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Lincoln



Farm Management Competition

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West Central Research and Extension Center

2018 MOISST Workshop: From Soil Moisture Observations to Actionable Decisions

June 4-7th, 2018





Questions & Hypothesis

Major Questions

- How do we increase adoption of best management practices and technology?
- Are we the best “Teachers” of the information?
- Are we addressing the questions asked by producers?
- How do we connect with many (not a few) producers?

Hypothesis

Producers would be more apt to adopting technology and best management practices if they:

1. Were first able to try them without exposing their whole operation to unknown results.
2. Could evaluate their management practices/techniques against their peers.

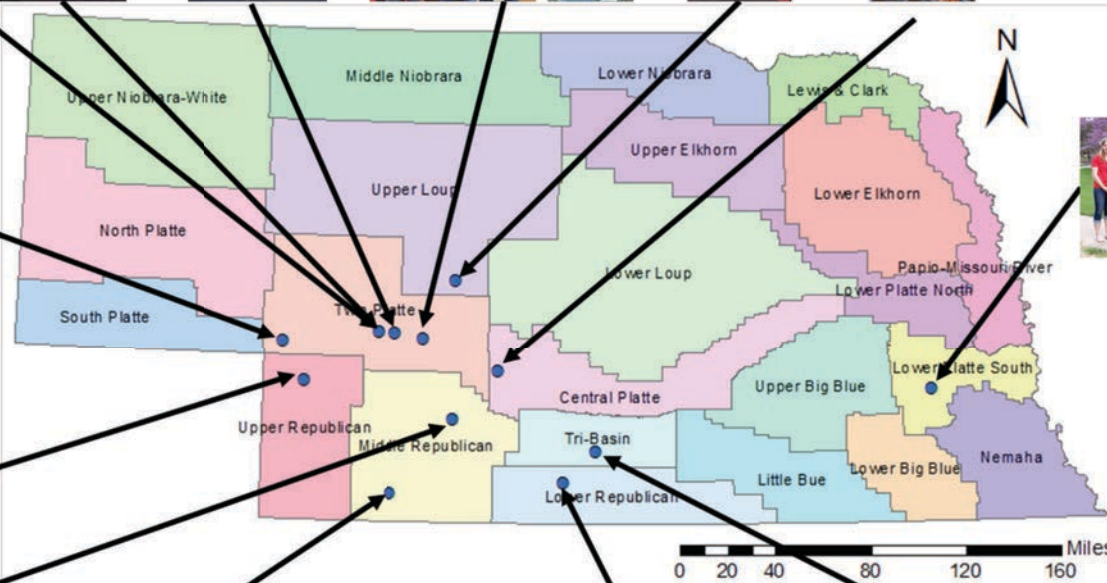
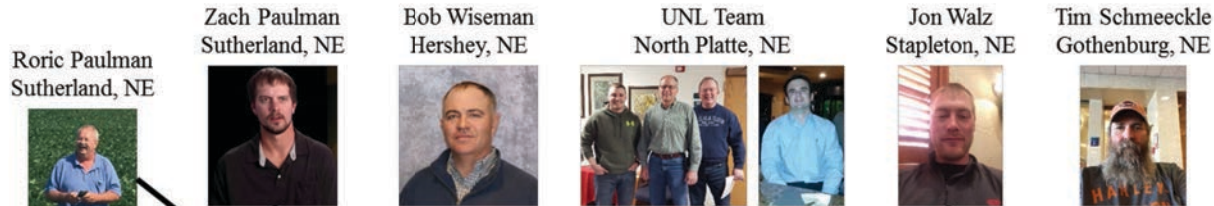
Overview



- The TAPS program enhances engagement of agricultural producers at a high level, including resource use efficiency and profitability by providing a common platform for peer-to-peer learning with participation by University scientists and industry personnel.
- The TAPS program hosts a “Farm Management Competition”
- TAPS is the platform where people can observe and use new ideas and technology, test conventional wisdom, and discover better ways to do business in an environment of friendly competition.



2017 Participants



Project Description



- Each “Farm” on paper included 3,000 harvested acres for the purposes of making decisions, but were imposed on 3 randomized plots (~0.4 acres) held under a variable rate irrigation (VRI) pivot at WCREC in North Platte, NE.
- Management decisions included:
 - Insurance Selection
 - Nitrogen Management
 - Hybrid Selection
 - Seeding Rate
 - Irrigation Management
 - Marketing Grain

Real-time decisions are logged on TAPS.unl.edu

Planting-Farm 9

[Clone content](#)

Participants will have the option of using this year's default hybrid (Dyna-Gro D53VC55RIB, see attachment) or supplying their own seed. If participants decide to supply their own, 10 lbs of seed must be delivered at WCREC by April 10th with its associated market value. The value is needed to estimate planting costs associated with simulated the 3,000 acre farm. Keep in mind that the base hybrid for the competition will the DynaGrow 113 day hybrid. The competition field will be picked when this hybrid is near 18% moisture content. Hybrids picked at that time will be charged a drying cost of \$0.04 per point per bushel above 15.5%.

Participants will decide on the planting population density (seeds per acre based on a 30 in row spacing).

Hybrid

Cost

(\$/bag)

Population Density

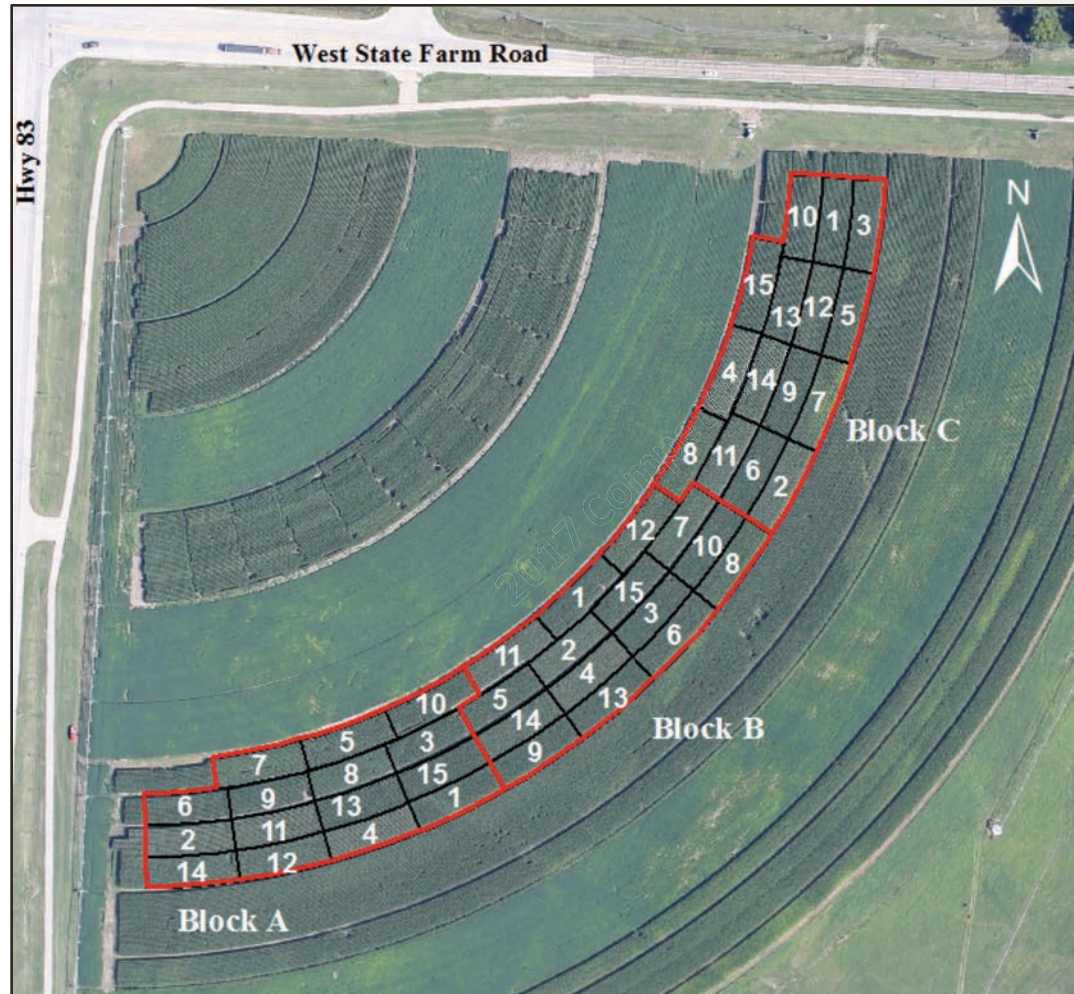
(seeds/acre)



2017 Site Description



- West Central Research and Extension Center (WCREC) in North Platte, NE
- Competition Design
 - 15 “Farms”
- Soil Type
 - Cozad Silt Loam
- Climate
 - Semi-Arid
- Seasonal Rainfall
 - 13.8 inches



Awards



1. Most Profitable Farm

- Amount = \$2,000

2. Highest Input Use Efficiency

- Amount = \$1,000

3. Greatest Grain Yield

- Amount = $\$500 \times (\text{Percent of Most Profitable Farm})$
 - Example: Farm 1 has highest yield, but only profited 78% of the most profitable farm.
 - $\$500 \times 0.78 = \390

What Happened?



Kick-off Meeting
March 20th



Crop Emergence
May 19th



First Irrigation
June 16th



First Fertigation
June 28th



WCREC Field Day
& Grower Panel
August 24th



Harvest
November 2nd



Awards Banquet
December 12th



Pre-Plant Nitrogen
May 5th



Planting
May 9th



Sidedress Nitrogen
June 12th



Field Tour &
Industry Workshop
June 27th



Insecticide Applied
July 27th



Plant Sampling
October 16th



Marketing Closed
November 22nd





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Decisions Made



Submitting Management Decisions



Nebraska Testing Ag Performance Solutions Farm Farm Demo Forward Contract



HOME

FARM

RESOURCES

PARTICIPANTS

SPONSORS

CONTACT US



CONTACT US



Forward Contract-Farm Demo

DATE OF TRANSACTION

Aug 24 2017

Contracted value (\$/bu)

3.85

Quantity (Bushels)

100,000

Delivery Point

North Platte Ag Valley

DELIVERY DATE

Dec 1 2017

SUBMIT

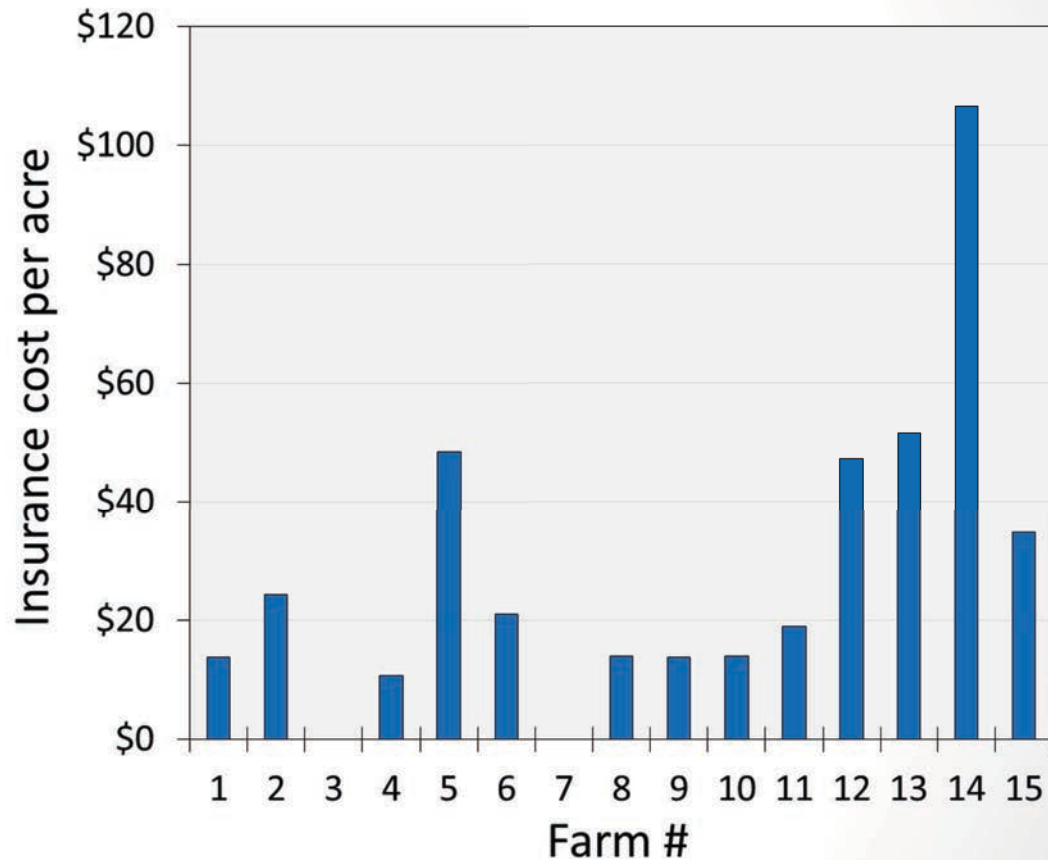
1 technologist.
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Insurance Cost



Farm #	Insurance Package	Hail Coverage	Wind Coverage
1	RP - EU - 80%	-	-
2	YP - OU - 75%	DDA: \$100	-
3	-	-	-
4	RP - OU - 65%	-	-
5	RP - OU - 75%	2/10: \$200	-
6	RP - OU - 65%	DDA: \$100	-
7	-	-	-
8	RP - OU - 70%	-	-
9	RP - EU - 80%	-	-
10	YP - OU - 75%	-	-
11	RP - EU - 70%	2/10: \$100	-
12	RP - EU - 80%	2+: \$150	-
13	RP - OU - 70%	2/5: \$200	-
14	RP - OU - 85%	2.5/15: \$300	\$300
15	RP - OU - 75%	DDB: \$200	-



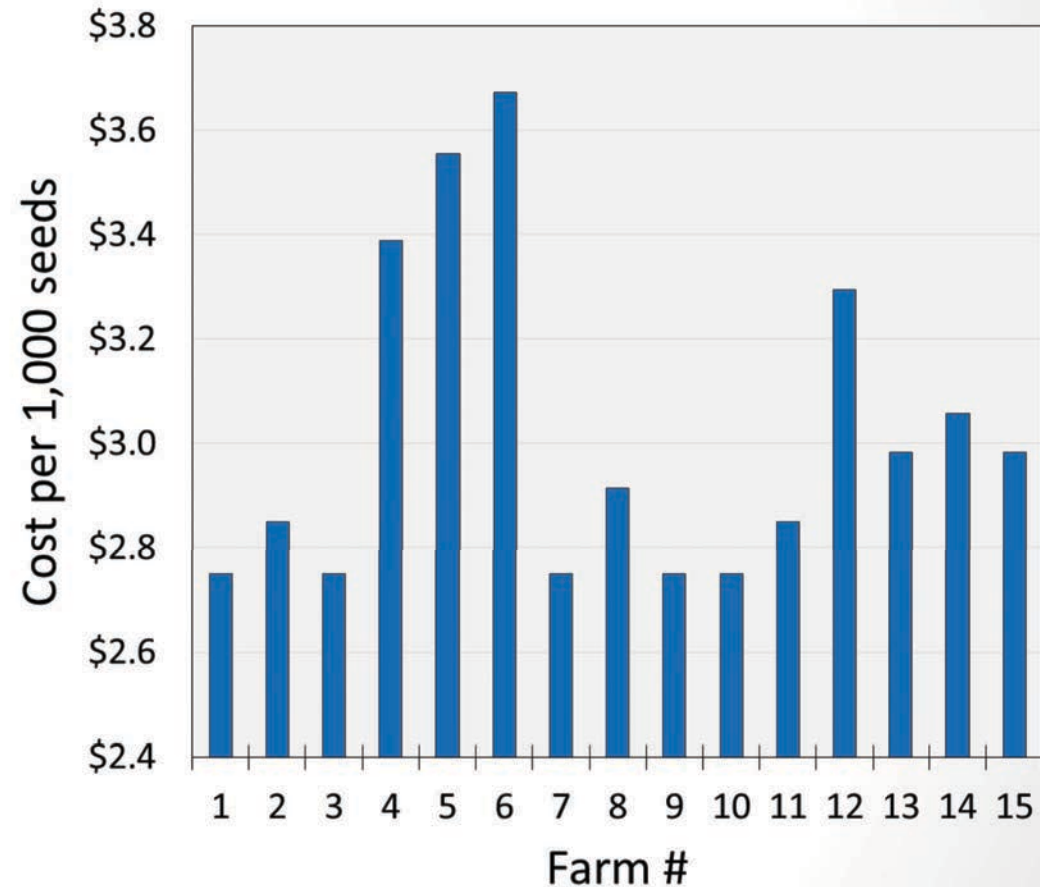
RP: Revenue Protection; YP: Yield Protection
 EU: Enterprise Units; OU: Operational Units



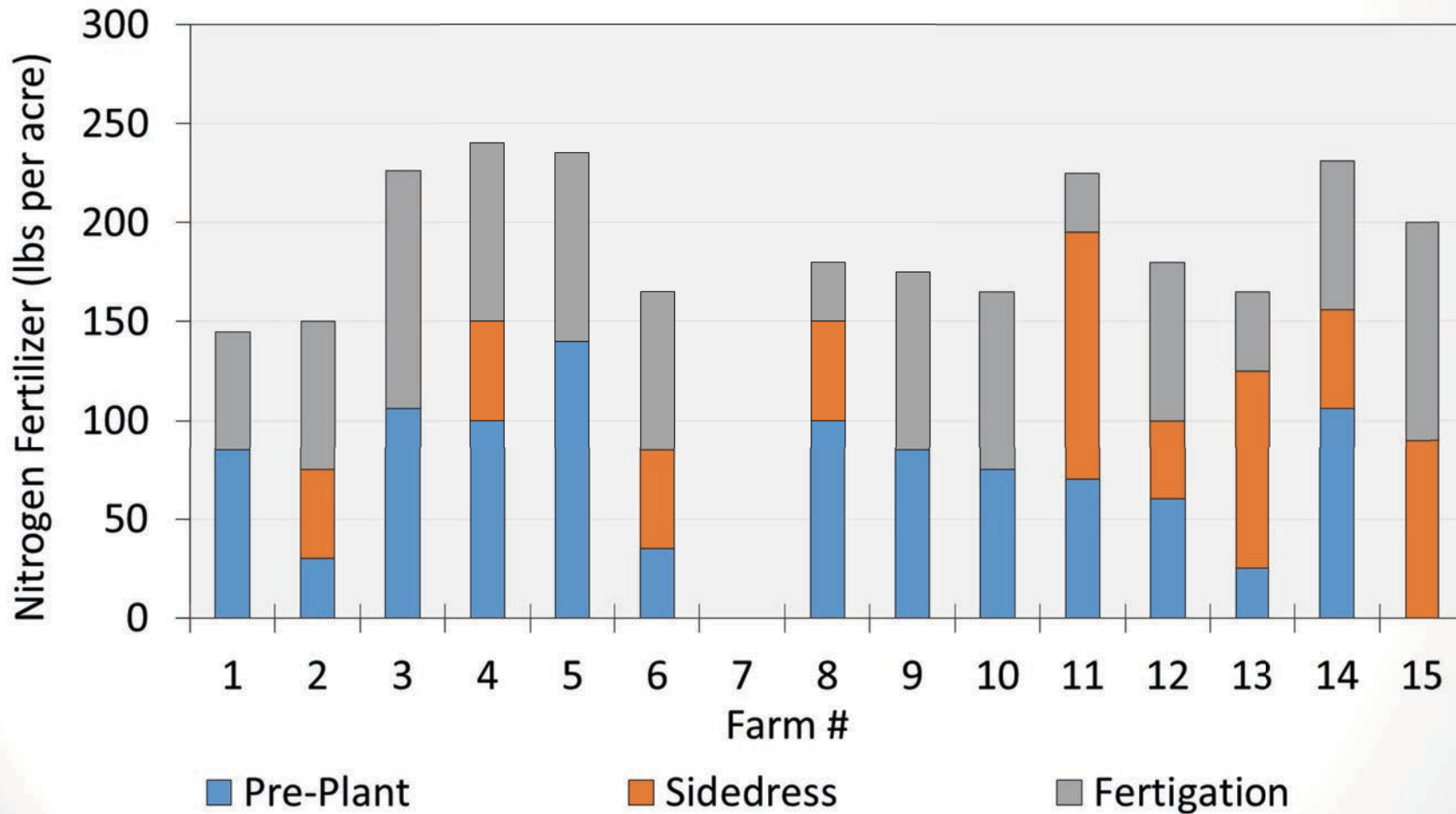
Hybrid Selection and Seeding Rate



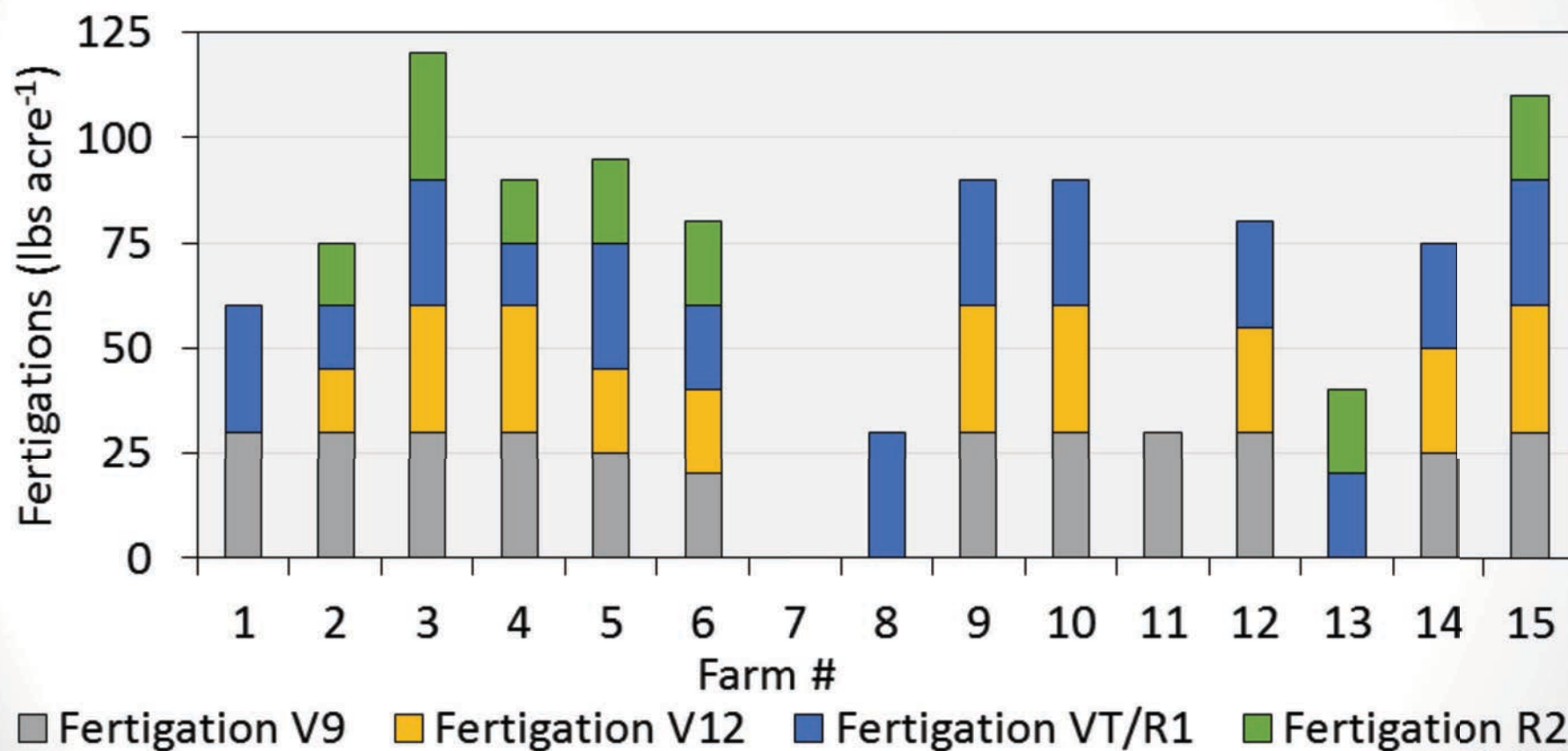
Farm #	Hybrid	Seeding (seeds/acre)
1	Dyna-Grow D53VC55RIB	34,000
2	Pioneer 801AM	30,000
3	Dyna-Grow D53VC55RIB	28,000
4	NuTech 5L-713	32,000
5	Dekalb 63-60RIB	33,500
6	Channel 210-26ST RIB	34,000
7	Dyna-Grow D53VC55RIB	34,000
8	Renk 877 Droughtgard	33,000
9	Dyna-Grow D53VC55RIB	34,000
10	Dyna-Grow D53VC55RIB	34,000
11	Pioneer 801AM	31,000
12	Fontanelle 11A224	34,500
13	Pioneer P1197AM	32,000
14	Golden Harvest G09Y24 3220a	30,000
15	Pioneer P1197AM	34,000



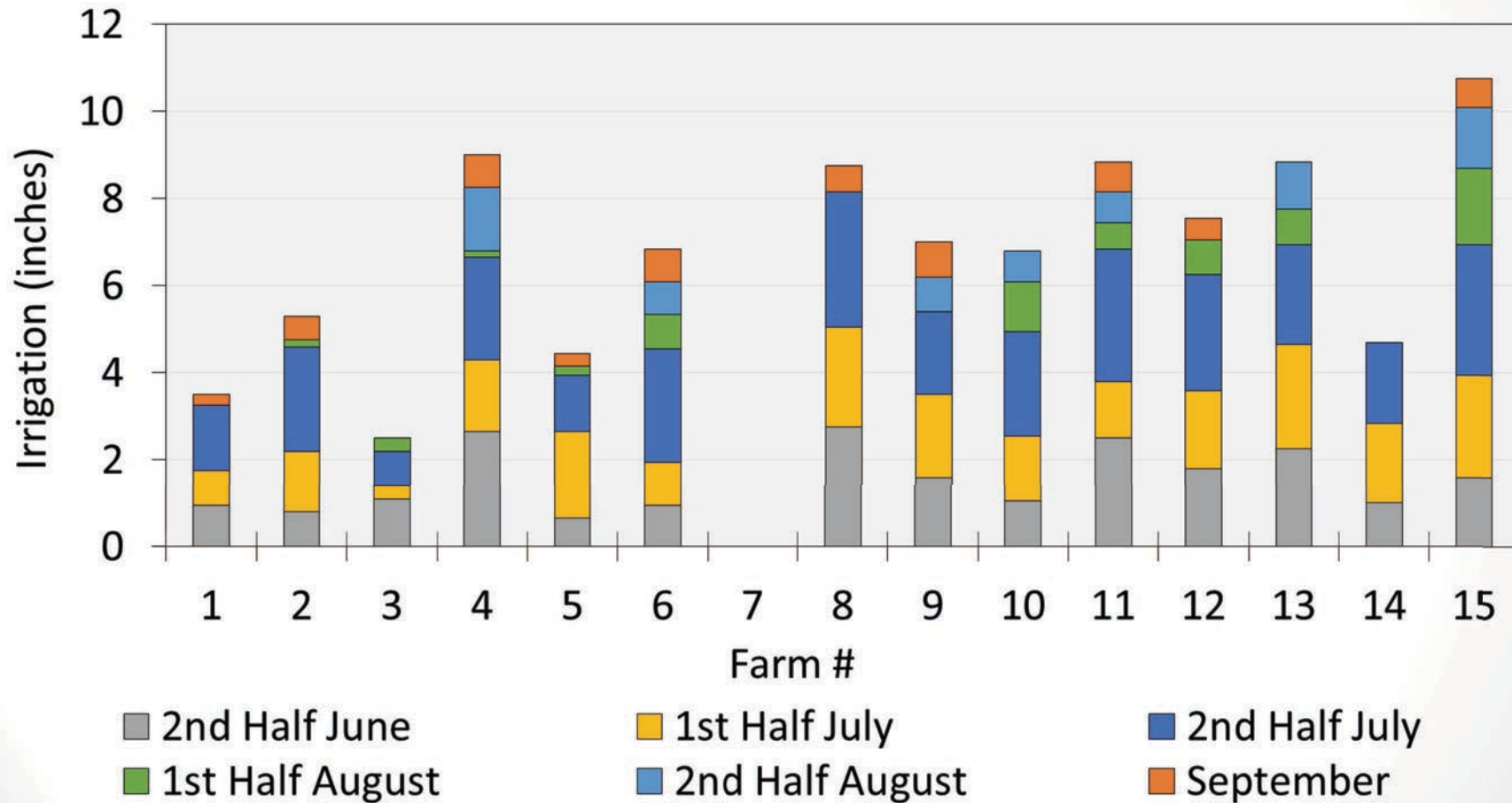
Nitrogen Management



Nitrogen Management (Fertigation)



Irrigation Management





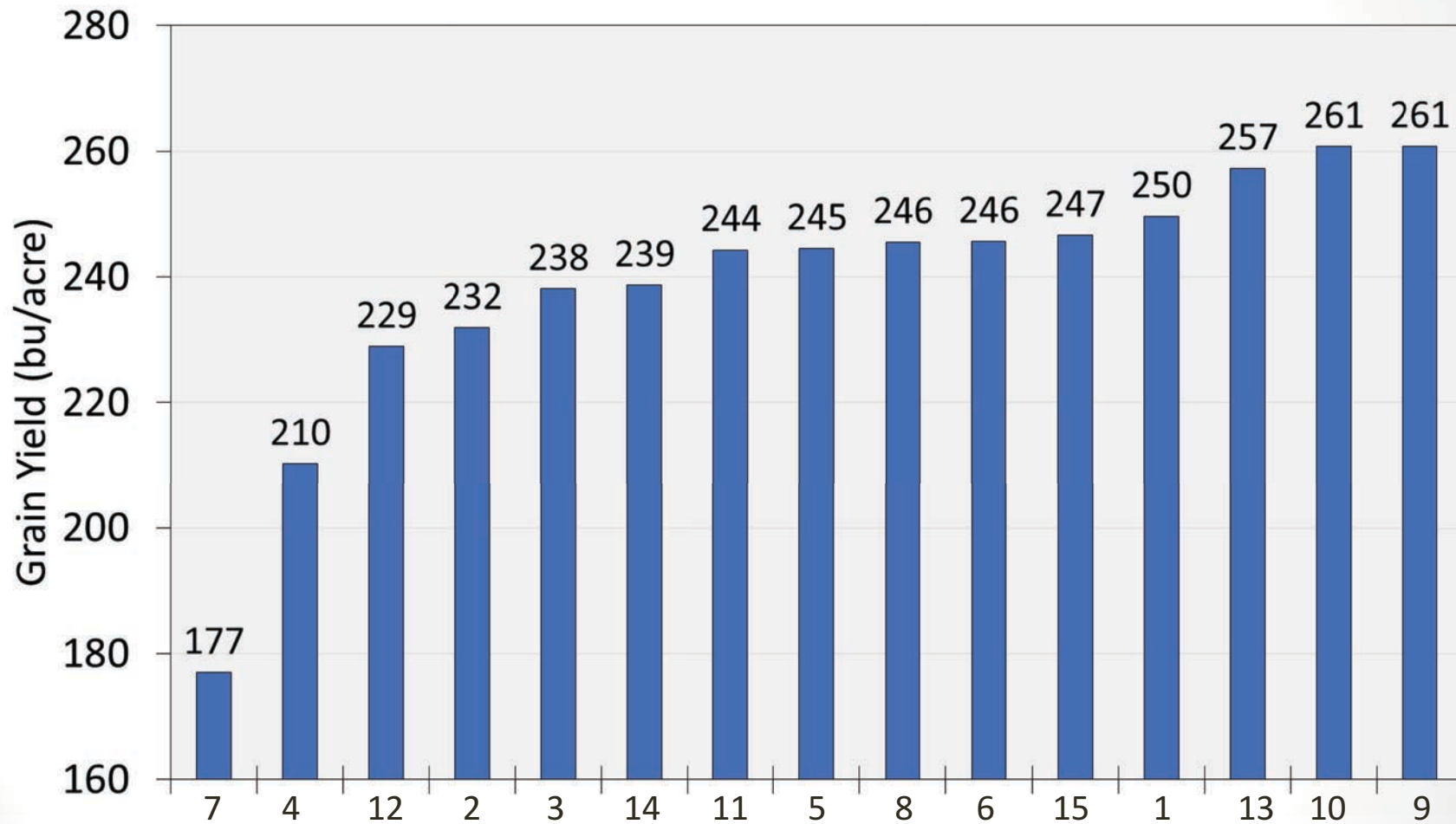
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Farm Results & Awards



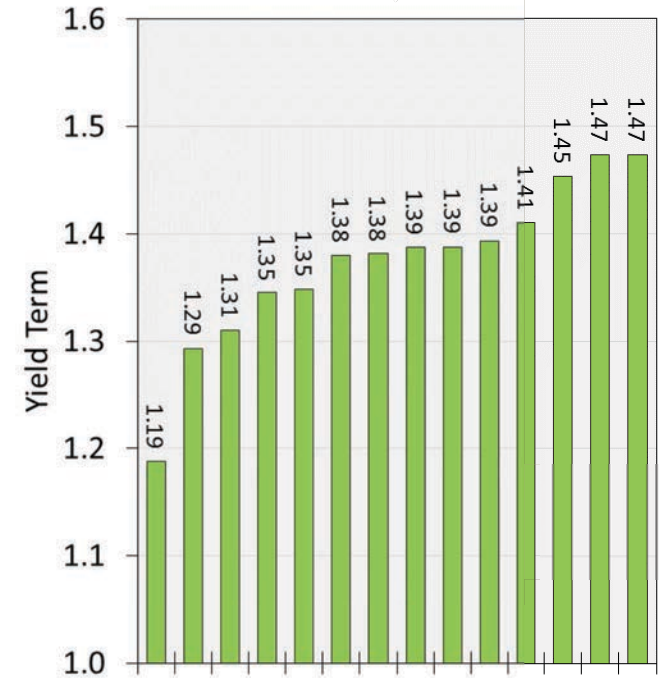
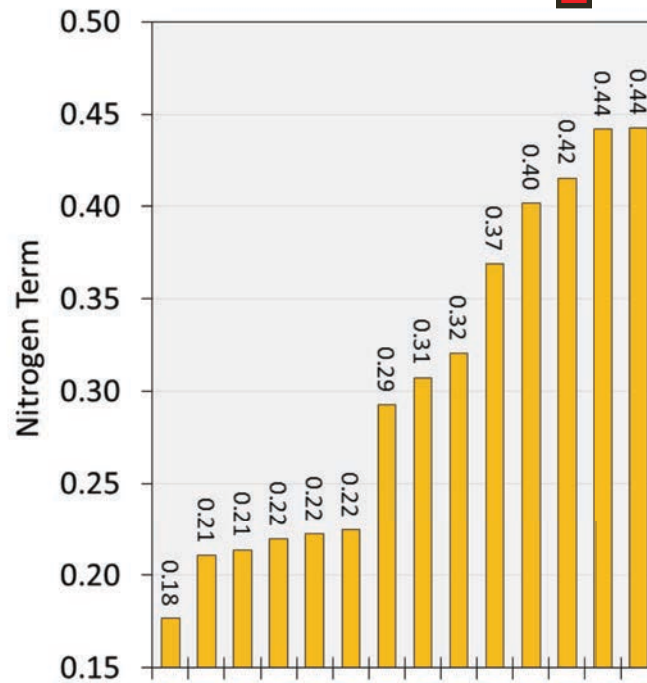
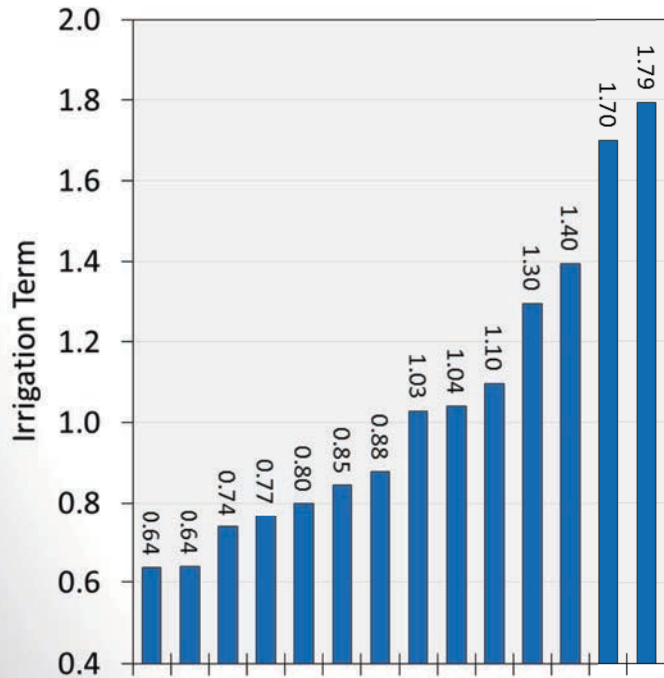
Grain Yield



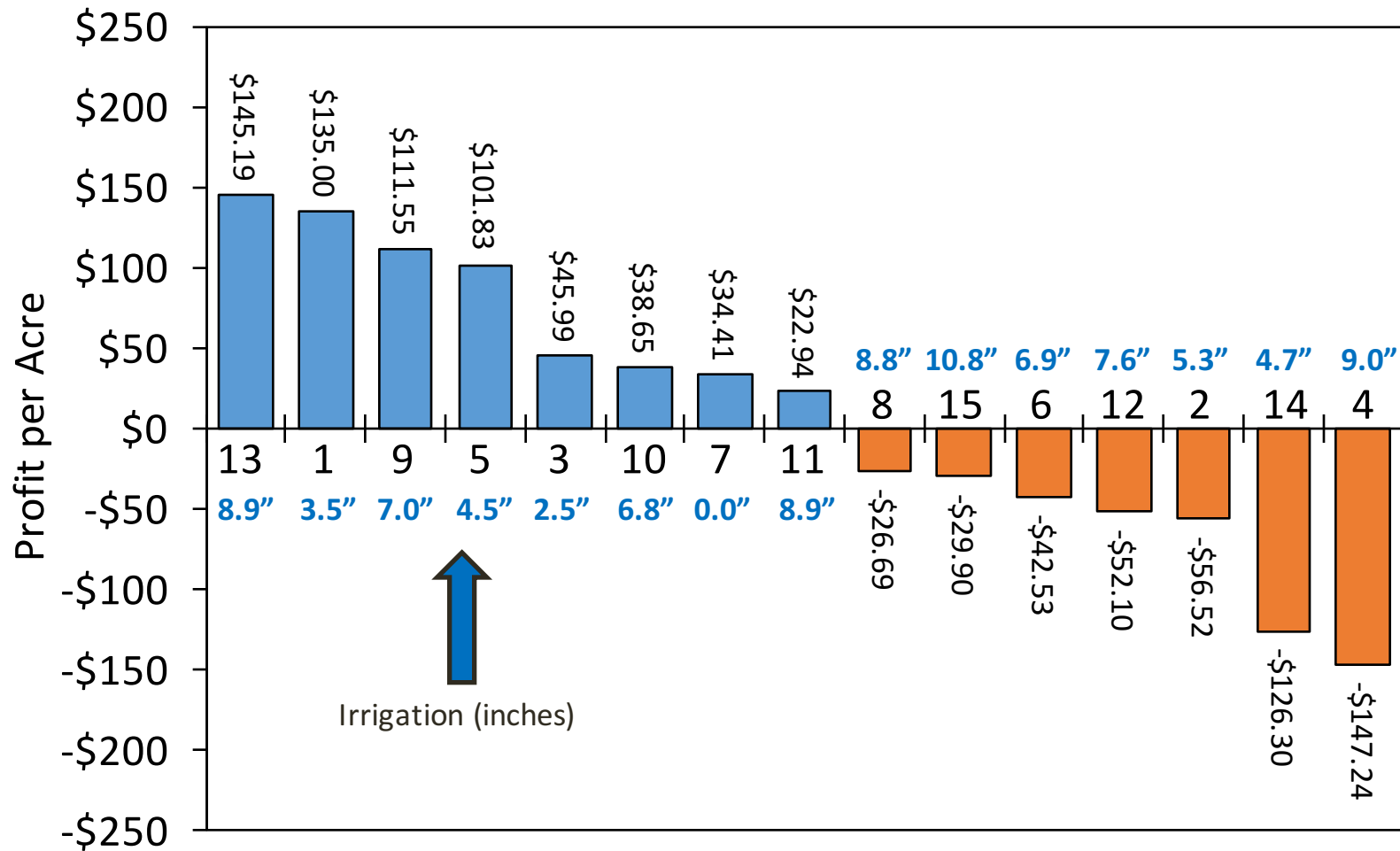
Input Use Efficiency



$$\text{Input Use Efficiency} = \frac{\text{Rank} \left[\frac{(ET_{Farm} - ET_{Irrigation})}{ET_{Farm}} \right] + \text{Rank} \left[\frac{(GNU_{Farm} - N_{Term})}{N_{Term}} \right] + \text{Rank} \left[\frac{Yield_{Farm}}{Yield_C} \right]}{\text{Rank} \left[\frac{ET_{Farm}}{ET_{Irrigation}} \right] + \text{Rank} \left[\frac{GNU_{Farm}}{N_{Term}} \right] + \text{Rank} \left[\frac{Yield_{Farm}}{Yield_C} \right]}$$



Farm Profitability



Highest Input Use Efficiency & Yield Award



Farm # 10

Tim Schmeckle of Gothenburg, NE

Cash Award: \$1,000

Hybrid: Dyna-Grow D53VC55RIB
Seeding Rate: 34,000 plants/acre
Irrigation: 6.80 inches
Nitrogen: 165 lbs/acre
Yield: 260.7 bushels/acre
ETUE: 1.04; GNUE: 0.42; Y_{ratio} : 1.47



Most Profitable Farm



Farm # 13

Roric Paulman of Sutherland, NE

Cash Award: \$2,000

Hybrid: Pioneer P1197AM

Seeding Rate: 32,000 plants/acre

Irrigation: 8.85 inches

Nitrogen: 165 lbs/acre

Yield: 257.3 bushels/acre

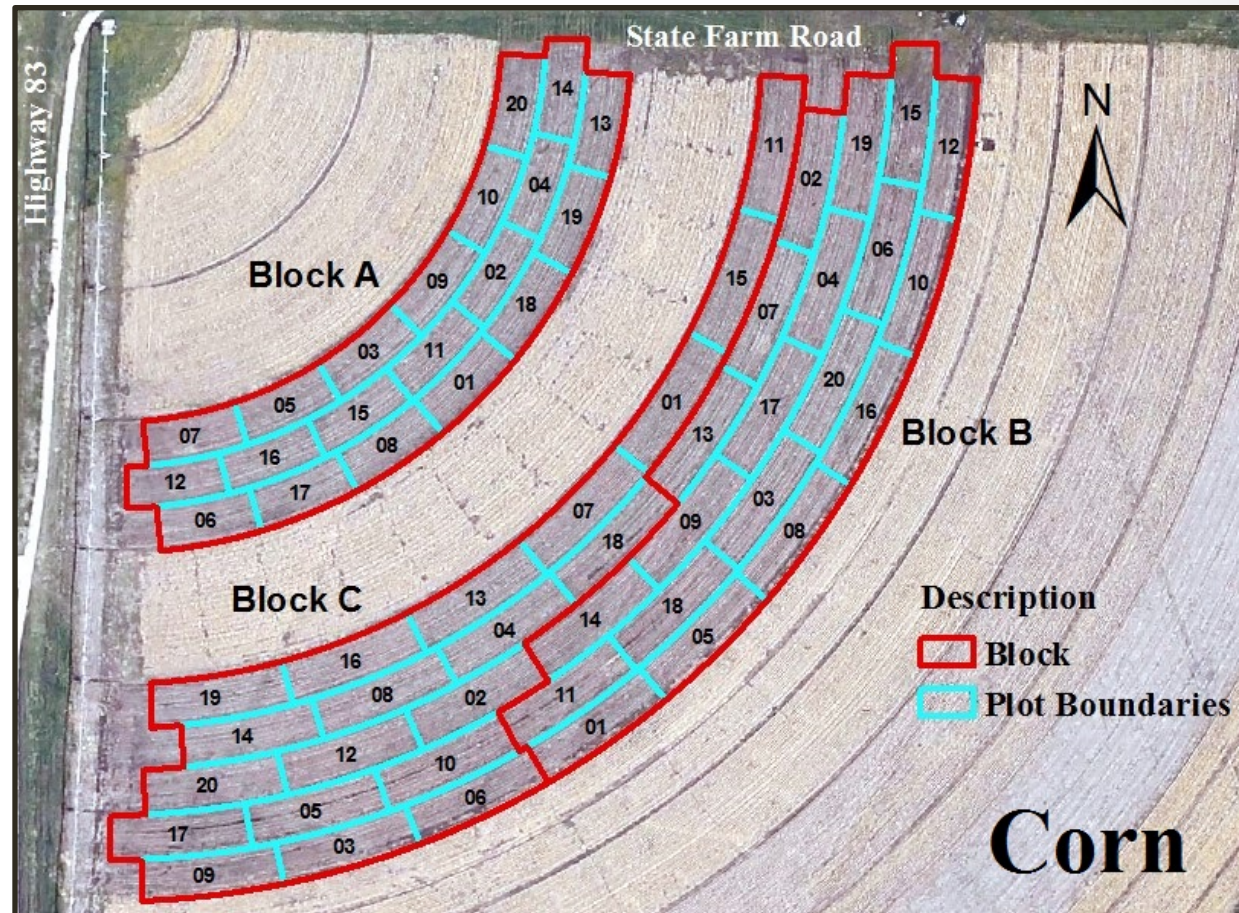
Profit: \$146.89 per acre



2018 Site Description



- West Central Research and Extension Center (WCREC) in North Platte, NE
- Competition Design
 - 20 Corn Farms
 - 8 Sorghum Farms
- > 80 individuals
- New technologies
 - Soil Sensors
 - Plant Sensors
 - Imagery
 - Etc.



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Understanding the Results



What information was collected?



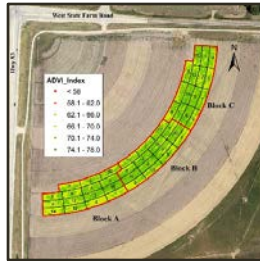
Data has been generated on:

- Soil, plant, and atmospheric conditions

--- Plant Sensing ---



----- Imagery -----



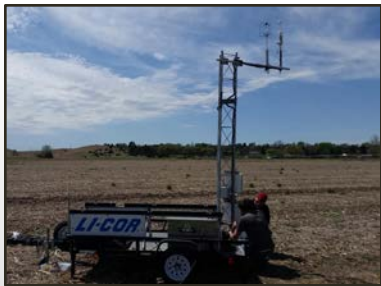
--- Residue ---



--- Field Scouting ---



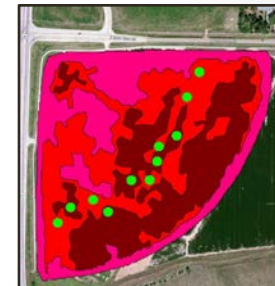
----- Evaporative Demand -----



--- Soil Water ---

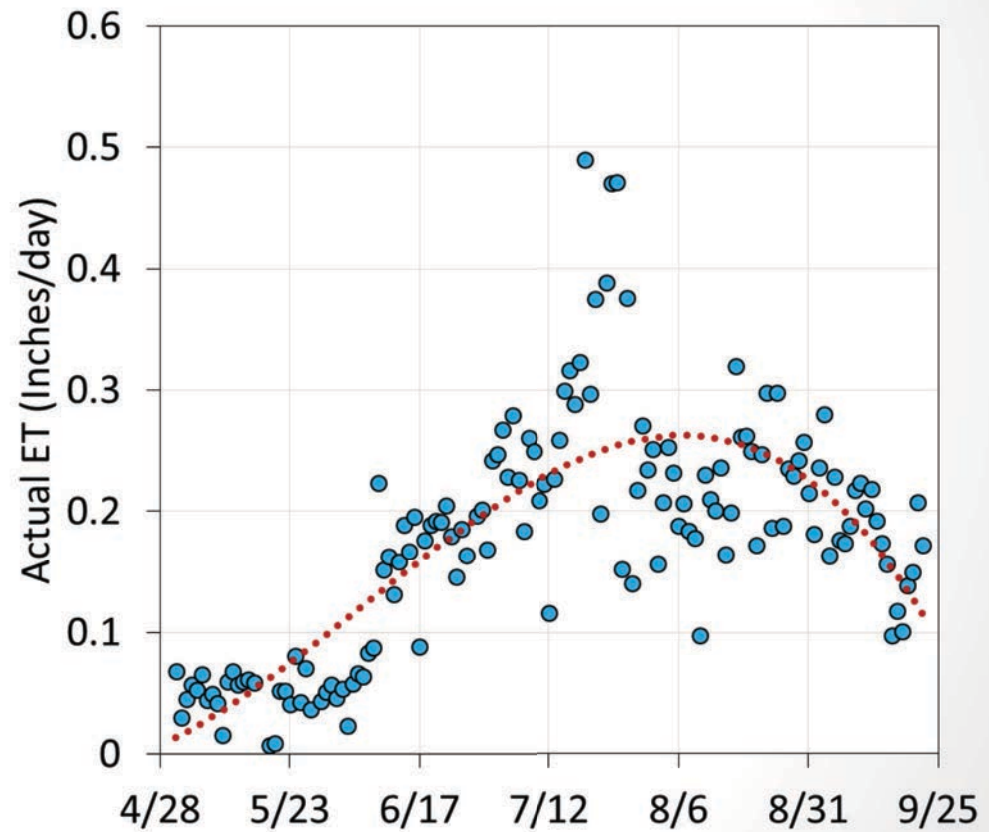


----- Soil Properties -----



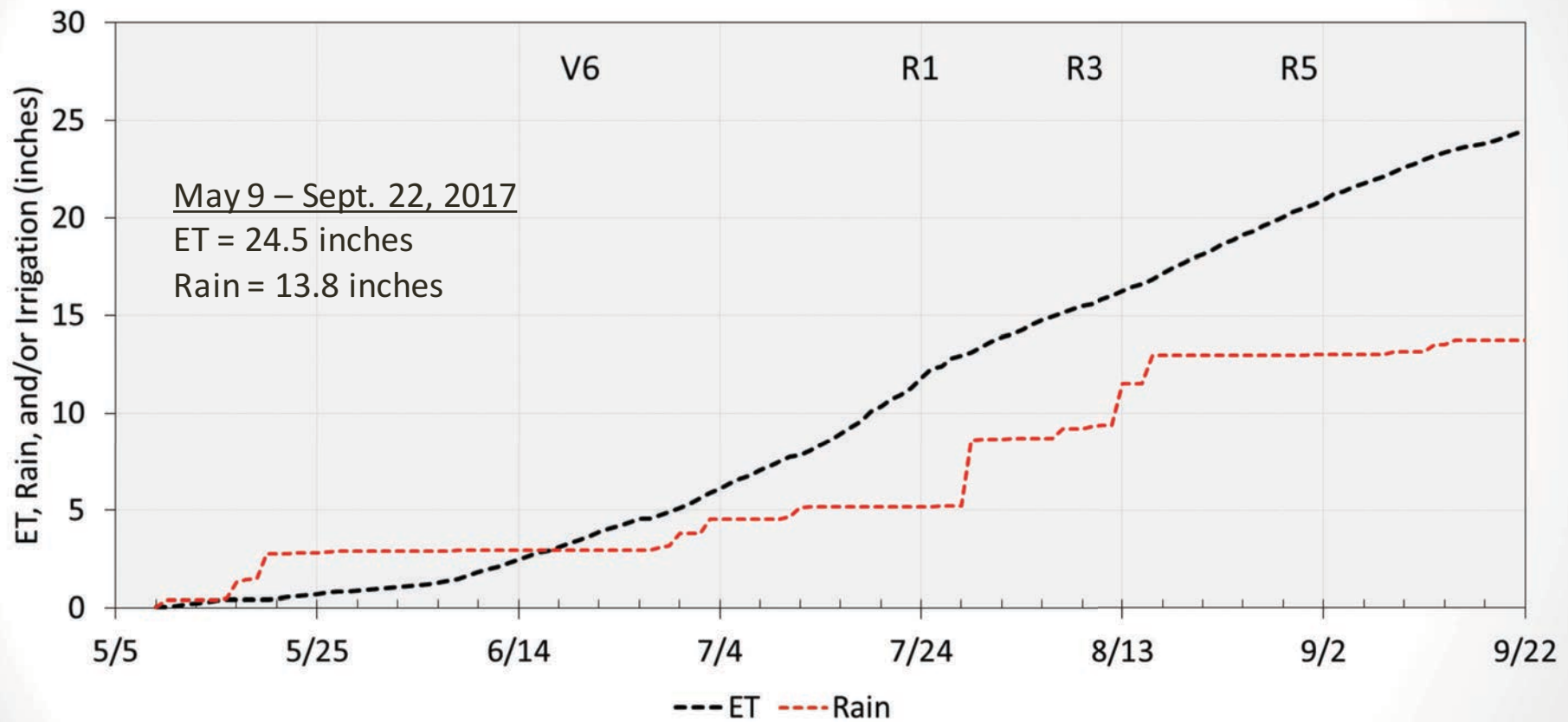
Crop Water Use (Evapotranspiration)

LI-COR

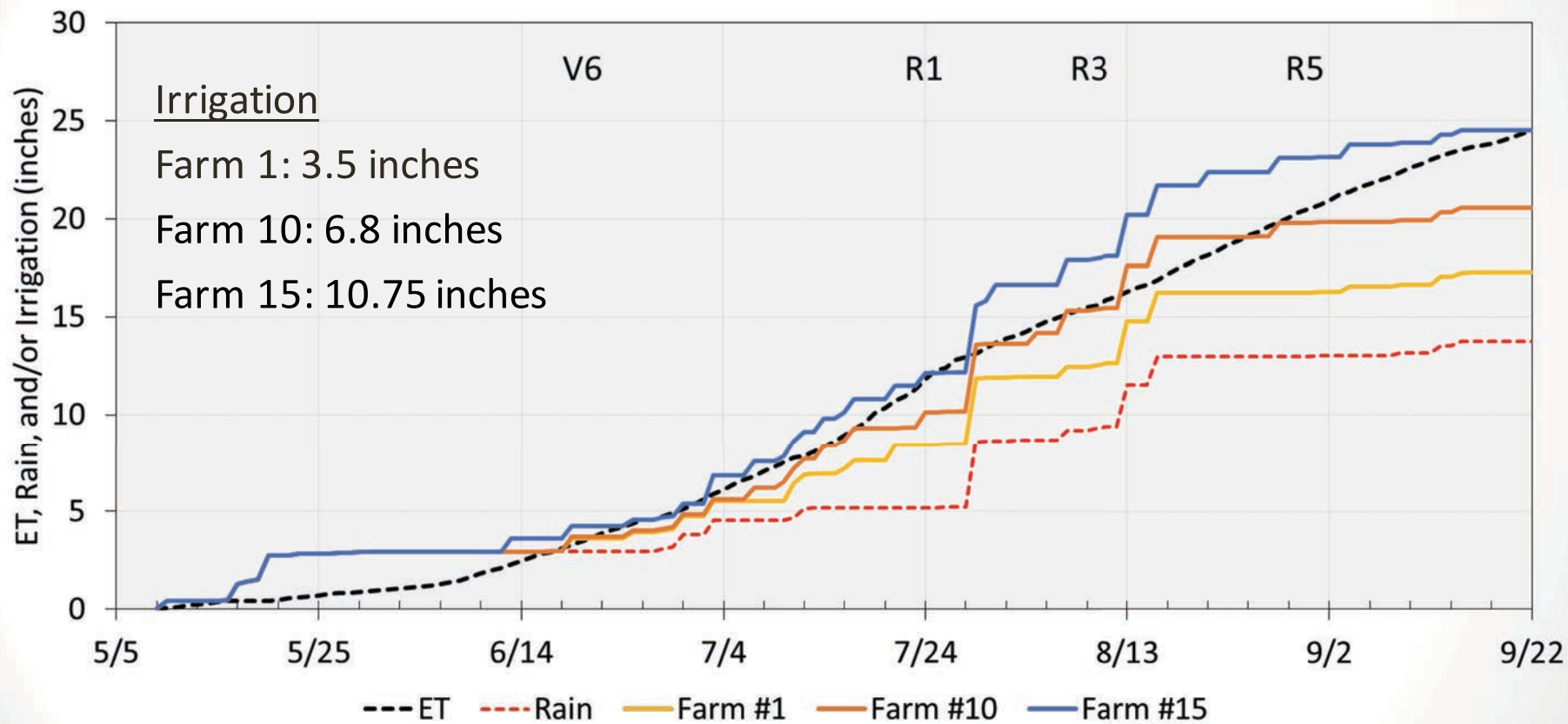


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ET vs. Water Supply



ET vs. Water Supply

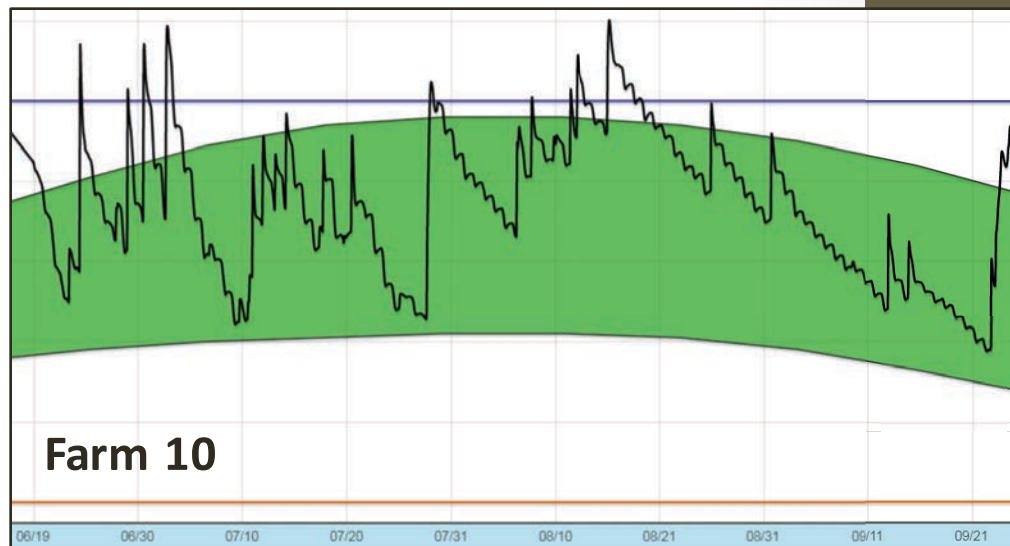
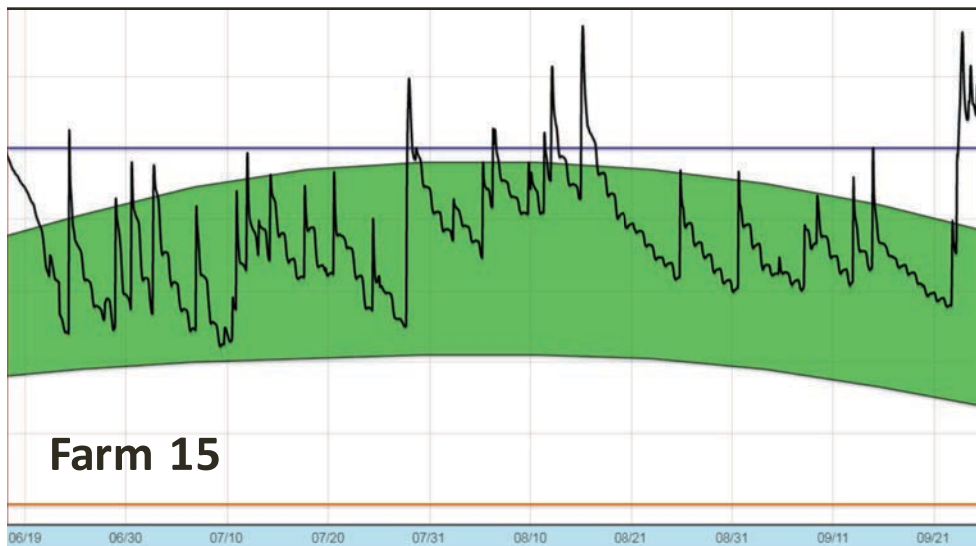


Soil Water Status

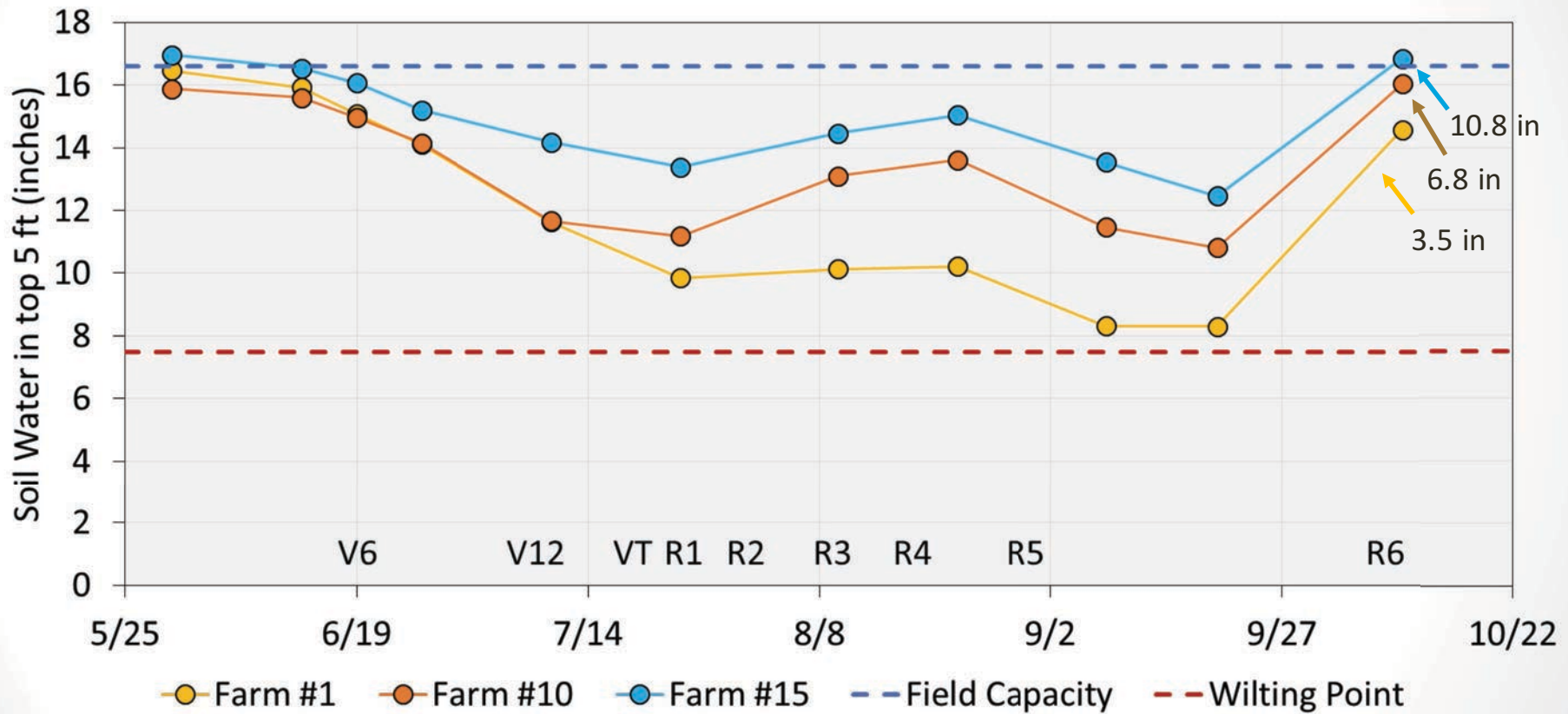
Farm 1: 3.5 inches

Farm 10: 6.8 inches

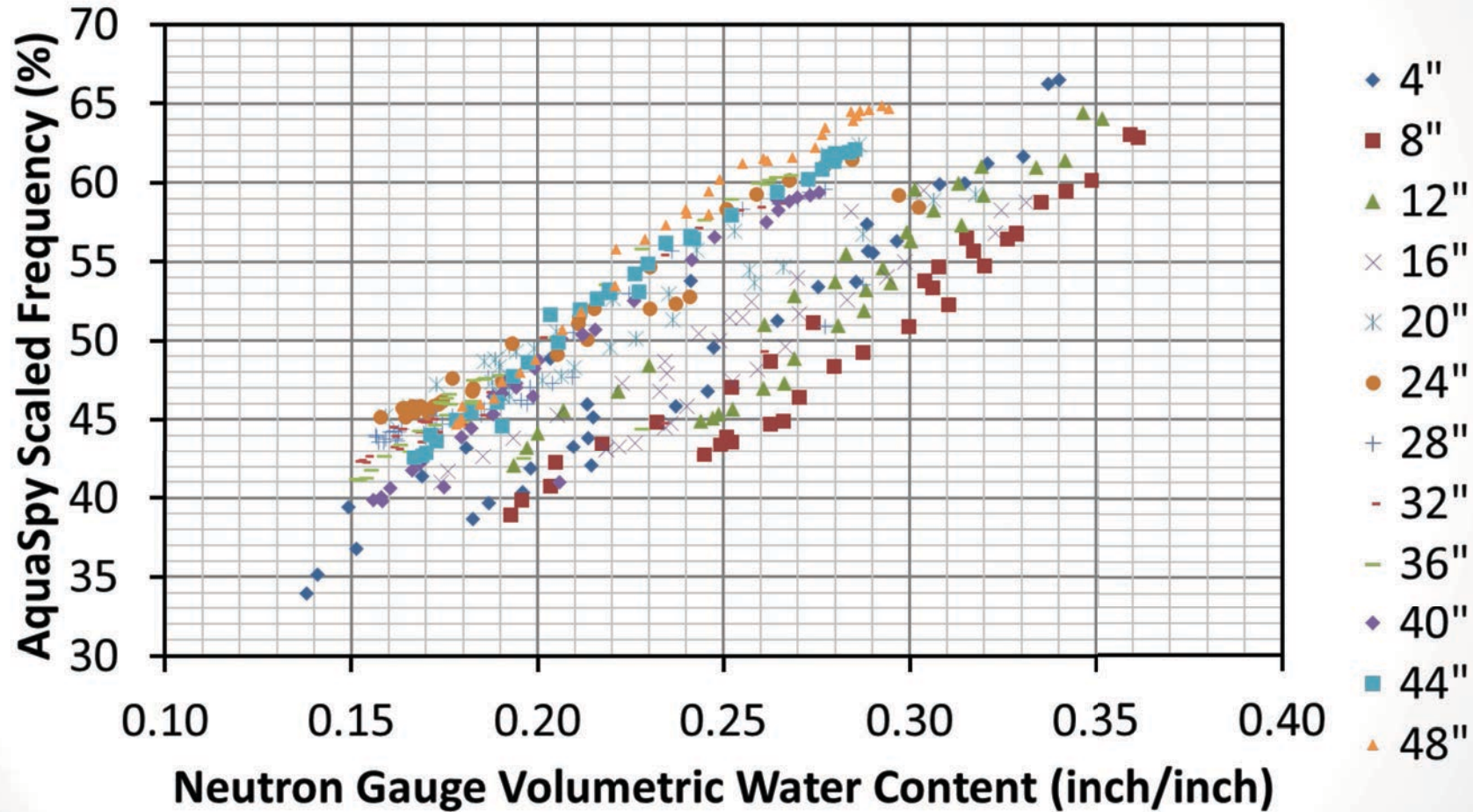
Farm 15: 10.75 inches



Volumetric Water Content



AquaSpy Sensor Response



Canopy Temperature Sensors



Infrared Thermometry

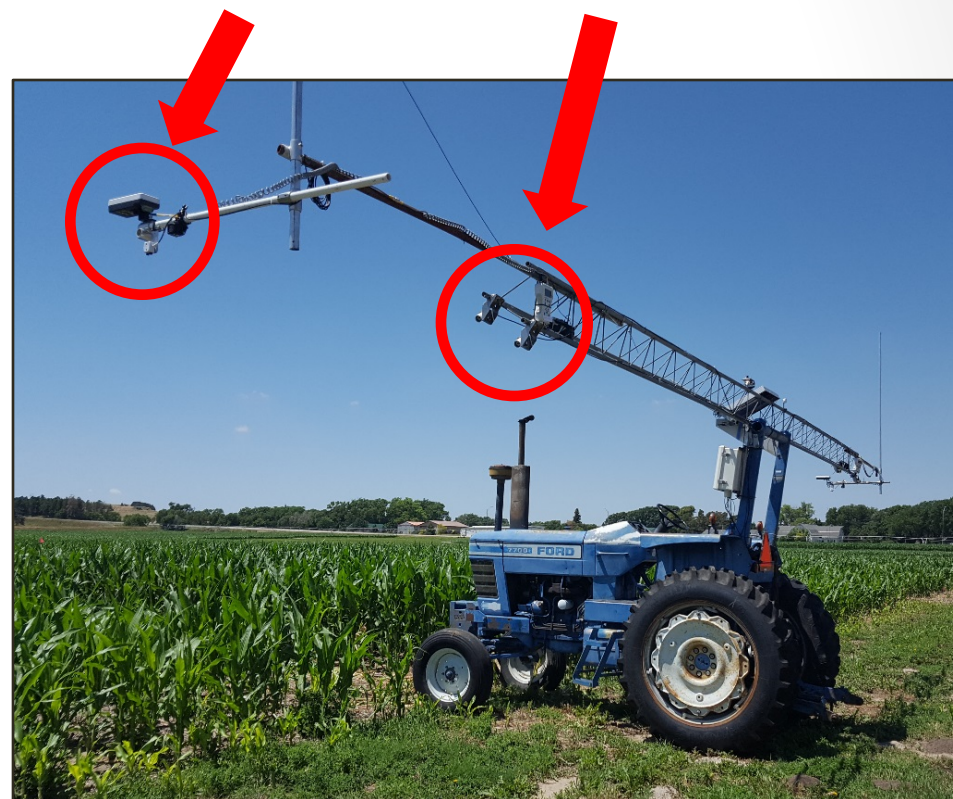
- Ideal method to monitor crop stress since it is non-destructive, scalable, continuous, and less expensive than alternative methods (DeJonge et al., 2015)

Crop Circle (Canopy Reflectance)

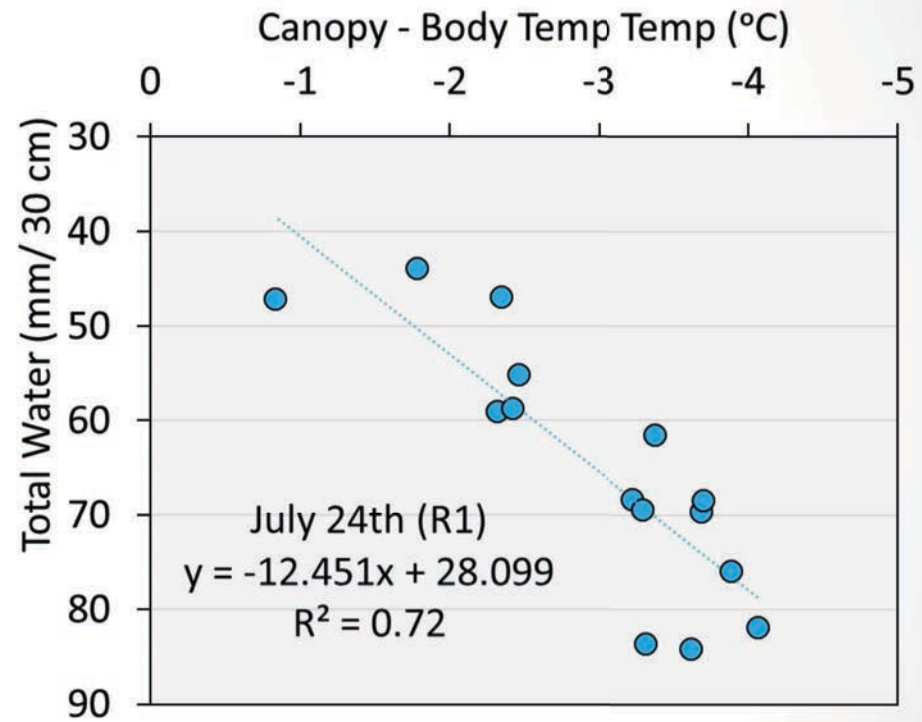
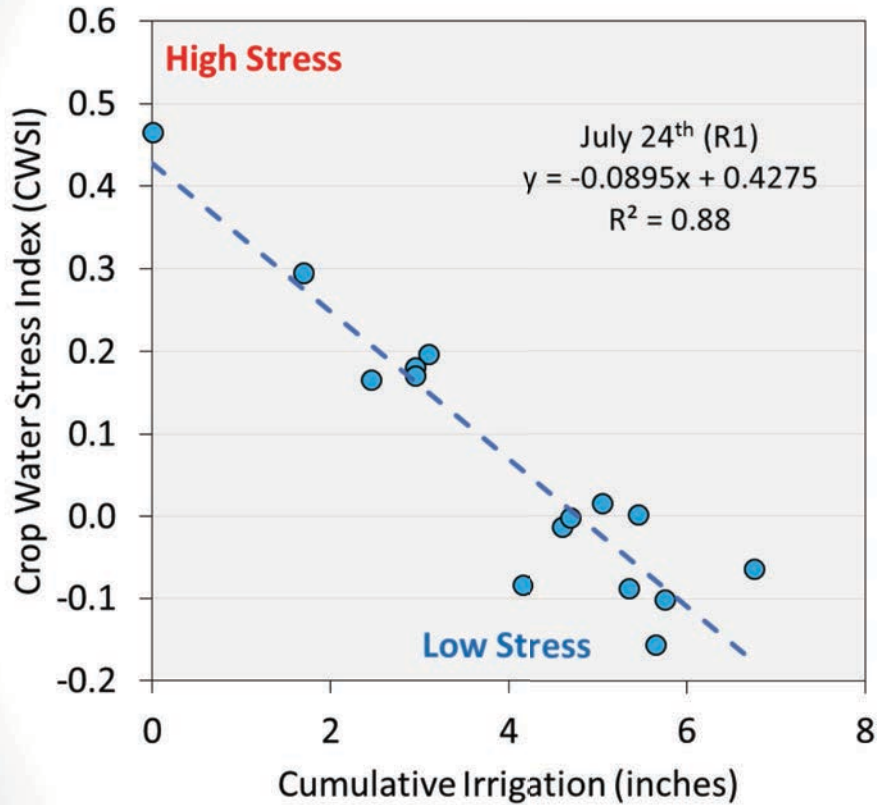
- Active canopy sensor that provides canopy reflectance data. Often used to assess differences in nitrogen status.

Canopy Reflectance

Canopy Temperature



Canopy Temperature



Baselines taken from Payero and Irmak (2006)



Growth Stages & Visual Differences

August 9th – Milk (R3)



Farm 1



Farm 2



Farm 3



Farm 4



Farm 5



Farm 6



Farm 7



Farm 8



Farm 9



Farm 10



Farm 11



Farm 12



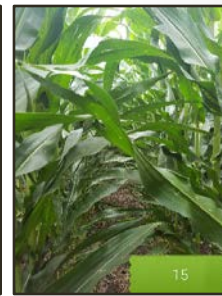
Farm 13



Farm 14



Farm 15



August 9th, 2017



Comparison of Ears



Comparison of Ears and Plants



Farm #	Kernels per Ear (g)	Above Ground Biomass (g/plant)	Plant Height (in)	V12 N% Leaf (%)	Stalk Nitrate (ppm N)
1	538	127	103	2.88+	2988
2	712	135	112	3.09	3564
3	597	152	102	3.02	4497
4	615	146	122	3.09	7543
5	603	123	106	3.05	7189
6	556	115	97	2.88+	5841
7	538	107	91	2.58+	208+
8	579	148	113	3.05	6316
9	563	126	103	2.93+	4177
10	568	129	104	2.75+	3133
11	734	133	117	3.28	7018
12	613	118	106	2.88+	5507
13	653	134	111	3.32	4229
14	656	136	113	2.91+	9971
15	541	129	113	3.24	3878

Bold: Statistically Different than UNL's Full Treatment (**Farm #9**)

+ Insufficient nitrogen status



Sponsors



Thank You!



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