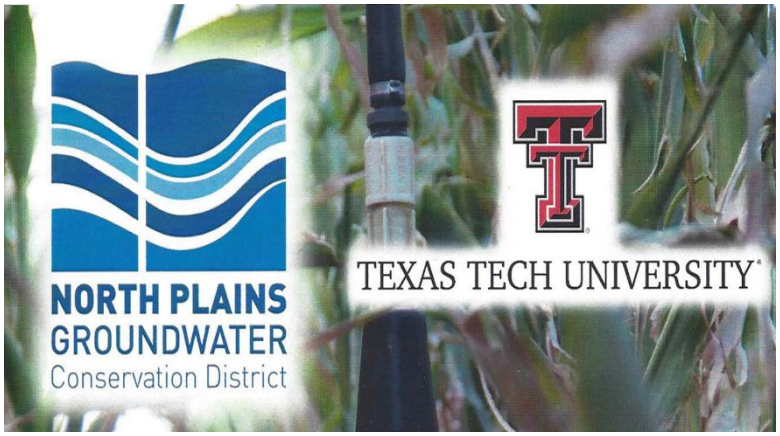
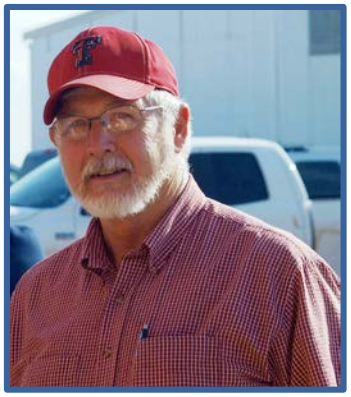


The Texas High Plains Initiative for Strategic and Innovative Irrigation Management and Conservation

Grant Contract: 69-3A75-11-184

Mr. Jeff Pate
Risk Management Specialist
Contact:
wjpate@ag.tamu.edu



Dr. Phil Johnson
Agricultural & Applied Economics
Contact:
phil.johnson@ttu.edu

Mr. Glenn Schur
Producer Cooperator

Mr. Rick Kellison
TAWC Project Director
Contact:
rick.kellison@ttu.edu

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

Funded by:
USDA Conservation Innovation Grant

Farm Level Data Collection

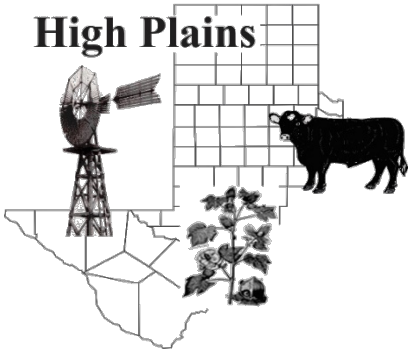
Jeff Pate, Risk Management

FARM Assistance
Planning Solutions

presenting for

Eddie Teeter,
Producer Cooperator

Producers Across the Southern High Plains



USDA CIG

Funded by:
USDA Conservation Innovation Grant

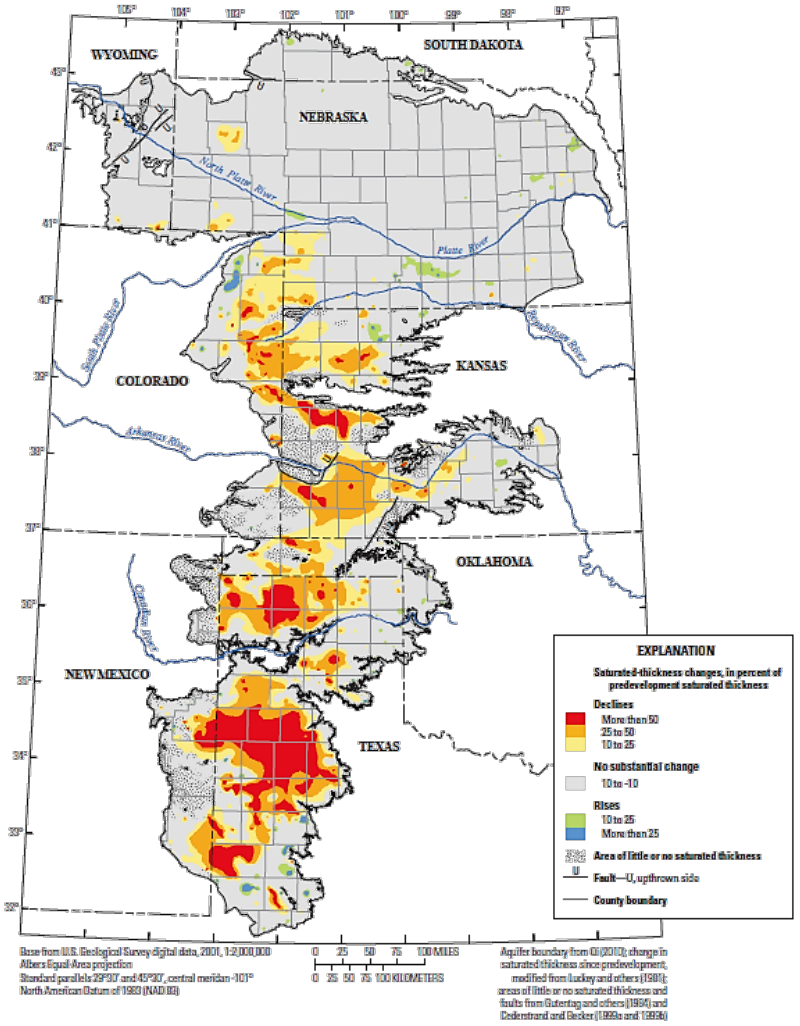
Southern High Plains
2011–2014

- **8 Producers, 10 Sites**

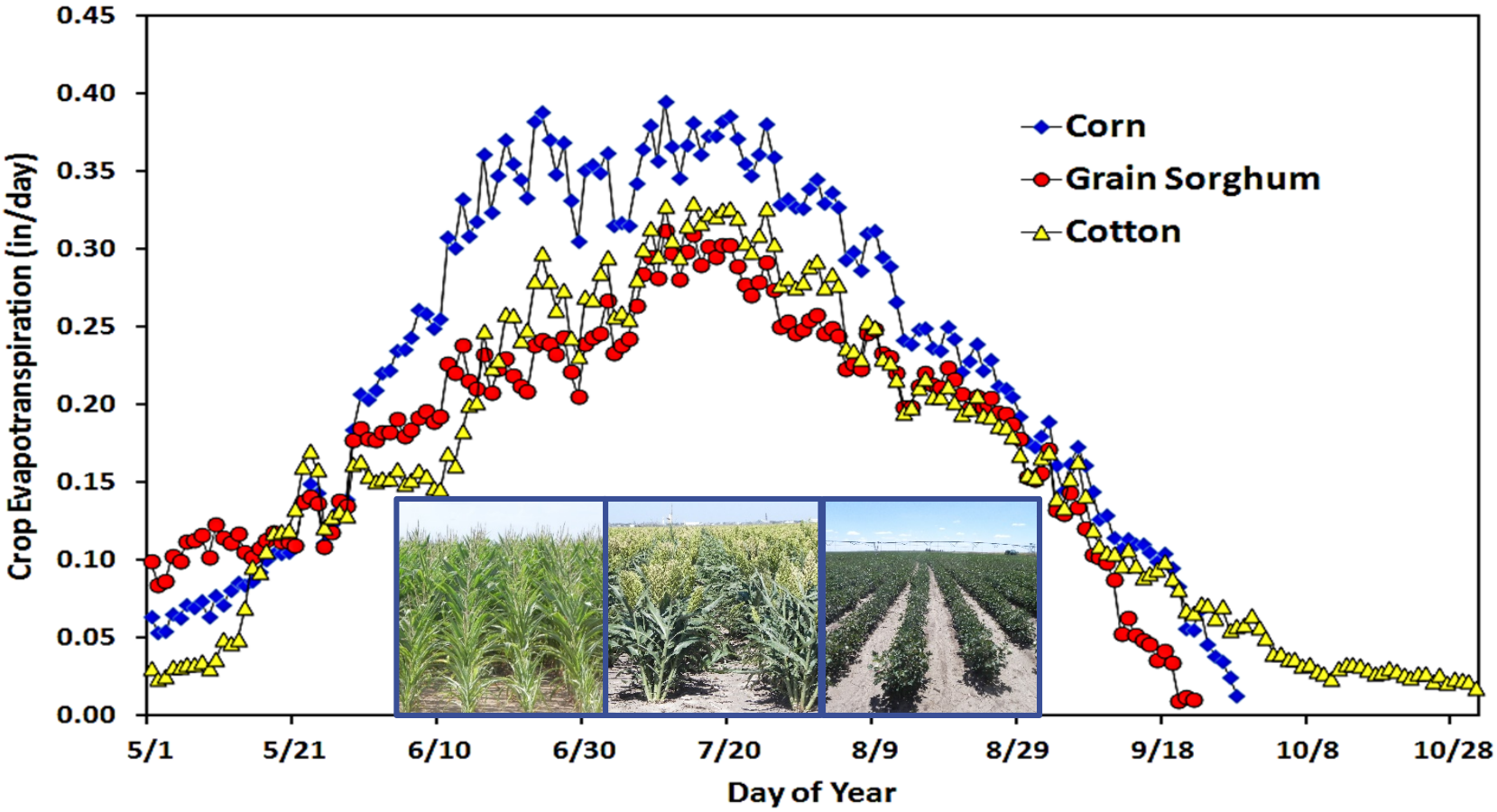
- **8 Counties**
  - **Crosby, Deaf Smith**
  - **Hale, Floyd**
  - **Lamb, Lubbock**
  - **Parmer, Swisher**

- **Irrigation Systems:**
  - **40” Drip, 80” Drip**
  - **Pivot**

Change in Saturated Thickness

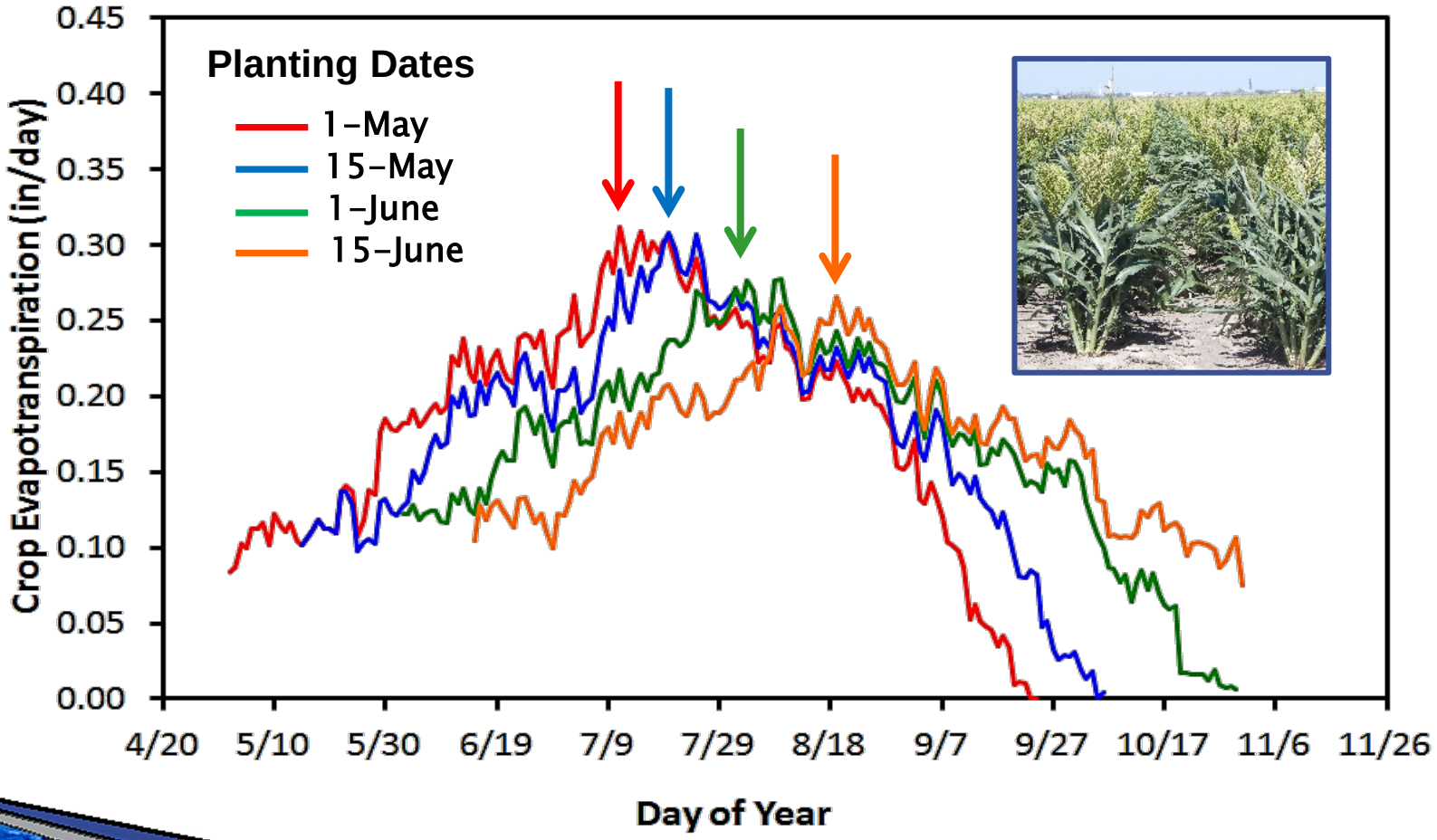


Crop Evapotranspiration Long-term Average (1997-2011)



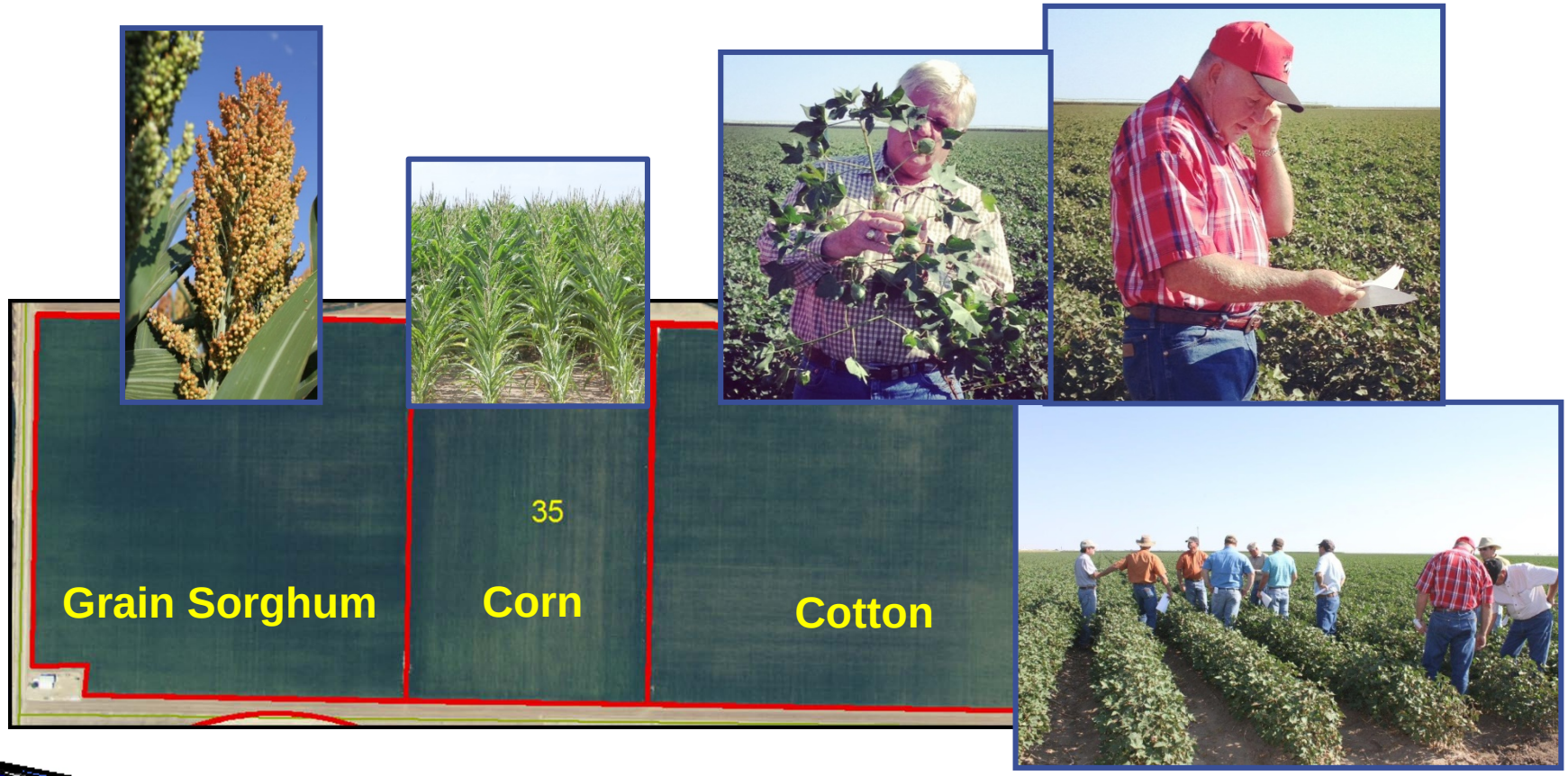
(Rajan and Maas)

Sorghum Evapotranspiration Long-term Average (1997-2011)



(Rajan and Maas)

Field Walks
2013

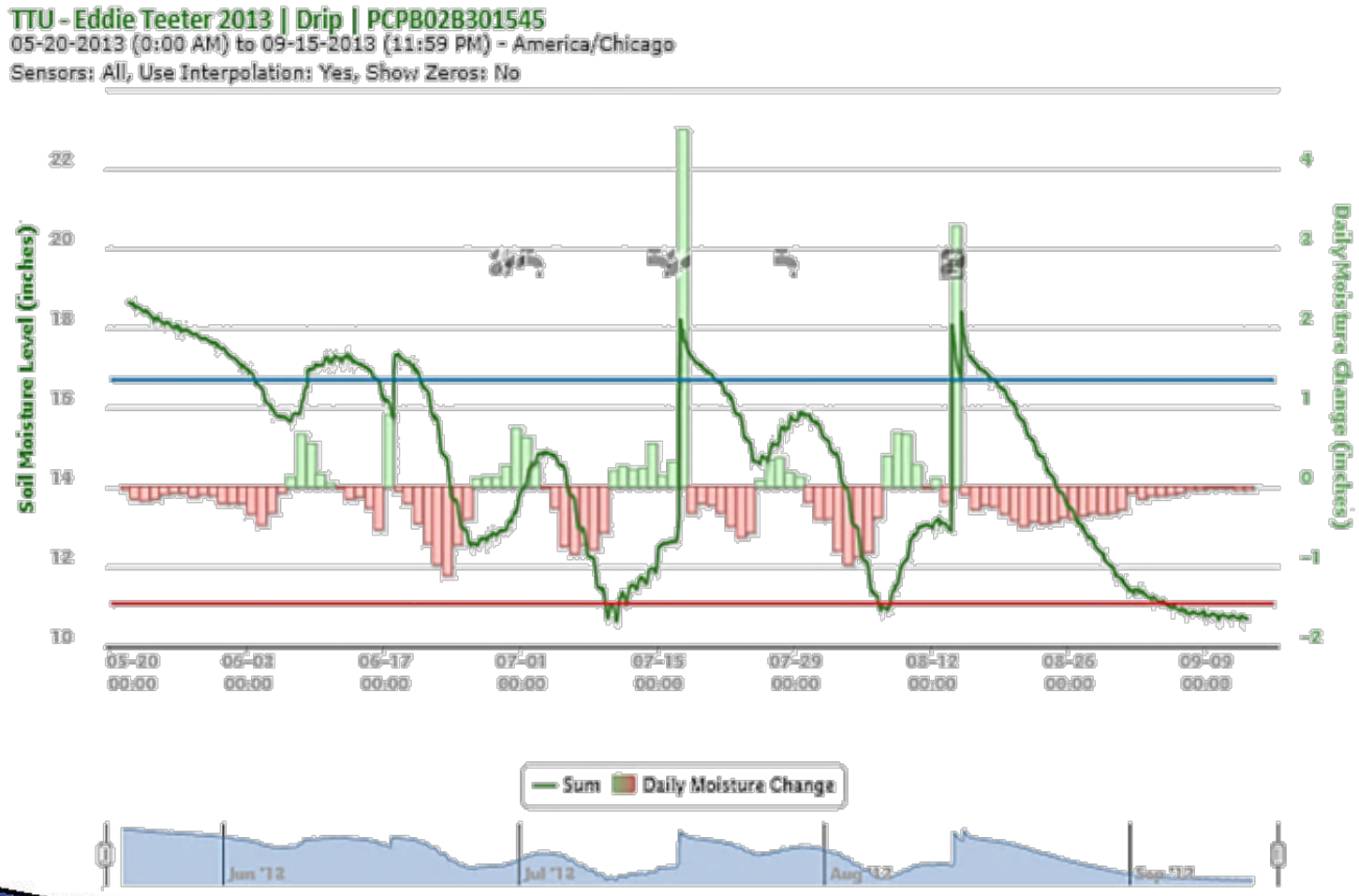


Eddie Teeter
Drip – Grain Sorghum

- Pioneer 86G32
- 73.2 acres produced 8,816 pounds/acre
- Total water supply = 18.2 inches irrigation (pre + season) plus 13 inches in-season rainfall =31.2 inches
- Total Water use efficiency = 282.5 lbs/acre-inch

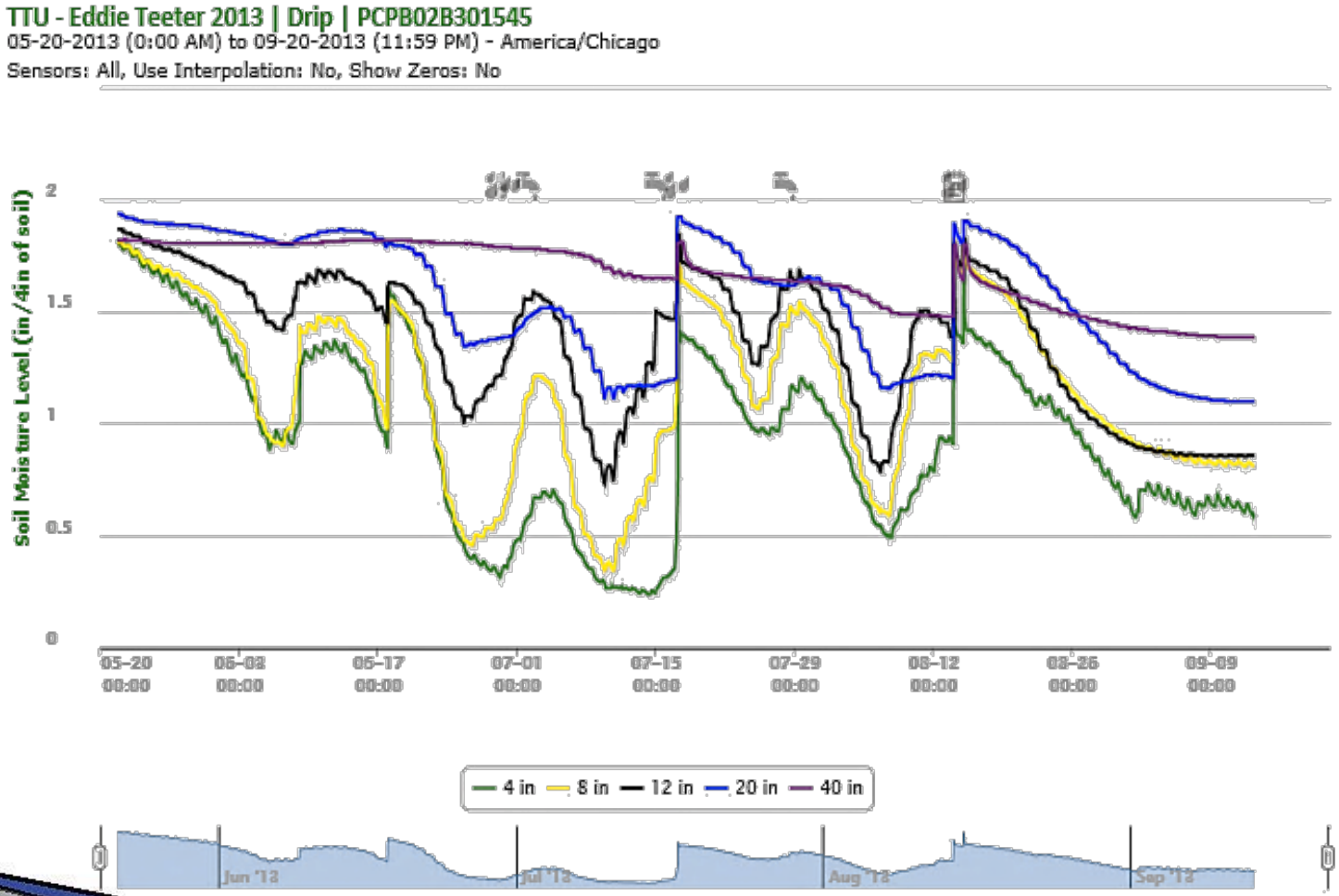
Eddie Teeter Drip Corn

Sum Graph – Jun 1–Aug 14, 2013



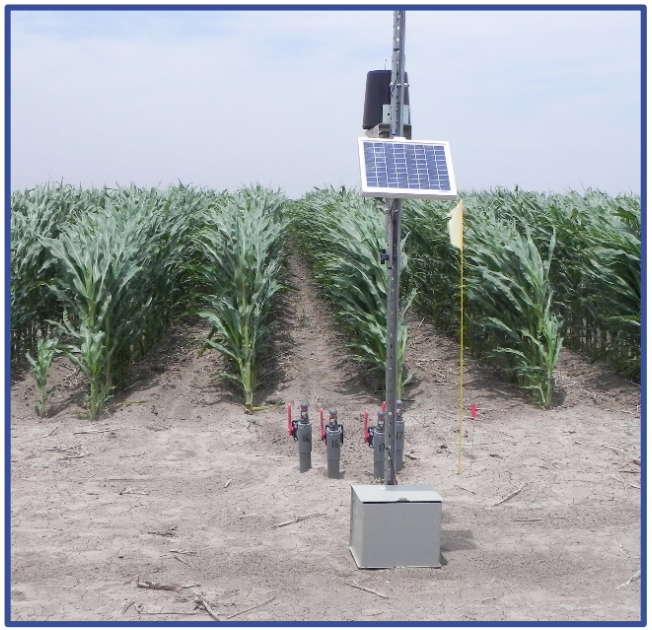
Eddie Teeter Drip Corn

Individual Sensor Jun 1–Aug 14, 2013



Eddie Teeter
Drip Corn

- Pioneer AquaMax™ Yellow Hybrid
- 60.9 acres produced 14,435 pounds/acre (258 bushels/acre)
- Total water supply = 25.7 inches irrigation (pre + season) plus 13.1 inches in-season rainfall =38.8 inches
- Total Water use efficiency = 372 lbs/acre-inch (6.6 bushels/acre-inch)

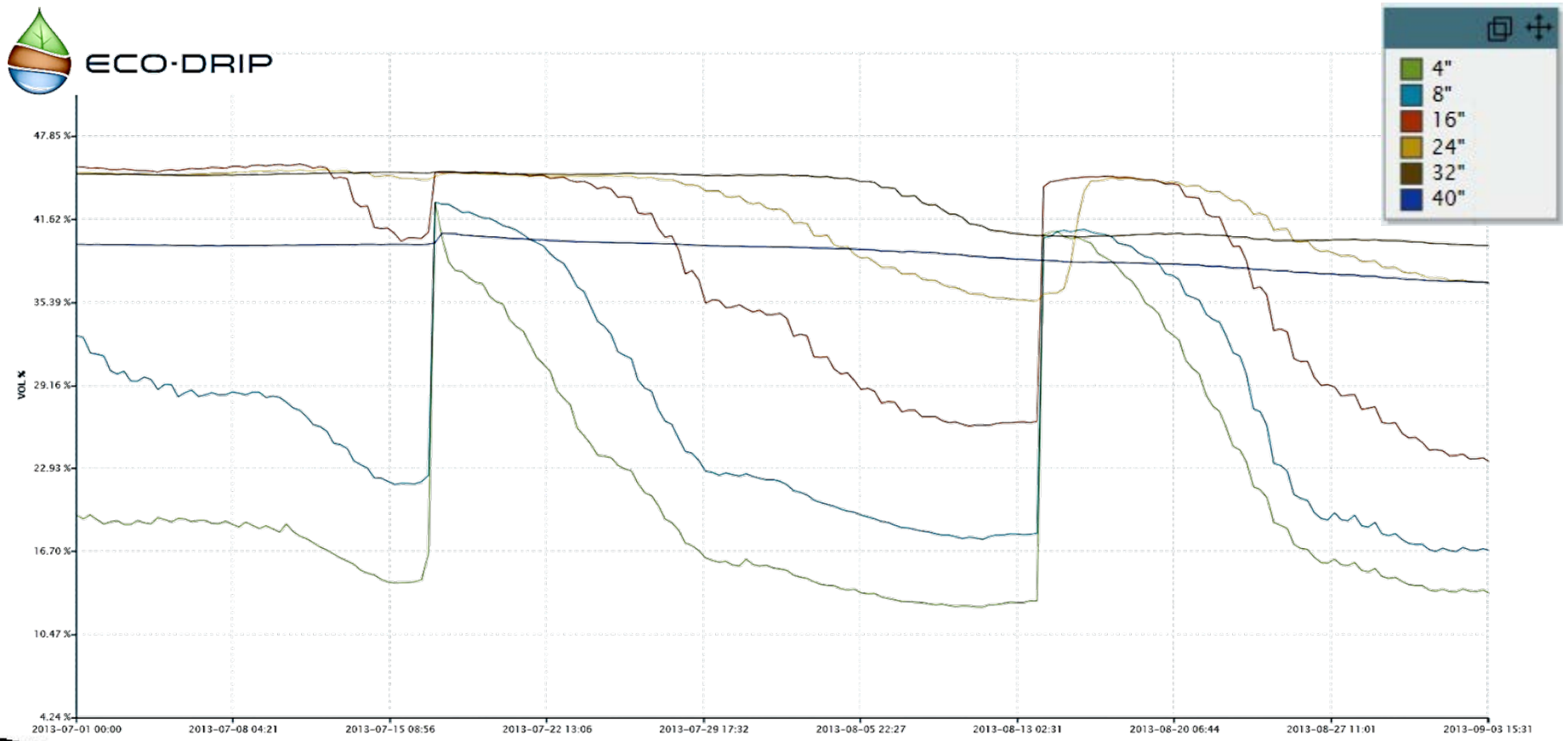


Eddie Teeter – Sum Graph

Drip Cotton 2013

Eddie Teeter – Sensors

Drip Cotton 2013



Eddie Teeter

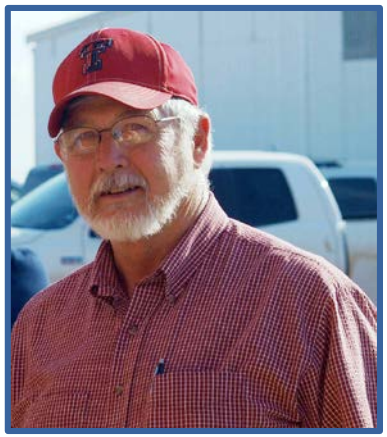
Drip – Cotton

- FM 2484 B2F
- 92.3 acres produced 1,890 pounds/acre
- Total water supply = 18.2 inches irrigation (pre + season) plus 14.2 inches in-season rainfall = 32.4 inches
- Total Water use efficiency = 58.3 lbs/acre-inch

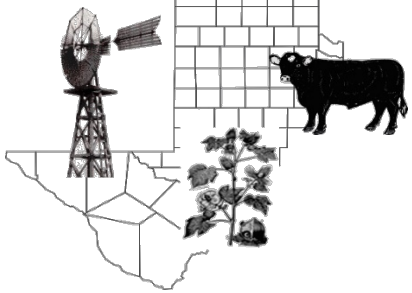
Economic Evaluation

Dr. Phil Johnson, Agriculture and Applied Economics

TEXAS TECH UNIVERSITY
College of Agricultural Sciences & Natural Resources



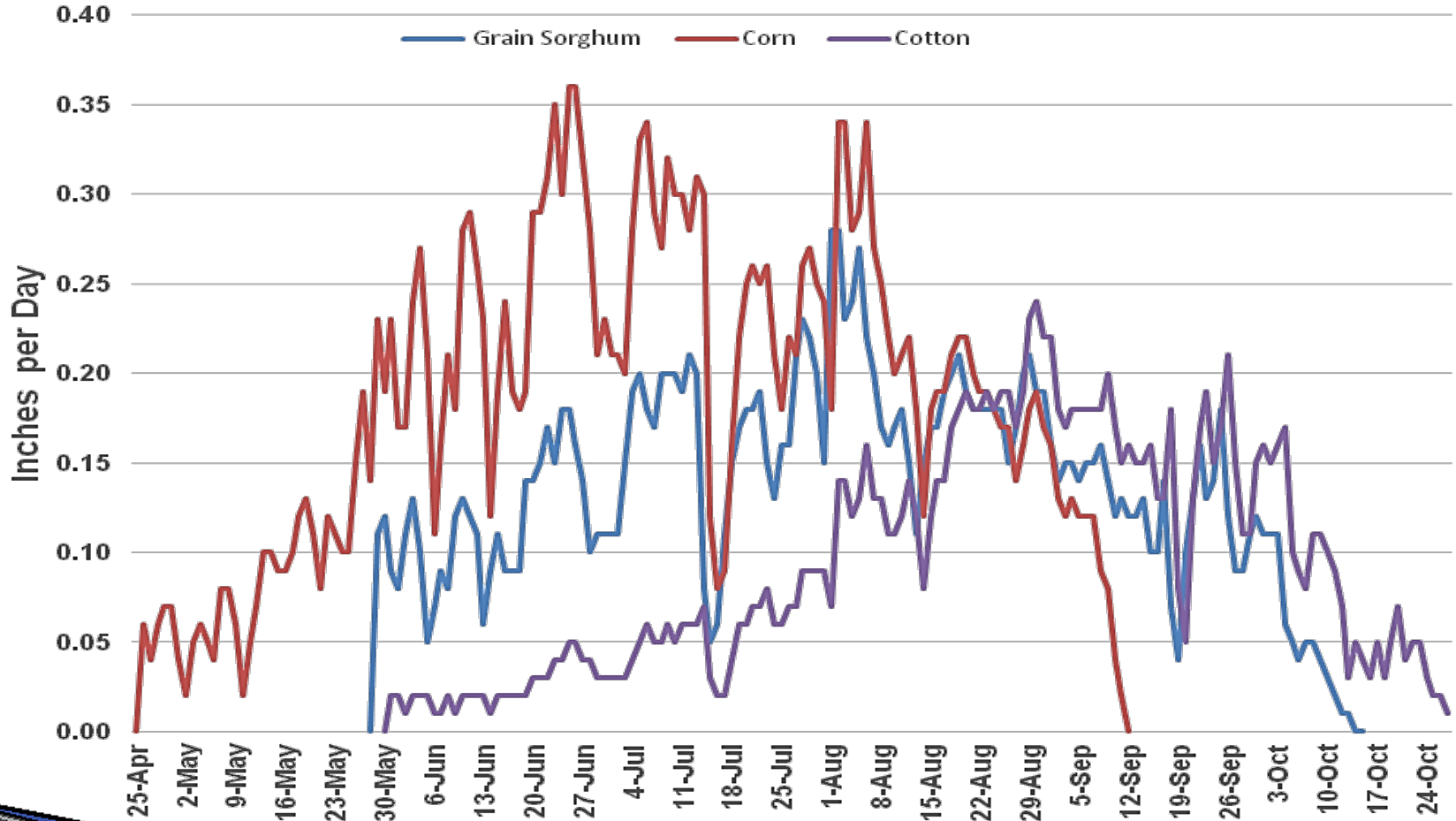
Producers Across the Southern High Plains



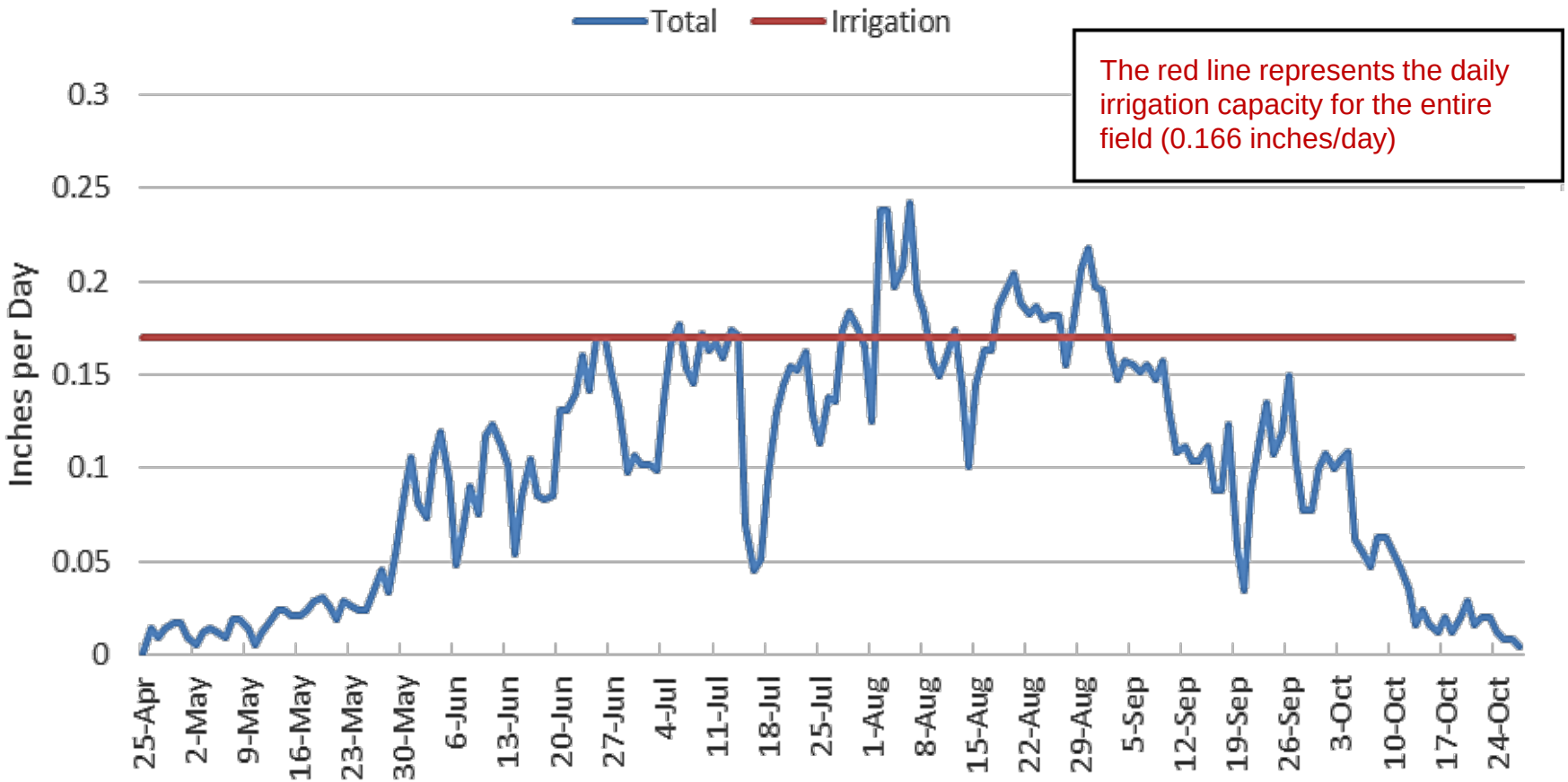
USDA CIG

Funded by:
USDA Conservation Innovation Grant

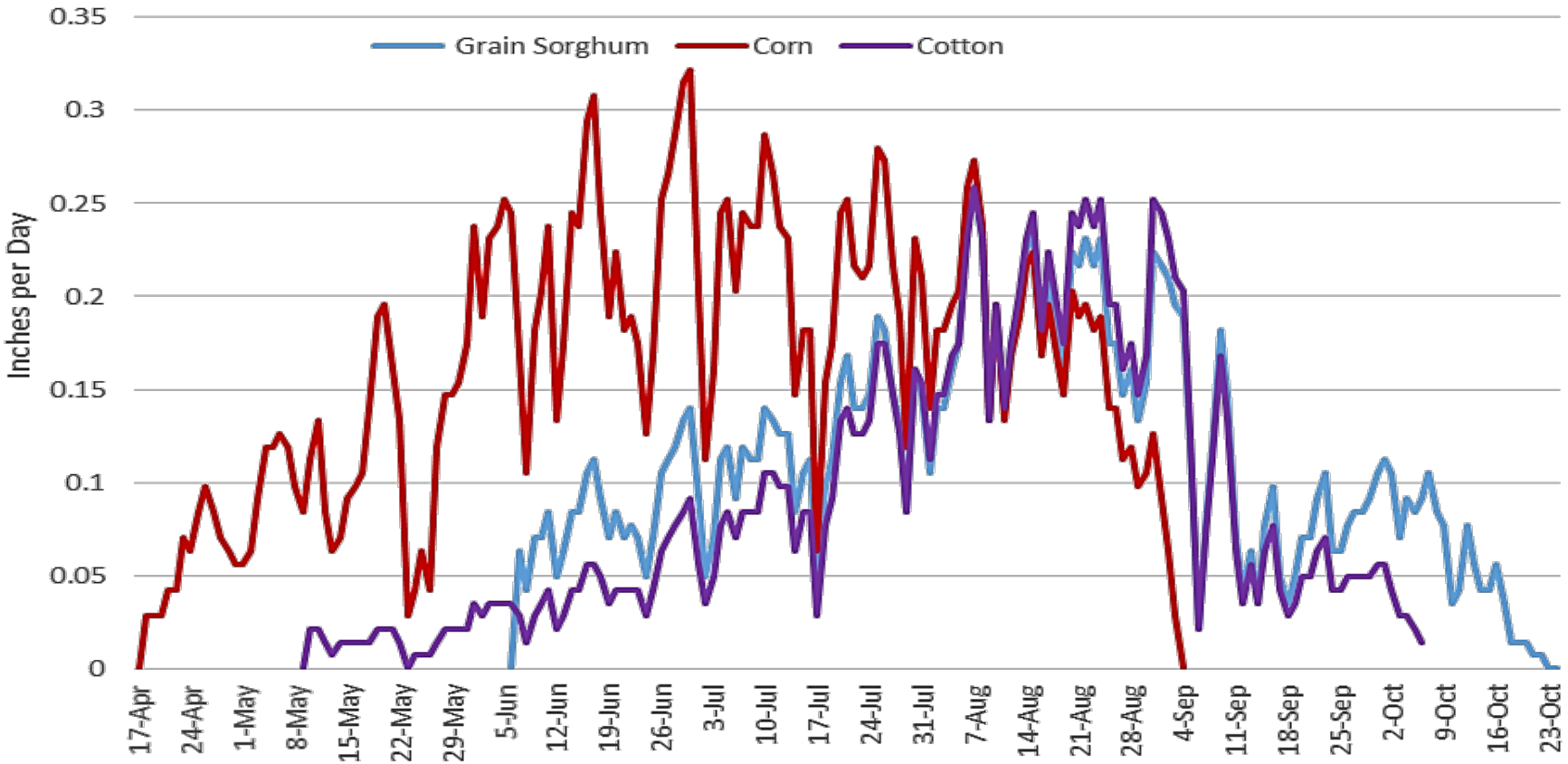
Daily Crop Water Demand by Crop (Teeter – 2013)



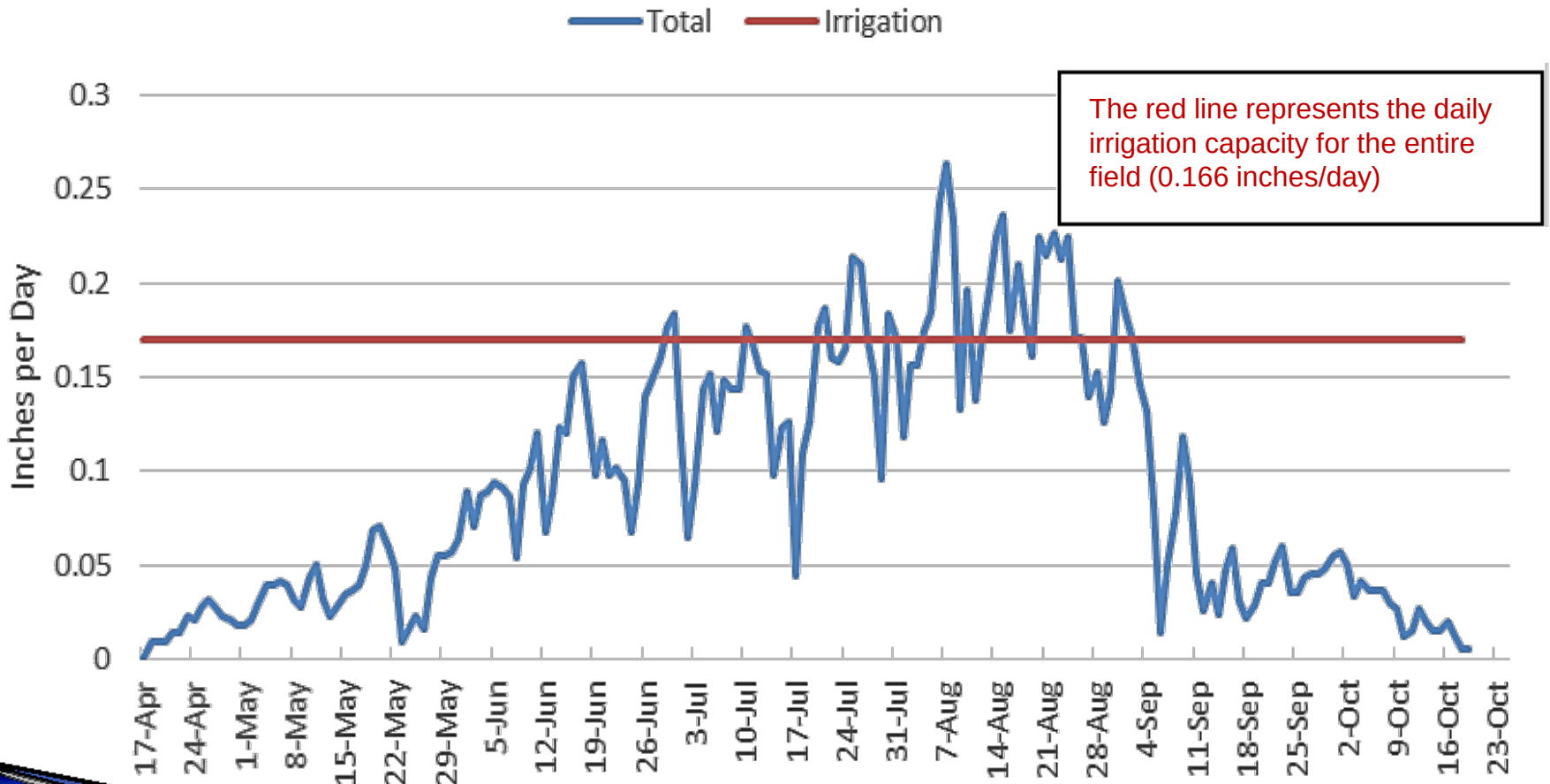
Weighted Average Daily Crop Water Demand (Teeter – 2013)



Daily Crop Water Demand by Crop (Teeter – 2014)

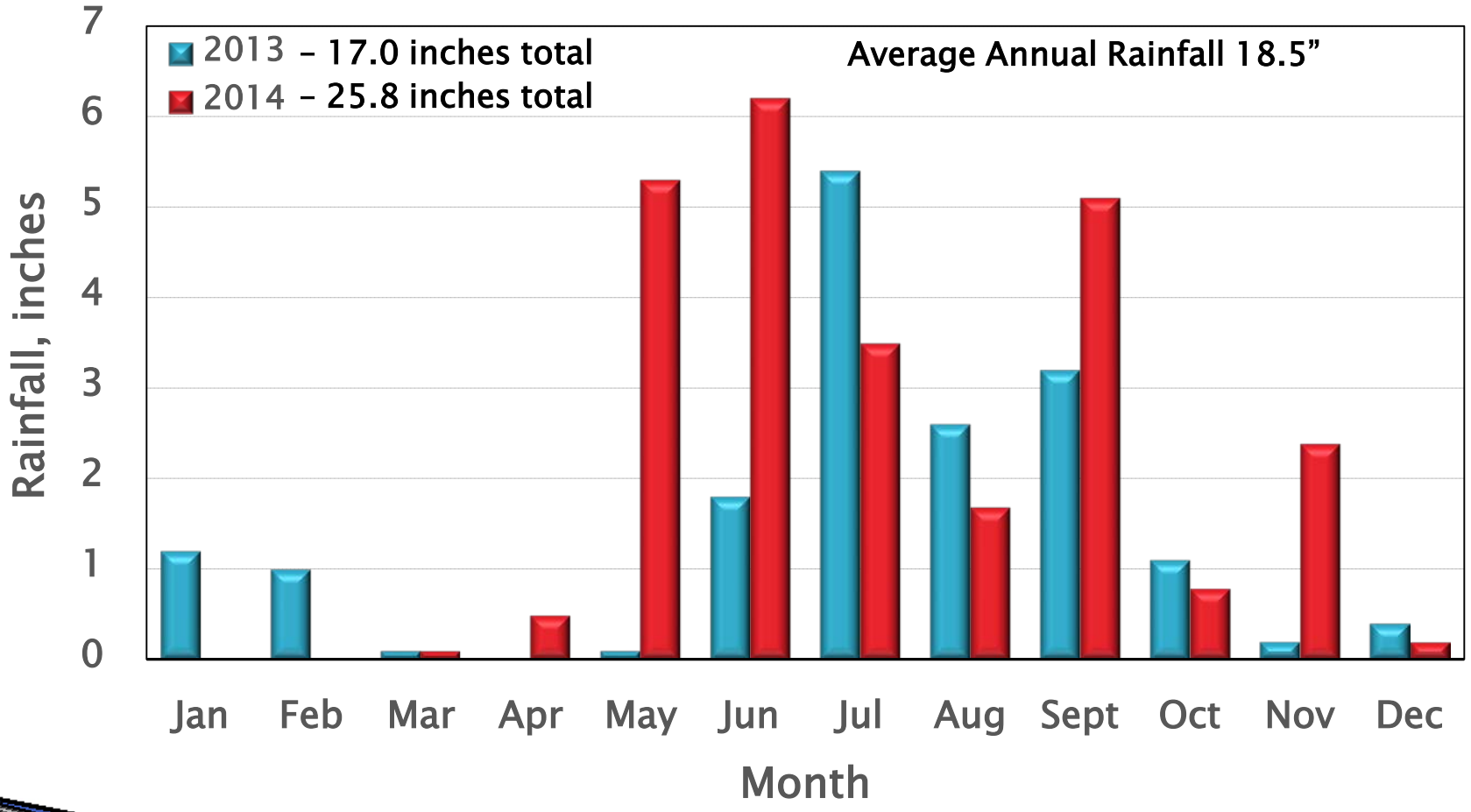


Weighted Average Daily Crop Water Demand (Teeter – 2014)



Average Site Rainfall

Teeter 2013 & 2014



Eddie Teeter – Drip
Floyd County

Year	Crop	Acres	Yield lbs/acre	Applied Irrigation inches	Revenue per acre-inch	Gross Margin per acre-inch	Gross Margin per acre
2013	Grain Sorghum	73.2	8,816	18.2	$41.18	$9.64	$175.52
2013	Corn	60.9	14,435	25.7	$56.37	$21.92	$563.22
2013	Cotton	92.3	1,890	18.2	$93.60	$48.70	$886.29
2013	Weighted avg	226.4		20.22	$65.61	$28.17	$569.58
2014	Grain Sorghum	74.7	7,111	6.8	$69.96	($1.73)	($11.77)
2014	Corn	75.0	8,848	15.9	$59.52	$15.65	$248.86
2014	Cotton	80.5	1,233	14.0	$68.17	$5.07	$70.92
2014	Weighted avg	230.2		12.28	$64.85	$8.31	$102.06

Arthur Farms
Crosby County

Year	Site # - Description	Yield lbs/acre	Crop	Applied Irrigation inches	Revenue Per acre-inch	Gross Margin Per acre-inch	Yield lbs/acre	Applied Irrigation inches	Revenue per acre-inch	Gross Margin per acre-inch	Gross Margin per acre
2012	50–Pivot	547	Cotton	14.6	$40.51	$7.78	Cotton Average 2012 & 2014				
2014	50–Pivot	1,283	Cotton	8.4	$121.05	$28.49	915	11.5	$80.78	$18.14	$208.55
2012	51–80” Drip	877	Cotton	9.3	$102.17	$19.15	Cotton Average 2012 & 2014				
2014	51–80” Drip	1,507	Cotton	9.4	$126.97	$44.93	1,192	9.4	$114.57	$32.04	$299.58
2013	50–Pivot	85.9 Bu	Grain Sorg.	8.5	$47.97	$21.72					
2013	51–80” Drip	120.6 Bu	Grain Sorg.	7.5	$76.92	$45.95					

***The drip sites consistently produced higher revenue and gross margin per acre-inch of irrigation compared to the pivot site.**

Davis Farms
Lamb County

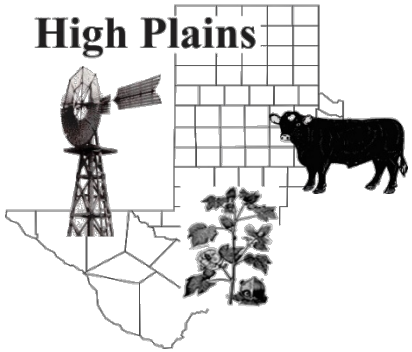
Year	Site # - Description	Yield lbs/acre	Crop	Applied Irrigation inches	Revenue per acre-inch	Gross Margin per acre-inch	Yield lbs/acre	Applied Irrigation inches	Revenue per acre-inch	Gross Margin per acre-inch	Gross Margin per acre
2012	52– Pivot	1,181	Cotton	19	$68.49	$27.13	Cotton Average 2012 & 2014				
2014	52– Pivot	997	Cotton	15.5	$50.90	($9.45)	1,089	17.3	$59.70	$8.84	$152.49
2013	52– Pivot	127.9 Bu	G. Sorg.	7.9	$77.04	$39.32					
2012	53–40” Drip	1,353	Cotton	17.8	$81.45	$39.24	Cotton Average 2012 & 2014				
2014	53–40” Drip	1,368	Cotton	8.4	$128.34	$37.33	1,361	13.1	$104.90	$38.29	$501.53
2013	53–40” Drip	151.4 Bu	G. Sorg.	7.4	$97.37	$55.84					
2012	54–80” Drip	1,036	Cotton	15	$76.10	$31.58	Cotton Average 2012, 2013 & 2014				
2013	54–80” Drip	1,127	Cotton	8.8	$126.98	$56.92	1,167	10.7	$110.21	$40.45	$432.85
2014	54–80” Drip	1,337	Cotton	8.3	$127.55	$32.86					

***The drip sites consistently produced higher revenue and gross margin per acre-inch of irrigation compared to the pivot site.**

Water Management

Glenn Schur, Producer Cooperator

Producers Across the Southern High Plains



USDA CIG

Funded by:
USDA Conservation Innovation Grant

LEPA vs LESA Comparison

LESA

LEPA

LEPA vs LESA Budget Comparison
2011

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

LEPA vs LESA Budget Comparison
2012

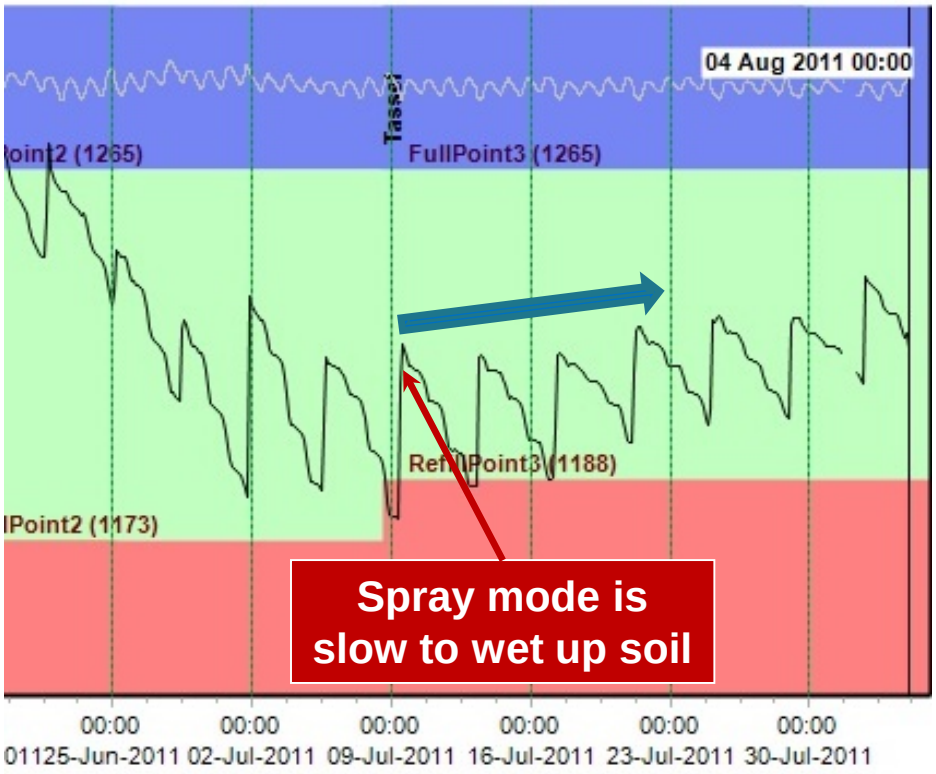
	2012			
	LESA		LEPA	
PER ACRE GROSS INCOME	**Quantity**	**Total**	**Quantity**	**Total**
Cotton lint	896	$ 806.40	1057	$ 951.30
Cotton seed	0.65	$ 180.88	0.76	$ 213.39
PER ACRE TOTAL GROSS INCOME		$ 987.28		$ 1,164.69
PER ACRE TOTAL OF ALL COST		$ 950.04		$ 980.33
PER ACRE NET PROJECTED RETURNS		**$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

LEPA vs LESA Budget Comparison
2013

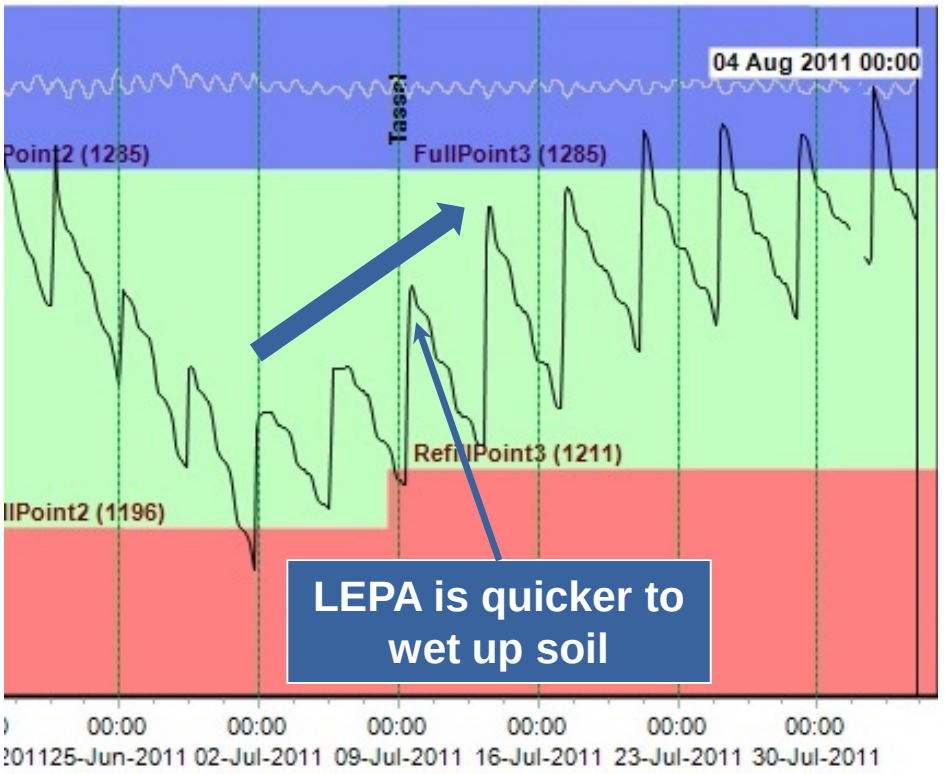
	2013			
	LESA		LEPA	
PER ACRE GROSS INCOME	**Quantity**	**Total**	**Quantity**	**Total**
Cotton lint	1028	$ 771.00	1165	$ 873.75
Cotton seed	0.74	$ 207.53	0.84	$ 235.19
PER ACRE TOTAL GROSS INCOME		$ 978.53		$ 1,108.94
PER ACRE TOTAL OF ALL COST		$ 906.33		$ 924.94
PER ACRE NET PROJECTED RETURNS		**$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

Comparison of Irrigation Method

LESA Mode

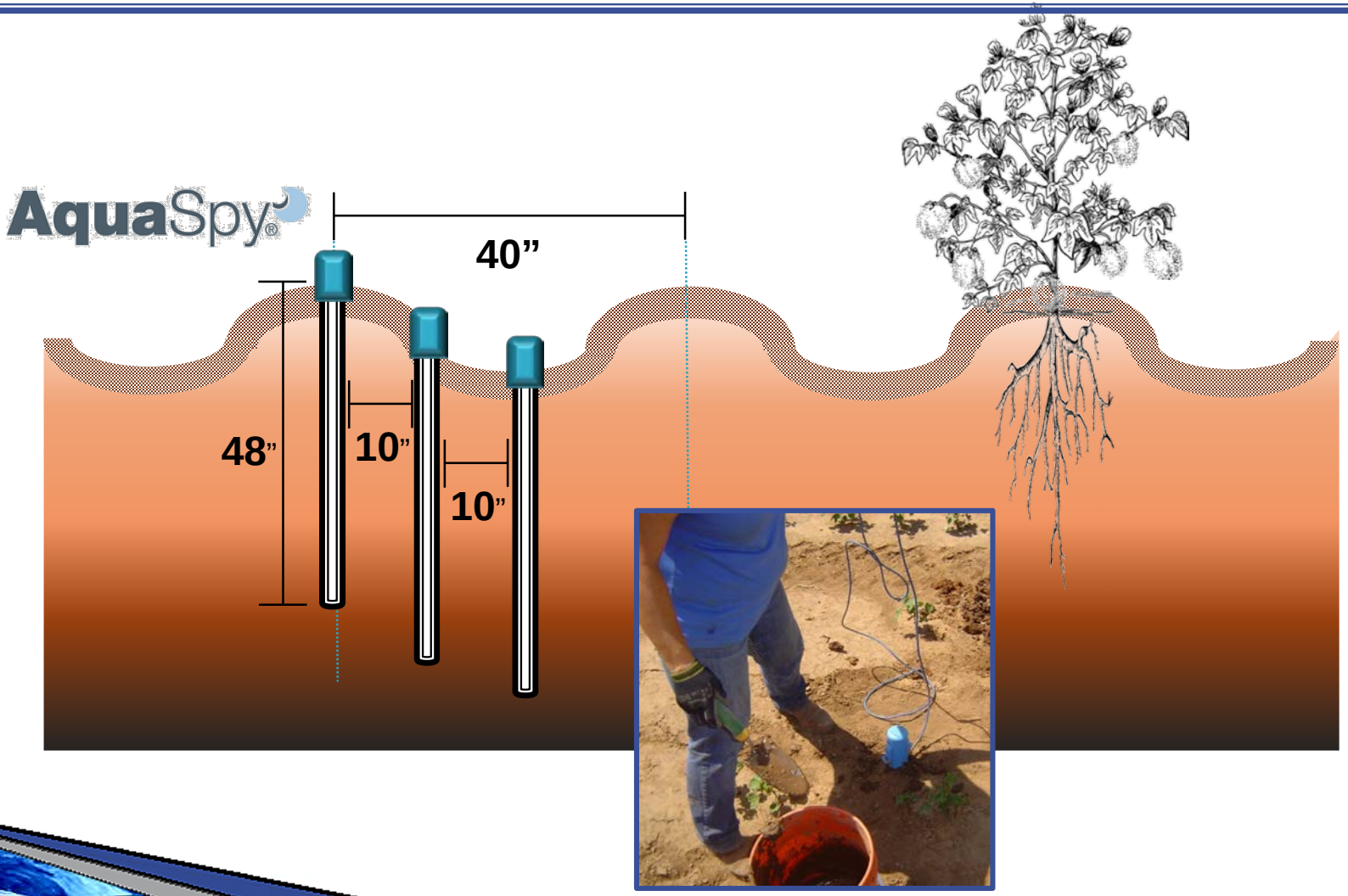


LEPA Mode



Placement of AquaSpy®

Capacitance Probes



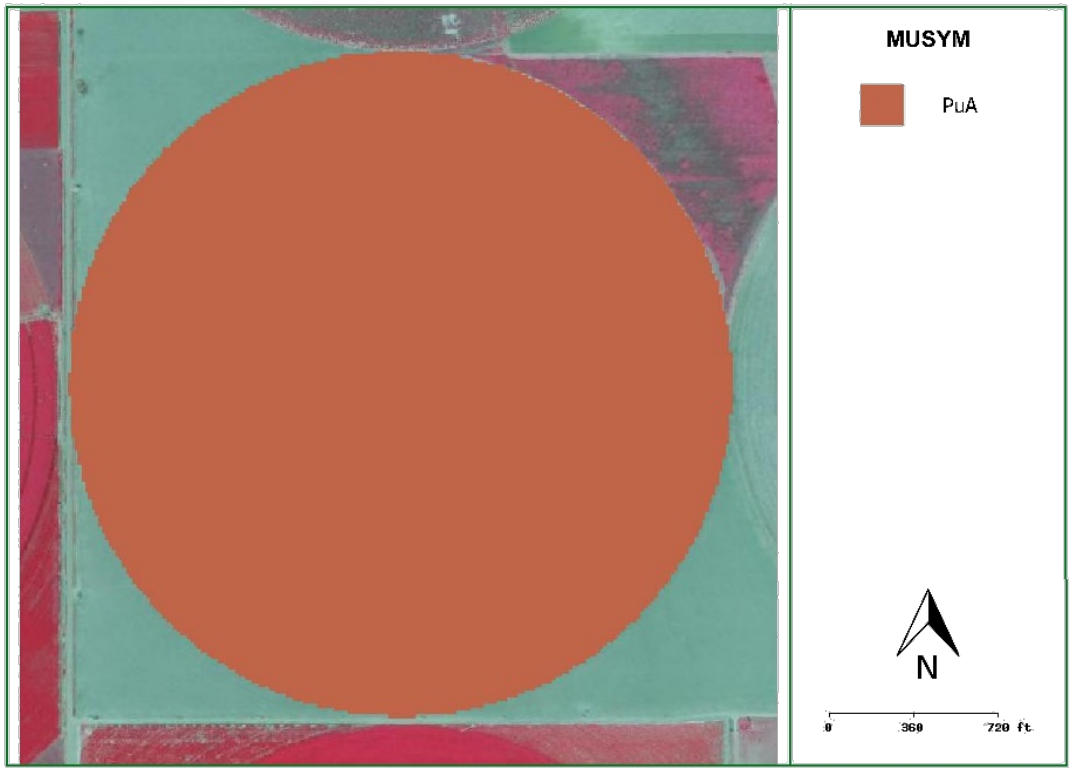
Soil Map

WINFIELD

LTON GRAIN COOP

Grower	GLENN SCHUR
Farm Name	Schur Farm
Farm Size	253.1 acres
Field Name	Hoyle
Field Size	123.9 acres
Crop	Corn

TAWC



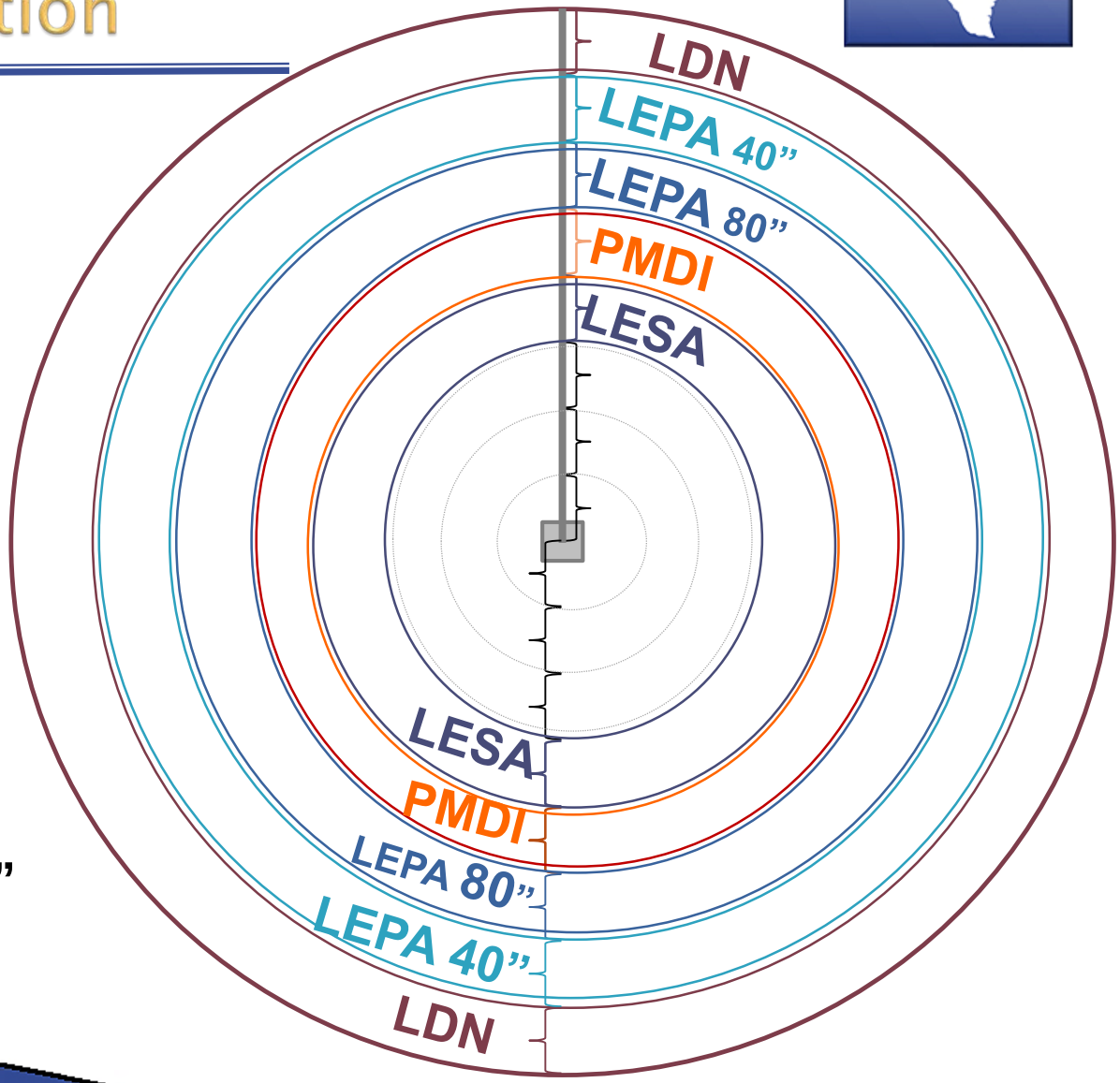
Soil Map zones

MUSYM	Soil Description	Drainage Class	Soil Texture	Area (acres)	%
PuA	Pullman clay loam, 0 to 1 percent slopes	Well drained	fine	123.9	100.0
			Total:	123.9	100

Pivot Irrigation Technology

2016 Demonstration

- **LDN**
  - Low drift nozzels
- **LEPA**
  - 40”
  - 80”
- **PMDI**
  - Precision Mobile Drip Irrigation
- **LESA**
  - Broadcast spray 80”



*450 gallon per minute from 3 wells

Online ET Tool

Texas Alliance for Water Conservation Partner

Rick Kellison, Project Director

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

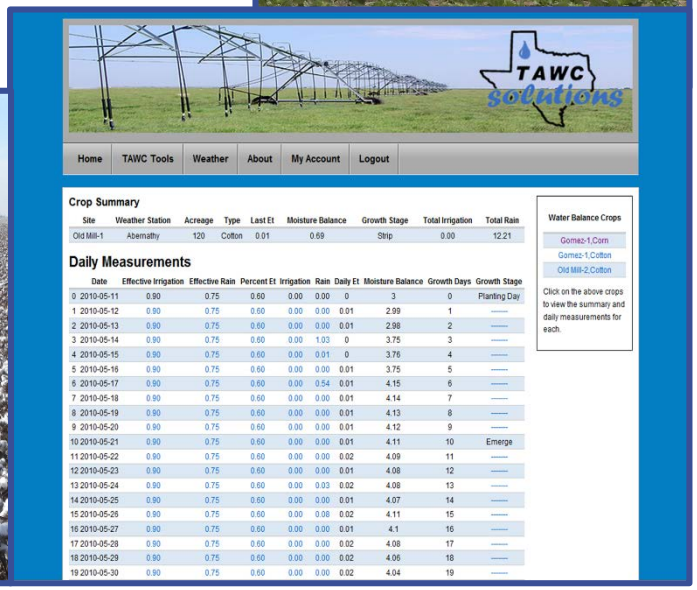
TAWC

Funded by:
Texas Water Development Board

TAWC–Solutions
ET Irrigation Scheduling Tool

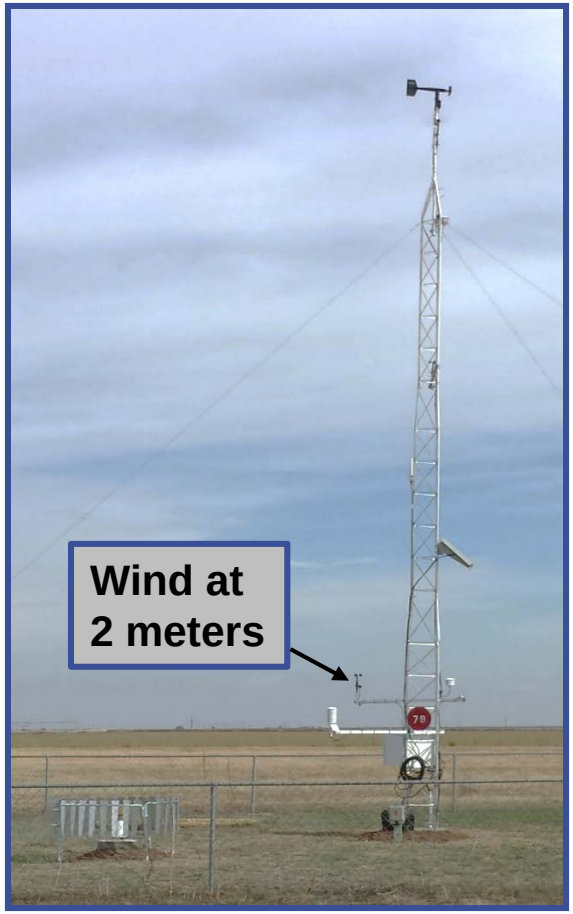
Web–based tool used to determine:

- When to apply water.
- How much water to apply.
- How to achieve specific management goals.



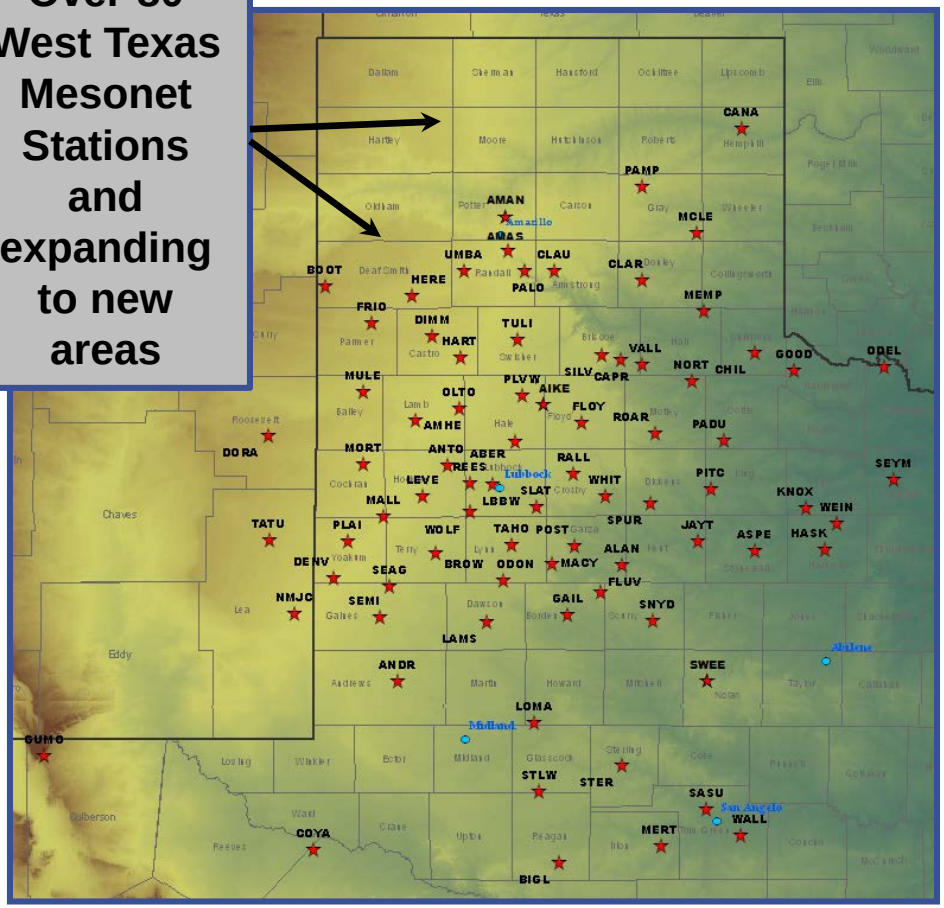
www.tawcsolutions.org

Potential Evapotranspiration



West Texas Mesonet

Over 80 West Texas Mesonet Stations and expanding to new areas



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.

TAWC-Solutions

ET Irrigation Scheduling Tool

Crop Summary

Site	Weather Station	Acreage	Type	Last Et	Moisture Balance	Growth Stage	Total Irrigation	Total Rain	Total ET
Cotton 2014-1	Abernathy 5ENE	120	Cotton	0.01	1.57	Strip	14.00	14.14	19.62

Daily Measurements

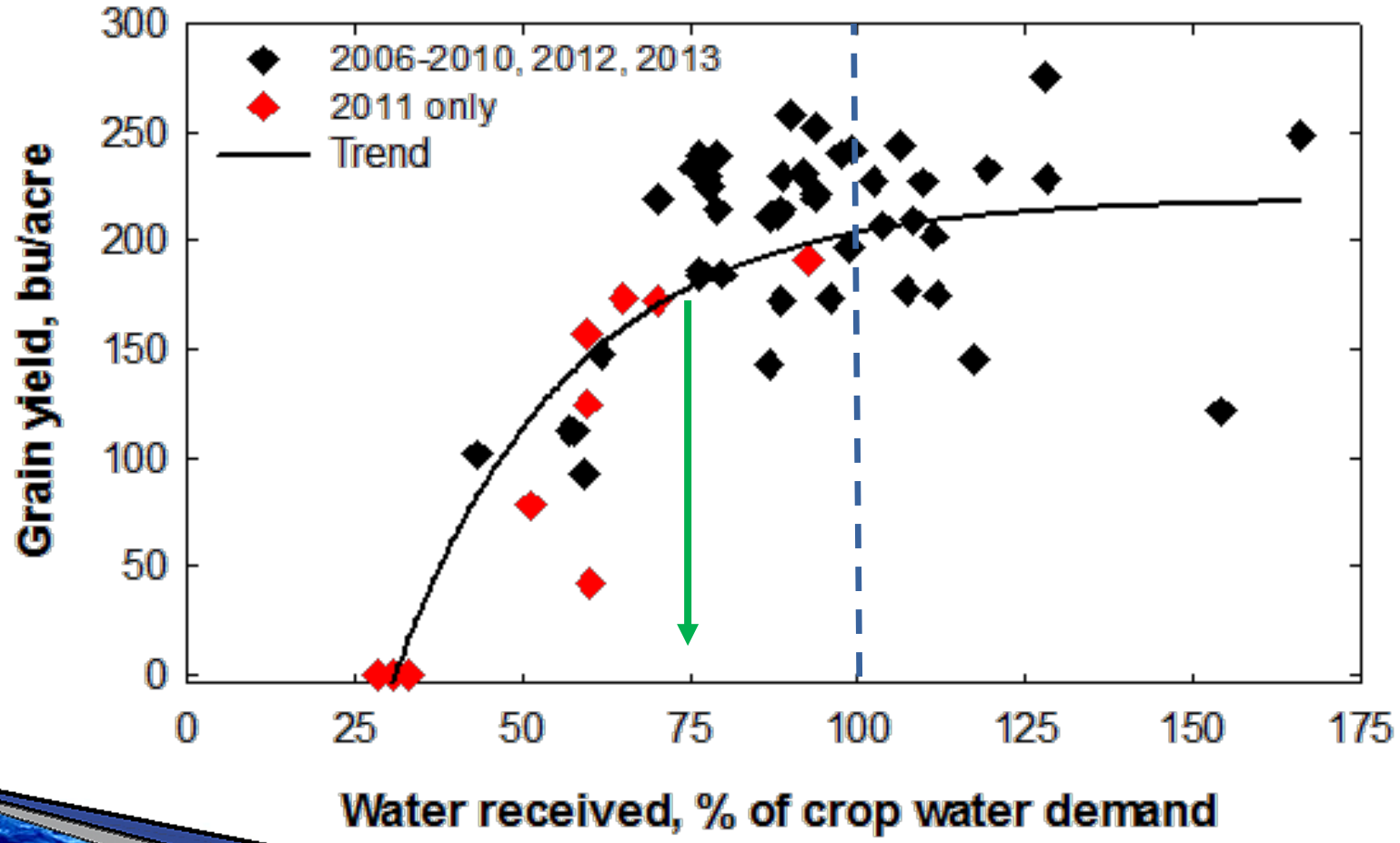
	Date	Effective Irrigation	Effective Rain	Percent Et	Irrigation	Rain	Daily Et	Moisture Balance	Growth Days	Growth Stage
0	2014-05-10	1.00	1.00	1.00	0.00	0.00	0	0	0	Planting Day
1	2014-05-11	0.90	0.60	1.00	0.00	0.00	0.03	0	1	-------
2	2014-05-12	0.90	0.60	1.00	0.00	0.00	0.02	0	2	-------
3	2014-05-13	0.90	0.60	1.00	0.00	0.00	0.01	0	3	-------
4	2014-05-14	0.90	0.60	1.00	0.00	0.00	0.02	0	4	-------

Water Balance Crops

- Cotton 2013-1,Cotton
- Cotton 2013-1,Cotton
- Corn 2013-1,Corn
- Corn 2014-1,Corn
- GS 2013-1,Sorghum
- GS 2014-1,Sorghum

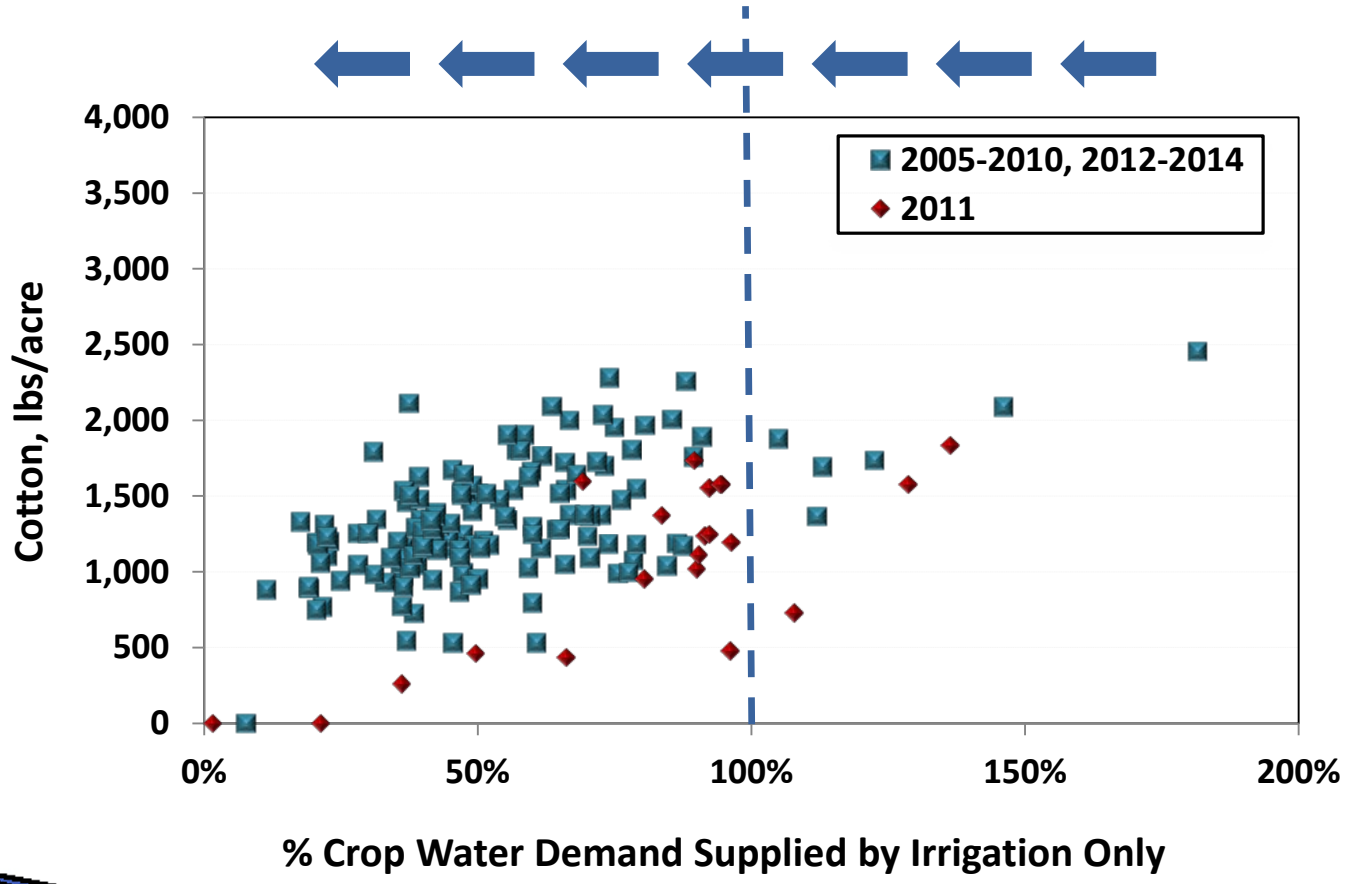
Click on the above crops to view the summary and daily measurements for each.

Corn response to water received



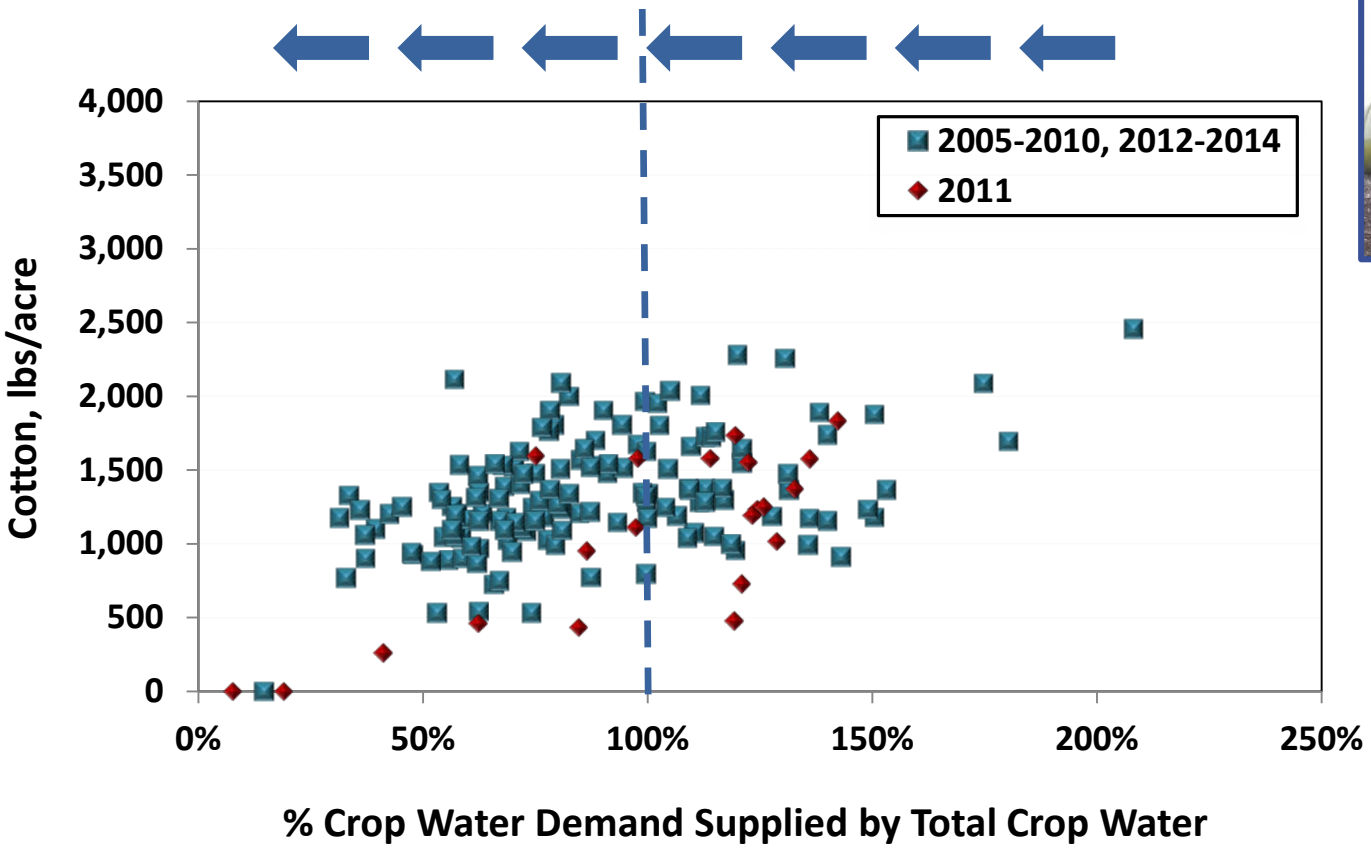
Yield and Percent Water Demand

Project Sites 2005–2014



Yield and Percent Water Demand

Project Sites 2005–2014



Rainfall Makes a Difference

- Rainfall is free and renewable; irrigation is neither.
- Better-timed rains reduce benefits of more efficient irrigation systems.
- Accurate, longer-term rain forecasts would prevent unneeded irrigations.
- Need to better utilize the free rain to replace costly, nonrenewable irrigation.

Take Aways

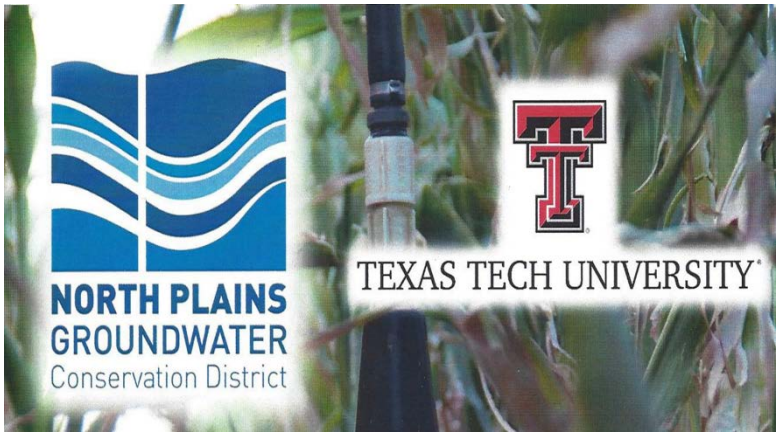
- **The management of our water resource is critical to the continued economic success of agriculture worldwide.**
- **We have determined that irrigated water savings are most effective at levels of 70-80% of potential evapotranspiration.**
- **Producers are continually faced with evaluating new irrigation and crop management technologies and how they affect profitability.**
- **Future water conservation will require focus on climate models and improved management practices.**

Thank You!

Funded by:
USDA Conservation Innovation Grant

Funded by:
Texas Water Development Board

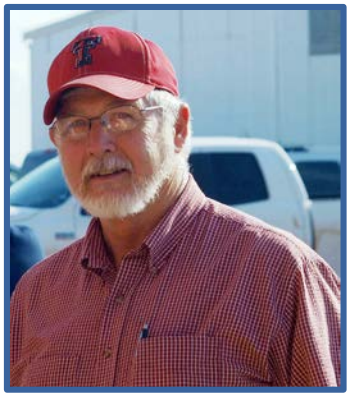
TEXAS TECH UNIVERSITY
College *of* Agricultural Sciences & Natural Resources



The Texas High Plains Initiative for Strategic and Innovative Irrigation Management and Conservation

Grant Contract: 69-3A75-11-184

Mr. Jeff Pate
Risk Management Specialist
Contact:
wjpate@ag.tamu.edu



Dr. Phil Johnson
Agricultural & Applied Economics
Contact:
phil.johnson@ttu.edu

Mr. Glenn Schur
Producer Cooperator

Mr. Rick Kellison
TAWC Project Director
Contact:
rick.kellison@ttu.edu

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

Funded by:
USDA Conservation Innovation Grant