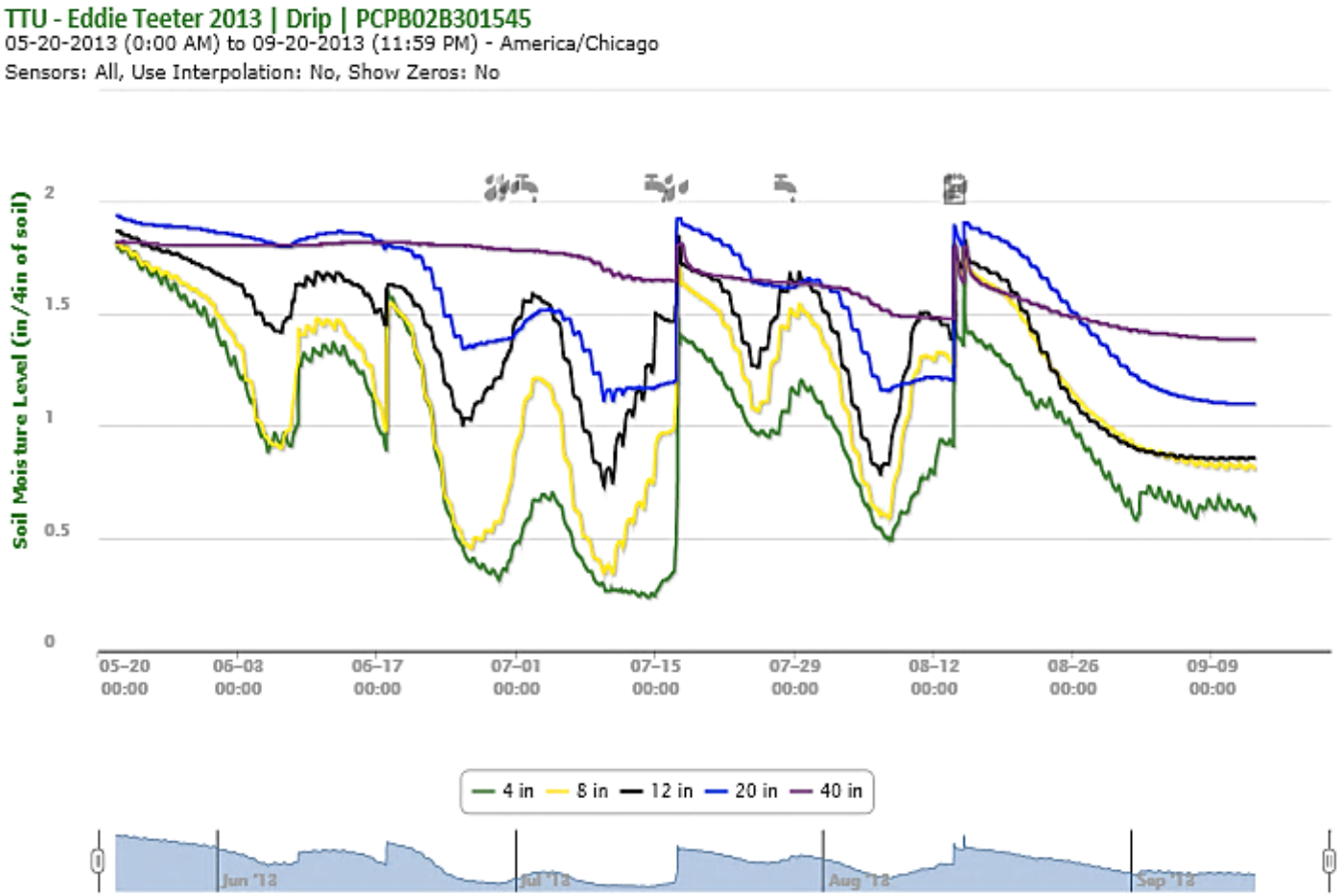
Eddie Teeters Drip Corn – Sum Graph

June1–August 14, 2013



Eddie Teeters Drip Corn –Individual Sensor

June1–August 14, 2013



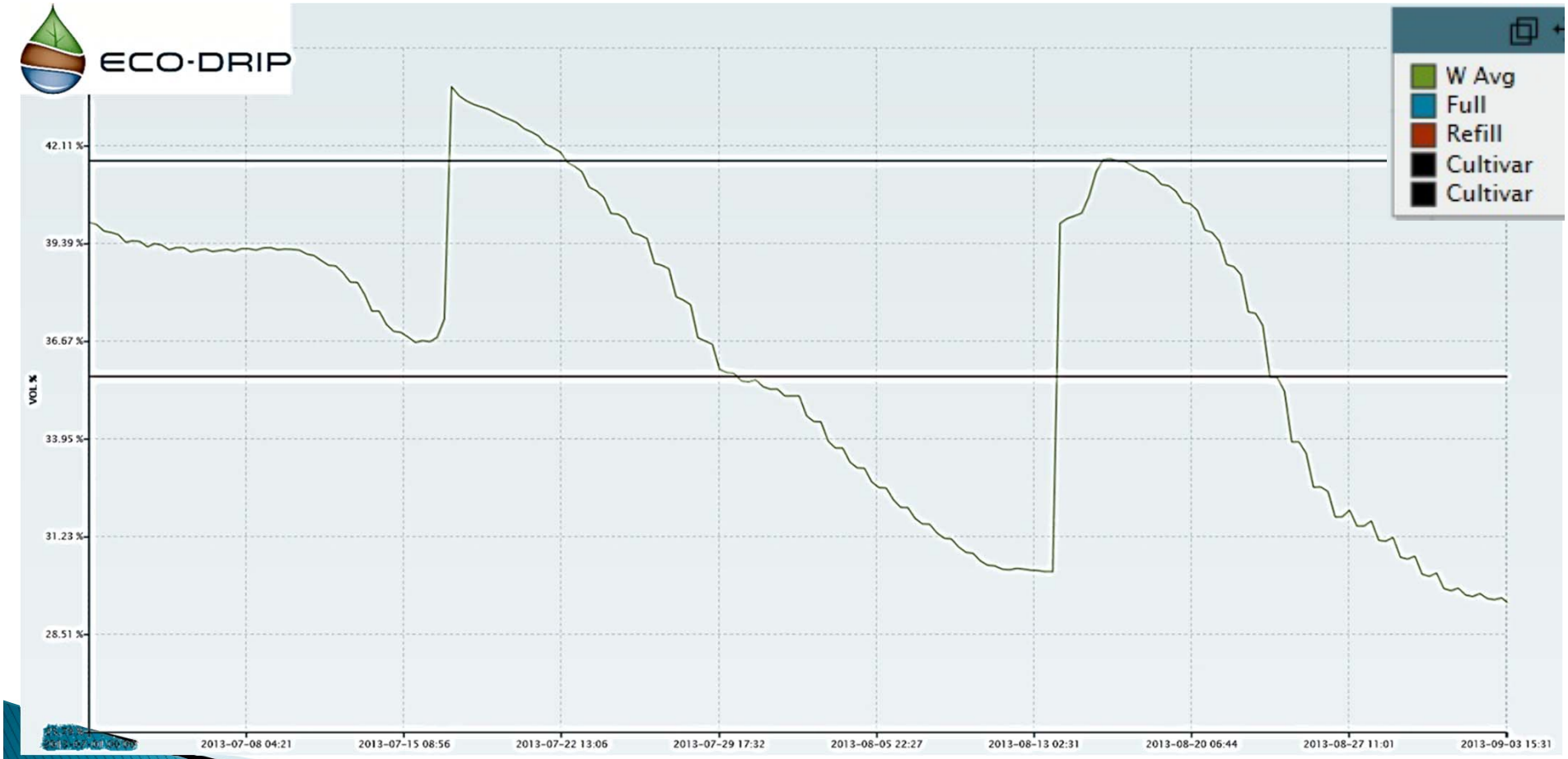
Eddie Teeter

Drip Corn

- Pioneer Aqua Max Yellow Hybrid
- 54.1 acres produced 818,240 pounds
  grain = 240.5 bushels/acre
- Total water supply = 16.9 inches irrigation and 13.0 inches rain =32.9 inches
- Water use efficiency = 7.32 bushels/inch

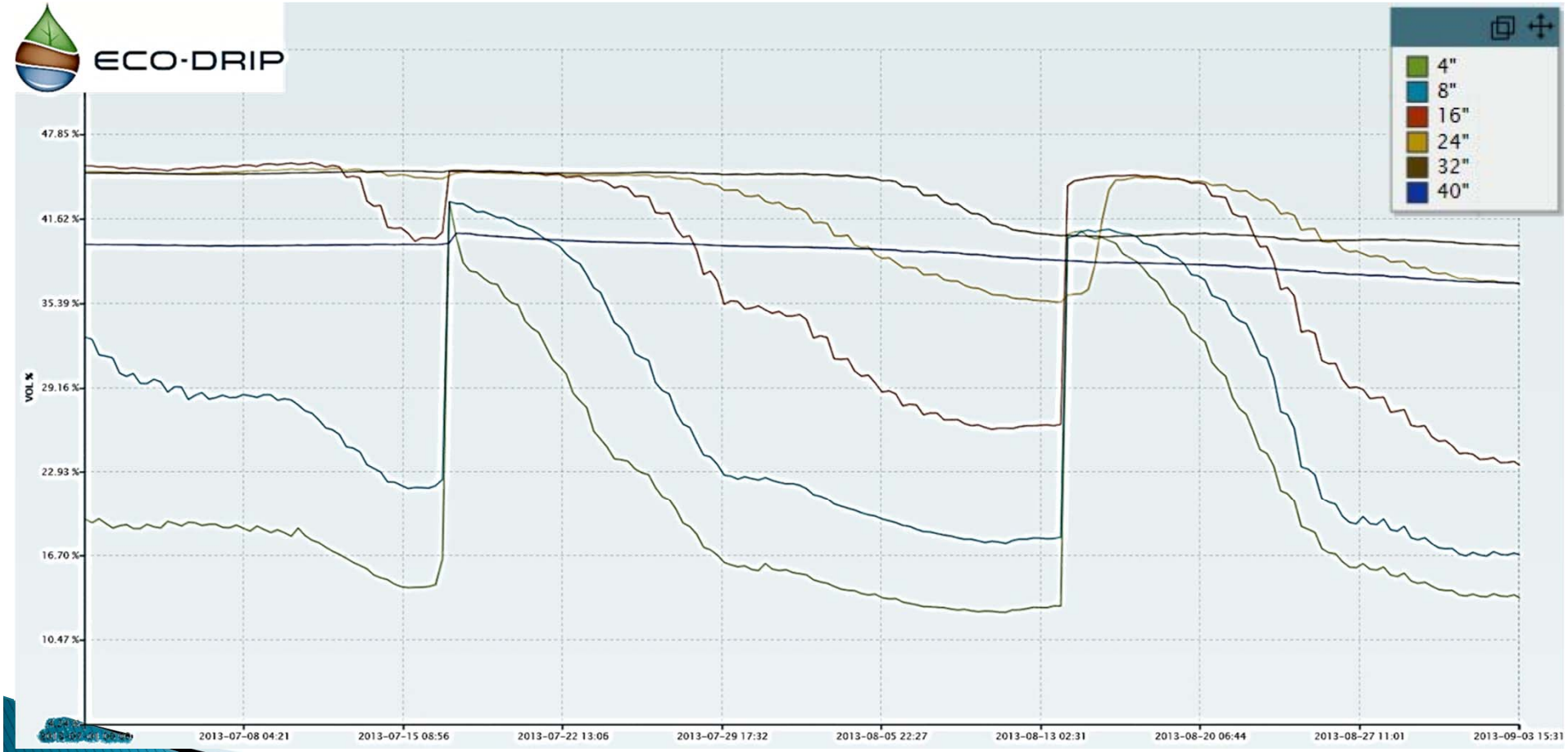
Eddie Teeter – Sum Graph

Drip Cotton 2013



Eddie Teeter – Individual Sensor

Drip Cotton 2013

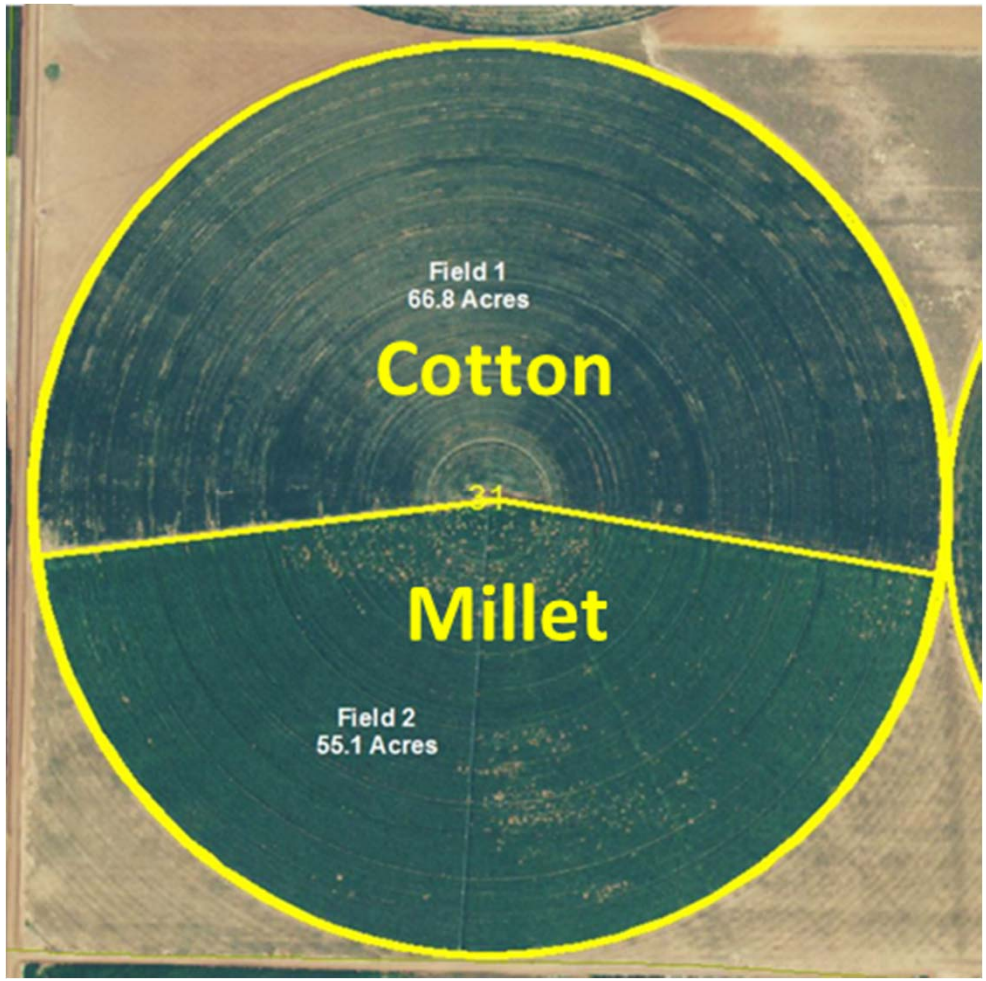


Eddie Teeter

Drip – Cotton

- FM 2484 B2F
- 92.3 acres produced 1891 pounds/acre
- Total water supply = 11 inches irrigation and 13.9 inches rain =24.9 inches
- Water use efficiency = 75.9 lbs/inch

Water Management LEPA vs LESA



LEPA vs LESA

LESA

LEPA

LEPA vs LESA Budget Comparison
2011

	2011			
	LEPA		LESA	
PER ACRE GROSS INCOME	**Quantity**	**Total**	**Quantity**	**Total**
Cotton lint	1001	$ 900.90	879	$ 791.10
Cotton seed	0.72	$ 245.39	0.63	$ 215.48
PER ACRE TOTAL GROSS INCOME		$ 1,146.29		$ 1,006.58
PER ACRE TOTAL OF ALL COST		$ 968.89		$ 945.93
PER ACRE NET PROJECTED RETURNS		$ 177.40		$ 60.65
Percent Increase		193%		
WATER APPLIED - INCHES		26.1		
Lint lbs per acre-in of water applied		38.4		33.7
Percent Increase		13.9%		

LEPA vs LESA Budget Comparison
2012

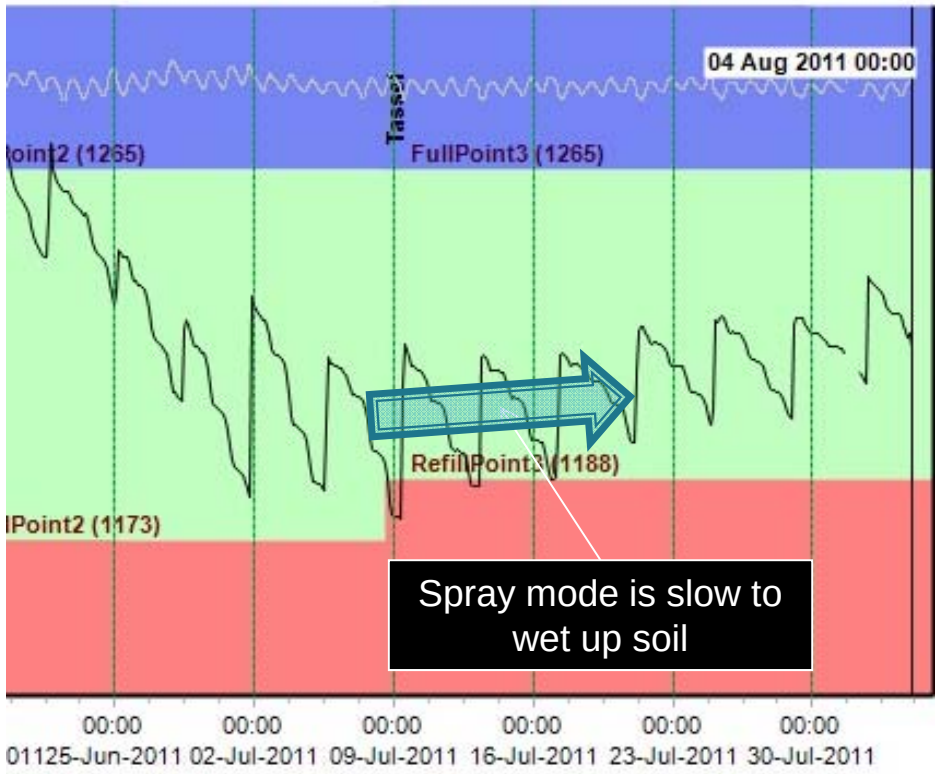
	2012			
	LEPA		LESA	
PER ACRE GROSS INCOME	**Quantity**	**Total**	**Quantity**	**Total**
Cotton lint	1057	$ 951.30	896	$ 806.40
Cotton seed	0.76	$ 213.39	0.65	$ 180.88
PER ACRE TOTAL GROSS INCOME		$ 1,164.69		$ 987.28
PER ACRE TOTAL OF ALL COST		$ 980.33		$ 950.04
PER ACRE NET PROJECTED RETURNS		$ 184.35		$ 37.25
Percent Increase		395%		
WATER APPLIED - INCHES		19		
Lint lbs per acre-in of water applied		55.6		47.2
Percent Increase		18.0%		

LEPA vs LESA Budget Comparison
2013

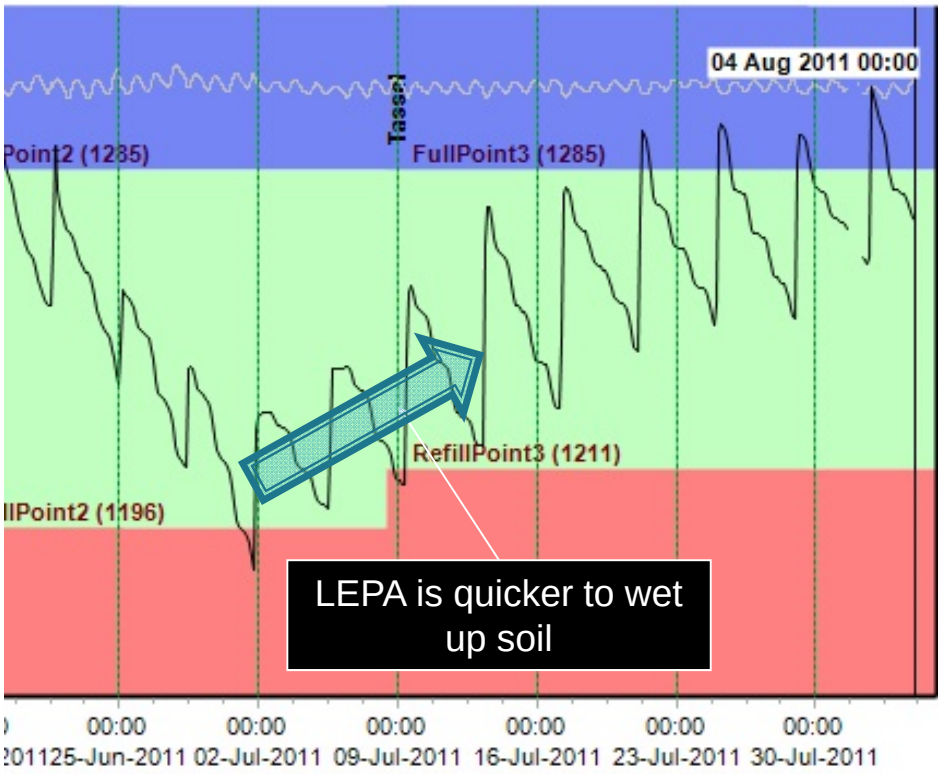
	2013			
	LEPA		LESA	
PER ACRE GROSS INCOME	**Quantity**	**Total**	**Quantity**	**Total**
Cotton lint	1165	$ 873.75	1028	$ 771.00
Cotton seed	0.84	$ 235.19	0.74	$ 207.53
PER ACRE TOTAL GROSS INCOME		$ 1,108.94		$ 978.53
PER ACRE TOTAL OF ALL COST		$ 924.94		$ 906.33
PER ACRE NET PROJECTED RETURNS		$ 184.00		$ 72.20
Percent Increase		155%		
WATER APPLIED - INCHES		16.5		
Lint lbs per acre-in of water applied		70.6		62.3
Percent Increase		13.3%		

Comparison of Irrigation Method

Spray Mode



LEPA Mode



Solution Aids

“Water is Our Future”

TAWC-Solutions

Resource Allocation Analyzer

TAWC-Solutions
Resource Allocation Analyzer

- To be used as a planning aid
- Captures changes in commodity price, water availability, and production costs
- Generates several options which maximize net returns/acre

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Resource Allocation Analyzer

Production Site Parameters

Field Acreage	Pumping Capacity	Water Budget	Pumping Cost	Pumping Season
120 [Acres]	400 [GPM]	12 [In]	$ 9 /[Acre-Inch]	90 [Days]

Crops to be Analyzed

Crop Type	Contracted Acres	Maximum Yield	Irrigation Required	Production Cost	Expected Price
Cotton	0 [Acres]	1500 [lb,bu]	18 [In]	$ 500 /[Acre]	$ .90 /[lb,bu]
Corn	0 [Acres]	250 [lb,bu]	22 [In]	$ 500 /[Acre]	$ 5 /[lb,bu]
None	0 [Acres]	0 [lb,bu]	0 [In]	$ 0 /[Acre]	$ 0 /[lb,bu]
None	0 [Acres]	0 [lb,bu]	0 [In]	$ 0 /[Acre]	$ 0 /[lb,bu]
None	0 [Acres]	0 [lb,bu]	0 [In]	$ 0 /[Acre]	$ 0 /[lb,bu]

Analyze | Clear Form

Useful Information

Introduction

Background

The Resource Allocation Analyzer is designed to estimate field level cropping options for irrigated land which maximize net returns per acre. This program designs acreage allotments, yield goals, and irrigation application rates in a manner which maximizes profit while utilizing the available irrigation water to its greatest potential.

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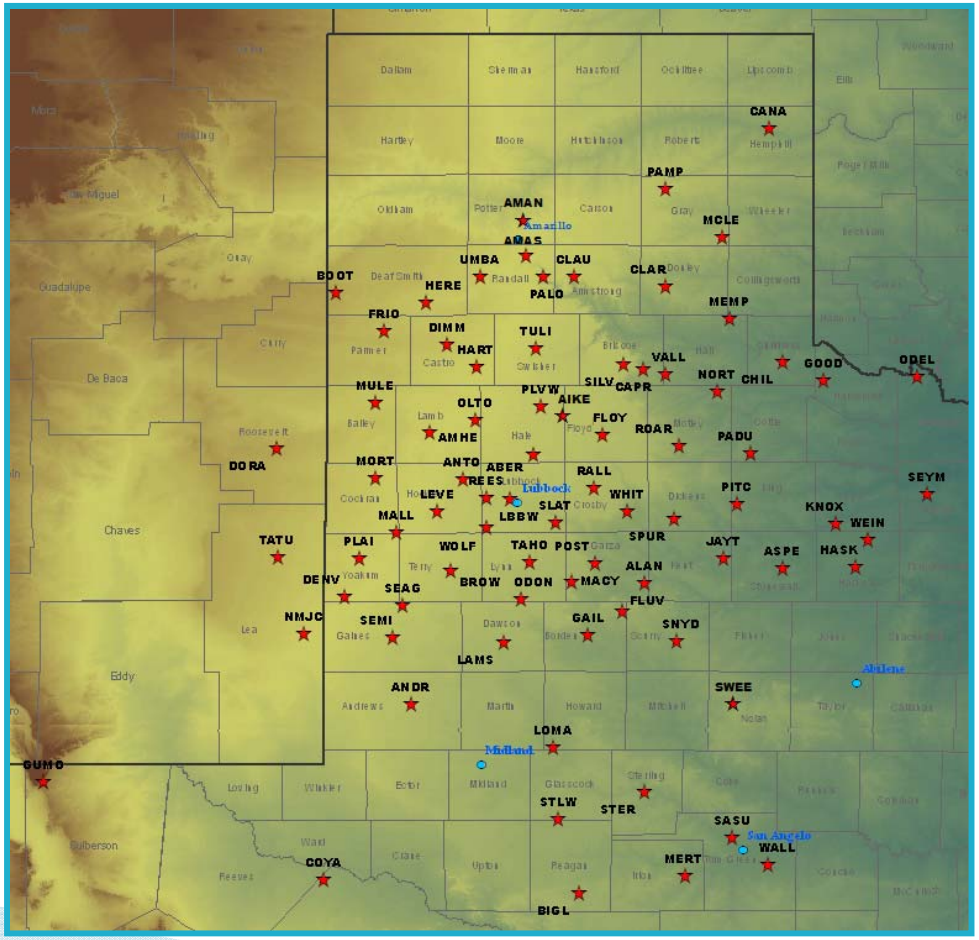
Disclaimer: Neither the programmers nor The Texas Alliance for Water Conservation and its affiliated institutions are to be held responsible for the information generated from this program.

Irrigation Scheduling

The procedure used to determine:

- When to apply
- How much water to apply
- Specific Management Goals

Potential Evapotranspiration



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New Crop Water Balance Track

Site:

Gomez-1

Select the site where this crop is located.

Crop Type:

NHP-Corn

Select the type of crop and crop coefficients. Currently only Northern High Plains(NHP) coefficients are supported.

Select Planting Date:

Feb | 21 | 2011

Weather Station:

Abernathy

Select the nearest or preferred weather station.

Crop Acreage: *

120

Total acreage for this crop, not necessarily the irrigated area.

Starting Moisture[in]: *

0

The initial estimate for moisture in the soil at planting time.

Initial Effective Rain[%]: *

100

This is the initial effective rain percentage, which can be adjusted at a later date if necessary.

Initial Effective Irrigation [%]: *

100

This is the initial effective irrigation value, which can be changed at a later date.

Initial Et[%]: *

100

This is the percentage of predicted evapotranspiration to use. This can be changed at a later date as well.

Create New Crop Water Balance Track | Cancel

Crop Summary

Site	Weather Station	Acreage	Type	Last Et	Moisture Balance	Growth Stage	Total Irrigation	Total Rain
Old Mill-1	Abernathy	120	Cotton	0.01	0.69	Strip	0.00	12.21

Daily Measurements

	Date	Effective Irrigation	Effective Rain	Percent Et	Irrigation	Rain	Daily Et	Moisture Balance	Growth Days	Growth Stage
0	2010-05-11	0.90	0.75	0.60	0.00	0.00	0	3	0	Planting Day
1	2010-05-12	0.90	0.75	0.60	0.00	0.00	0.01	2.99	1	-------
2	2010-05-13	0.90	0.75	0.60	0.00	0.00	0.01	2.98	2	-------
3	2010-05-14	0.90	0.75	0.60	0.00	1.03	0	3.75	3	-------
4	2010-05-15	0.90	0.75	0.60	0.00	0.01	0	3.76	4	-------
5	2010-05-16	0.90	0.75	0.60	0.00	0.00	0.01	3.75	5	-------
6	2010-05-17	0.90	0.75	0.60	0.00	0.54	0.01	4.15	6	-------
7	2010-05-18	0.90	0.75	0.60	0.00	0.00	0.01	4.14	7	-------
8	2010-05-19	0.90	0.75	0.60	0.00	0.00	0.01	4.13	8	-------
9	2010-05-20	0.90	0.75	0.60	0.00	0.00	0.01	4.12	9	-------
10	2010-05-21	0.90	0.75	0.60	0.00	0.00	0.01	4.11	10	Emerge
11	2010-05-22	0.90	0.75	0.60	0.00	0.00	0.02	4.09	11	-------
12	2010-05-23	0.90	0.75	0.60	0.00	0.00	0.01	4.08	12	-------
13	2010-05-24	0.90	0.75	0.60	0.00	0.03	0.02	4.08	13	-------
14	2010-05-25	0.90	0.75	0.60	0.00	0.00	0.01	4.07	14	-------
15	2010-05-26	0.90	0.75	0.60	0.00	0.08	0.02	4.11	15	-------
16	2010-05-27	0.90	0.75	0.60	0.00	0.00	0.01	4.1	16	-------
17	2010-05-28	0.90	0.75	0.60	0.00	0.00	0.02	4.08	17	-------
18	2010-05-29	0.90	0.75	0.60	0.00	0.00	0.02	4.06	18	-------
19	2010-05-30	0.90	0.75	0.60	0.00	0.00	0.02	4.04	19	-------

Water Balance Crops

- Gomez-1,Corn
- Gomez-1,Cotton
- Old Mill-2,Cotton

Click on the above crops to view the summary and daily measurements for each.

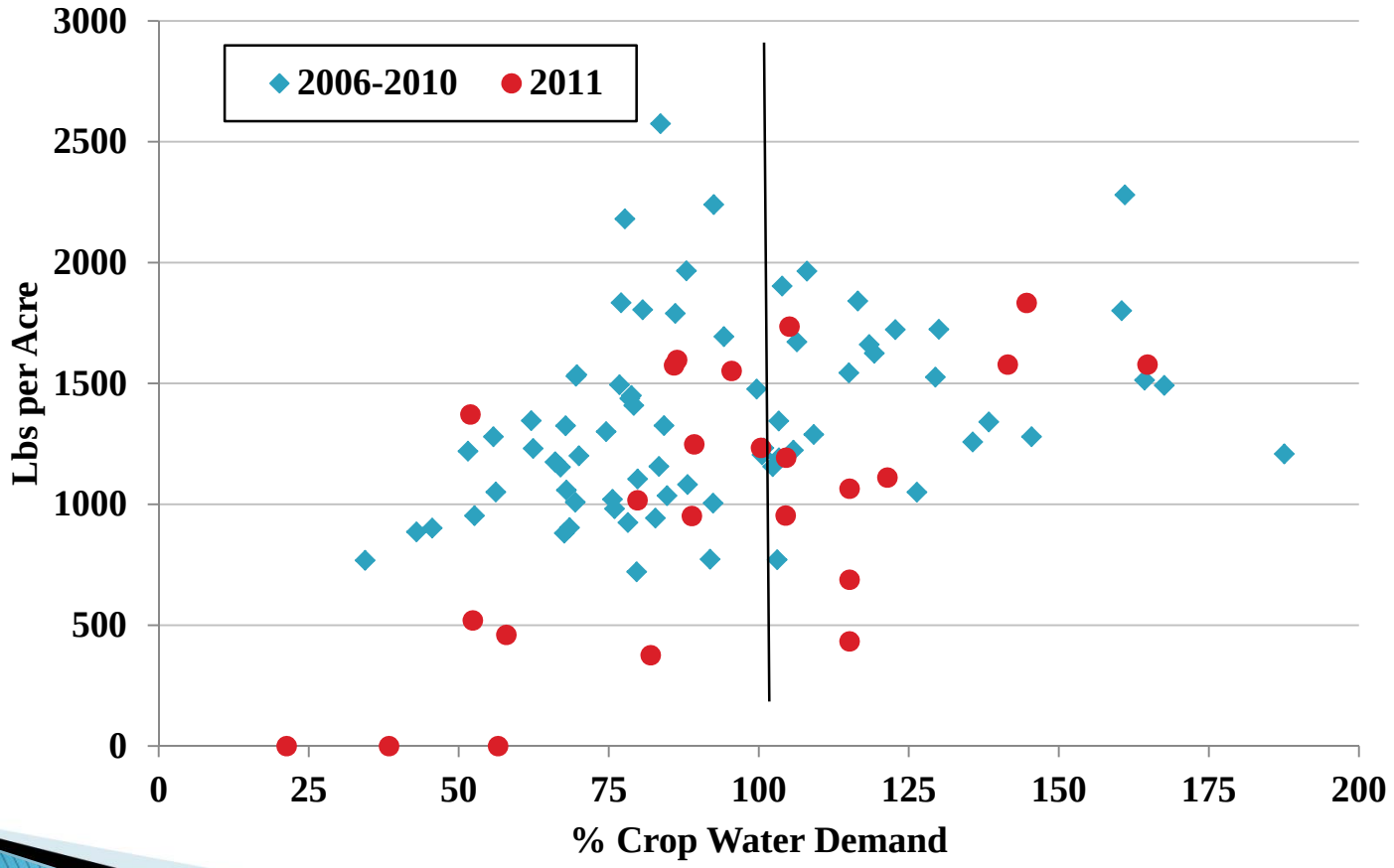
Maximizing Water Use Efficiency

The Goal Of Production Agriculture

Thank You!

Texas Alliance for Water Conservation

TEXAS TECH UNIVERSITY
College *of* Agricultural Sciences
& Natural Resources

Relationship between Cotton Yield and Percent Water Demand

Project Sites 2006-2011