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# Cotton - Field to Gin

**Yesterday**  
**Today**  
**Tomorrow**

**Texas Alliance for Water  
Conservation**

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& 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 – ?

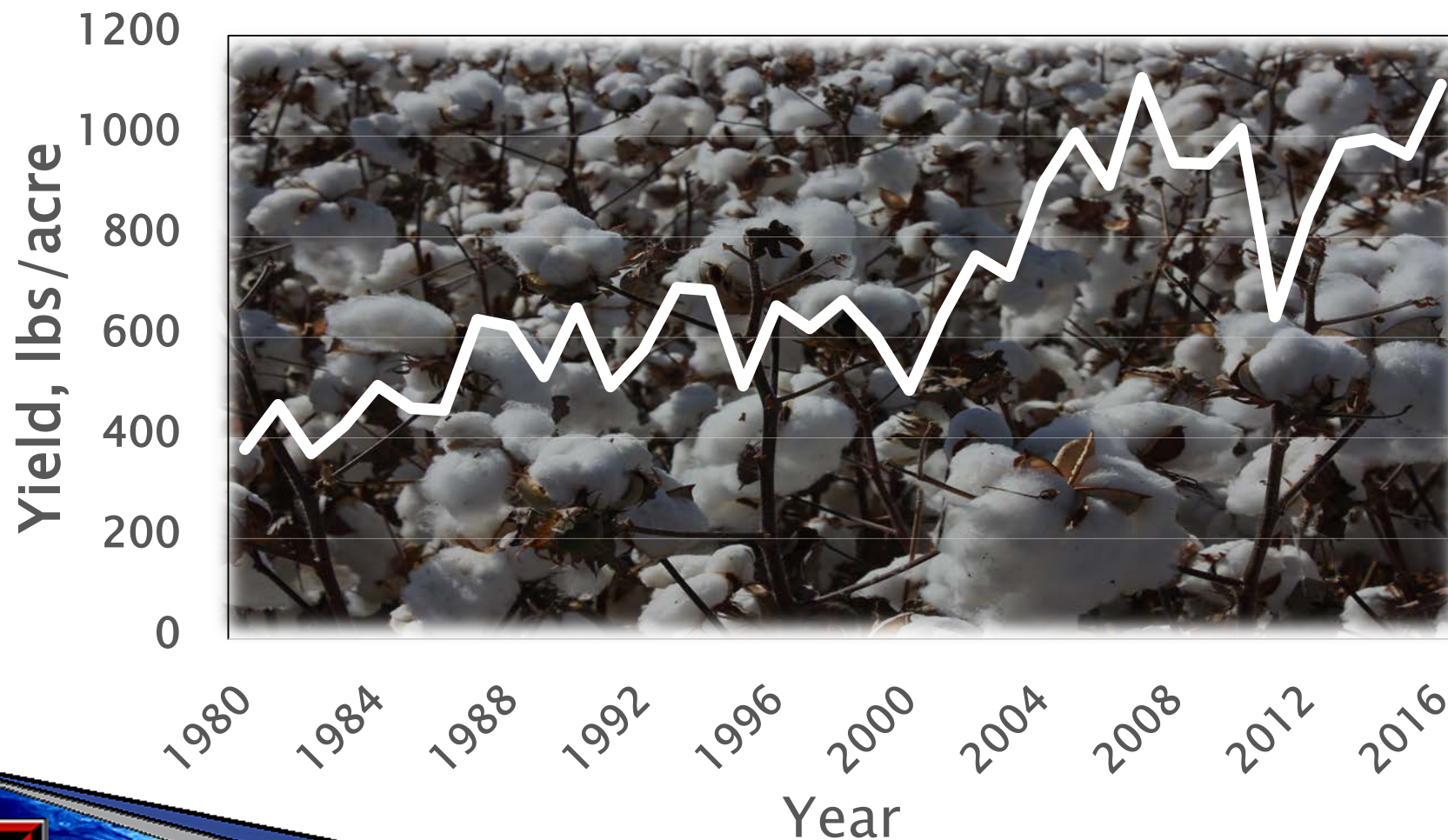


# Cotton Yield Increase

## 1980-2016



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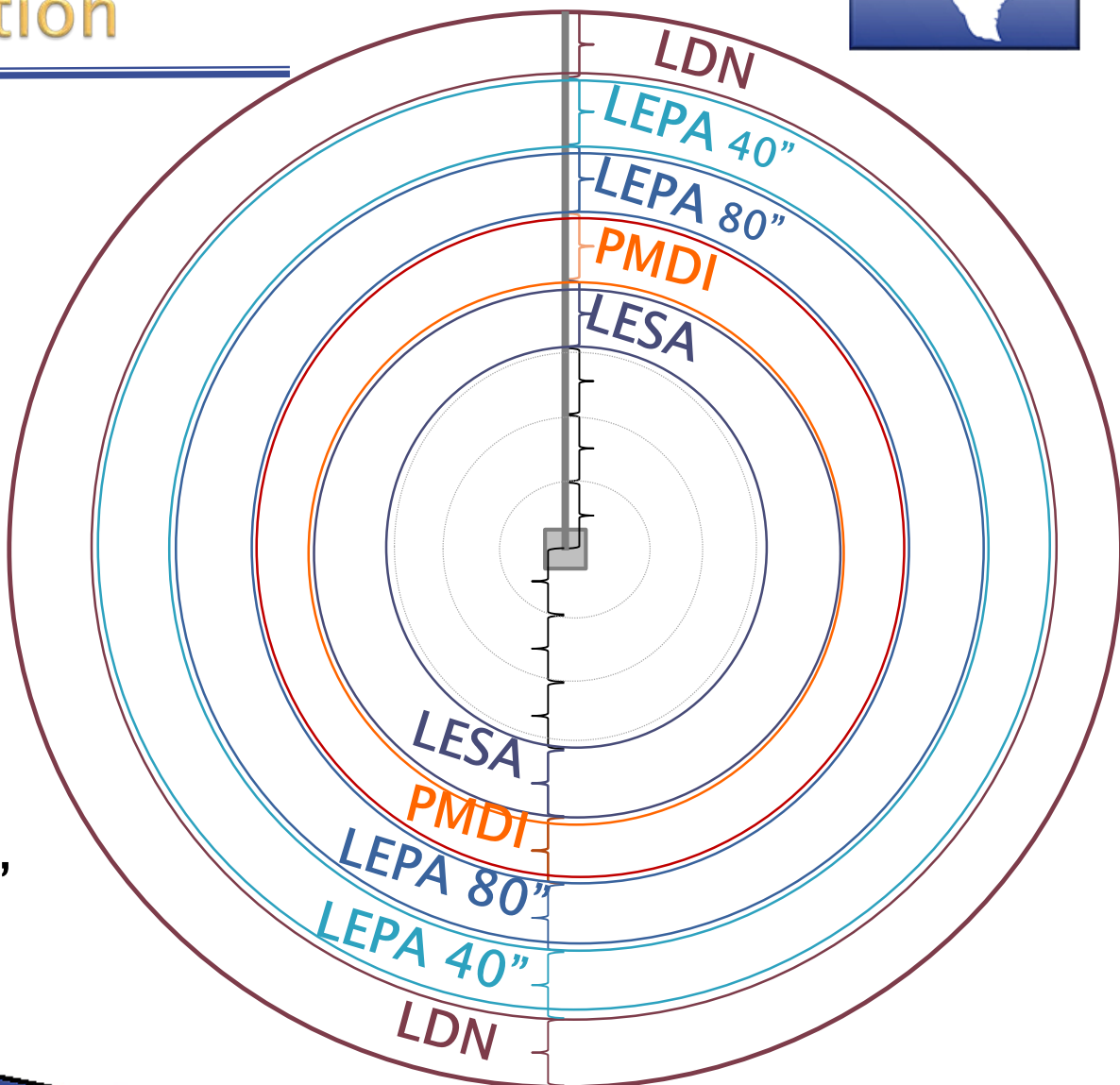


# Pivot Irrigation Technology

## 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





# LESA Broadcast Spray





# LEPA 80"

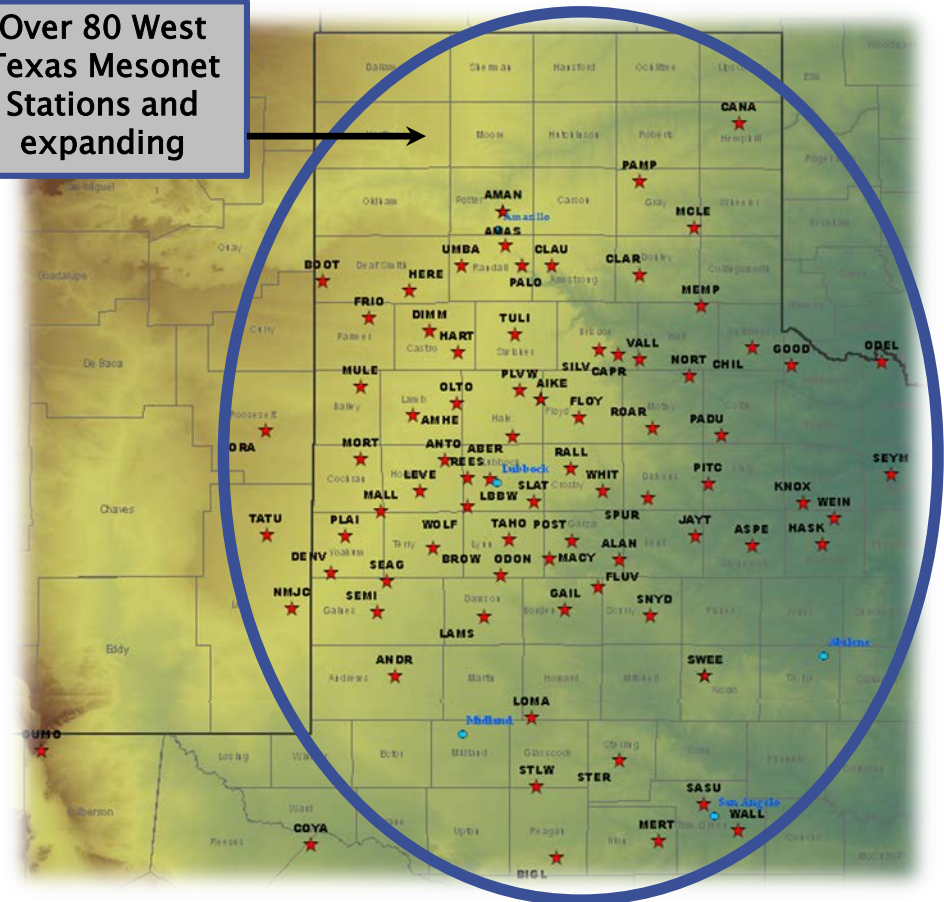
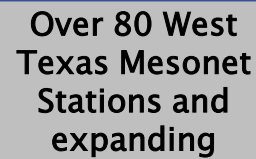
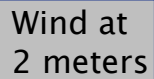




# PMDI







# 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.



[www.tawcsolutions.org](http://www.tawcsolutions.org)



**Crop Summary**

Site	Weather Station	Acresage	Type	Last Et	Moisture Balance	Growth Stage	Total Irrigation	Total Rain
Cid MS-1	Abilene	120	Cotton	0.01	0.69	80p	0.90	12.25

**Daily Measurements**

Date	Effective Irrigation	Effective Rain	Percent Et	Irrigation	Rain	Daily Et	Moisture Balance	Growth Days	Growth Stage
0 2010-05-11	0.00	0.75	0.50	0.00	0.00	0	3	0	Planting Day
1 2010-05-12	0.00	0.75	0.50	0.00	0.00	0.01	2.99	1	---
2 2010-05-13	0.00	0.75	0.50	0.00	0.00	0.01	2.98	2	---
3 2010-05-14	0.00	0.75	0.50	0.00	1.03	0	3.76	3	---
4 2010-05-15	0.00	0.75	0.50	0.00	0.01	0	3.76	4	---
5 2010-05-16	0.00	0.75	0.50	0.00	0.00	0.01	3.75	5	---
6 2010-05-17	0.00	0.75	0.50	0.00	0.54	0.01	4.15	6	---
7 2010-05-18	0.00	0.75	0.50	0.00	0.00	0.01	4.14	7	---
8 2010-05-19	0.00	0.75	0.50	0.00	0.00	0.01	4.13	8	---
9 2010-05-20	0.00	0.75	0.50	0.00	0.00	0.01	4.12	9	---
10 2010-05-21	0.00	0.75	0.50	0.00	0.00	0.01	4.11	10	Emerge
11 2010-05-22	0.00	0.75	0.50	0.00	0.00	0.02	4.09	11	---
12 2010-05-23	0.00	0.75	0.50	0.00	0.00	0.01	4.08	12	---
13 2010-05-24	0.00	0.75	0.50	0.00	0.03	0.02	4.06	13	---
14 2010-05-25	0.00	0.75	0.50	0.00	0.00	0.01	4.07	14	---
15 2010-05-26	0.00	0.75	0.50	0.00	0.00	0.02	4.11	15	---
16 2010-05-27	0.00	0.75	0.50	0.00	0.00	0.01	4.11	16	---
17 2010-05-28	0.00	0.75	0.50	0.00	0.00	0.02	4.08	17	---
18 2010-05-29	0.00	0.75	0.50	0.00	0.00	0.02	4.06	18	---
19 2010-05-30	0.00	0.75	0.50	0.00	0.00	0.02	4.04	19	---

**Water Balance Crops**

- Gomco 1.Cotton
- Gomco 1.Cotton
- Cid MS-2.Cotton

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





# 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.

# 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**



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# Fieldprint Calculator

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- Analytical tool designed by Field to Market: The Alliance for Sustainable Agriculture
- Evaluates crop production operations and computes their sustainability and operational efficiency
- A producer's sustainability is evaluated based on metrics in the calculator





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# Metrics

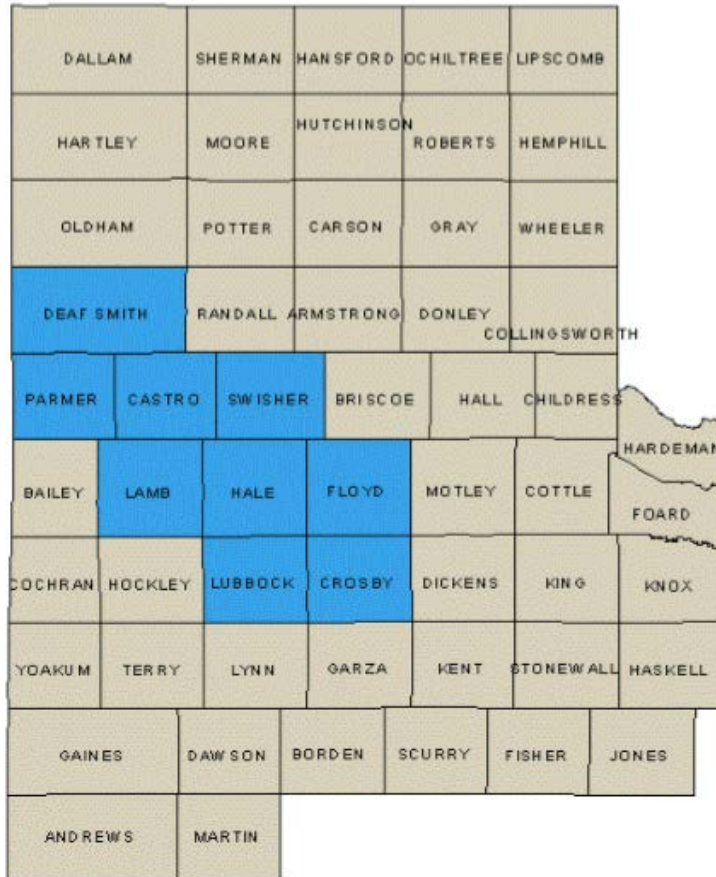
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- Land Use
- Irrigation Water Use
- Energy Use
- Greenhouse Gas Emissions
- Soil Conservation
- Soil Carbon
- Water Quality Index



# TAWC Pilot

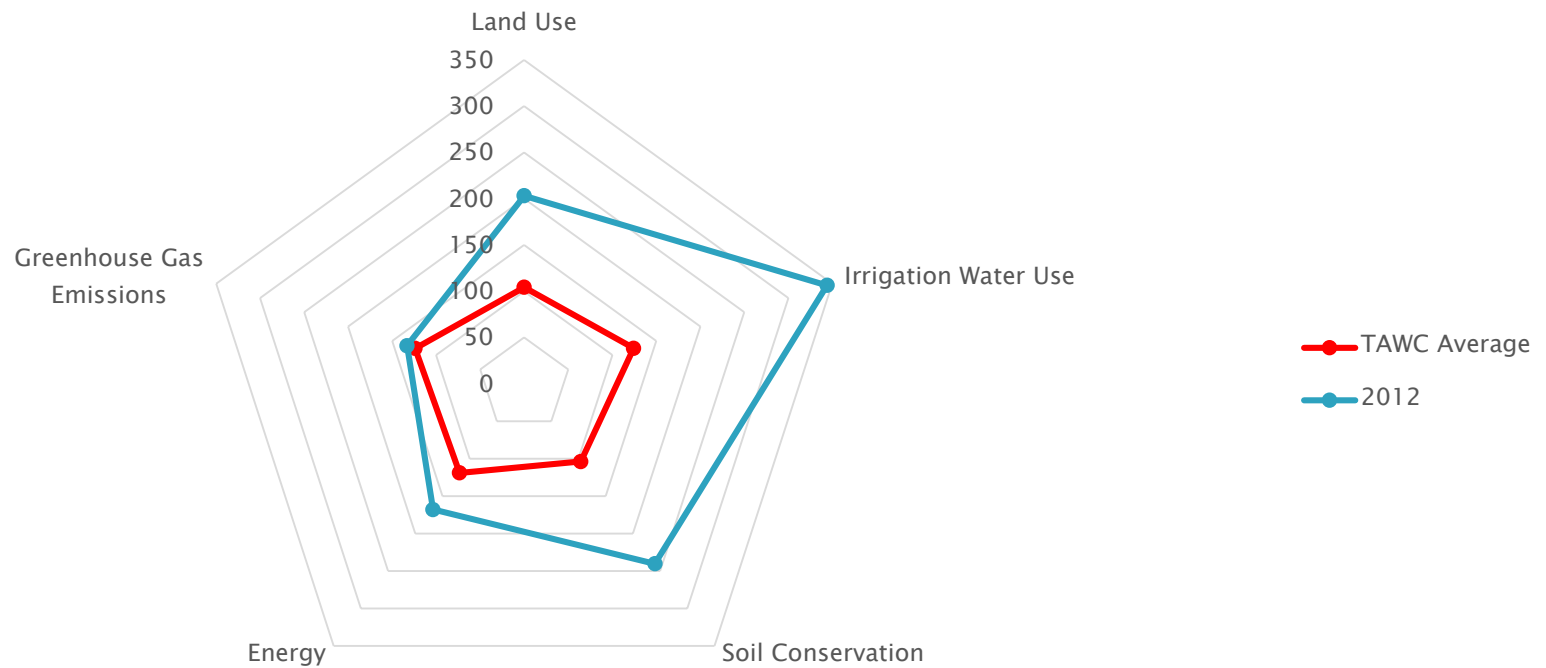


- Years of Production: 2007 – 2015
- 26 Producers, 34 sites, 193 Observations
- Field size: 13 – 398 acres
- Tillage Practices: No-till, Strip-Till, Conventional
- Irrigation: Furrow, Pivot, SDI

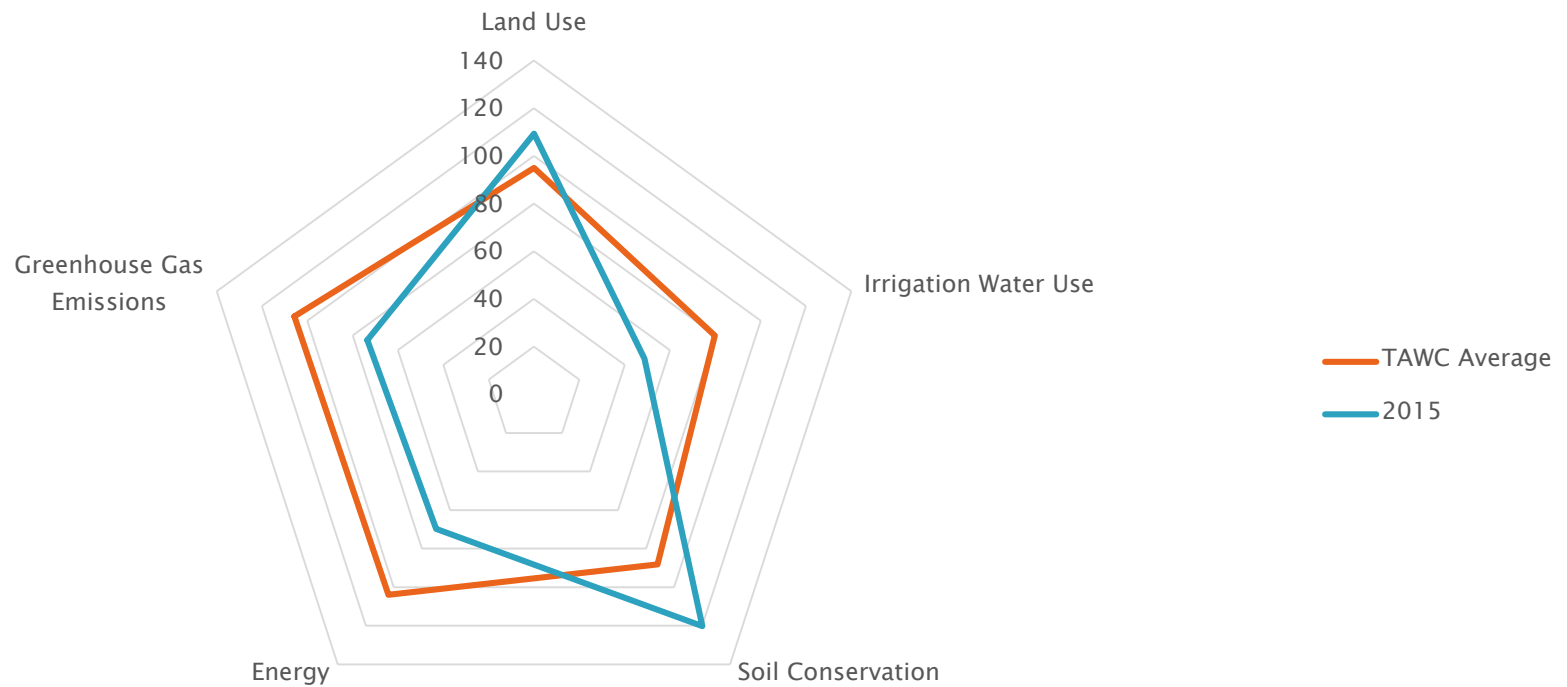




# Lloyd Arthur – 2012



# Lloyd Arthur – 2015





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# Research Results

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- Analyzing the relationship between gross margin and sustainability
  - Development of a profitability metric
- Evaluating specific production practices (tillage, irrigation systems) to determine the magnitude of their impact



# Thank You!



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