Water Technology Farms UPDATE

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Kansas Water Office

OgallalaWater.org
OPTIMIZING WATER USE TO SUSTAIN FOOD SYSTEMS

KANSAS STATE UNIVERSITY

VISION STATEMENT

Vision:

Kansans *act on a shared commitment to have the water resources necessary to support the* ***state's social, economic and natural resource*** *needs for* ***current and future generations.***

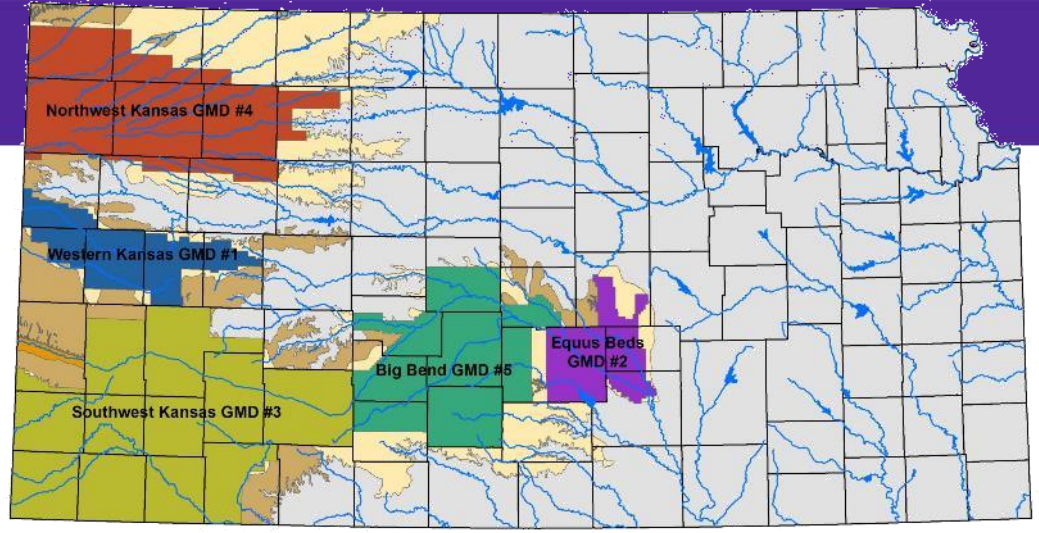
- At every point in the Vision development process, the Water Vision Team has been reminded the key to a reliable, long-term water supply is rooted in every Kansan understanding the importance of the state's water resources.
- The Vision statement calls on every Kansan, as stakeholders, to not only commit to ensuring a reliable water supply but also to act on that commitment.
- The Vision attempts to make clear water is necessary for human-health and welfare as well as environmental stewardship and our economic well-being.
- The Vision is also based on the concept that water is not only important for today but also for our future as a state.

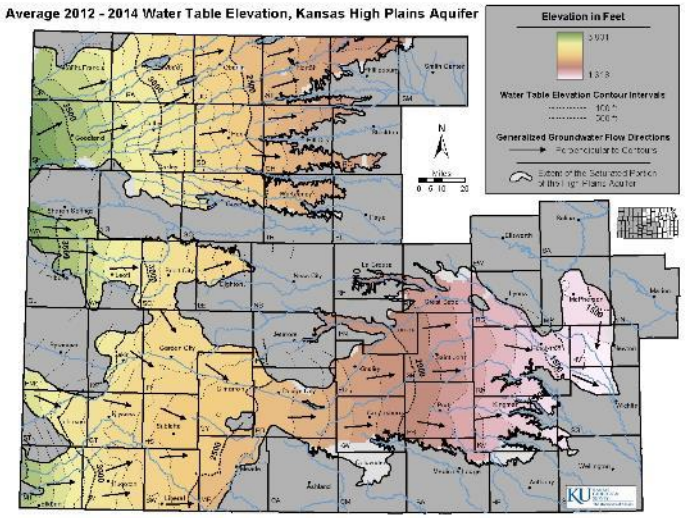
Mission:

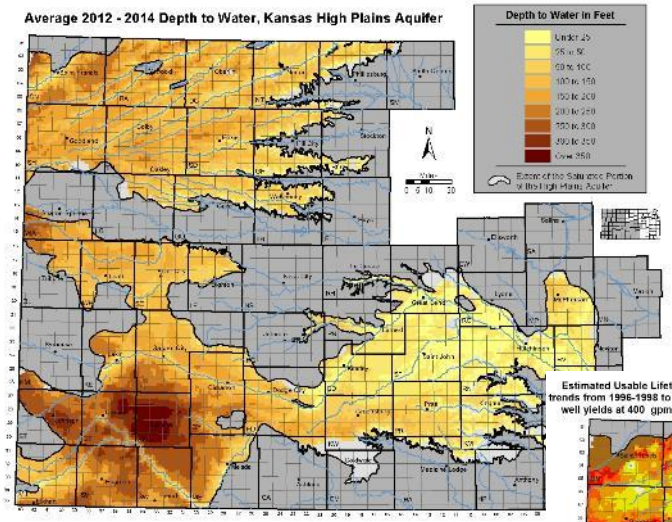
Provide Kansans *with the framework, policy and tools,* ***developed in concert with stakeholders****, to manage, secure and protect a reliable, long term statewide water supply while balancing conservation with economic growth.*

Locally driven solutions have the highest opportunity for long term success. Therefore, the intentional focus of the action items presented in the Vision are to provide the necessary tools and support to allow for greater flexibility and management of water resources at the local level.

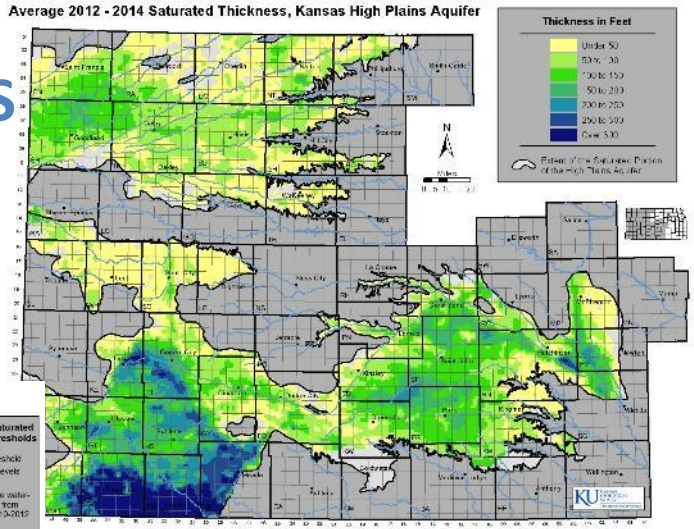
1. Locally driven solutions have the highest opportunity for long term success. Therefore, the intentional focus of the action items presented in the Vision are to provide the necessary tools and support to allow for greater flexibility and management of water resources at the local level.
2. Policies and programs should not unintentionally penalize those who have already demonstrated good stewardship with the state's water resources.
3. Voluntary, incentive and market-based water conservation and land management activities are the preferred tools for ensuring a reliable statewide water supply.
4. Action is necessary now to ensure a reliable supply into the future.

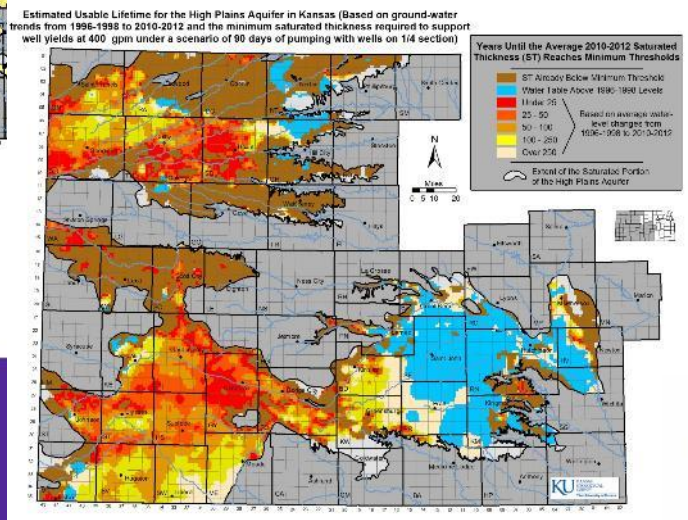






LOCAL CONDITIONS ARE DIFFERENT!





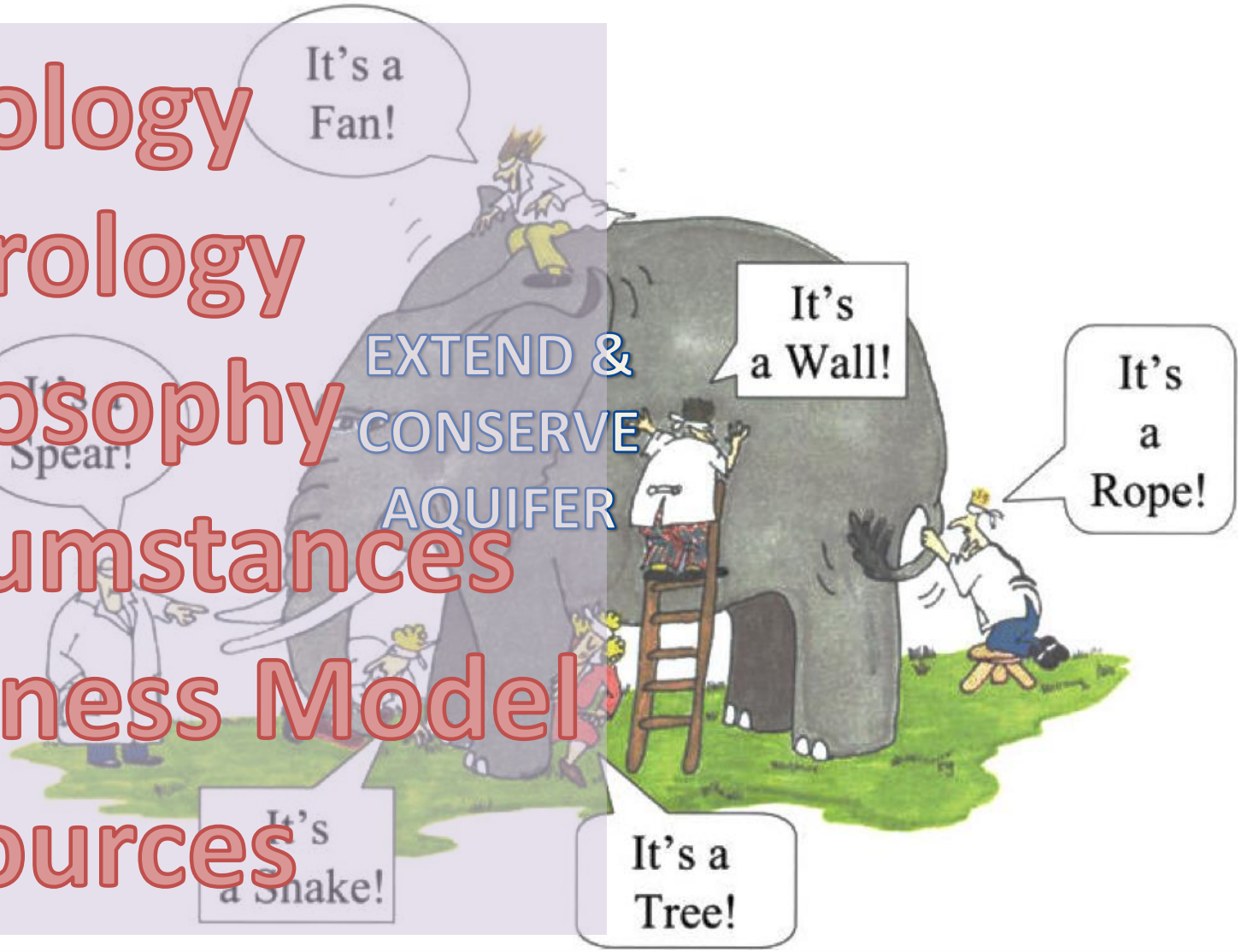
KANSAS STATE UNIVERSITY

OgallalaWater.org
OPTIMIZING WATER USE TO SUSTAIN FOOD SYSTEMS

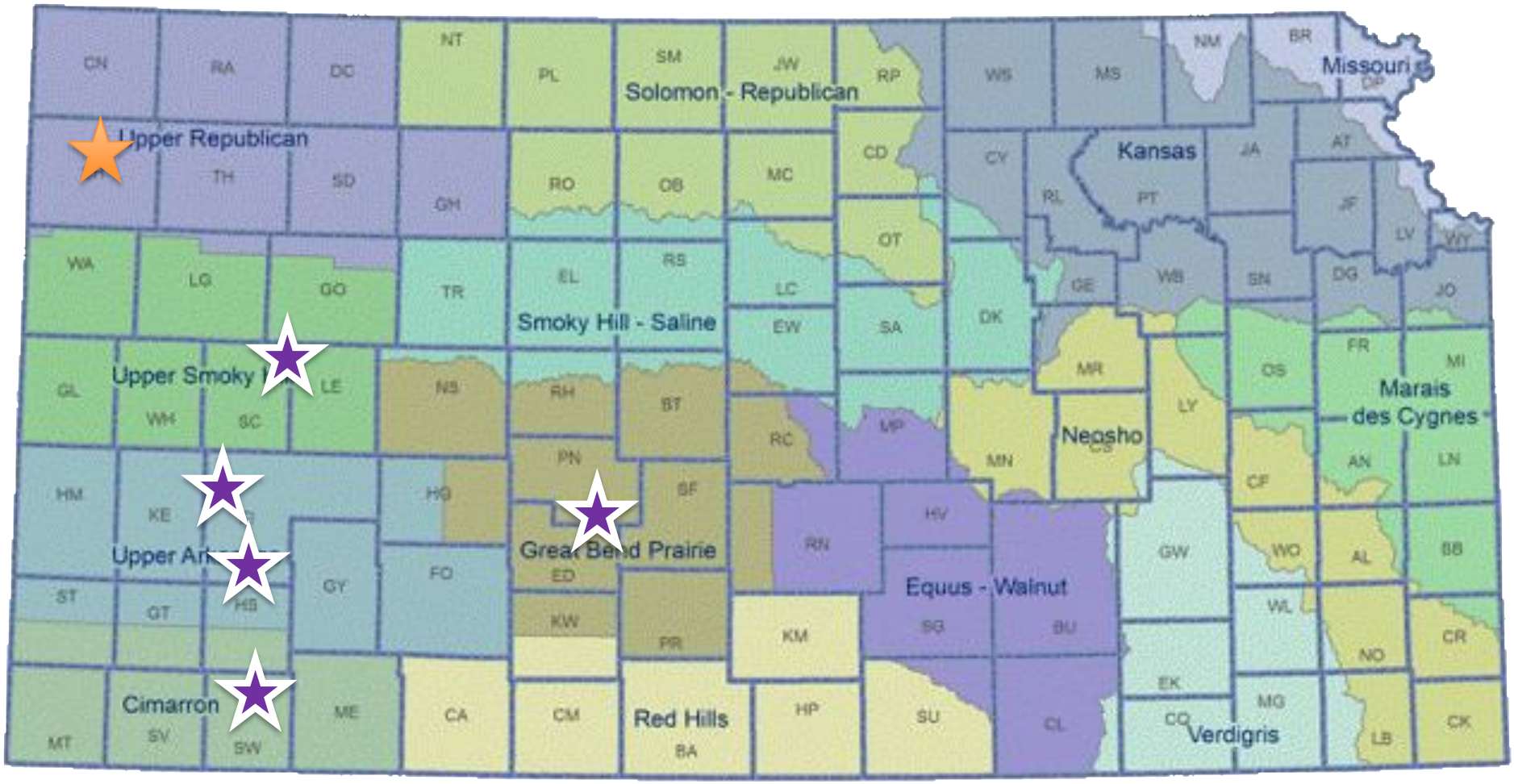
WATER TECHNOLOGY FARMS: The Concept

Lithology
Hydrology
Philosophy
Circumstances
Business Model
Resources

EXTEND &
CONSERVE
AQUIFER



2017 Water Technology Farms



2016 Water Technology Farms

Willis Farm

-Water conservation (WCA)

-Telemetry

- MDI, Spray

- Soil moisture sensors

Roth-GCCo Farm

-Effectiveness

-MDI, Bubbler, iWobs

-Zone management

-surface/well water

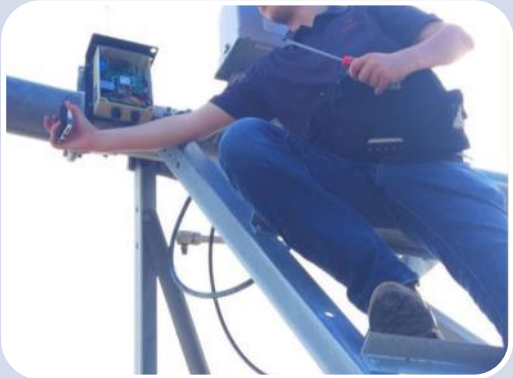
WaterPACK

-Efficiency

-MDI, Spray

-High capacity well, sandy

+ 2017 Water Technology Farms



Hatcher's Farm

- iWob, Bubbler, and spray
- Soil vs plant sensors
- Scheduling

Circle C Farm

- iWob, Bubbler, and spray
- Variable rate irrigation
- Cover crops use and mixes

NW Tech College Farms

- Soil water sensors
- Workforce development

Hatcher and Circle C Farms

Preliminary Data

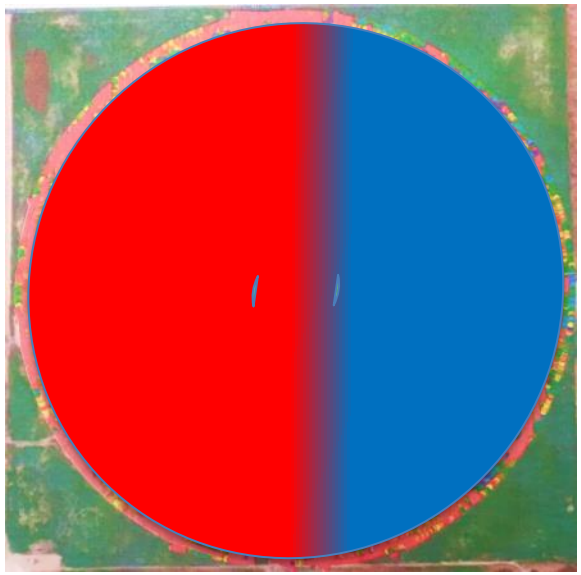
Hatcher's Farm

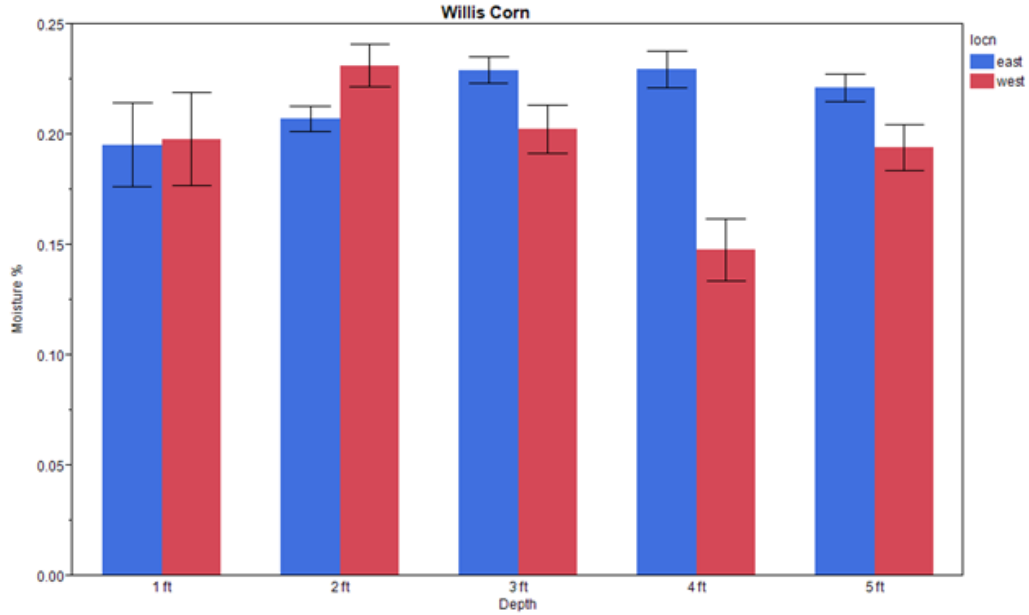
- East (Tedford) Field = 247 bu/ac
- West (Tedford) Field = 244 bu/ac

	Average of ears			Average of plants			Average of Adj. Yield		
	bubbler	iwob	spray	bubbler	iwob	spray	bubbler	iwob	spray
Hatchers	**24**	**24**	**26**	**25**	**25**	**26**	**270**	**280**	**289**
CornE	25	24	27	25	25	27	279	285	306
CornW	24	25	25	24	25	25	262	274	273

T&O Farms
Water Technology Farm

2016 Willis Farm Corn Circle, Spray





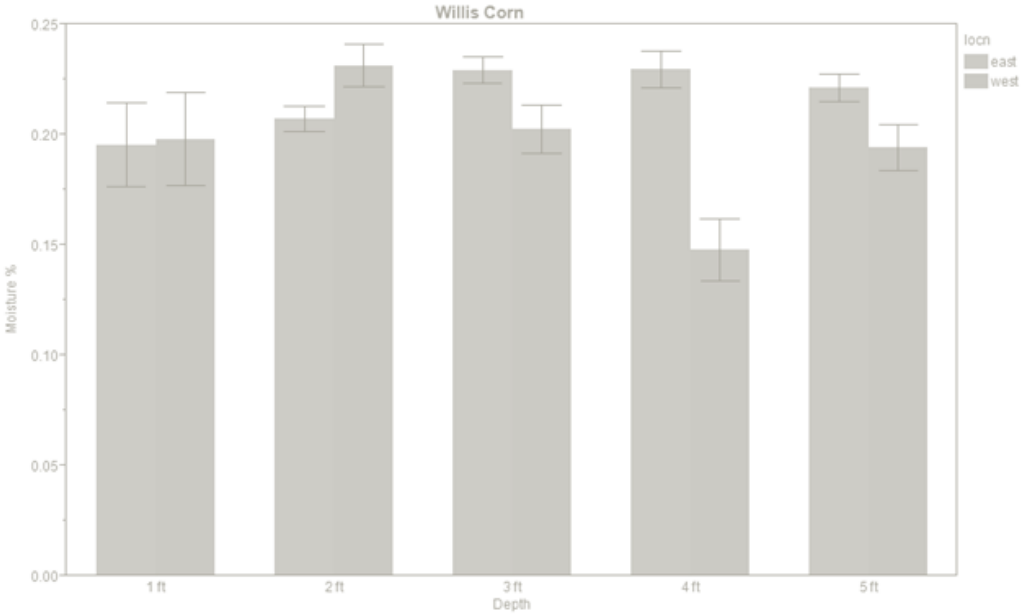
- Without Polyacrylamide (PAM)
- Yield = 235 bu/ac*

- With PAM
- Yield = 259 bu/ac*

- Whole field combine yield = 218 bu/ac
- Had some nematode issues

*Hand harvested

2017 Willis Farm Corn Circle, MDI



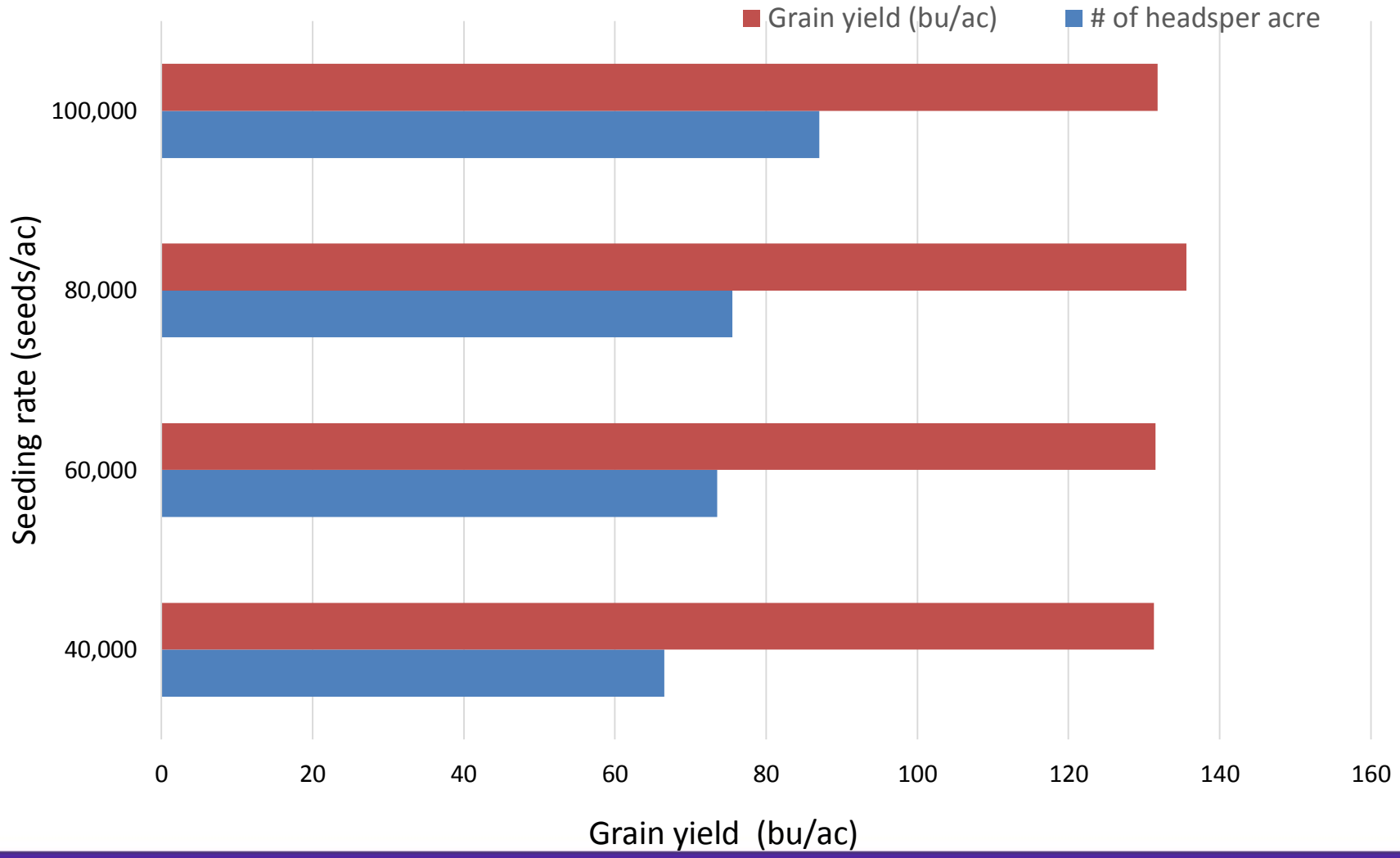
- Without Polyacrylamide (PAM)
- Yield = 252 bu/ac*

- With PAM
- Yield = 264 bu/ac*

- Whole field combine yield = ____ bu/ac
- Rainfall = 15 in

*Hand harvested

Sorghum Seeding Rate Yield Result



T&O Farms
Water Technology Farm

Alfalfa on MDI

2016 Highlights

Repair Cost

Rainfall = 17 inches

MODE	TOTAL COST	AVERAGE COST
SPRAY (6 circles)	$ 4,596.00	$766.00
MDI (4 circles)	$ 180.00	$ 45.00

Field	Crop	Irrigation (in)	Yield	Water Use Efficiency		Repair Cost ($)
1 MDI	Alfalfa	4.5	365 t	81.8	tons/in	0
2 SPRAY	Sorghum	9.3	145 bu	15.6	bu/in	1,901
3 MDI	Sorghum	9.6	140 bu	14.5	bu/in	475
4 SPRAY	Alfalfa	3.8	385 t	102.1	tons/in	180

2016 Partial Budgets

Pivot Designation	NE20	SW20	SW22	NE19	NW27	SE19	SE20	NW20	SE21	SW21
Technology	MDI	Spray	Spray	Spray	Spray	MDI	MDI	Spray	MDI	Spray
Crop	Alfalfa	Alfalfa	Alfalfa	Corn	Corn	Sorghum	Sorghum	Sorghum	Soybeans	Wheat
Income										
Acres	123	123	122	100	121	90	123	122	122	122
Yield per Acre	2.97	3.13	8.58	160.80	219.52	130.67	140.04	145.25	79.00	118.00
Price	$161.48	$161.48	$161.48	$4.88	$4.88	$4.46	$4.46	$4.46	$10.25	$6.18
Gross Profit ($/ac)	$479.19	$505.45	$1,385.82	$784.70	$1,071.24	$582.77	$624.58	$647.80	$809.75	$729.24
Expenses										
Seed	$74.63	$96.59	$0.00	$81.35	88.45	$8.00	$8.45	$9.00	$73.14	$9.00
Herbicide	$13.18	$13.18	$58.56	$123.20	107.38	$57.26	$60.68	$59.37	$48.60	$18.45
Fertilizer	$25.06	$40.88	$36.54	$145.33	$153.33	$72.46	$77.69	$91.69	$20.35	$59.96
Drive Train Repairs	$0.00	$3.86	$5.74	$4.25	$6.20	$0.00	$0.00	$12.88	$0.00	$1.97
Variable Expenses	$112.87	$154.51	$100.84	$354.13	$355.36	$137.72	$146.82	$172.94	$142.09	$89.38
Profit Above Variable Expenses	$366.31	$350.94	$1,284.98	$430.57	$715.88	$445.05	$477.76	$474.86	$667.66	$639.86
Water Use (ac-in/ac)	4.46	3.77	No Record	14.33	No Record	10.39	9.65	9.36	11.65	5.98
Profit per ac-in/ac	$82.14	$93.10	No Record	$30.04	No Record	$42.83	$49.53	$50.71	$57.33	$106.91
Yield per ac-in/ac	0.67	0.83	No Record	11.22	No Record	12.57	14.52	15.51	6.78	19.72

Notes:

NW20 had a bad SCA infestation that hit the first week of Oct, and a severe pig weed problem

SE20 had a bad SCA infestation that hit the first week of Oct, and a severe pig weed problem

SE19 had hail damage, and a severe pig weed problem

NE19 had hail damage and a bacteria which impacted yield

NW27 had a bacteria which impacted yield

2016 Partial Budgets

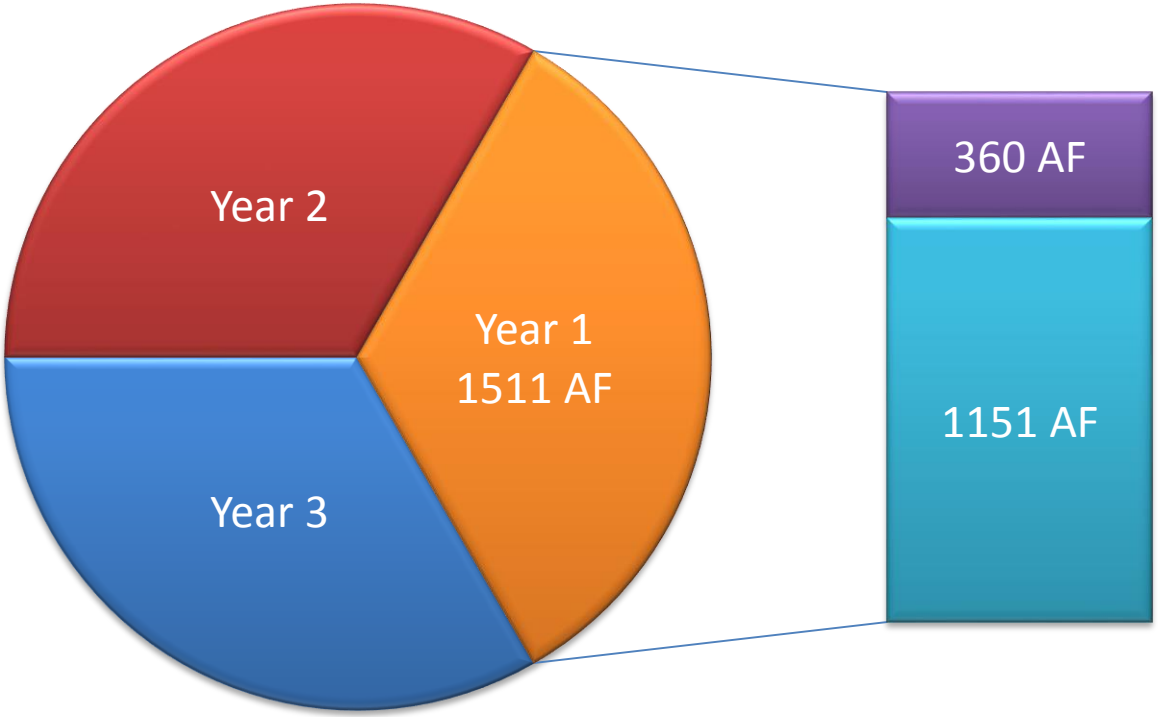
Pivot Designation	NE20	SW20	SE20	NW20
Technology	MDI	Spray	MDI	Spray
Crop	Alfalfa	Alfalfa	Sorghum	Sorghum
Income				
Acres	123	123	123	122
Yield per Acre	2.97	3.13	140.04	145.25
Price	$161.48	$161.48	$4.46	$4.46
Gross Profit ($/ac)	$479.19	$505.45	$624.58	$647.80
Expenses				
Seed	$74.63	$96.59	$8.45	$9.00
Herbicide	$13.18	$13.18	$60.68	$59.37
Fertilizer	$25.06	$40.88	$77.69	$91.69
Drive Train Repairs	$0.00	$3.86	$0.00	$12.88
Variable Expenses	$112.87	$154.51	$146.82	$172.94
Profit Above Variable Expenses	$366.31	$350.94	$477.76	$474.86
Water Use (ac-in/ac)	4.46	3.77	9.65	9.36
Profit per ac-in/ac	$82.14	$93.10	$49.53	$50.71
Yield per ac-in/ac	0.67	0.83	14.52	15.51

2016 Water Use

- WCA 3-yr allocation 4,533 AF
- WCA yearly allocation 1,511 AF
- 2016 Water Use 1,151 AF

24% Less of Allocated

2016 Water Use



WCA Allocation

A Key Lesson

Visual cues from index well, soil moisture sensors, and water meters **helped** a lot in **making decisions**

Roth/Garden City Co. Farm Features

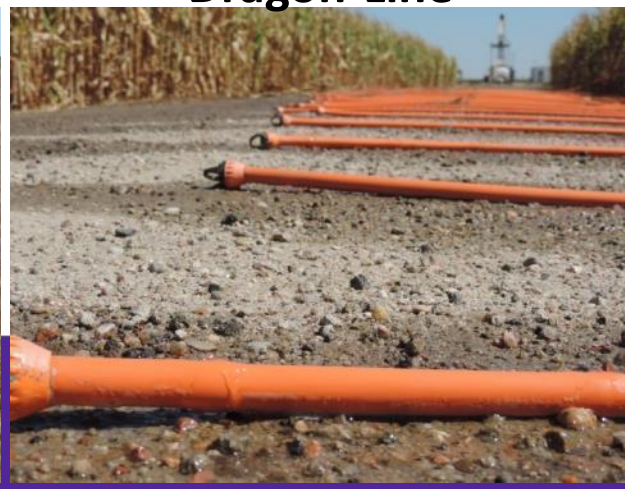
- MDI vs. iWob vs. Bubbler
- Soil Moisture Sensors
- Center Pivot Telemetry
- Soil mapping and zoning
- Aerial Mapping
- Ground and Surface Water

Bubbler and iWob

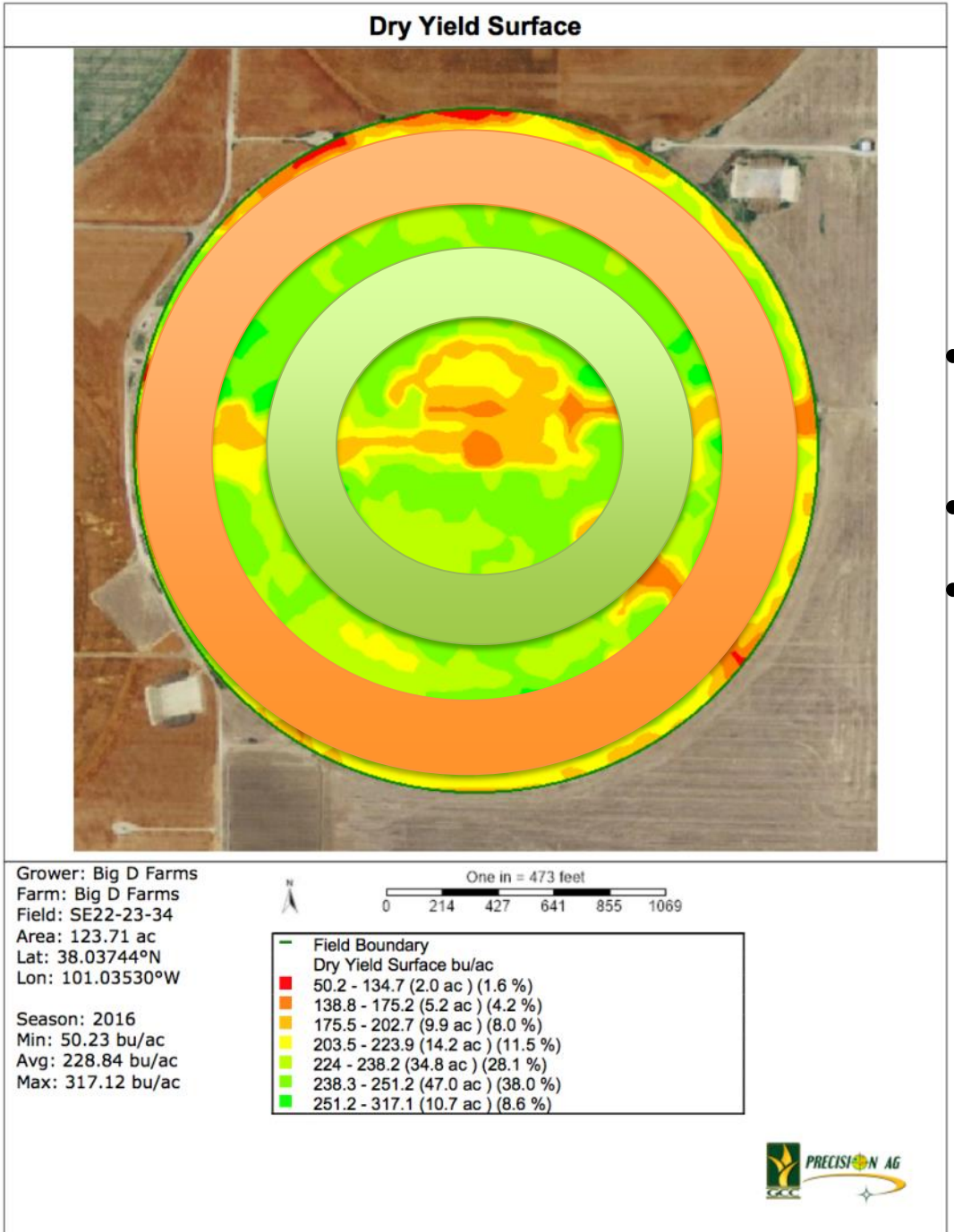
Bubbler

iWob

Dragon-Line



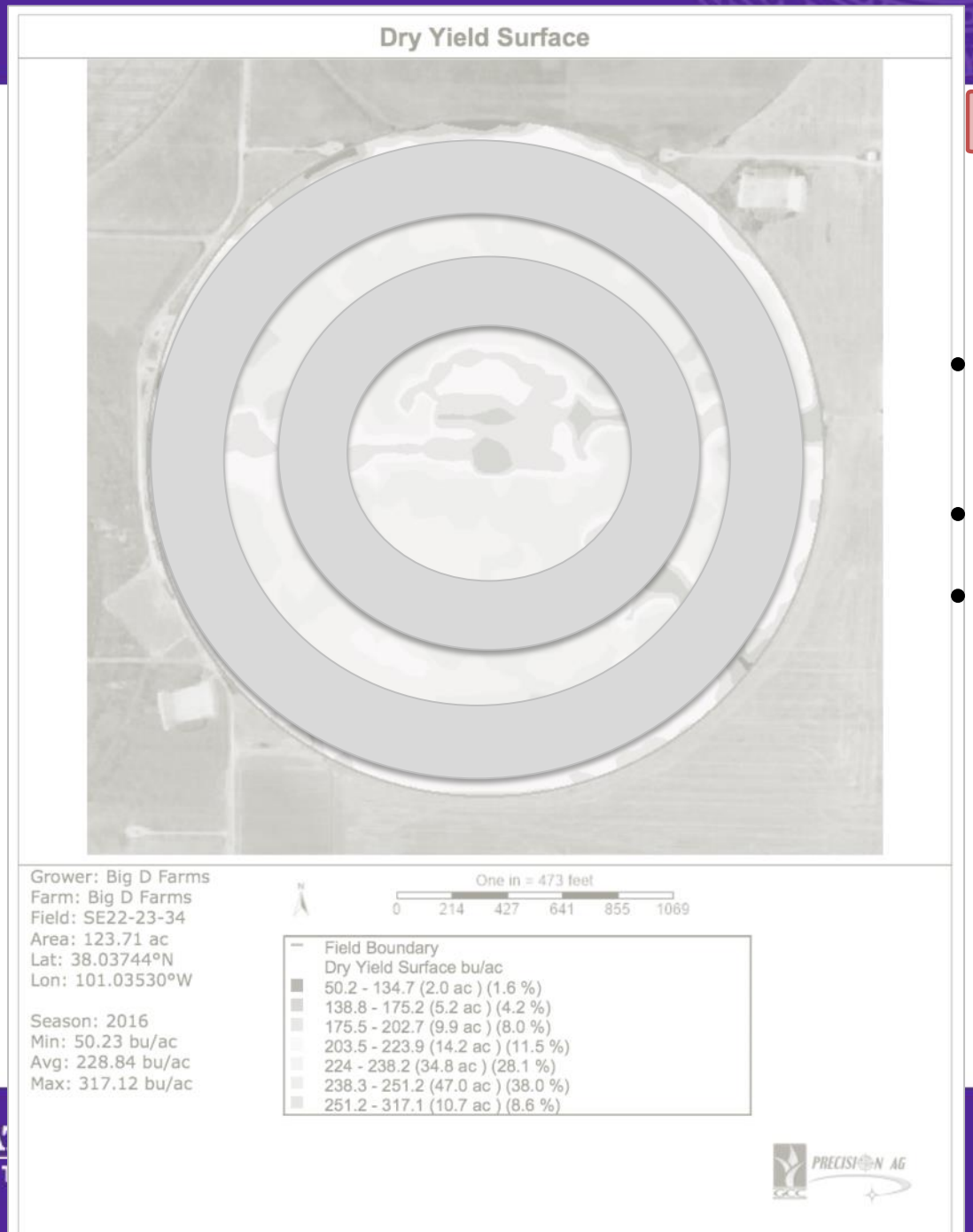
2016



Roth Corn Field

- Yield = 228 bu/ac
- Rain = 25.2 in
- Irrigation Applied = 11.1 in

2017



Roth Corn Field

- Yield = 228 bu/ac
- Rain = 25.2 in
- Irrigation Applied = 11.1 in

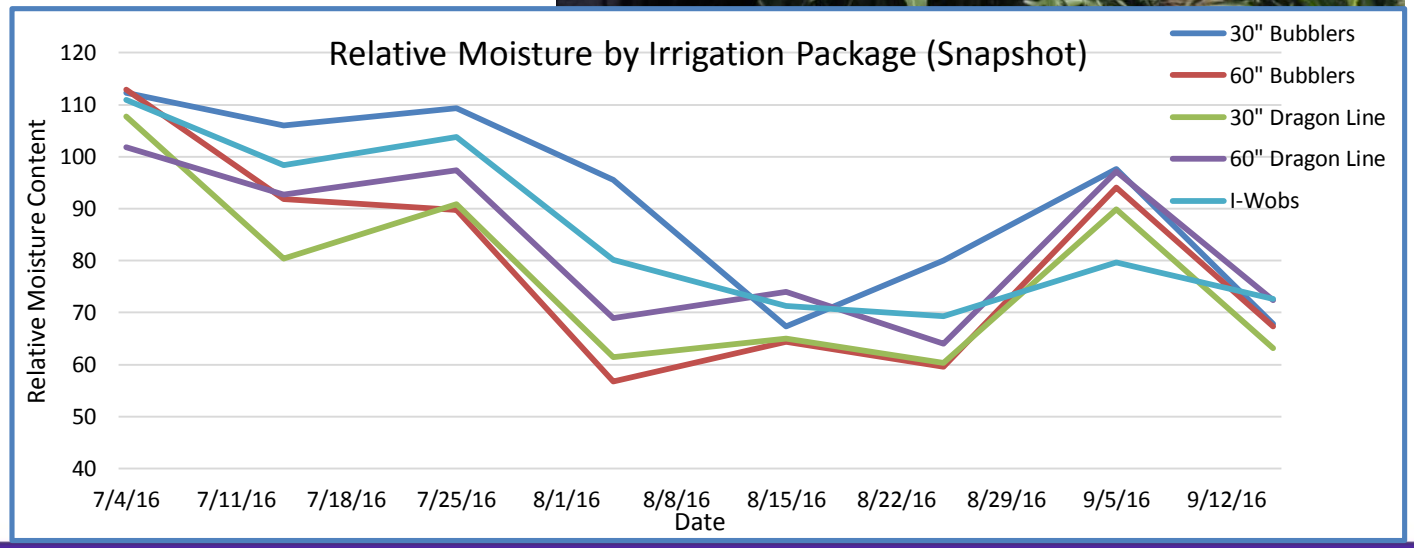
Water Quality Plot

	Ears		Plants		Yield (bu/ac)	
	nopam	pam	nopam	pam	nopam	pam
Average	25	27	18	17	**140**	**144**
DRY	27	28	16	19	**149**	**152**
IRRIG	23	26	19	15	**131**	**136**

Preliminary Data

Notes

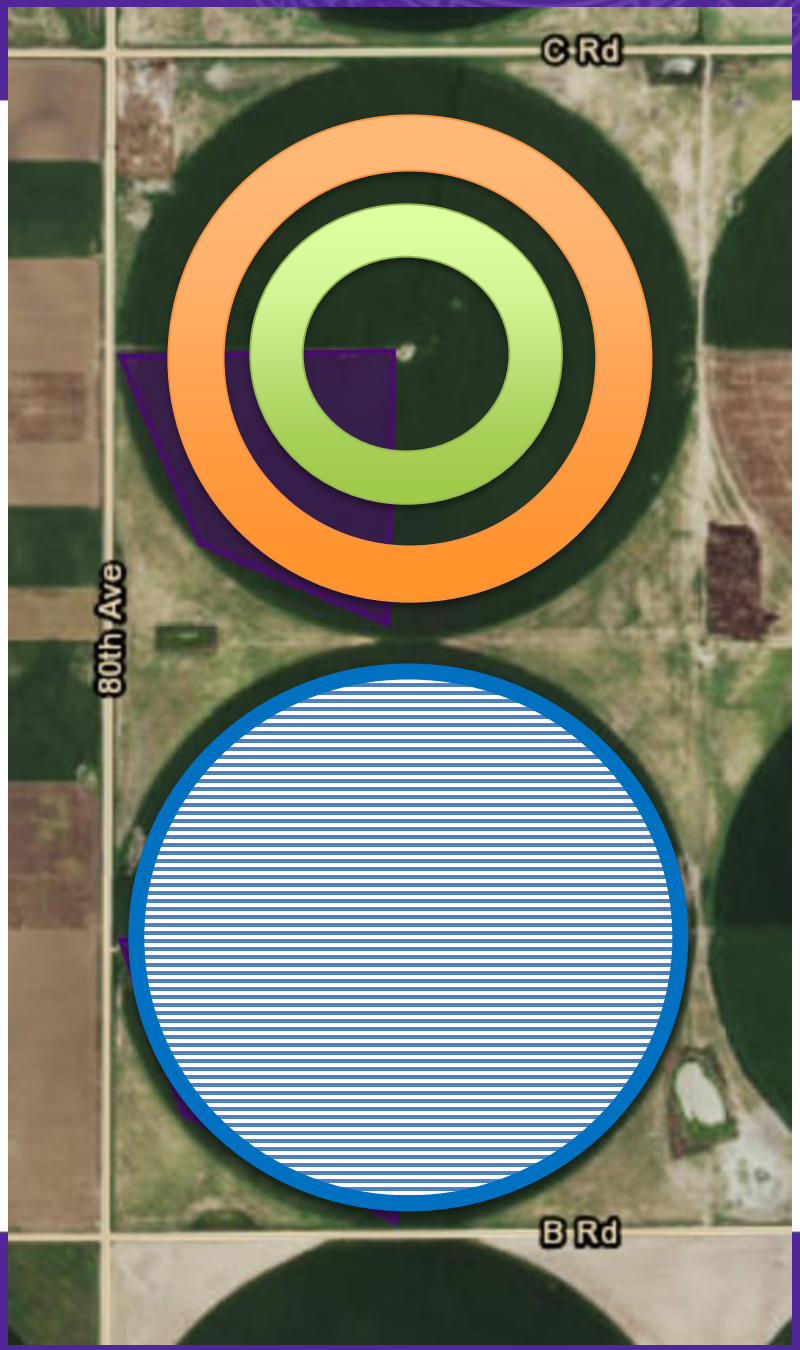
- This field is only one of several fields where other trials are being performed
- Soil water sensors were used in making **confident** decision



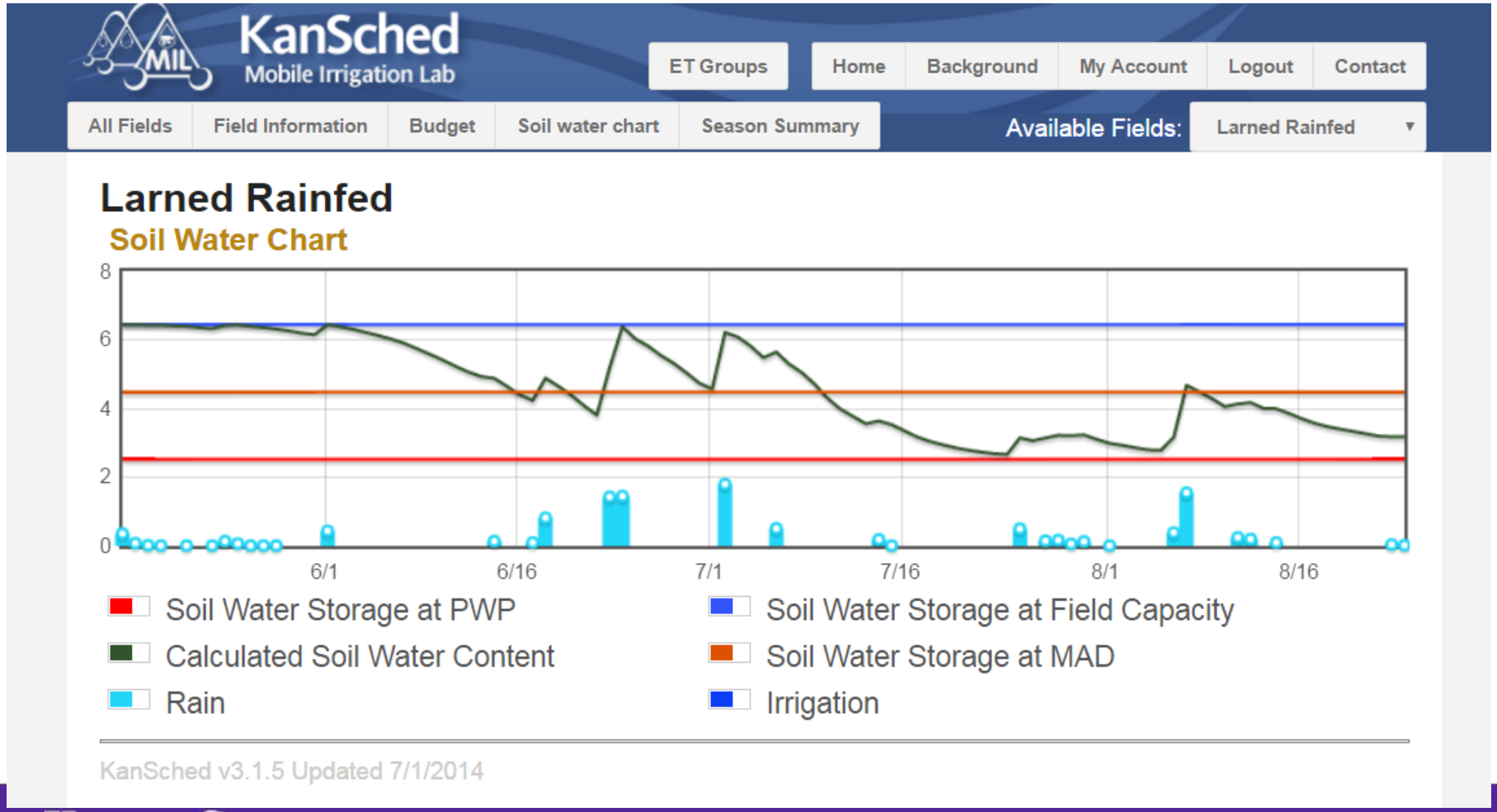
WaterPACK/ILS Farm Features

- MDI vs Spray
- Circular vs Straight planting
- Soil Moisture Sensors
- High capacity wells
- Sandy loam soil

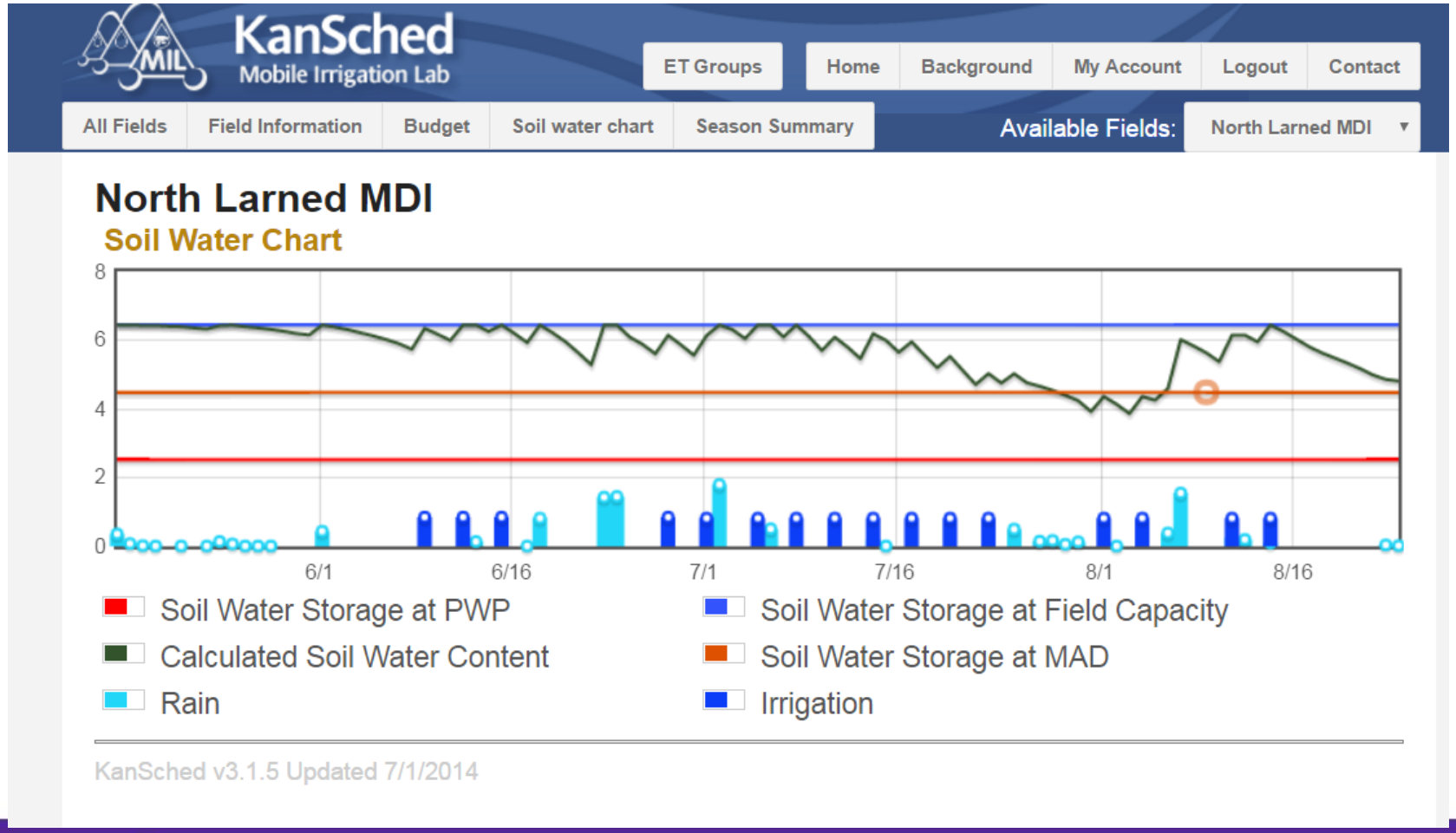
- **Side-by-side comparison**
- North field (#16) is where the trials are installed
- South field (#15) is the control
- Does planting in circles have substantial advantage over straight planting?



ILS – Water PACK Water Technology Farm
2016 Water Budget for Dryland Conditions
ETr = 23.83 ETc = 13.93 Rain: 11.2 inches Eff Rain 10.7 inches



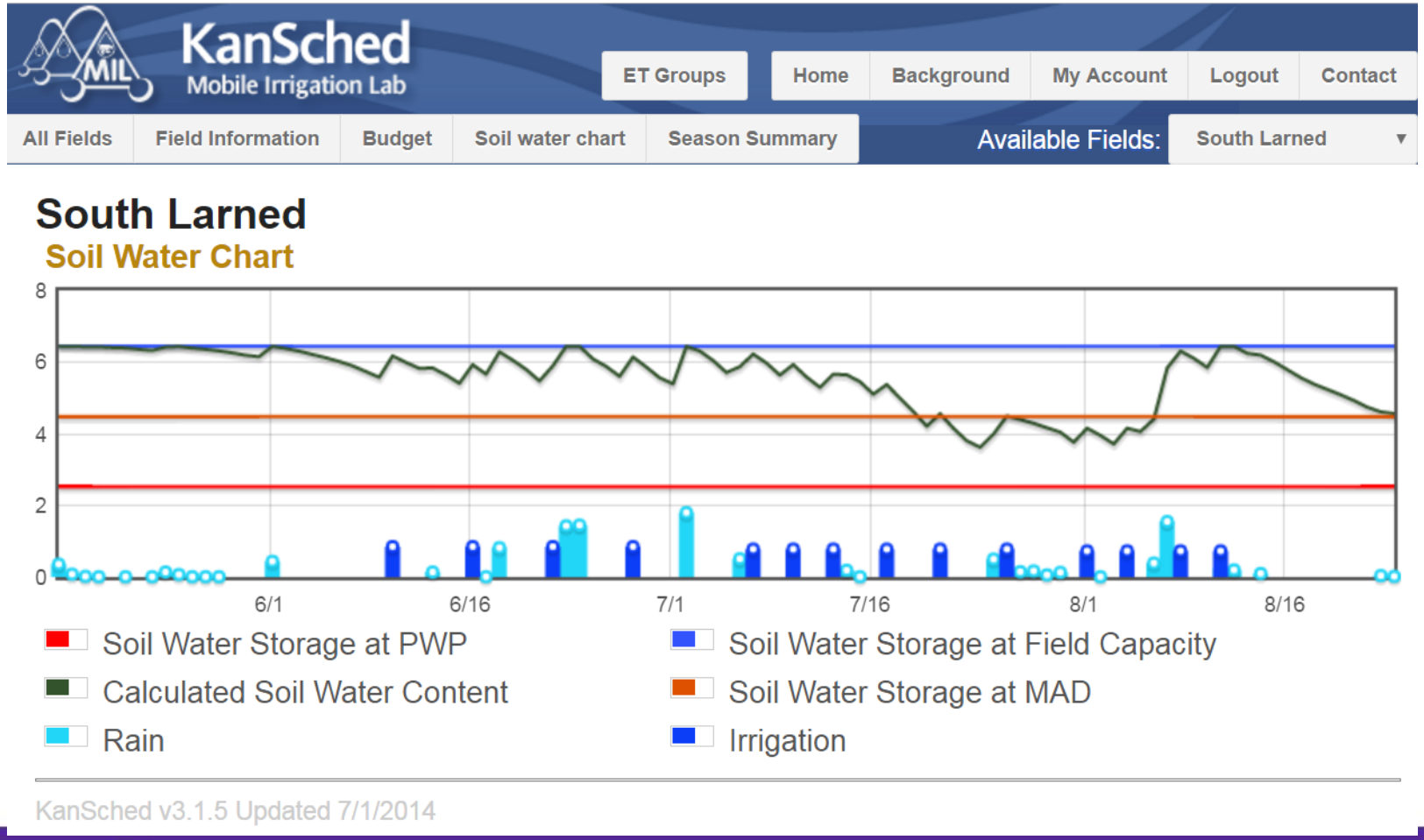
ILS – Water PACK Water Technology Farm
2016 Water Budget for MDI/Spray Field
ETr = 23.83 ETc = 20.28 In-season Irrigation 13.2 inches



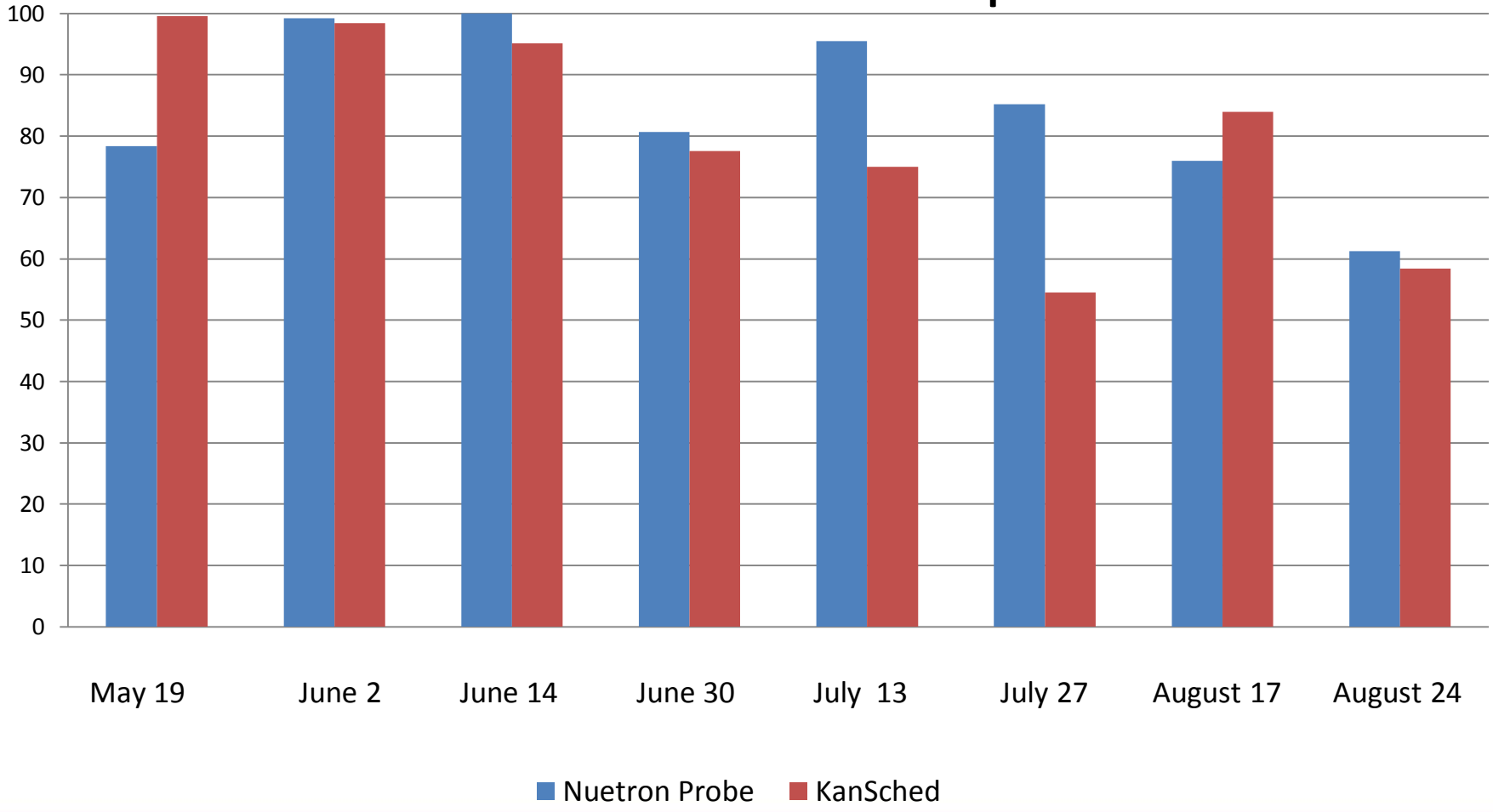
ILS – Water PACK Water Technology Farm

2016 Water Budget for Spray Field

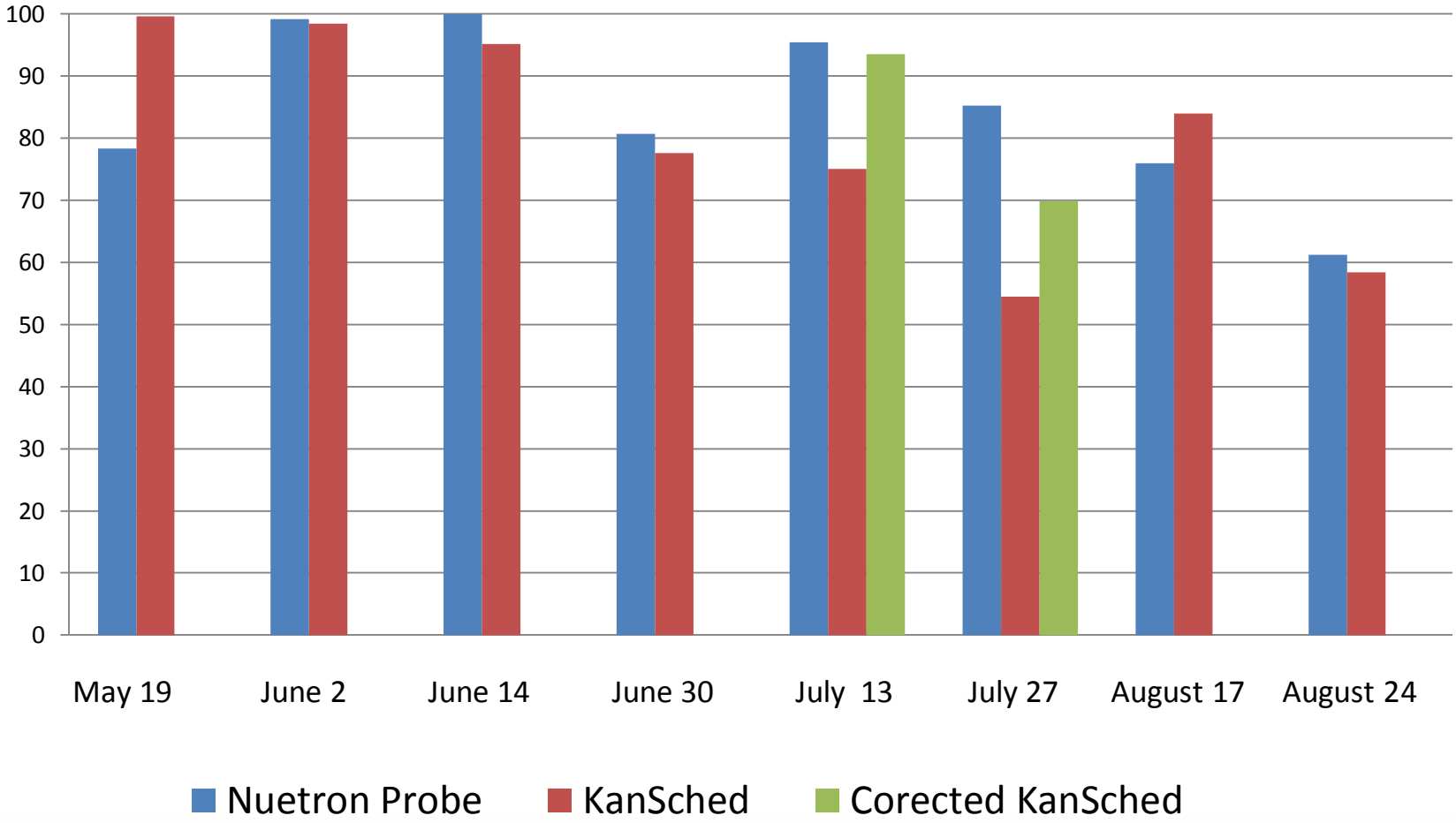
ETr = 23.83 ETc = 19.65 In-season Irrigation 11.0 inches



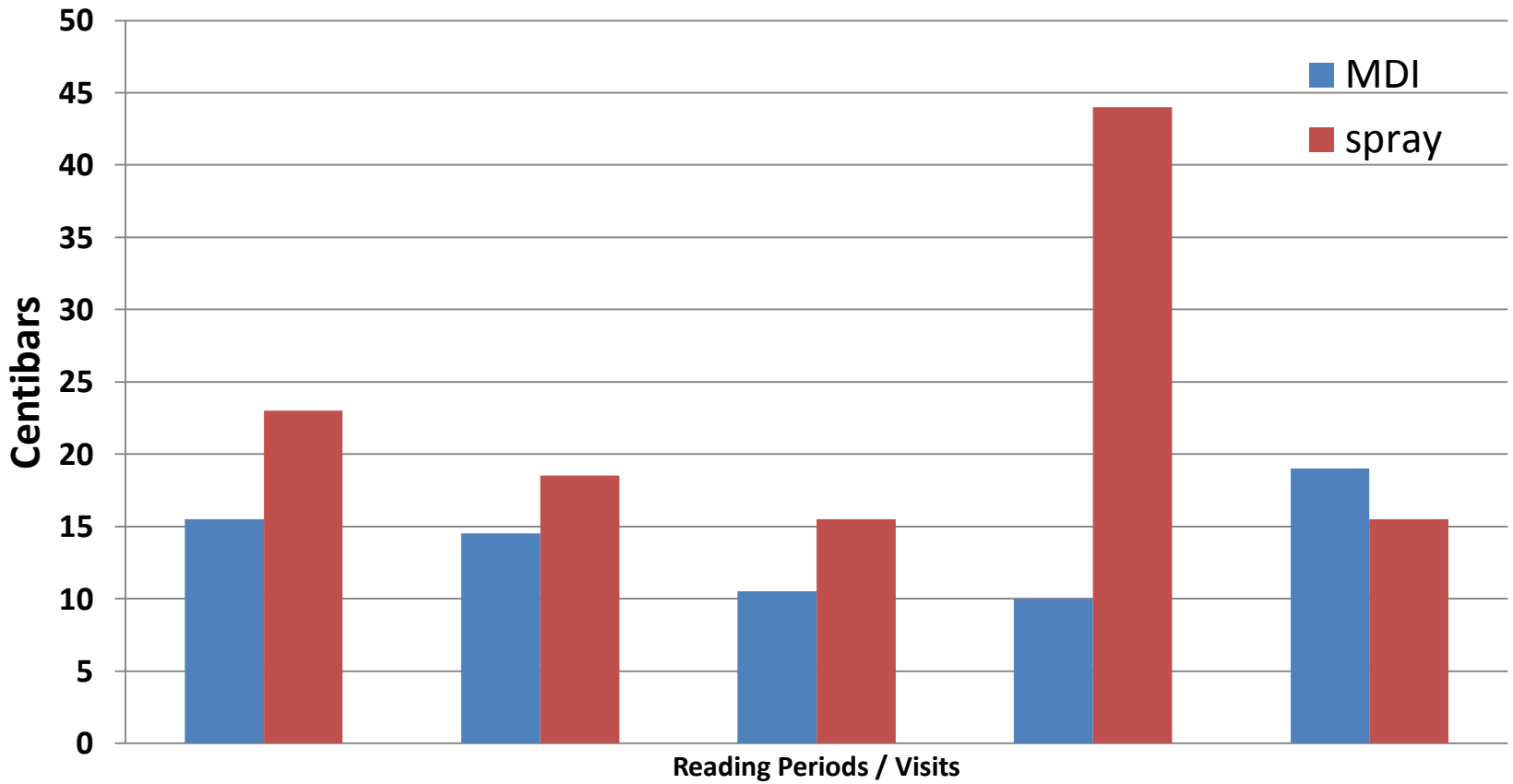
Neutron Probe vs KanSched Available Soil Water Comparisons



Neutron Probe vs KanSched
Available Soil Water Comparisons



MDI vs Spray Soil Comparison



Irrigation = 14.8 RF = 17 in
Avg. Yield = 205 bu/ac

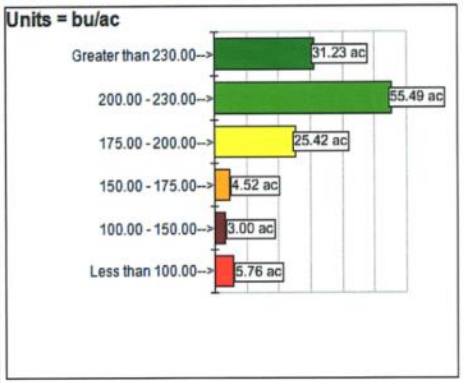
Client Information:

Client:	ILS Farm Partnership
Farm:	WFY Holding Co., Inc
Field:	16

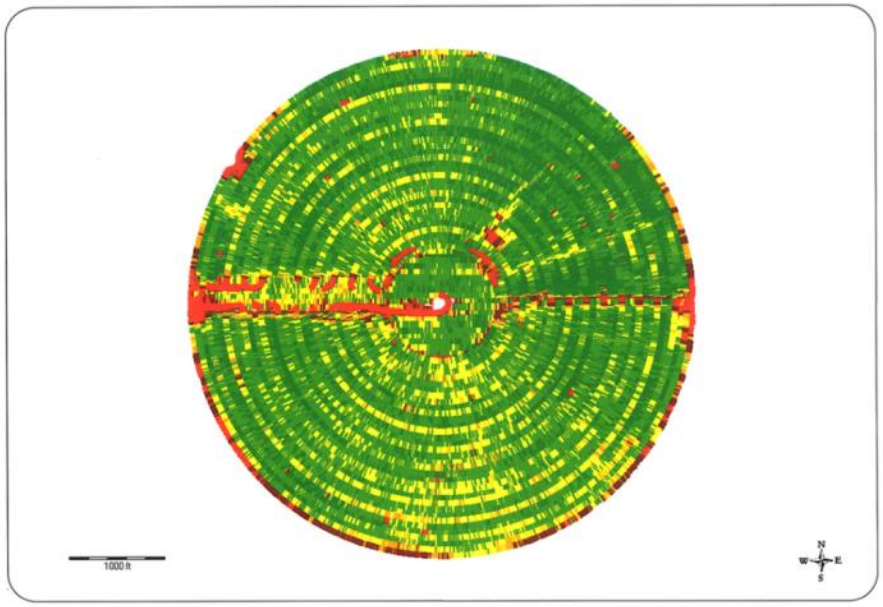
Field Information:

Crop:	Corn
Start Date:	8/23/2016
Product:	Corn
Elapsed Time:	10.491 h
Area:	120.85 ac
Average Yield:	205.1 bu/ac
Average Dry Weight:	11,483.7 lb/ac
Total Yield:	25,721.8 bu
Total Dry Weight:	1,440,355 lb
Average Moisture:	24.02 %
Productivity(area/hour):	11.96 ac/h

Legend Information:



Field information and legend apply to active map layer only.



Irrigation = 14.0 in
Avg. Yield = 198 bu/ac

JOHN DEERE Operations Center

2016 Corn: Harvest 15

Layer: Yield ILS Farm Partnership | WFY Holding Co., Inc

Operation Dates: 09/05/2016 - 09/05/2016

AGRONOMIC DATA

TOTAL YIELD
25,842.43 bu

AVG. YIELD
198.21 bu/ac

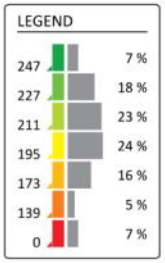
AVG. MSTR
23.84 %

AREA WORKED
130.38 ac

WET WEIGHT
1,615,045.51 lb

AVG. WET WEIGHT
12,387.22 lb/ac

LEGEND



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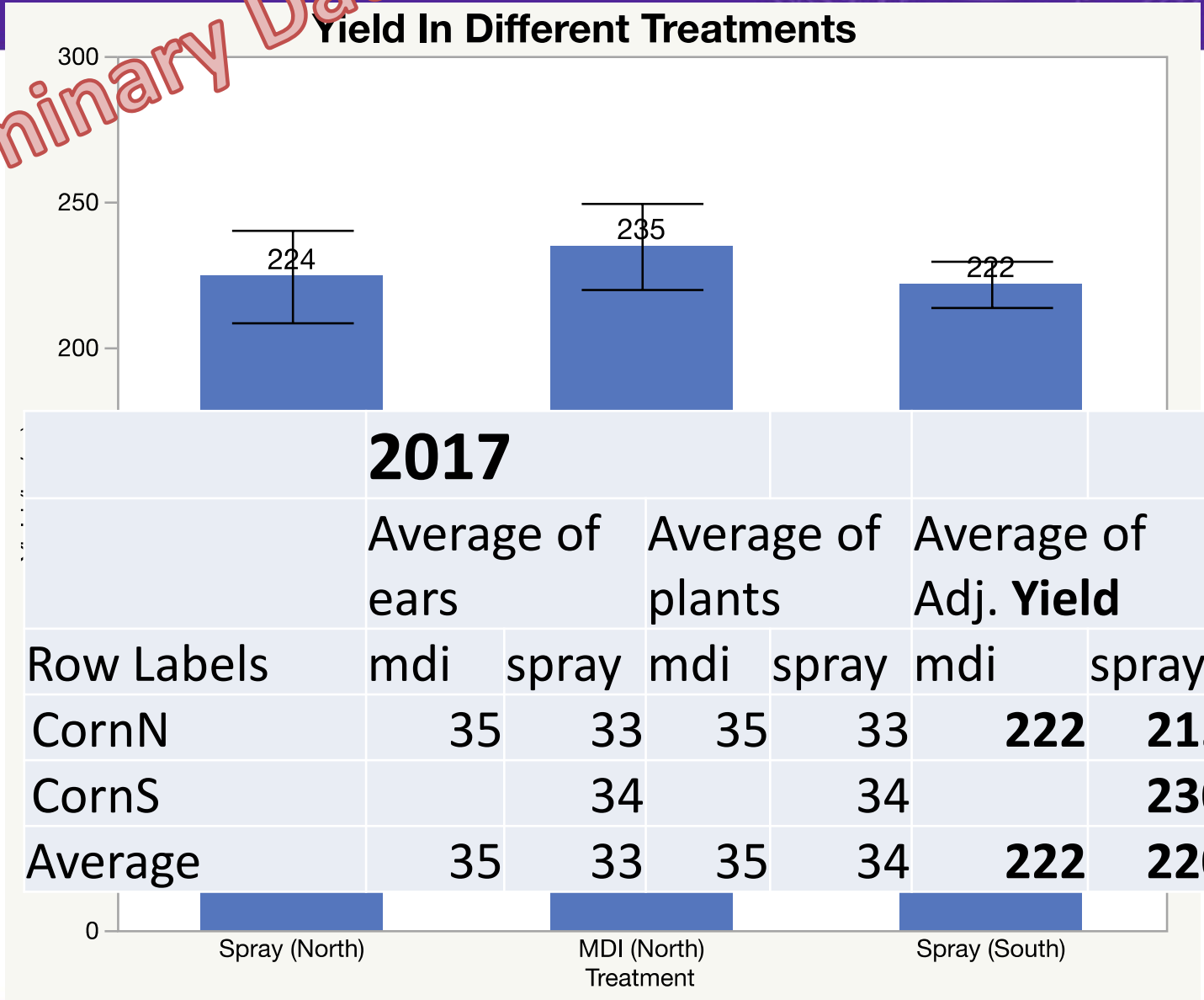
Preliminary Data



	2017					
	Average of ears		Average of plants		Average of Adj. **Yield**	
Row Labels	mdi	spray	mdi	spray	mdi	spray
CornN	35	33	35	33	**222**	**215**
CornS		34		34		**230**
Average	35	33	35	34	**222**	**220**

Notes

- How do you winterize the system?
- What different management practice will be done to accommodate grazing?

FRAMEWORK AT THE FARM:

Public-Private Project for the Conservation of the Ogallala Aquifer

Water Technology Farm
HATCHER FARMS

K·STATE Research and Extension

LINDSAY CORPORATION · Kansas Water Office · Seaman Crop Consulting

AMERICAN IRRIGATION · servi tech · KANSAS CORN COMMISSION · TerrAvion

A Public-Private Project for the Conservation of the Ogallala Aquifer

Educational Component

- Attendance in field days are impressive
  - 2016: more than 325
  - 2017: more than 295
- Some additional tours were organized for key participants
  - KS Policy Makers ~50 in attendance at T&O Farm
  - National Farm Cooperative ~ 45 in attendance at ILS Farm
  - KWA Tour ~ 45 in attendance at Roth Farm
  - Water Congress Virtual Tour ~ 60 in attendance

Organize field days and other educational events

Educational Component

- Invited to talk at different conferences and forums in and out of the state (e.g. High Plains Conference in TX, CPIA in CO)
- Media coverage was significant
  - Featured in Successful Farming TV Show
  - Article published by Farm Journal
  - Articles published by High Plains Journal and other regional/local outlets

TAKE HOME

- Water Technology Farm is a great way to **showcase** new technologies and MANagement practices "**in your neighborhood**" at your scale
- Field days on these farms foster **good conversation** between farmers and managers
- Starting to **identify advantages and challenges**
- Leveraging this concept to **expand the conversation** beyond the region

Acknowledgment

- Kansas Water Office
- USDA OAP
- Kansas Water Office
- *Private industry:* Dragon-line, Netafim, Servi-tech, Monsanto, and more
- Kansas Corn Commission
- K-State Global Food System
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- USDA-NIFA

OgallalaWater.org
OPTIMIZING WATER USE TO SUSTAIN FOOD SYSTEMS

THANK YOU

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