

# Impact of Improved Soil Health on Sustainability and Profitability of Cotton

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2018 Louisiana Agricultural Technology and Management Conference



Cooperative Extension Service



Cotton  
Incorporated

# COTTON LEADS™

Cotton LEADS™  
is a program committed to  
responsibly produced cotton.





# Field to Market

The Keystone Alliance for Sustainable Agriculture

# No-Till Cover vs. Farmer Standard No Cover

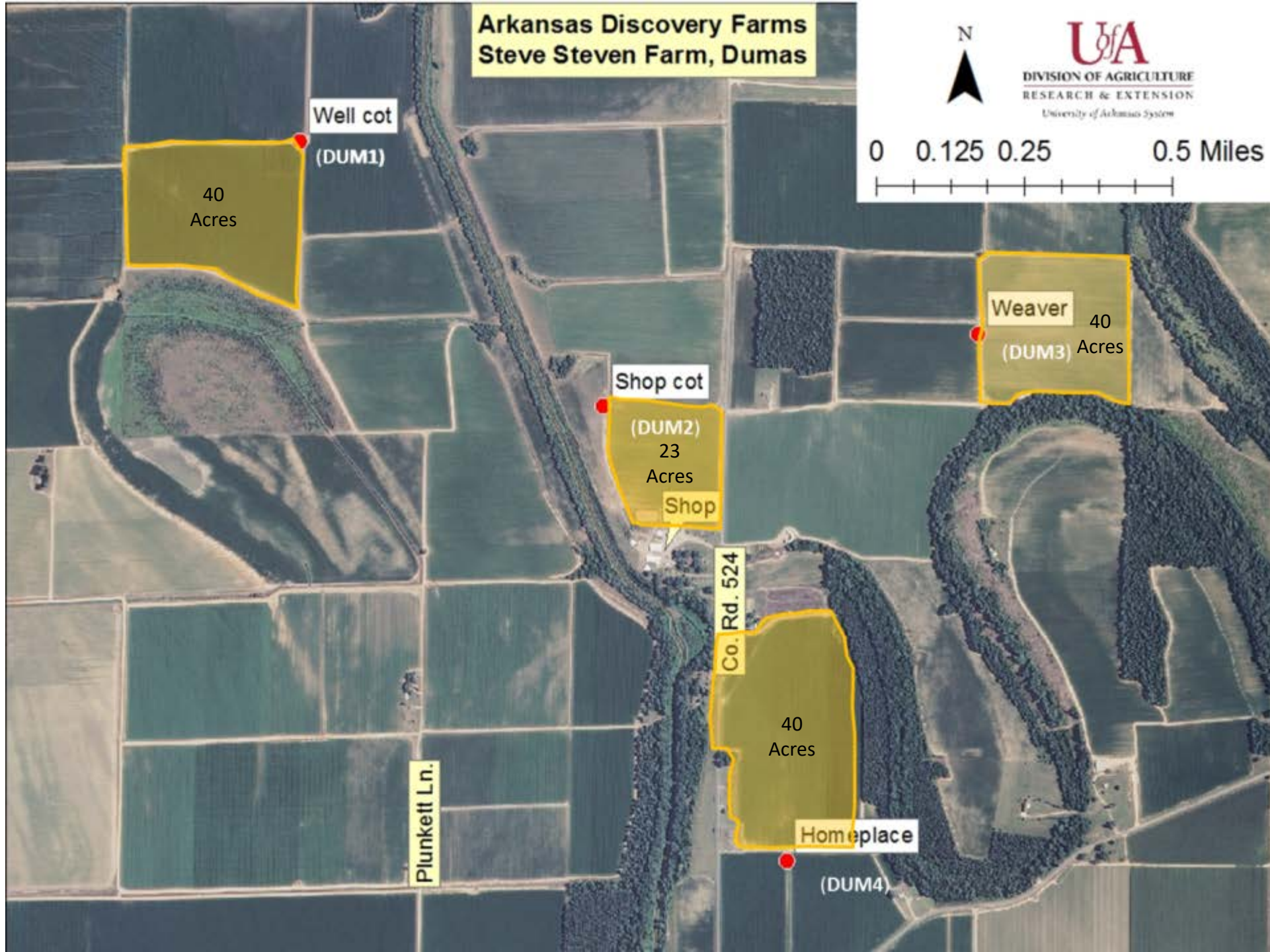
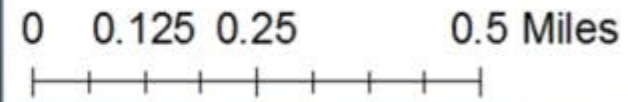
## 2015 and 2016 Research



**Arkansas Discovery Farms  
Steve Steven Farm, Dumas**



**U of A**  
DIVISION OF AGRICULTURE  
RESEARCH & EXTENSION  
University of Arkansas System



Well cot  
(DUM1)

40  
Acres

Weaver  
(DUM3) 40  
Acres

Shop cot  
(DUM2)  
23  
Acres

Shop

Co. Rd. 524

40  
Acres

Homeplace  
(DUM4)

Plunkett Ln.

# Flow Meters



# Trapezoidal Flume

- Consists of a submerged pressure transducer
  - Measures Depth of water flowing through flume.
  - Dimensions are known by Discovery Farm
- Equation set up in System
  - Reading produced represents discharge in cfs.
- This device allows for determination of how much water runs off on both irrigation and rainfall events.



# A producers' main goal is to increase efficiency in hopes of becoming more profitable

- Practices that lead to improved efficiency often improves sustainability and soil health.
- A couple of strategies to increase Sustainability
  - Reducing Tillage
  - Converting to a no-till production system with cover crop.
- Fields had the availability to be split in half and watered in different sets.
- $\frac{1}{2}$  of each field was composed of No-till with cover and the other  $\frac{1}{2}$  was composed of Farmer Standard.
- Which allowed for observation of how much the expenses differed among the two treatments.



# Cover Crops

- Cereal Rye was broadcast seeded.
  - Buggy
  - Airplane
- Targeted seeding rate of 56 lb/A
- On No-till with cover fields
- On farmer standard side of field as well if producer desires.
- Sections were killed out on each side of the field to have comparison of cover vs. no cover



No-till with Cover and Stale seedbed rehipped  
with cover crop.





**Field Conditions after  
3.5 inches of Rain**

**No-till with cover crop**

**Stale seedbed rehipped  
with cover crop**





Almost No-till

The only tillage operation

Farmer Standard: Stale Seedbed

One of several tillage operations





**No-till: slight water furrows with residue exposed.**

**Farmer Standard- No Cover: Water Furrows for Irrigation**



# TILLAGE SAVINGS

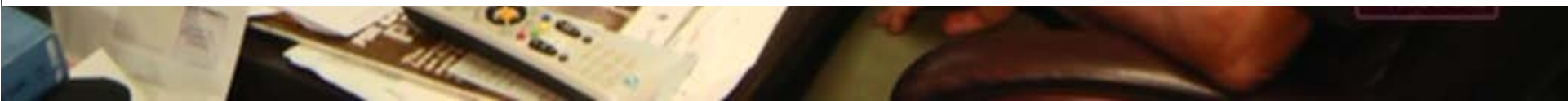
- ▶ Disk 2 times \$24
- ▶ V-Ripper 1 time \$17/A
- ▶ Harrow 1 time \$6
- ▶ Land Plane/Float 2 times \$20
- ▶ Hipper/Roller 1 time fall \$7
- ▶ Hipper/Roller 1 time Spring \$7
- ▶ TOTAL \$81 /A
- ▶ Field Cultivate before hipper/roller \$\$8
- ▶ TOTAL \$89 /A



# Return on Investment



PHAUCET (Pipe Hole and Universal Crown Evaluation Tool)



# Water Conservation

- Delta Plastics' H2O Initiative launched in 2014
- Pipe Planner is the cornerstone of this initiative
- Goal to reduce irrigation water use within the Mississippi Delta by 20 percent by 2020



# Irrigation Scheduling



# Irrigation

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- Furrow Irrigation with polypipe
- PHAUCET Program used to Determine outlet size to ensure uniform distribution among furrows
- Irrigation Flow Meters
- Surge Valve



# Irrigation Efficiency improved using PHAUCET

Field	Crop/ Year	# of Events	Irrigation Volume <i>inches</i>	Runoff <i>inches</i>	Effective Irrigation <i>Inches</i>	Irrigation Efficiency %
<b>WellCot</b>	Corn 2015	6				
Mean			<b>2.23</b>	<b>0.31</b>	<b>1.92</b>	<b>85</b>
Std. Dev			0.72	0.11	0.67	4
<b>Shopcot</b>	Cotton 2015	4				
Mean			<b>2.44</b>	<b>0.22</b>	<b>2.22</b>	<b>91</b>
Std. Dev			0.39	0.10	0.31	3
<b>Homeplace</b>	Cotton 2015	5				
Mean			<b>1.70</b>	<b>0.31</b>	<b>1.39</b>	<b>81</b>
Std. Dev			0.24	0.10	0.27	6

***Irrigation Efficiency = (Irrigation Volume – Runoff/ Irrigation Volume)***

# IRRIGATION COST/SAVINGS

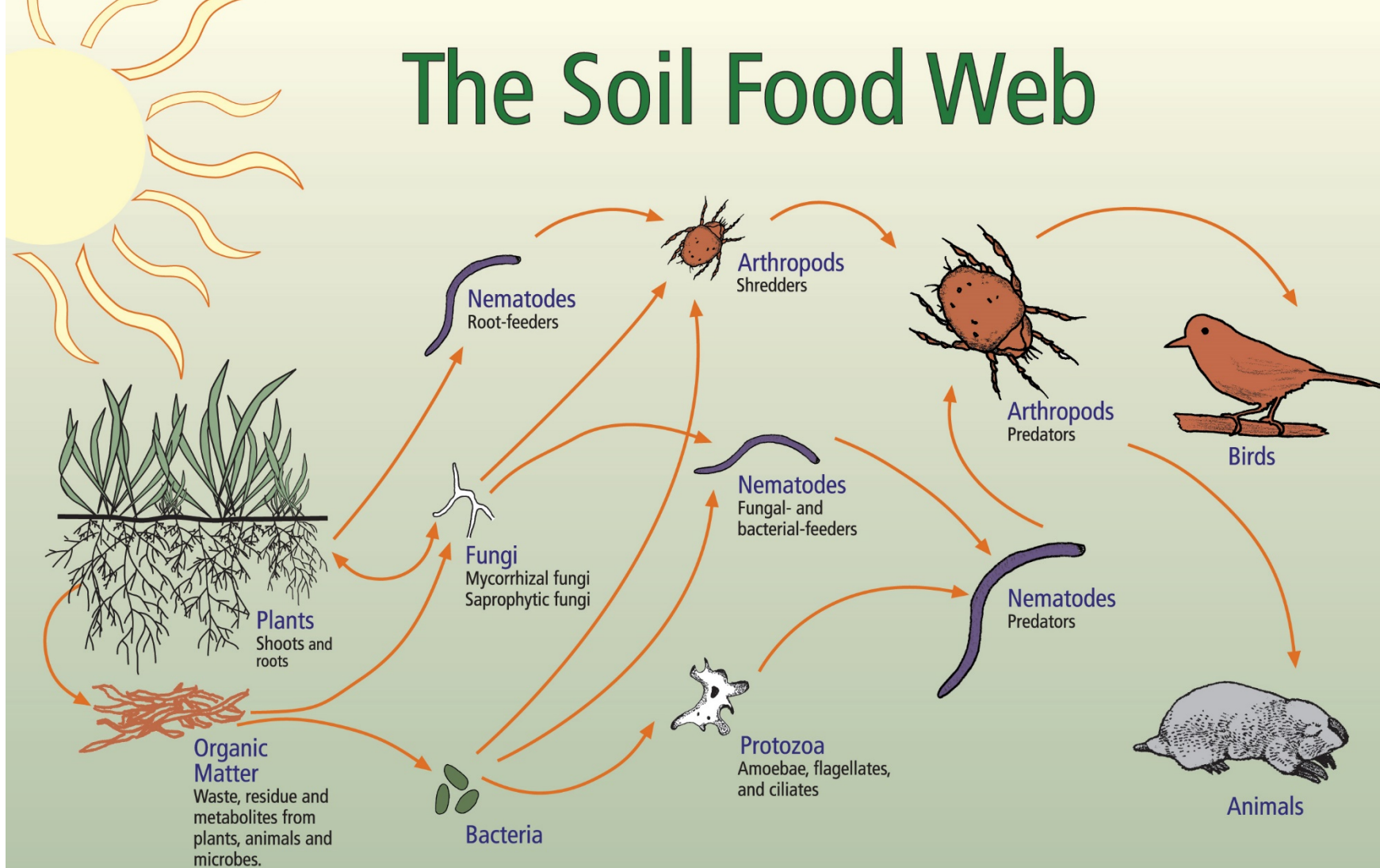
- ▶ Cost to Furrow irrigate \$7.50/A per irrigation
- ▶ 5 irrigations \$37.50
- ▶ Cut 2 irrigations out in 2016 \$15/A Savings
  
- ▶ Google Doug Peterson Rainfall Simulator  
Or just google Rainfall Simulator



# Soil Health Indicators



# The Soil Food Web



**First trophic level:**  
Photosynthesizers

**Second trophic level:**  
Decomposers  
Mutualists  
Pathogens, Parasites  
Root-feeders

**Third trophic level:**  
Shredders  
Predators  
Grazers

**Fourth trophic level:**  
Higher level predators

**Fifth and higher trophic levels:**  
Higher level predators

# Soil Your Undies



Demonstrating Soil Health

# Soil Microbe Activity

## No-till with Cover vs. Farmer Standard No Cover



No-Till with Cereal Rye Cover Crop



Farmer Standard No Cover

Significant difference after being buried for five weeks.

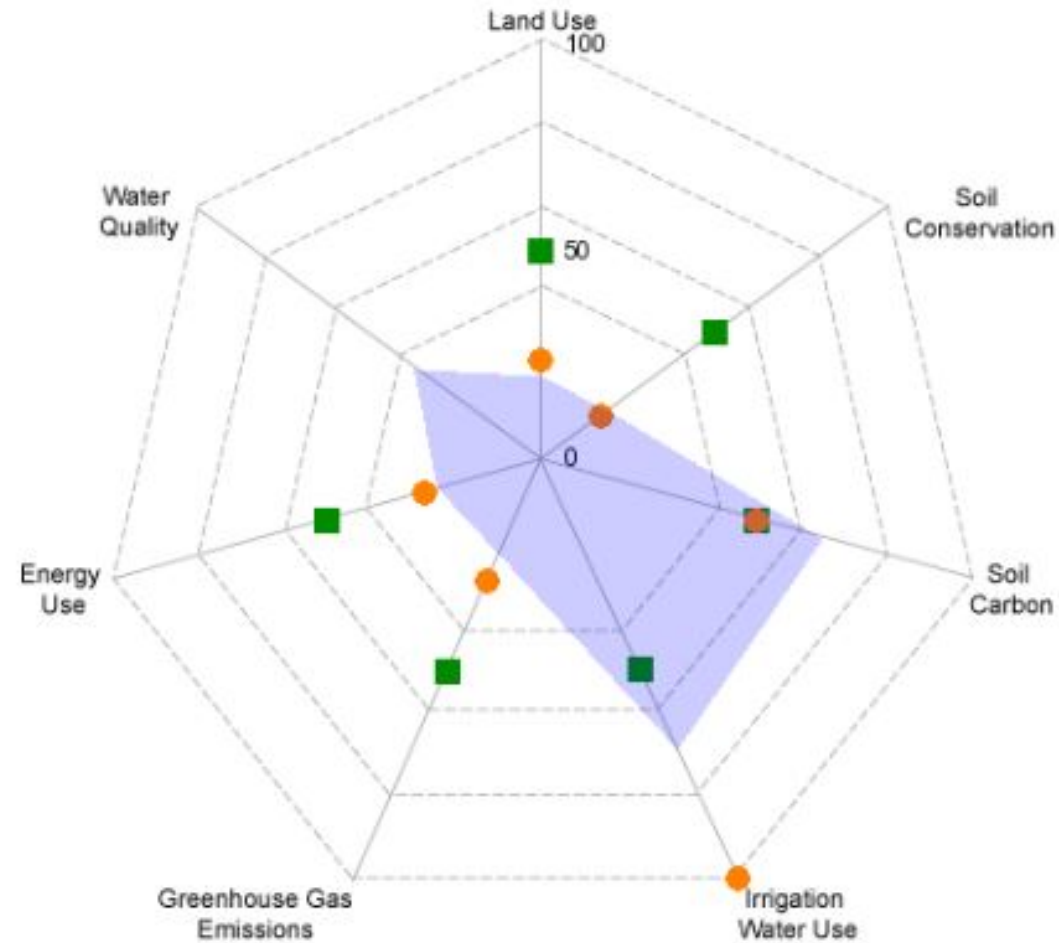


# Data Collected

- Throughout the year all of the producers inputs were recorded giving us the information we needed to calculate both fixed and variable costs.
- All fields were monitored for inputs, and entered into the Field to Market, Fieldprint Calculator.

# Fieldprint Calculator

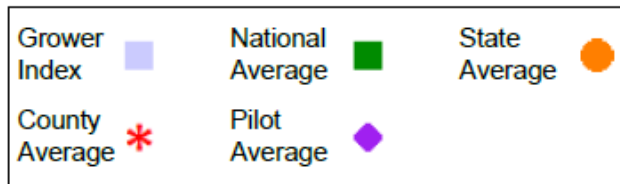
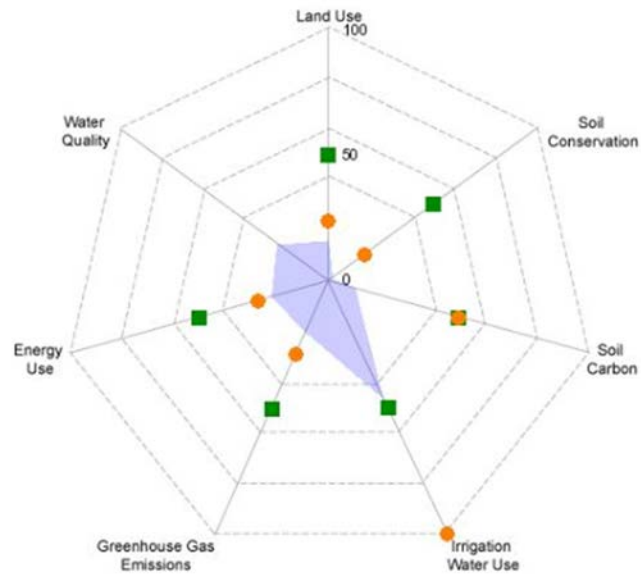
## A method used to measure Sustainability



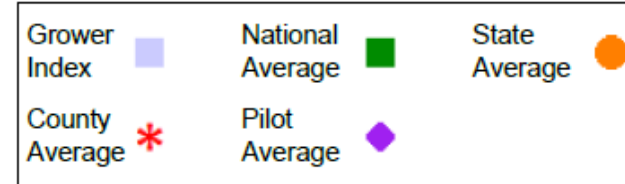
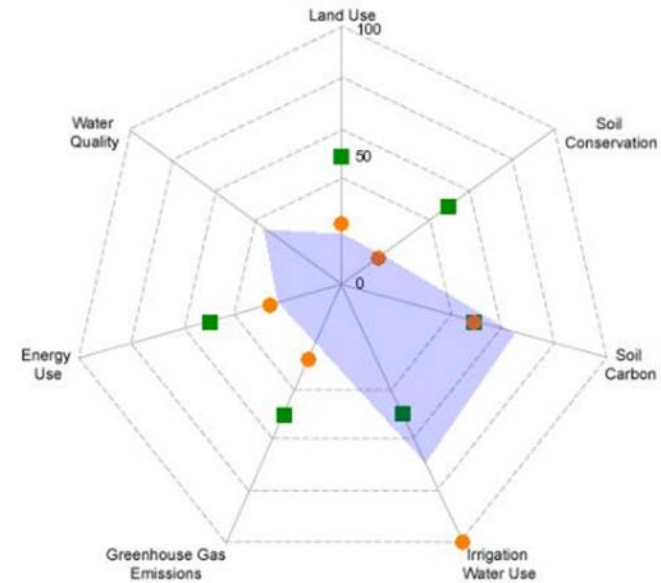
# Fieldprint Calculator

## Fieldprint Summary

No-till / Cover Crop



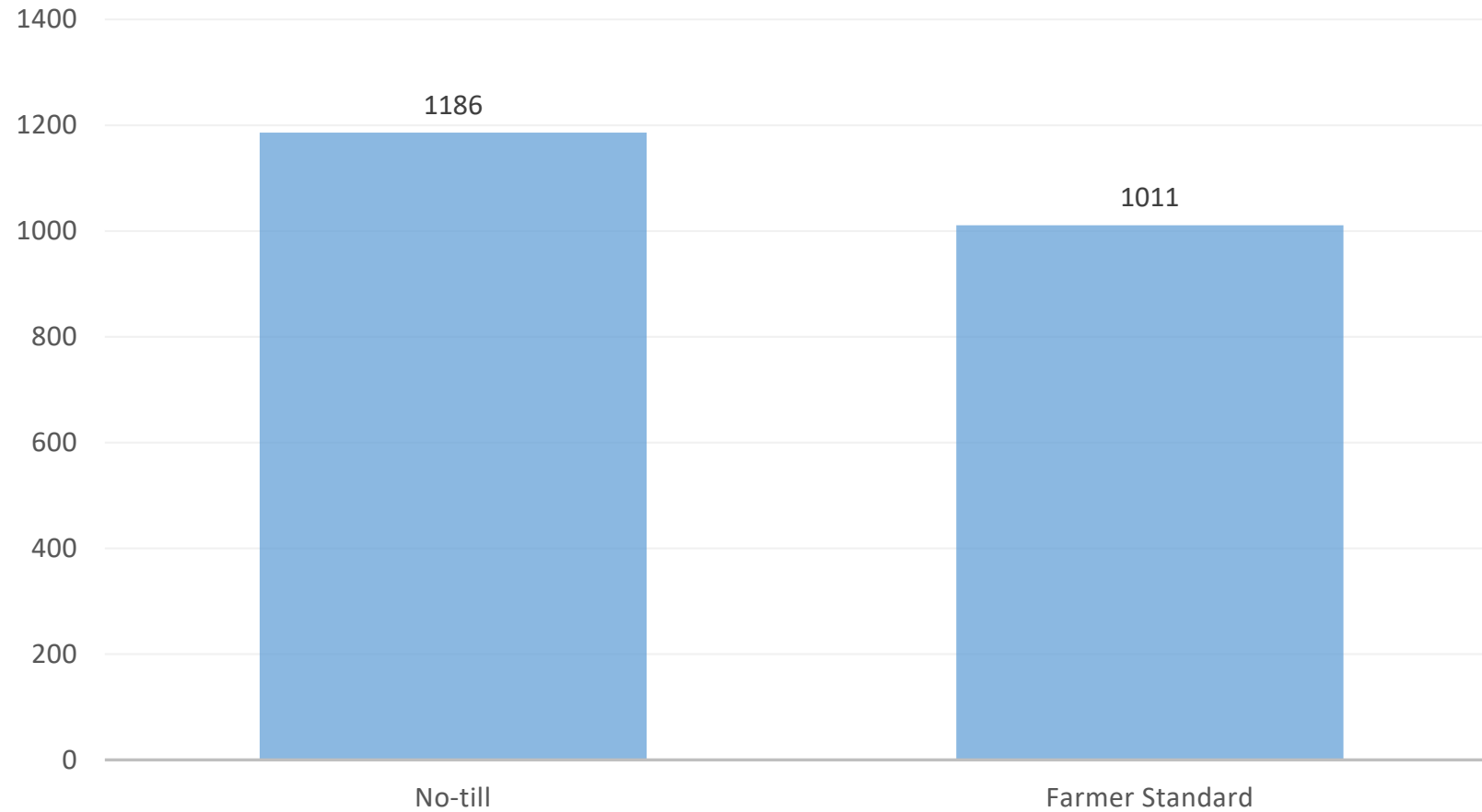
Till / No Cover Crop



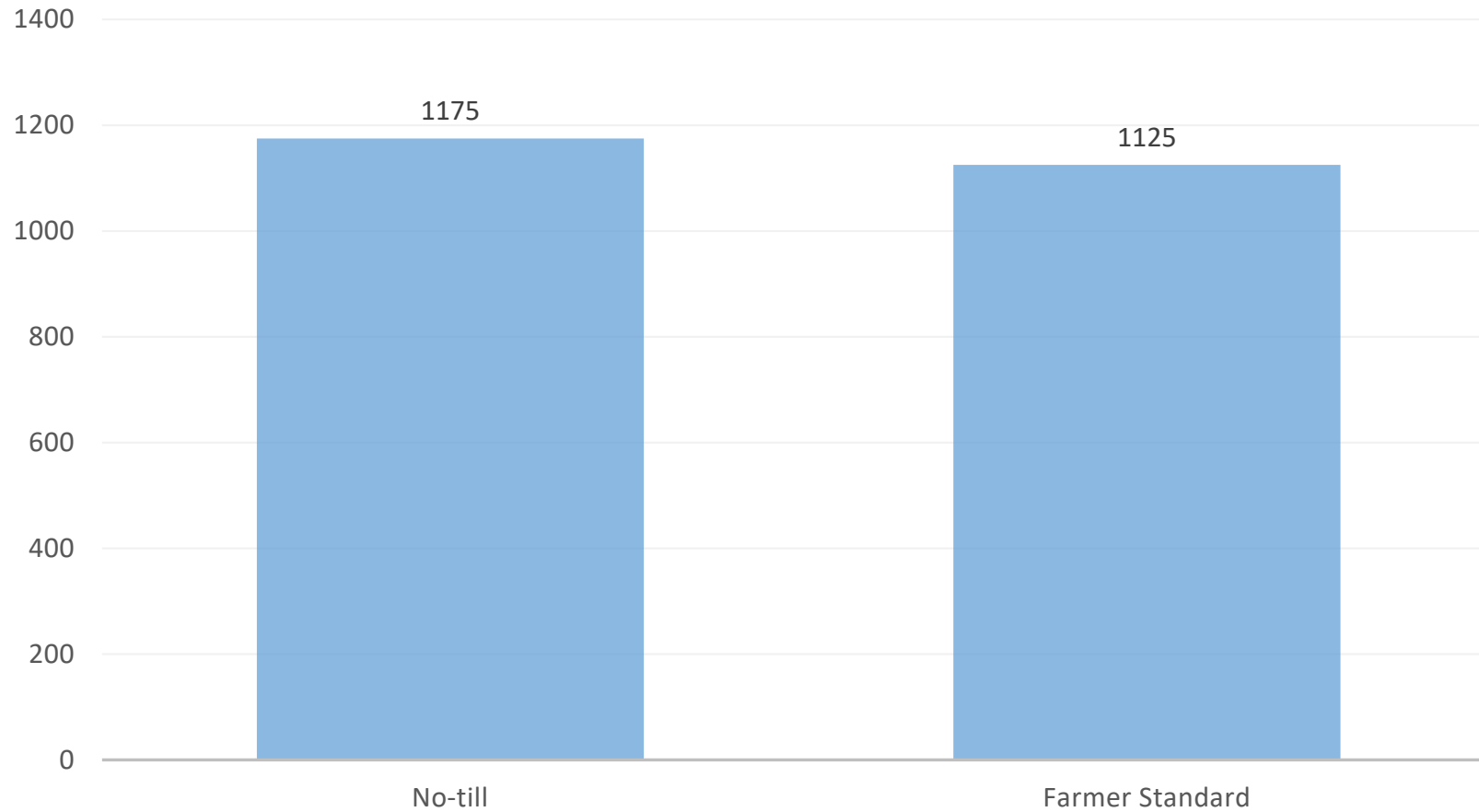
# Cover Crop Summary

- Irrigation water flow rates down the row slower in No-till / Cover
- Soil Compaction was consistently lower in No-till / Cover
- Soil Moisture was consistently higher in No-till / Cover.

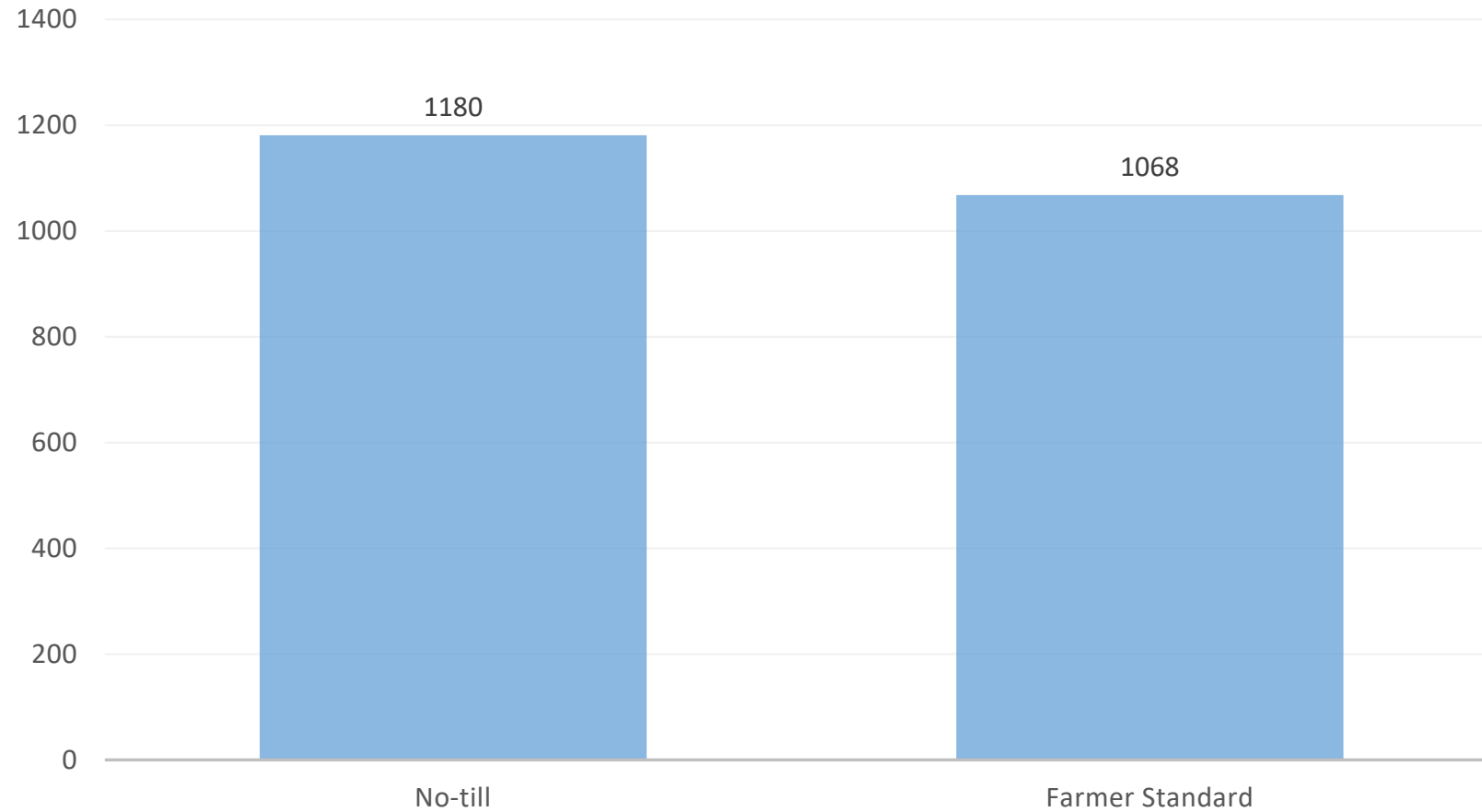
# 2015 Lint Yield Averages (2 Fields)



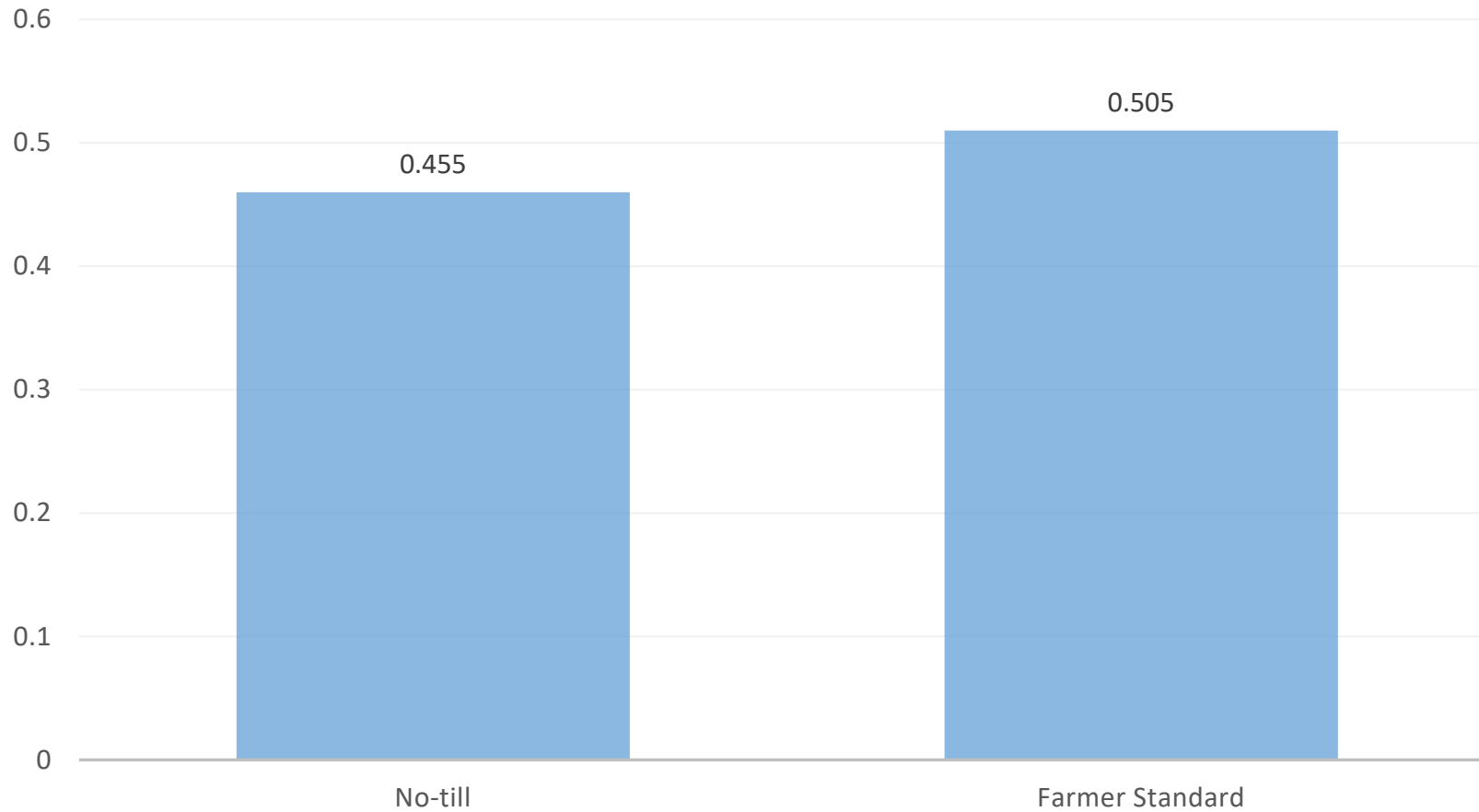
# 2016 Lint Yield Averages (2 Fields)



# Two Year Lint Yield Averages (2 Fields)



# Two Year Operating Expense (\$/lb lint) Averages (2 Fields)





# Cover Crop Economic Summary

- Cost/A averages same or less for No-till with Cover Crop
- Cost/lb Lint averages less for No-till with Cover Crop
- Cotton lint was produced \$0.05 per pound cheaper for no-till/cover compared to farmer standard till/no-cover in the two-year study

# No-till vs. Farmer Standard % change over 2 years

Parameters	No-till Cover	Farmer Standard	% Change
Yield	1180	1068	+9.49%
Operating Expenses	.455	.505	-10.99%
Land Use	.00071	.00079	-11.27%
Soil Conservation	.00075	.00235	-67.53%
Irrigation Water Use	.016	.020	-23.53%
Energy Use	5328	5967	-11.99%
Greenhouse Gas Emissions	1.26	1.40	-11.11%

# Thank You

