Cotton - Field to Gin

Yesterday
Today
Tomorrow

Texas Alliance for Water Conservation

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

Funded by:
Texas Water Development Board

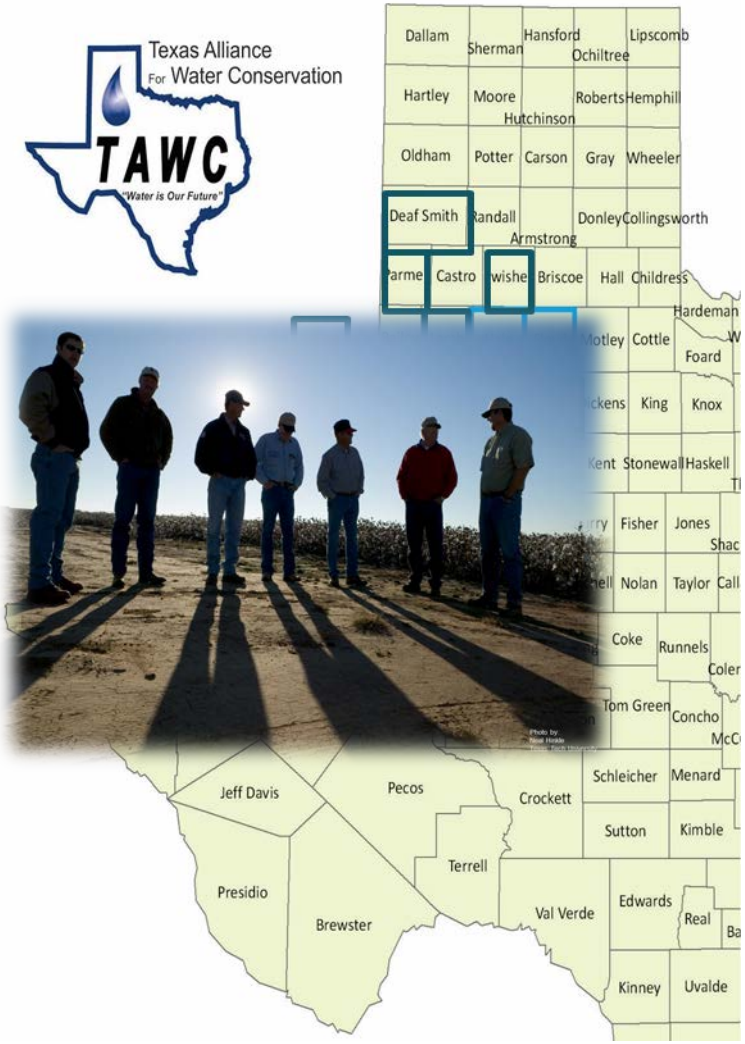
Texas Alliance for Water Conservation

- Project established 2004 from a State of Texas grant administered through the Texas Water Development Board.

- Project is **Producer Driven** and **Board Directed**.

Project Objectives

- Develop and Demonstrate new technologies and management tools and strategies that result in less water being used with enhanced profitability.
- Identify effective crop and irrigation systems.
- Impact producer decision-making.



Ogallala Aquifer

- Aquifer covers 174,000 square miles across 8 states in the High Plains of the United States.
- Over 95% water pumped is for irrigated agriculture.

- The Texas South Plains on the southern end of the aquifer is an intensive agricultural production area and the focus of this program.

Field to Gin

Texas Cotton Production

- **Texas No. 1 Cash Crop**
- **Statewide:**
  - 65% of acres are rain-fed
  - 35% are irrigated
- **High Plains:**
  - 60% of acres are rain-fed
  - 40% irrigated
- **Weather (rainfall) is most influential factor in yield**
  - Rain-fed : 250-650 lbs/ac
  - Irrigated : 500-1,500 lbs/ac
- **Harvest Methods**
  Stripper: Lower purchase & maintenance cost
  Picker: Higher purchase & maintenance cost

Data provided by
Plains Cotton Growers

Water: Doing More with Less

In 1980, the peak of irrigated acreage on the High Plains:

- **2.2 million** acres of cotton planted
- **2 million** acres harvested
- **1.59 million** bales produced

In 2010:

- **1.74 million** acres of irrigated cotton planted (LESS than the peak)
- **1.68 million** acres harvested
- **3.5 million** bales produced (120% increase in yield on LESS acreage)

Data provided by Plains Cotton Growers

More than fiber

- 1980 – 50 lbs lint/inch water
- 2015 – 100 lbs lint/inch water
- 2029 – ?

Cotton and Value

U.S. Dollar

- **Yield** per pound of raw cotton
  - Lint 35 %
  - Cotton seed 49 %
  - Trash 16 %
- For every pound of cotton we get 1.4 pounds of **cotton seed**

- Example of value
  - **Lint** 65 cents per pound
  - **Cotton** seed at $230.00 per ton
    = .115 per pound X 1.4 pounds
    = $.161 per pound of lint or **24.7% the value of the lint**

1980's to Today

- Greatest improvements in farming technology since mechanization
- Advancements in irrigation technology
- Improvements in cotton genetics
- Dramatic increases in yield
  - Average yield per acre has jumped from 150 lbs/acre in the 1930's to about 750 lbs/acre in 2013

Data provided by Plains Cotton Growers

Irrigation: Yesterday and Today

- First Irrigation Well on the High Plains: drilled in Bailey County, 1909
- First in Lubbock: 1911
- Used open discharge wells to deliver water to the field
- General decline in water well irrigation during World War I; introduction of tractor encouraged dryland farming on large tracts
- Little irrigation used from 1919-1926 because of above average rainfall
- Interest revived during 1930's drought, Dust Bowl and World War II
- Furrow irrigation introduced in 1940's

Data provided by
Plains Cotton Growers

Irrigation Advances

~98% Efficiency increase in return per inch of water since irrigation began. Combination of irrigation, fertility, tillage, pest management (Best Management Practices)

- Underground pipelines replaced open ditches in 1950's and 1960's
- High pressure center pivot and side roll sprinkler systems popular in 1960's and 1970's; had water losses of about 50 percent
- Center pivot sprinkler systems became popular in early 1980's; helped reduce water losses to about 20 percent
- Low energy precision application (LEPA) systems developed by Dr. Bill Lyle with the Texas A&M Research and Extension Center at Lubbock, Texas in 1980's
- Many producers now installing drip irrigation systems
- New technologies being evaluated

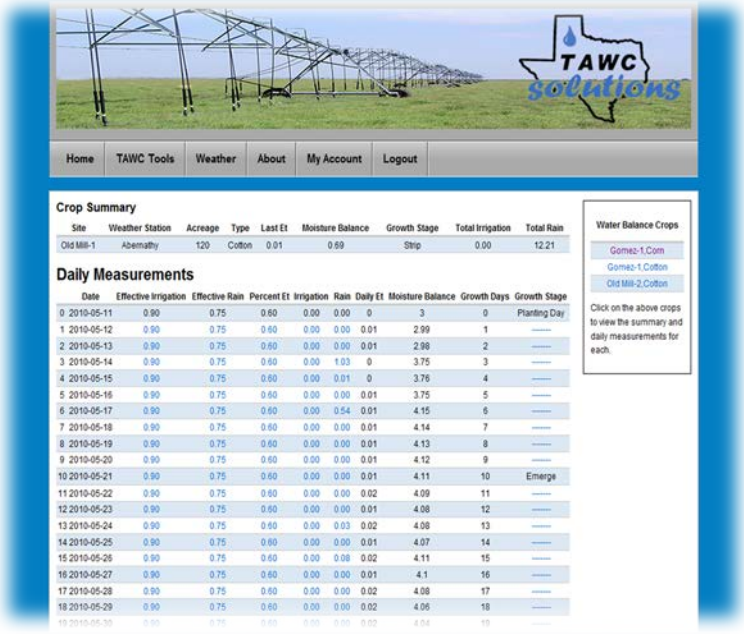
Data provided by Plains Cotton Growers

Technologies and Tools

Improved Water Management

Capacitance probes

VRI



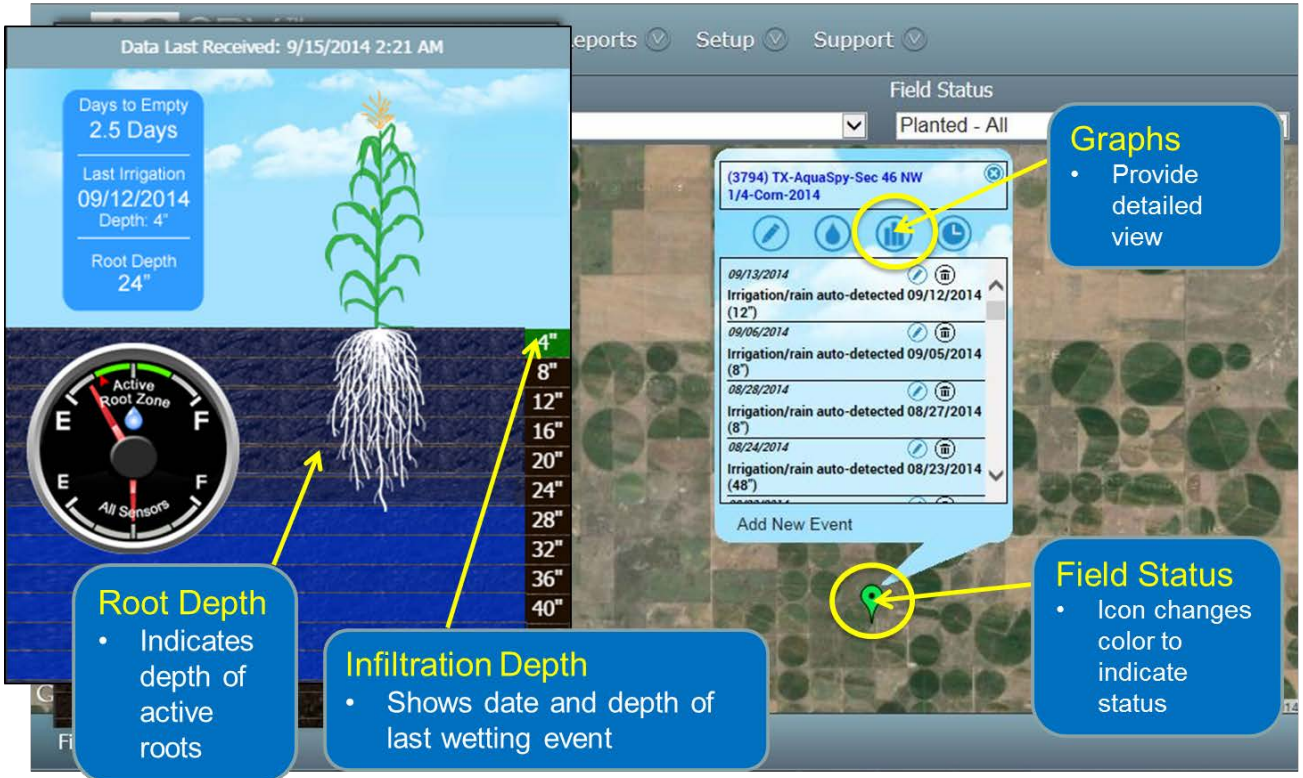
Online ET Scheduling Tool

PMDI

Crop Temperature Sensors

AquaSpy$_{TM}$ Capacitance Probe

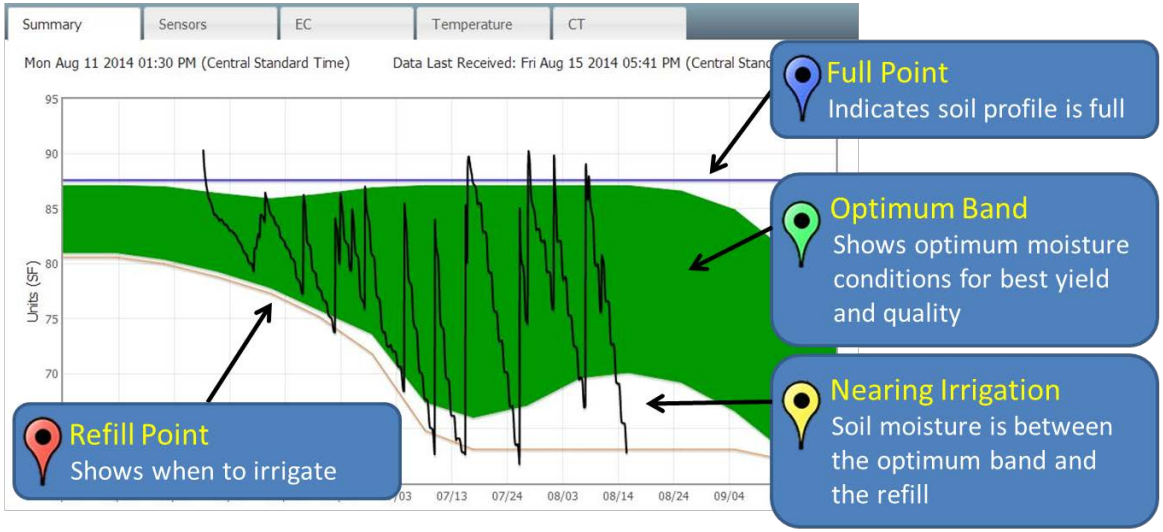
REAL TIME FIELD STATUS



AquaSpy$_{TM}$ Capacitance Probe

- Annual Subscription
- Web-based dashboard
- Visual cues for field status
- Optimum soil moisture
- When need to irrigate

IRRIGATION TEMPLATES

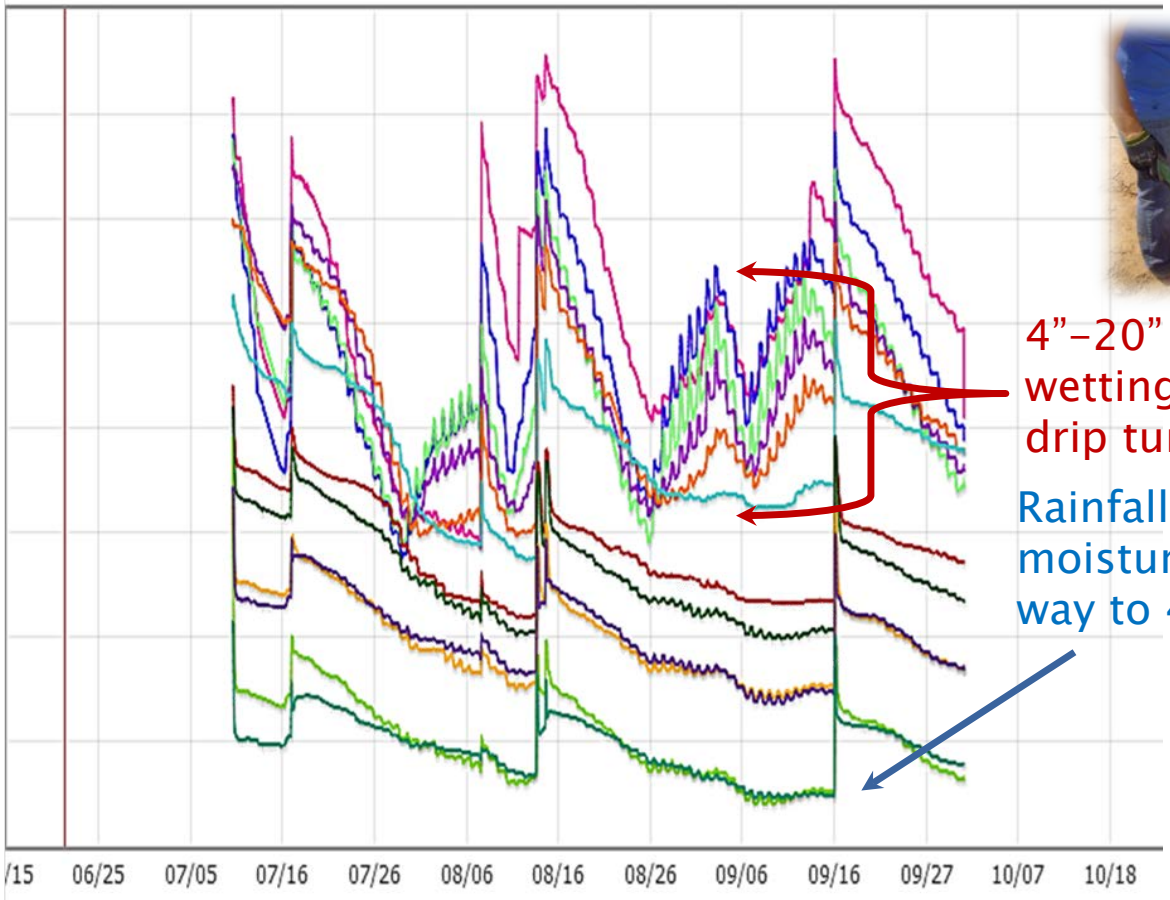


Why are Irrigation Templates so important?

- Season-long roadmap on how best to irrigate
- Catch and correct issues before they become a problem
- Enable you to effectively manage seasonal changes and new varieties
- **They provide PROCESS CONTROL & are your RECIPE FOR SUCCESS**

Monitoring Soil Moisture

Sensor Graph



4"–20" zones wetting up with drip turned on

Rainfall stored moisture all the way to 48"

Precision Mobile Drip Irrigation

PMDI™

Technology can be adapted to any type of crop and desired spacing

Precision Mobile Drip Irrigation

PMDI™

Contrast of water application with drag drip vs spray application

Precision Mobile Drip Irrigation

PMDI™

Precision water application using a center pivot

Variable Rate Technology

Why VRT?

- 20-30% of pivot irrigated acres should be converted to dryland
- Application of water to meet specific field needs through Pre-determined prescription
- Prescription based on:
  - Satellite imagery
  - EM mapping
  - Yield monitors
  - Soil type
  - Others

Ability to control individual nozzles and speed of pivot

Variable Rate Technology

VRT

Variable rate technology for pivots

Smartfield™ Technology SmartCrop®

- Measures crop **canopy temperature** using an infrared thermometer
- Temperature is significant measure of plant stress
- Measures an individual plants level of stress
- Can be used to determine if irrigation is necessary

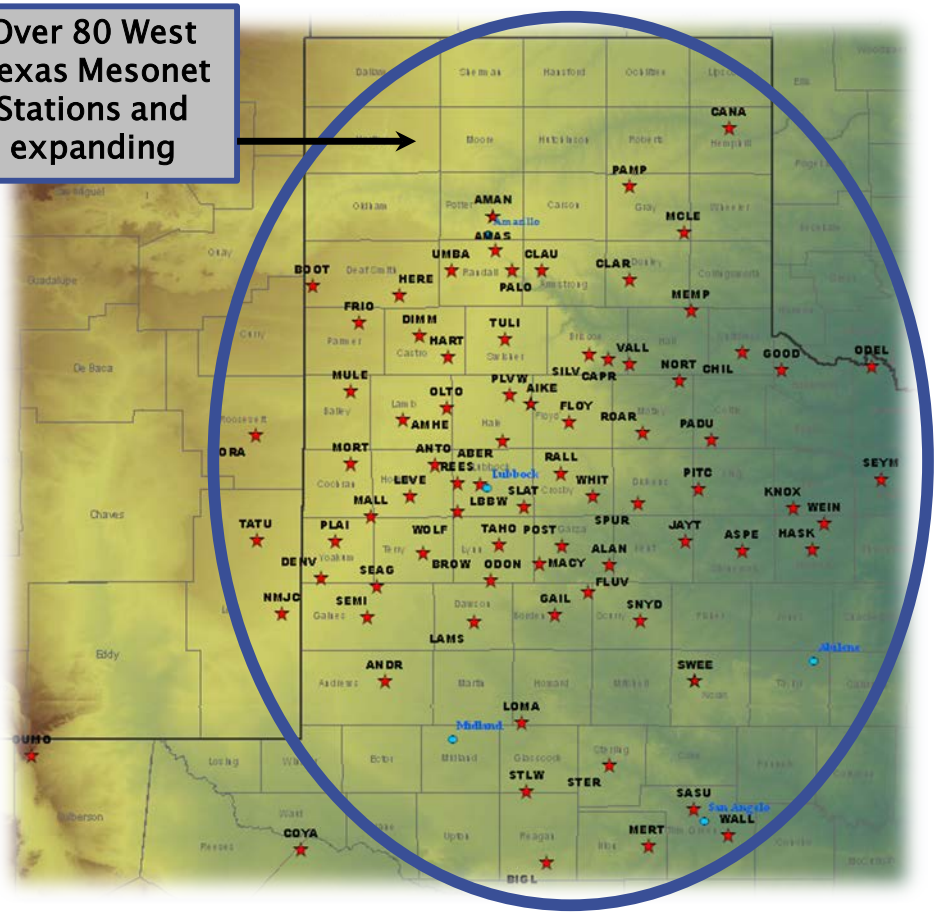
Smartfield™ Technology FIT System

- Advances individual sensing
- Captures canopy temperature data on hundreds of test areas
- Automatic irrigation triggers and crop management alerts

Potential Evapotranspiration

West Texas Mesonet

Over 80 West Texas Mesonet Stations and expanding

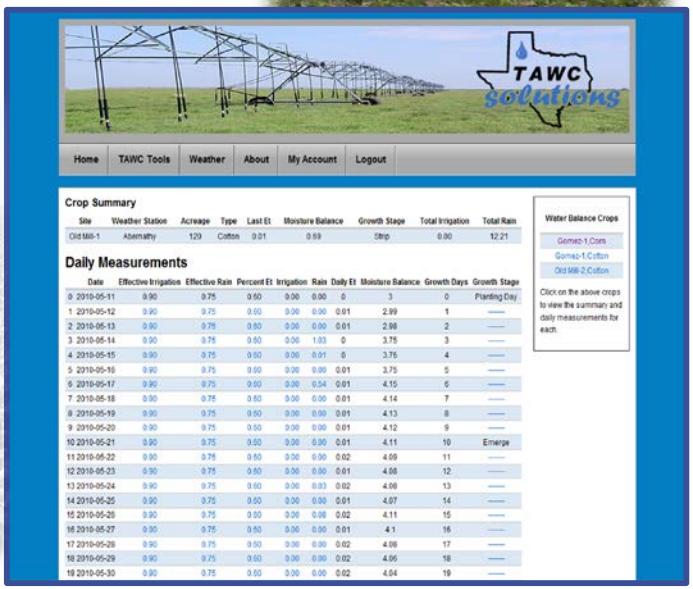


TAWC-Solutions

ET Irrigation Scheduling Tool

Free web-based tool used to determine:

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



TAWC solutions

www.tawcsolutions.org

Irrigation Scheduler – *In-season decisions*

Home | TAWC Tools | Weather | About | My Account | Logout

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	-------

Water Balance Crops

Gomez-1,Corn

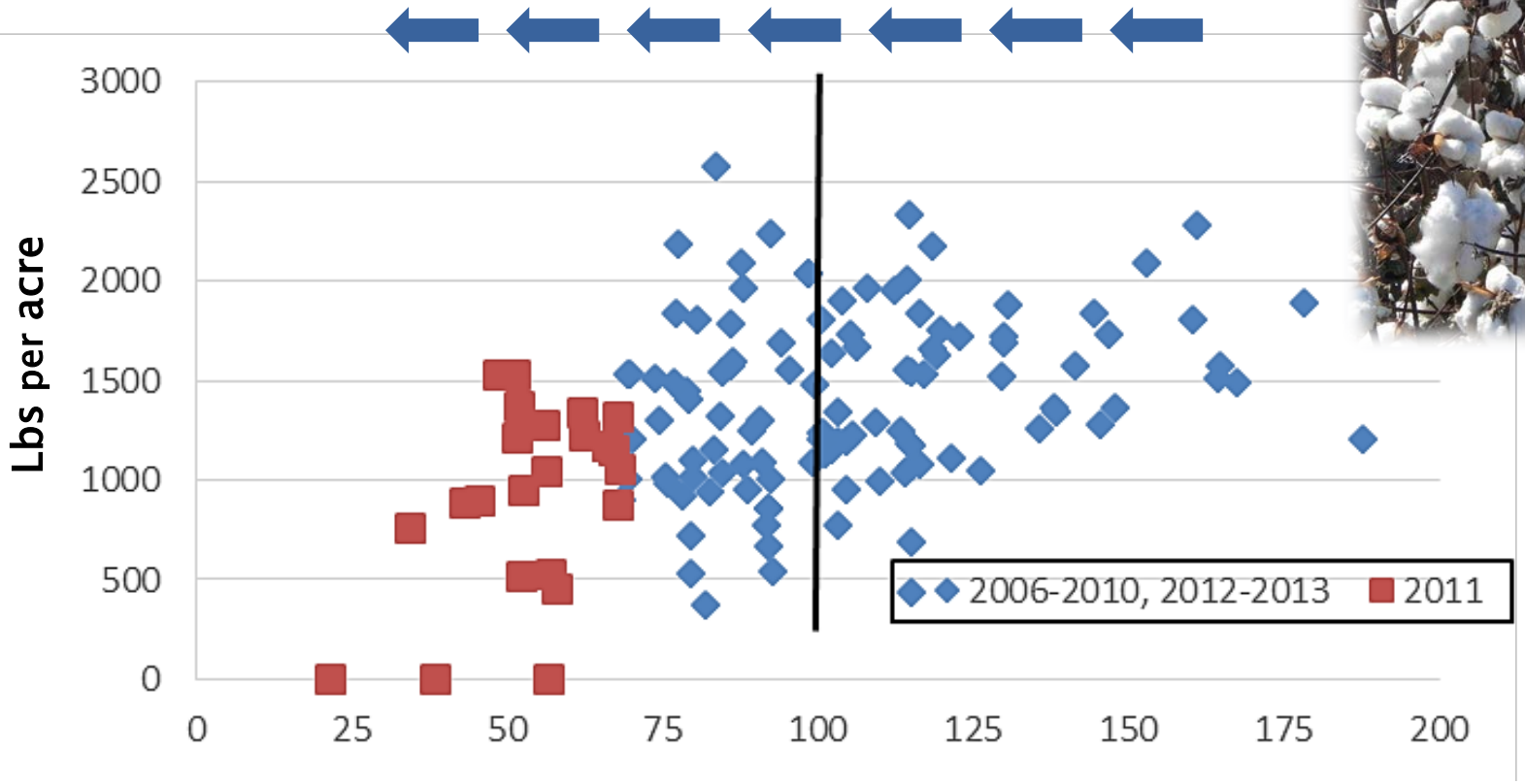
Gomez-1,Cotton

Old Mill-2,Cotton

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

Yield and Percent Water Demand

Project Sites 2006–2013



Yesterday/Today/Tomorrow

Yesterday–

- Open ditch high pressure pivot
  - 50% Efficiency

Today–

- SDI
  - 98% Efficiency
- Soil moisture monitoring
- PMDI™
- VRI
- Ability to measure plant stress
- Water management tools

Tomorrow–

- Can we expect more of the same?
- **Best Management Practices**

Thank You!

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