Water Tech Farms:
KSRE's Role and Updates

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Acknowledgment

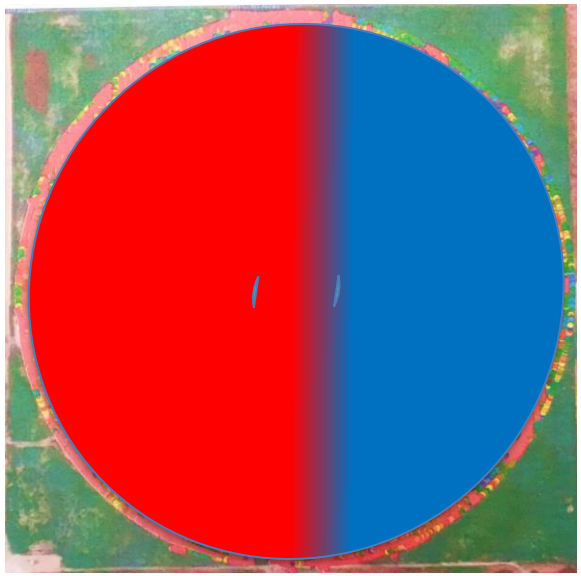
- Dan Rogers, Bill Golden, AJ Foster, Isaya Kisekka, Lucas Haag, Ag. Agents, K. Shaw, B. Niere, et al.
- Kansas Water Office
- USDA OAP
- Kansas Water Office
- *Private industry too many to list*
- Kansas Corn and Sorghum Commissions
- USDA NRCS Conservation Innovation Grant
- USDA-NIFA
- WTFarmers: WaterPACK, Roth, Willis, Compton, Long, Harshberger, Hatchers, Speer, Weber, among others

OgallalaWater.org
OPTIMIZING WATER USE TO SUSTAIN FOOD SYSTEMS

K-State Research-Extension Role

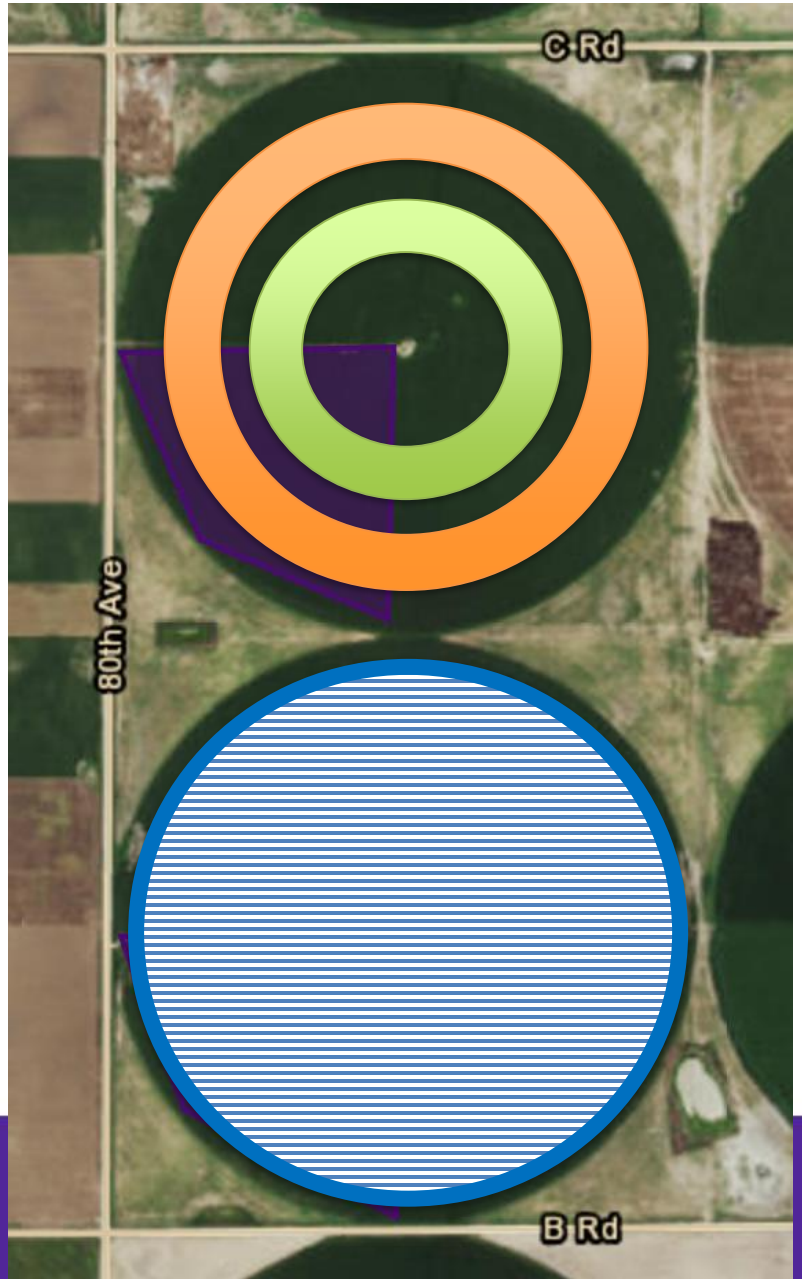
KSRE's Role

Help design the farm to address the farmer's concern



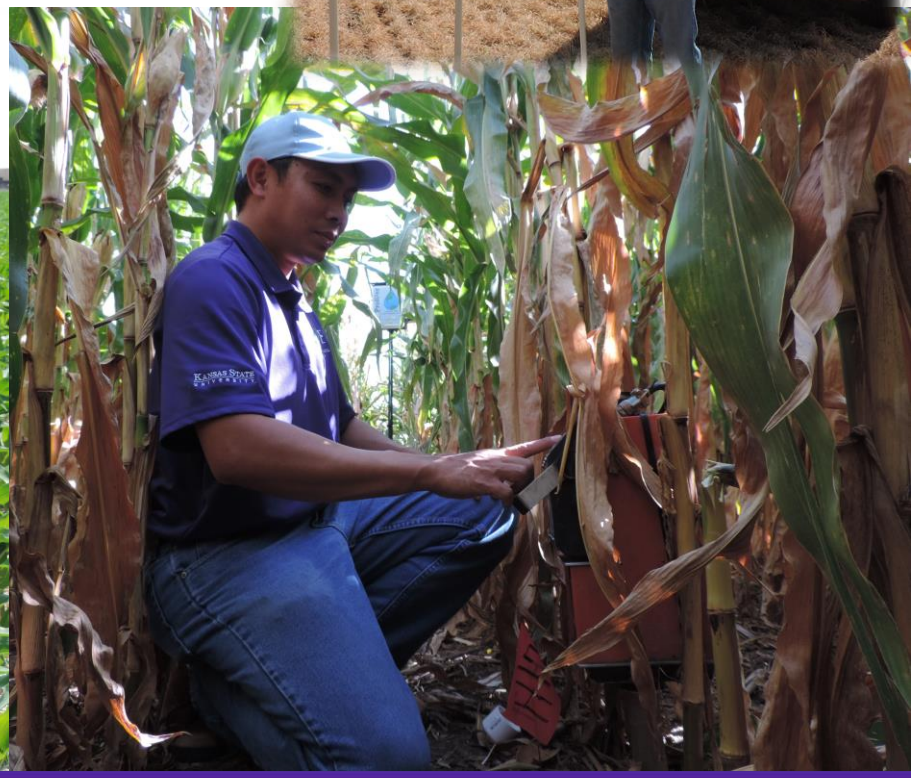
Corn with and without PAM

MDI vs Spray on Circular vs Straight Planting



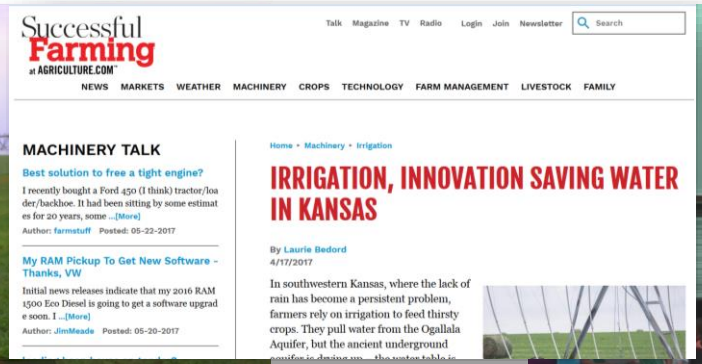
KSRE's Role

Provide technical assistance and monitoring activities



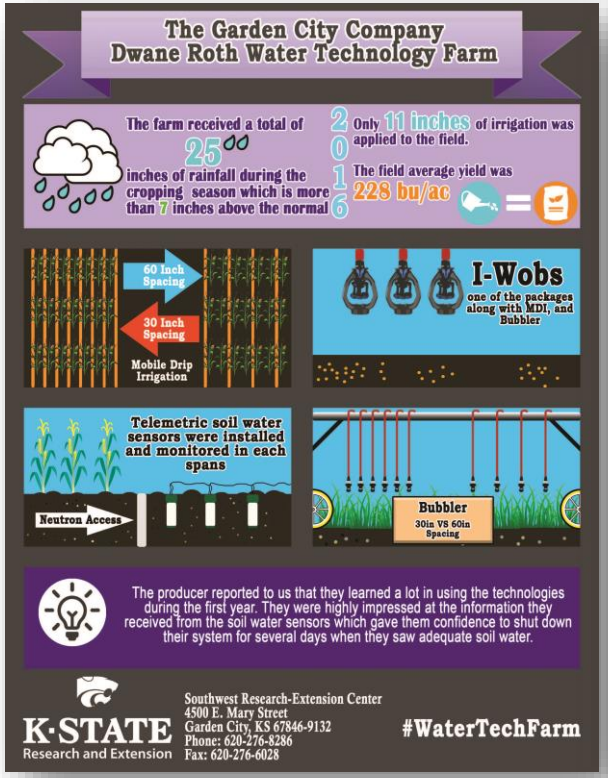
Organize field days and other educational events

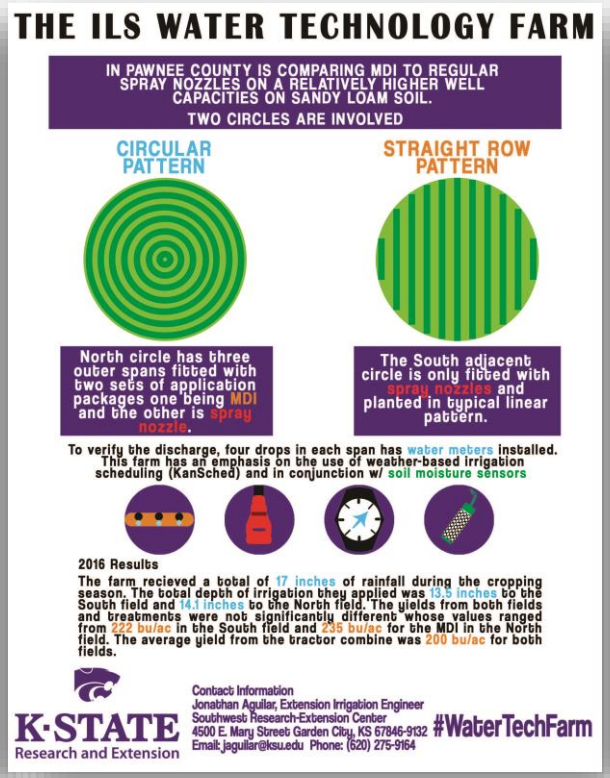
Help in public outreach and other activities

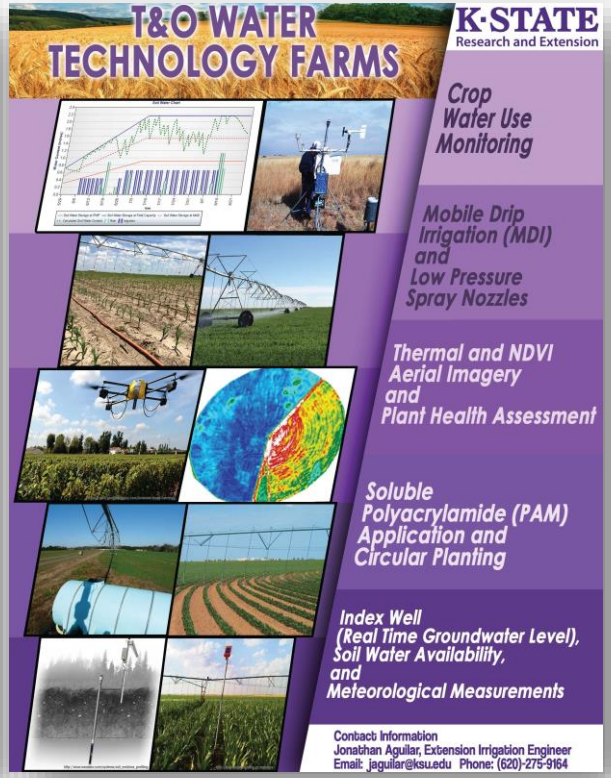


TECHNOLOGY SPOTLIGHT: WATER CONSERVATION – PART 1

Compile and synthesize data for public dissemination

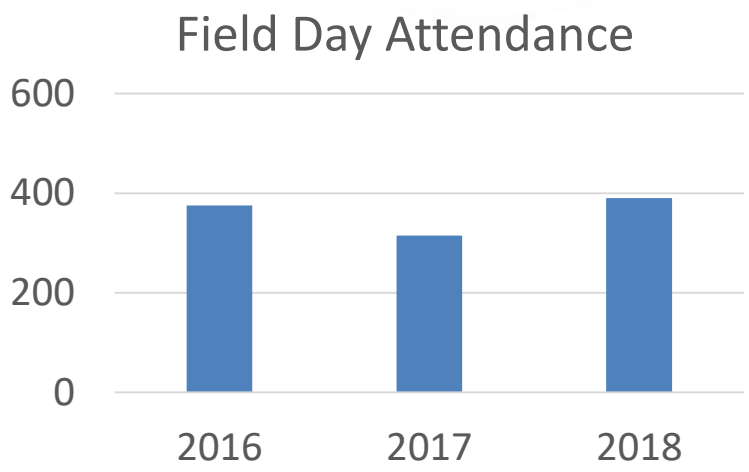






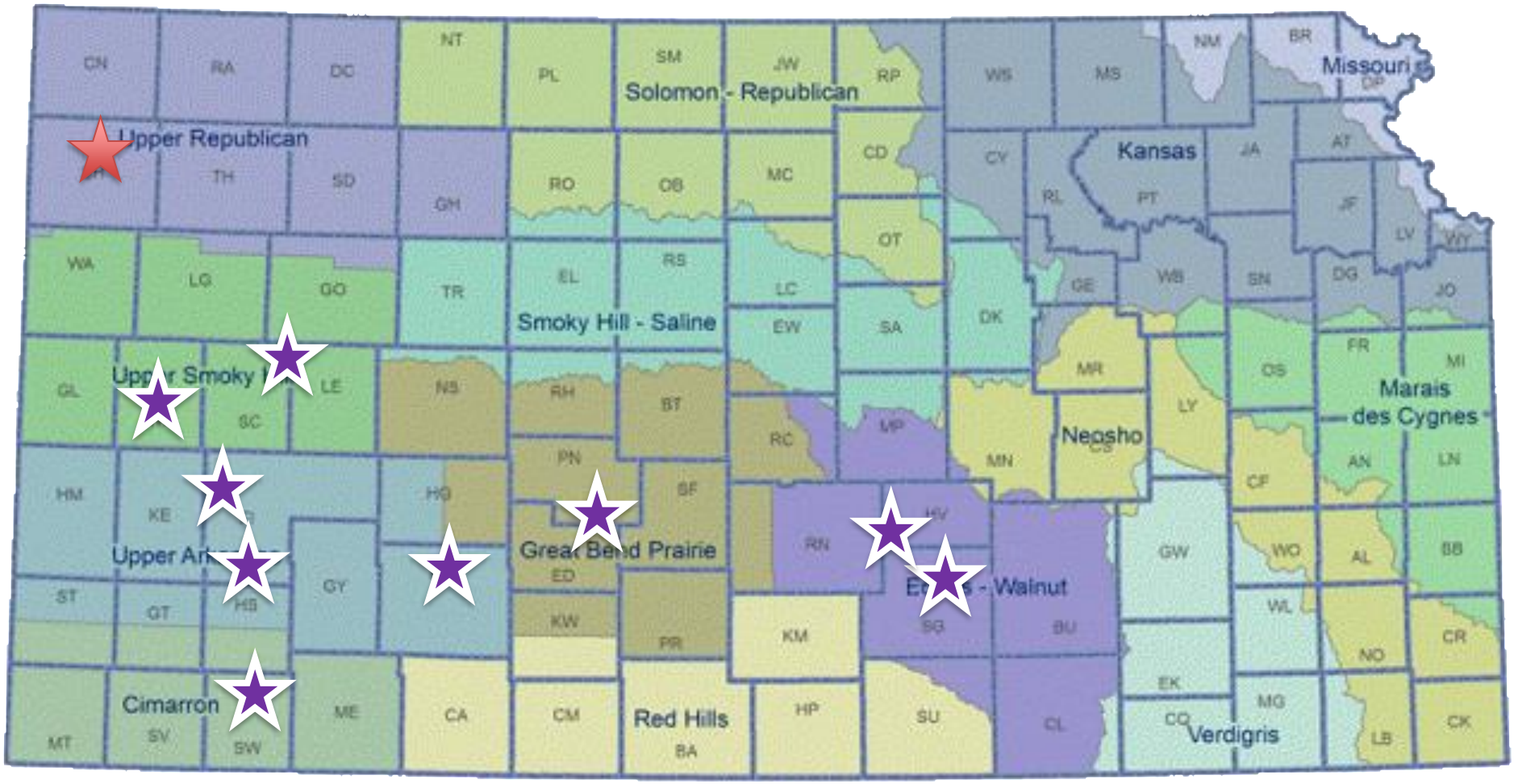
Educational Component

- Attendance in field days are impressive



- 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
  - Kansas Water Authority Tour ~ 45 in attendance at Roth Farm
  - Water Congress Virtual Tour ~ 60 in attendance

2018 Network of Water Technology Farms



2016 Water Technology Farms

T&O Farm

-Water conservation (WCA)
-Telemetry
-MDI, Spray
-Soil water sensors

Roth Farm

-Effectiveness
-MDI, Bubbler, iWobs
-Zone management
-surface/well water

ILS Farm

-Efficiency
-MDI, Spray
-High capacity well, sandy
-Irrigation scheduling

+ 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

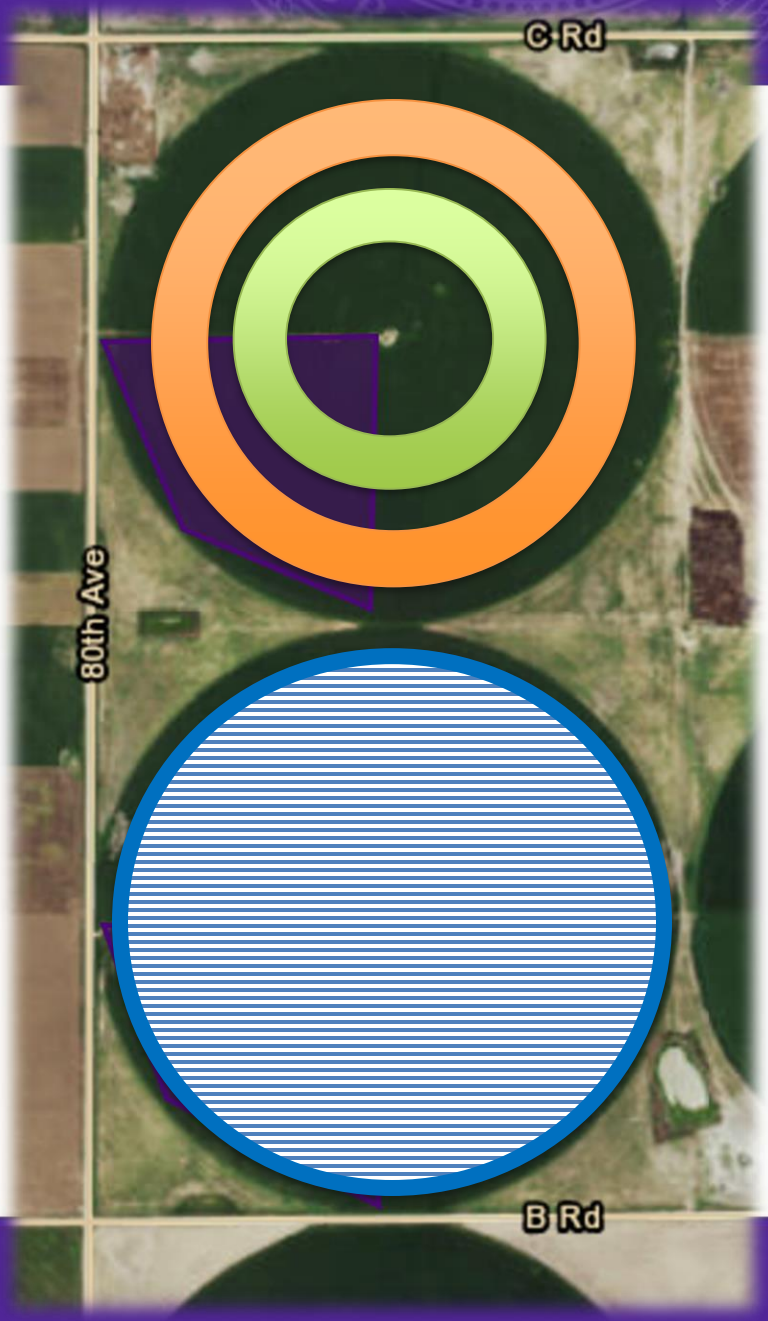
NW Tech College Farms

- Soil water sensors
- Workforce development

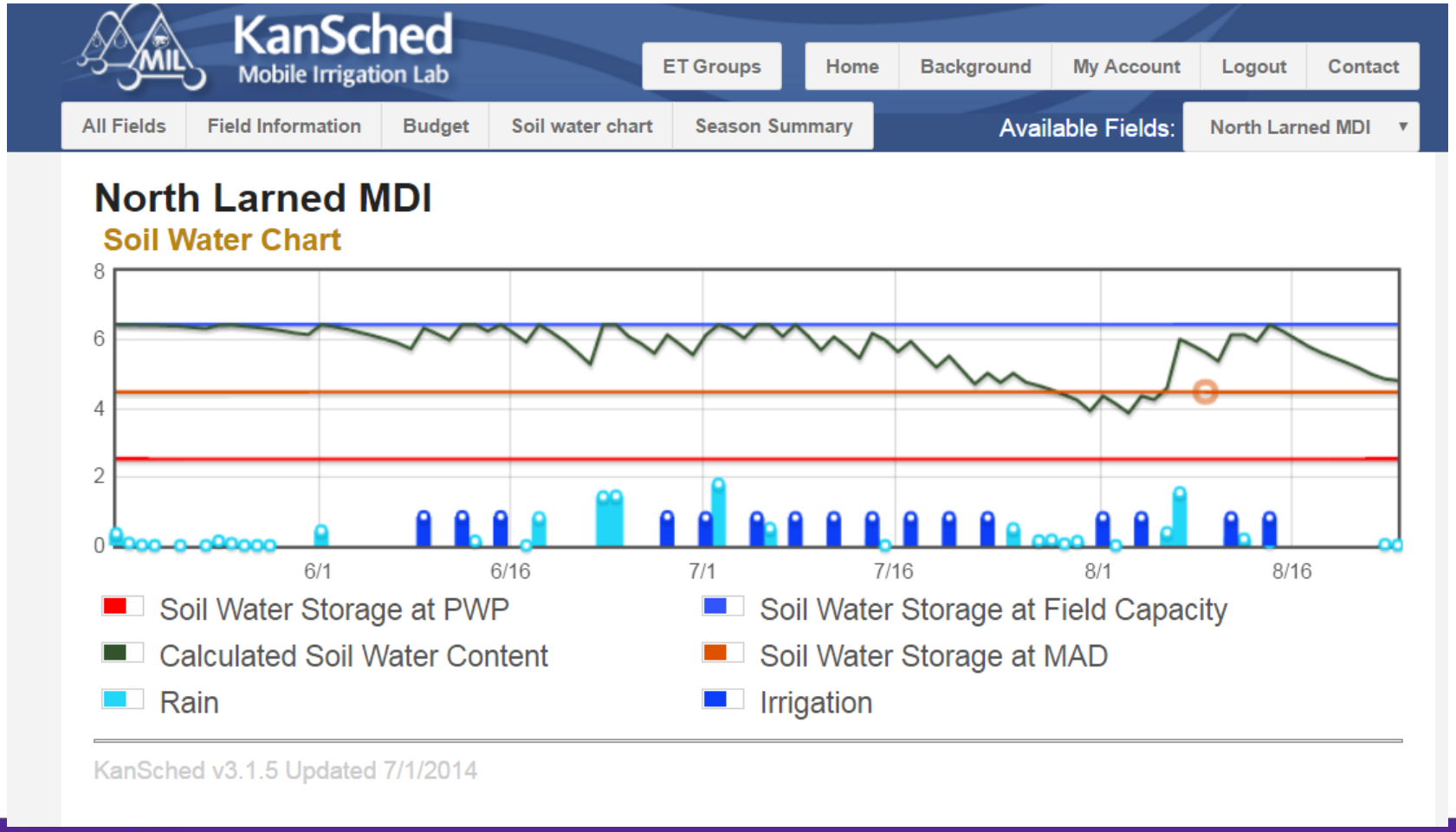
Water PACK/ILS Farm Features

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

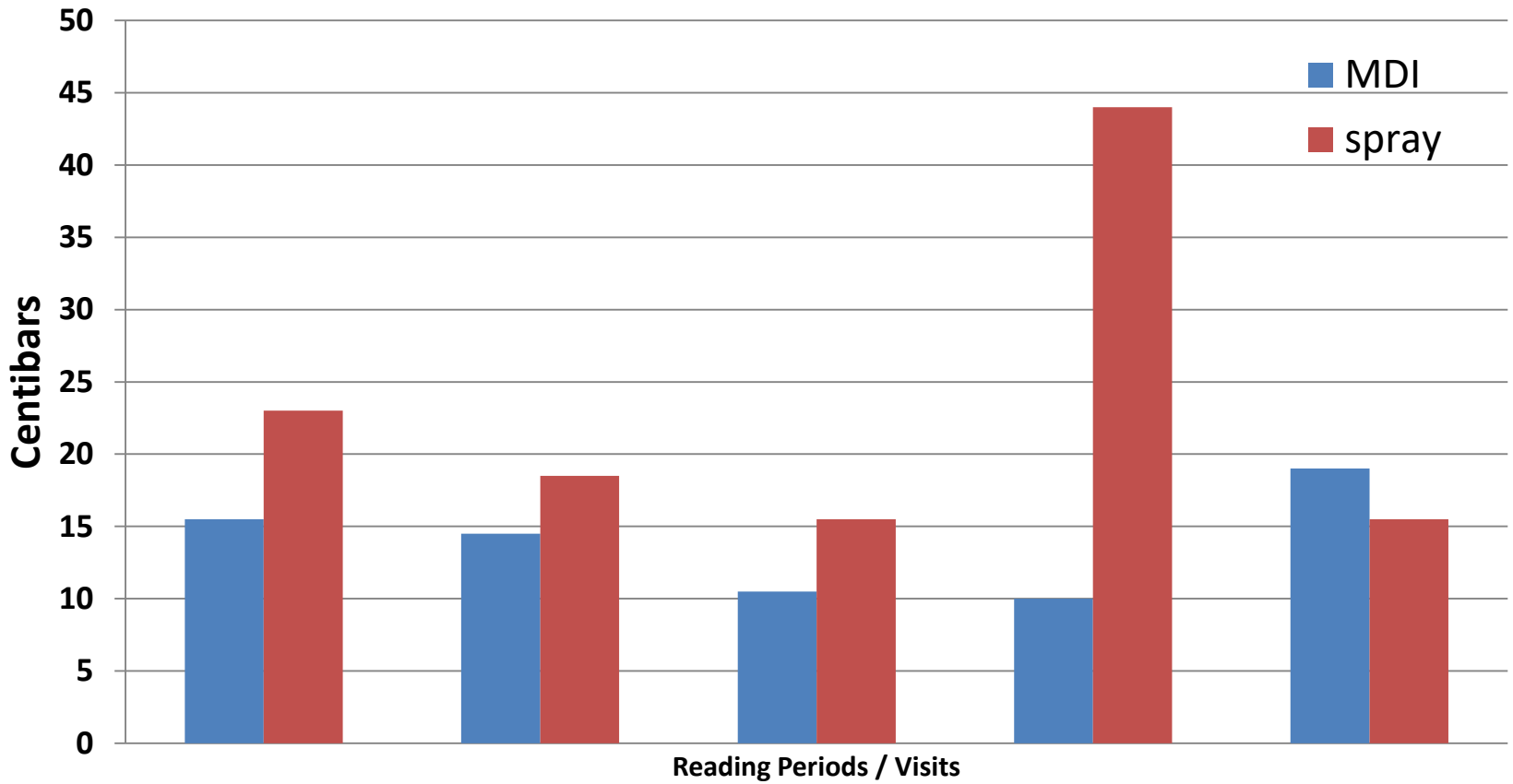
- **Side-by-side comparison**
- North field (#16) is where the trials are installed
- South field (#15) is the control
- Does planting in circles have substantial advantage over straight planting?



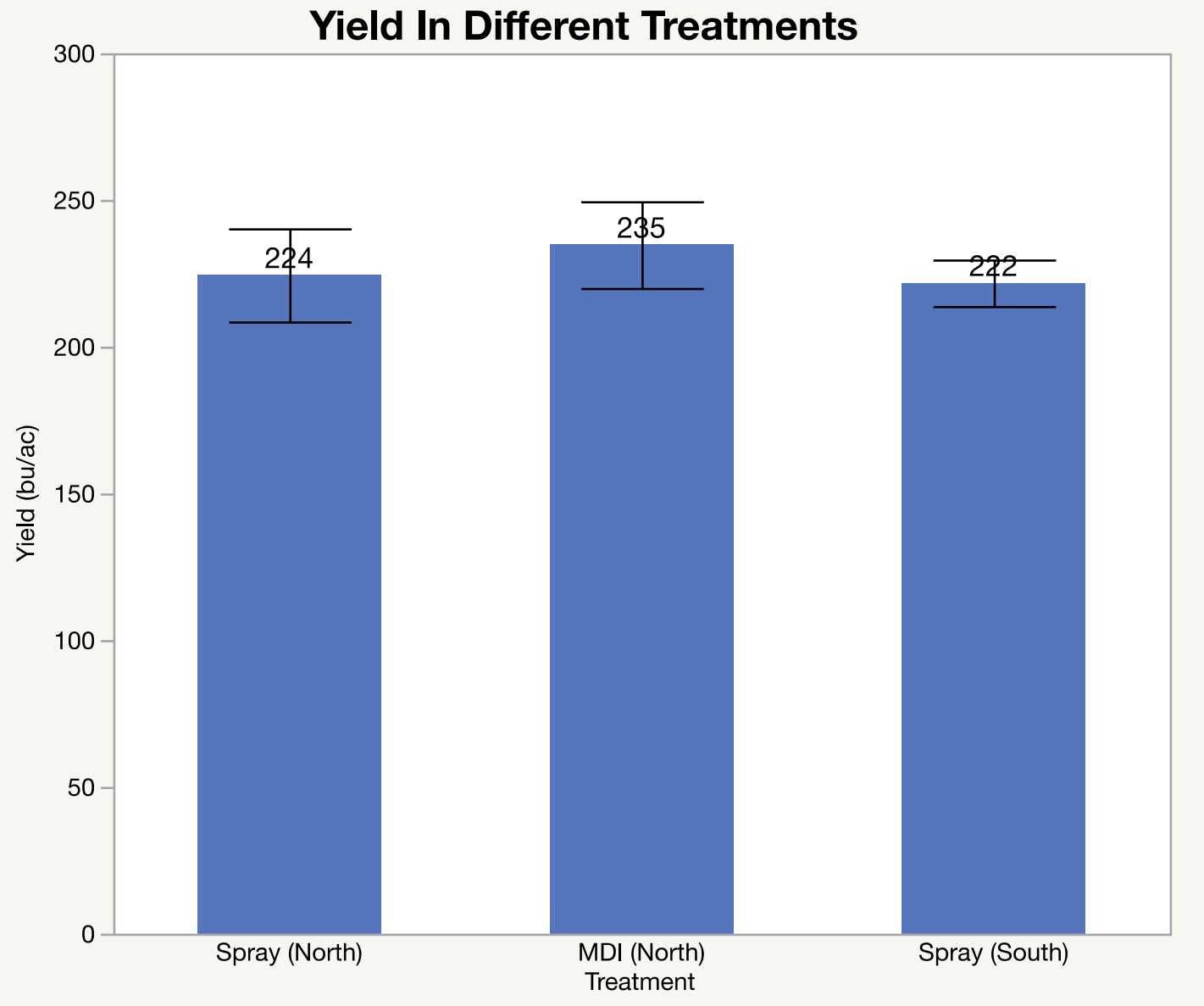
ILS – Water PACK Water Technology Farm
2016 Water Budget for MDI/Spray Field
ETr = 23.83 ETc = 20.28 In-season Irrigation 13.2 inches



MDI vs Spray Soil Comparison



2016 Yield Data



2017 ILS Farm Data

Combine (and Hand-harvest) Data

North = 202 (217) bu/ac

South = 201 (230) bu/ac

MDI = 222 bu/ac

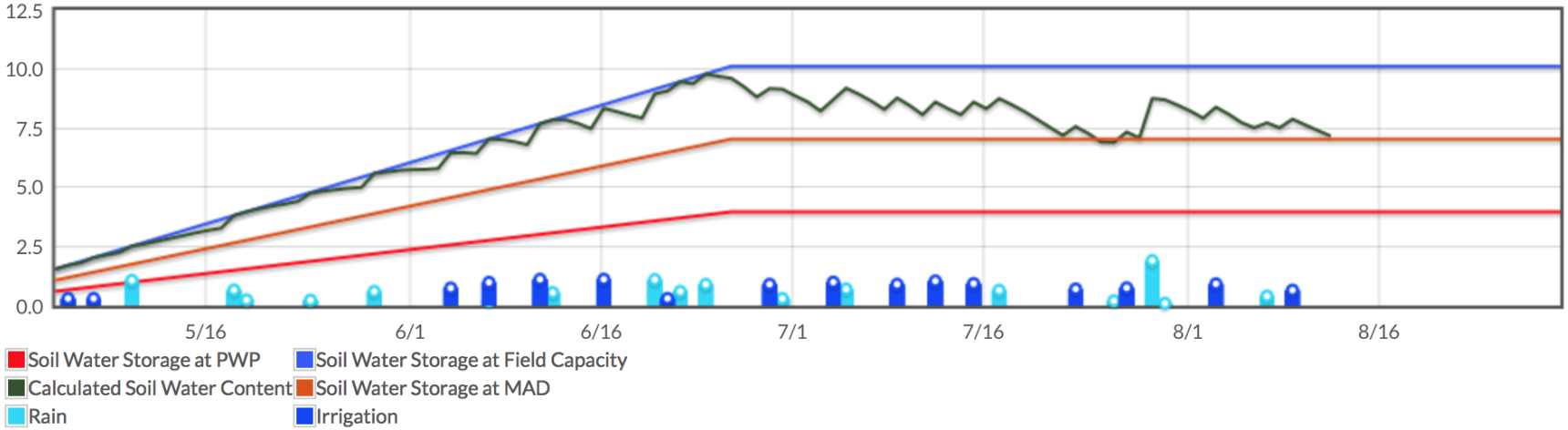
Spray = 215 bu/ac

ILS Farm Notes

- How do you winterize the system?
- What different management practice will be done to accommodate grazing?
- **Why don't we see substantial difference?**

ILS Field 15 Spray 2018

Soil Water Chart



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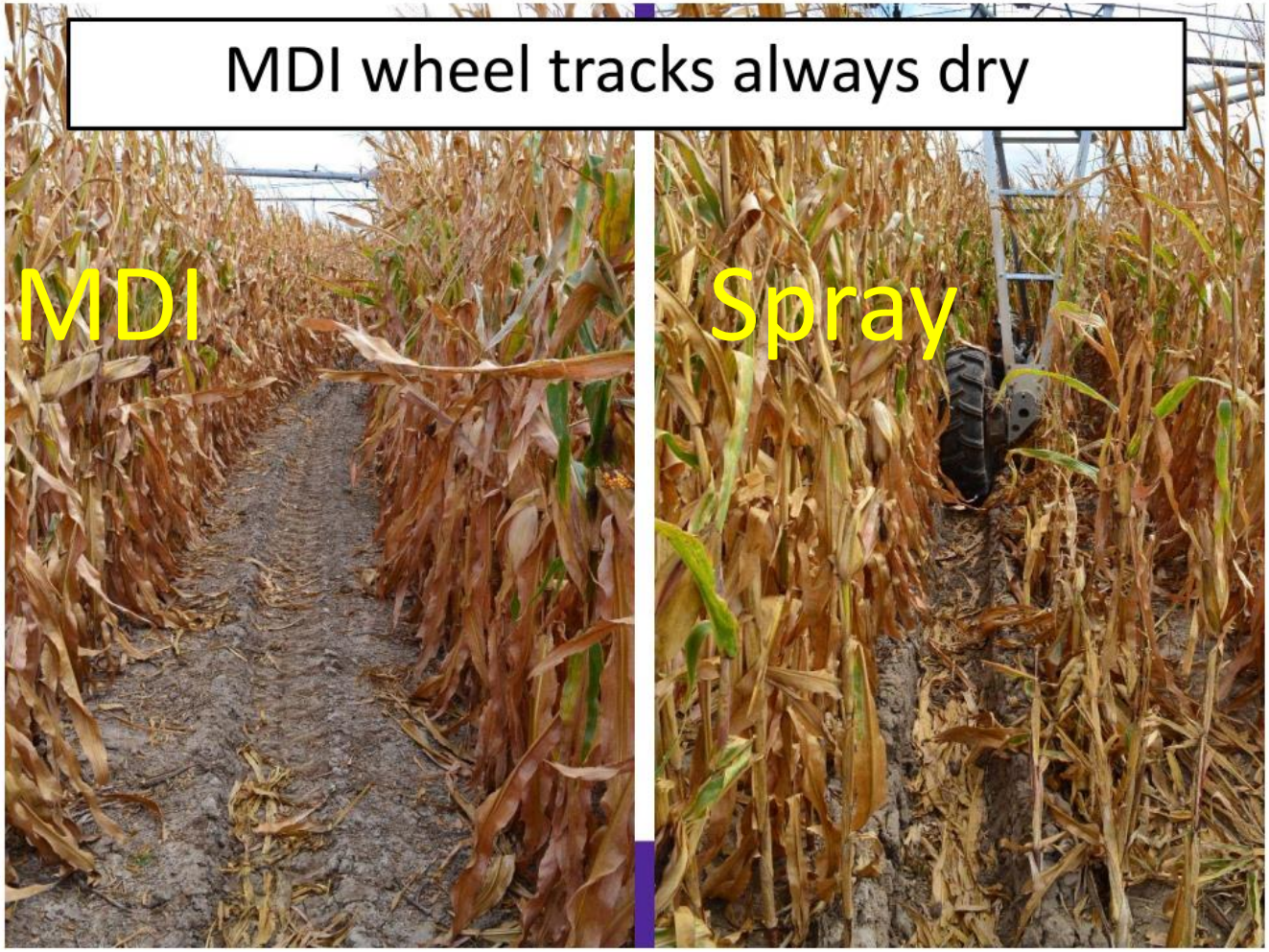
2018 ILS Farm Data

FIELD	TREATMENT	YIELD (Combine) (BU/AC)	YIELD (Hand) (BU/Ac)	IRRGN APPLIED (IN)	WATER USE EFFICIENCY (BU/Ac-IN)
NORTH 16	ALL	234	244	13.1	18.62
	MDI (70%)	231	243	9.8	24.8
	MDI (80%)		237	11.2	21.2
	SPRAY (100%)	249	259	14.0	18.5
SOUTH 15	SPRAY	232	237	15.3	15.5

Potential MDI advantage ….



T&O Farms
Water Technology Farm

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	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

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

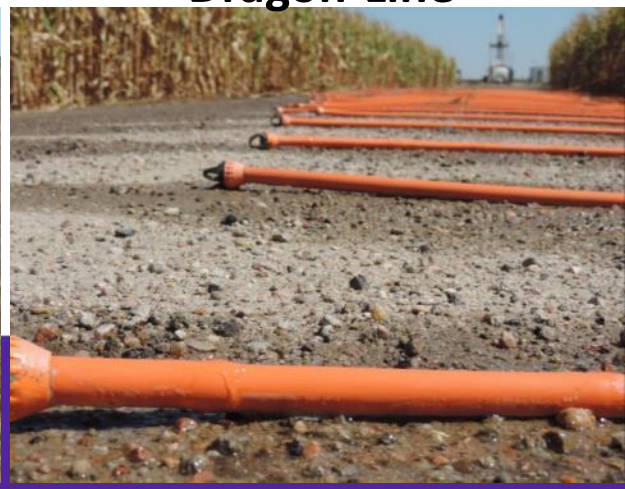
Applicators on each Span

Drag Hose

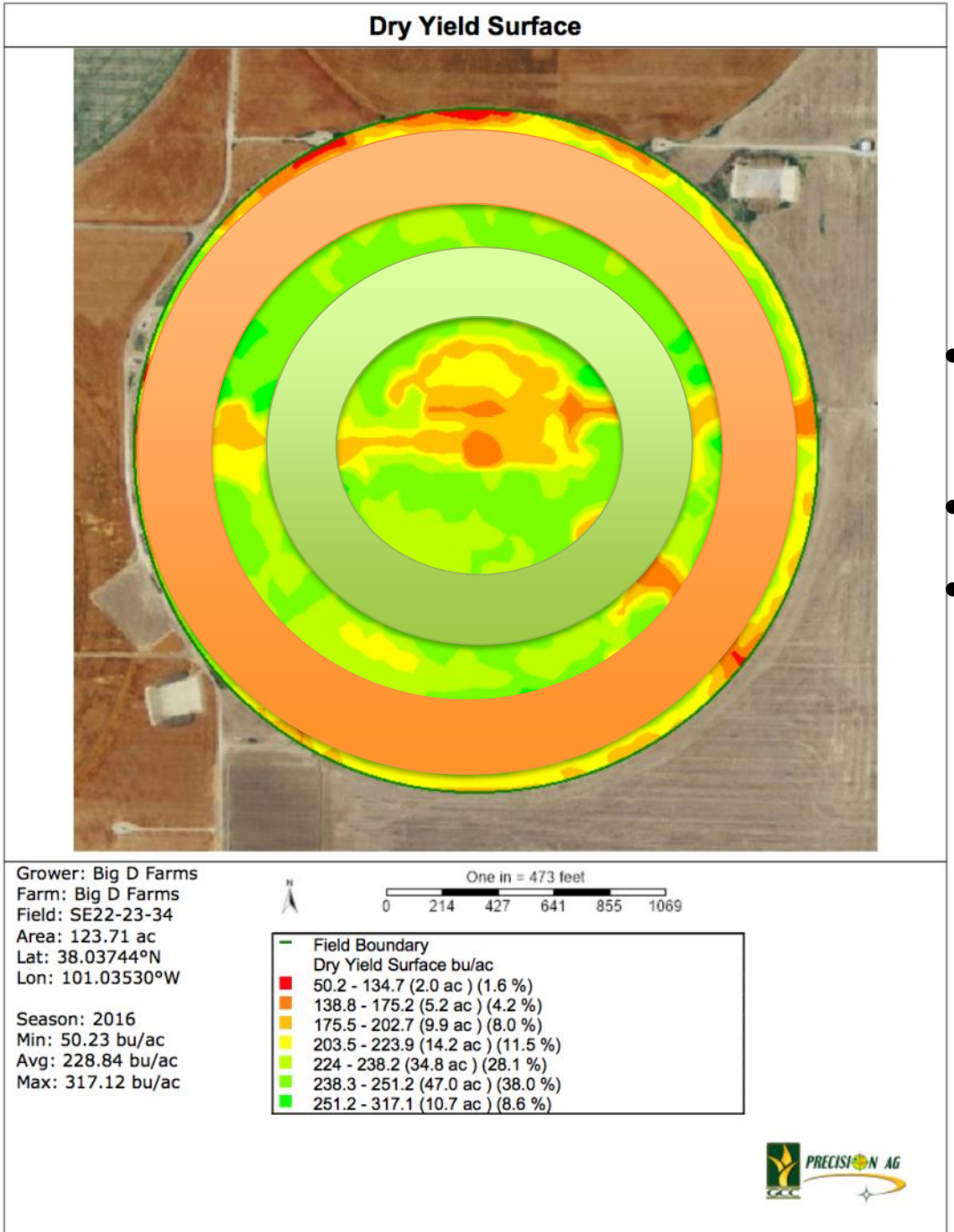
Bubbler

iWob

Dragon-Line

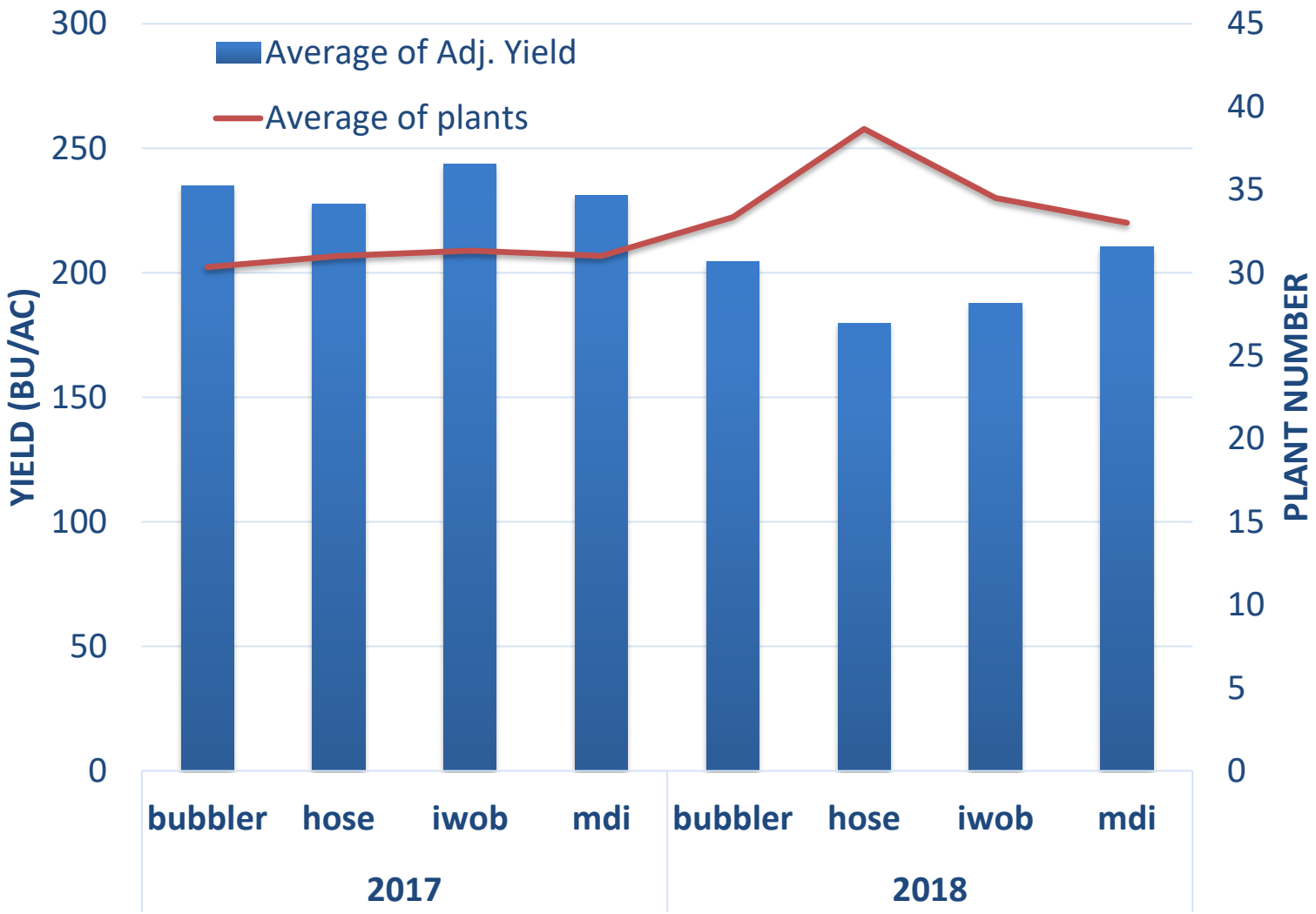


2016



Roth Corn Field

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


Average of Adj. Yield
Average of plants
YIELD (BU/AC)
PLANT NUMBER
300
250
200
150
100
50
0
45
40
35
30
25
20
15
10
5
0
bubbler
hose
iwob
mdi
bubbler
hose
iwob
mdi
2017
2018

Water Quality Plot

Average Yield (bu/ac):

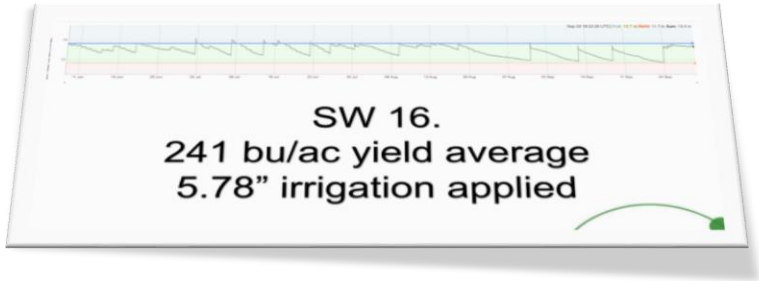
Dryland = 151

Ditch Irrigated = 133

2017 Roth Corn Field

Managed with soil moisture sensor

- Yield = 241 bu/ac
- Rain = 16 in
- **Irrigation Applied = 5.8 in**

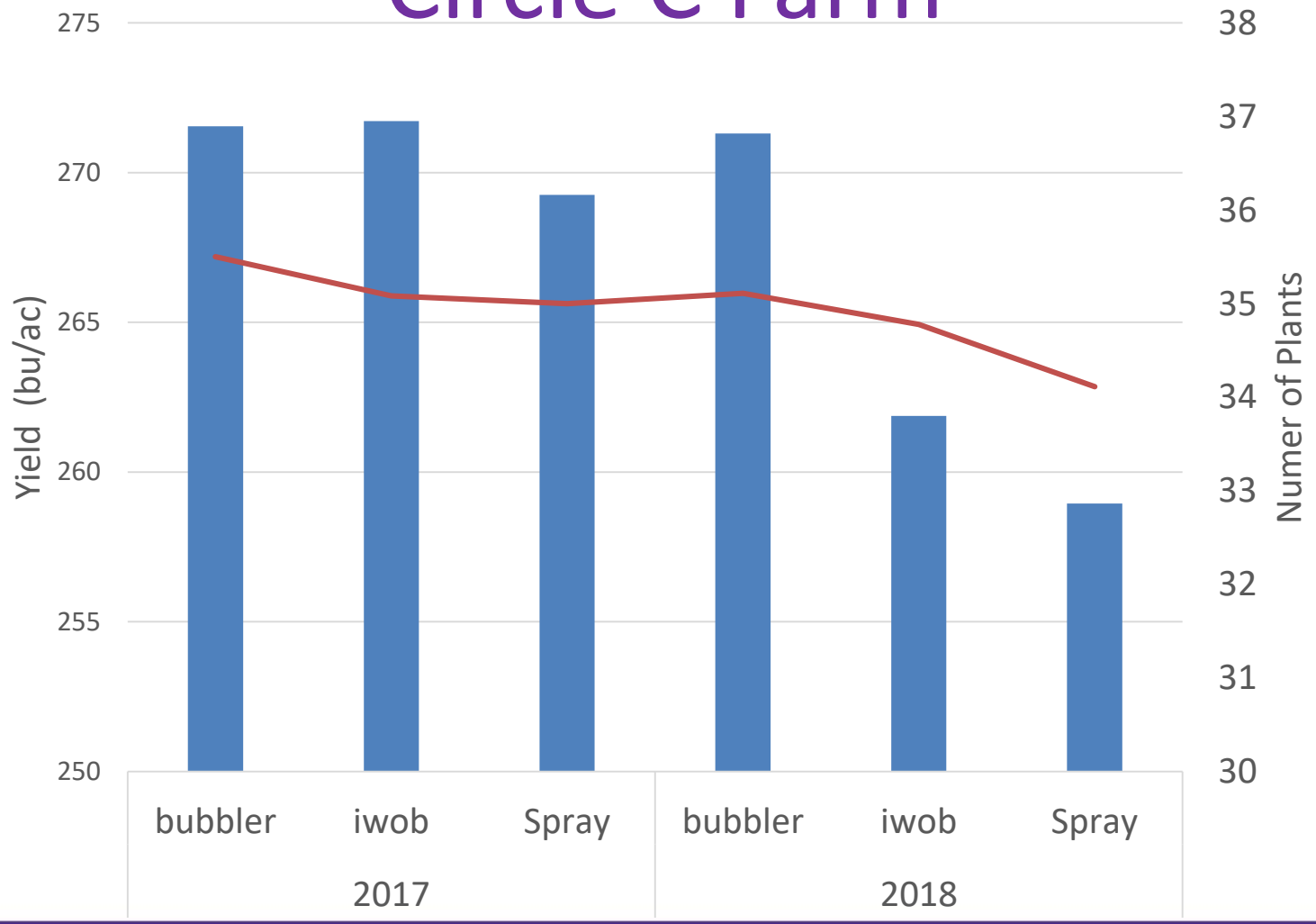


Managed by crop consultant –no sensor

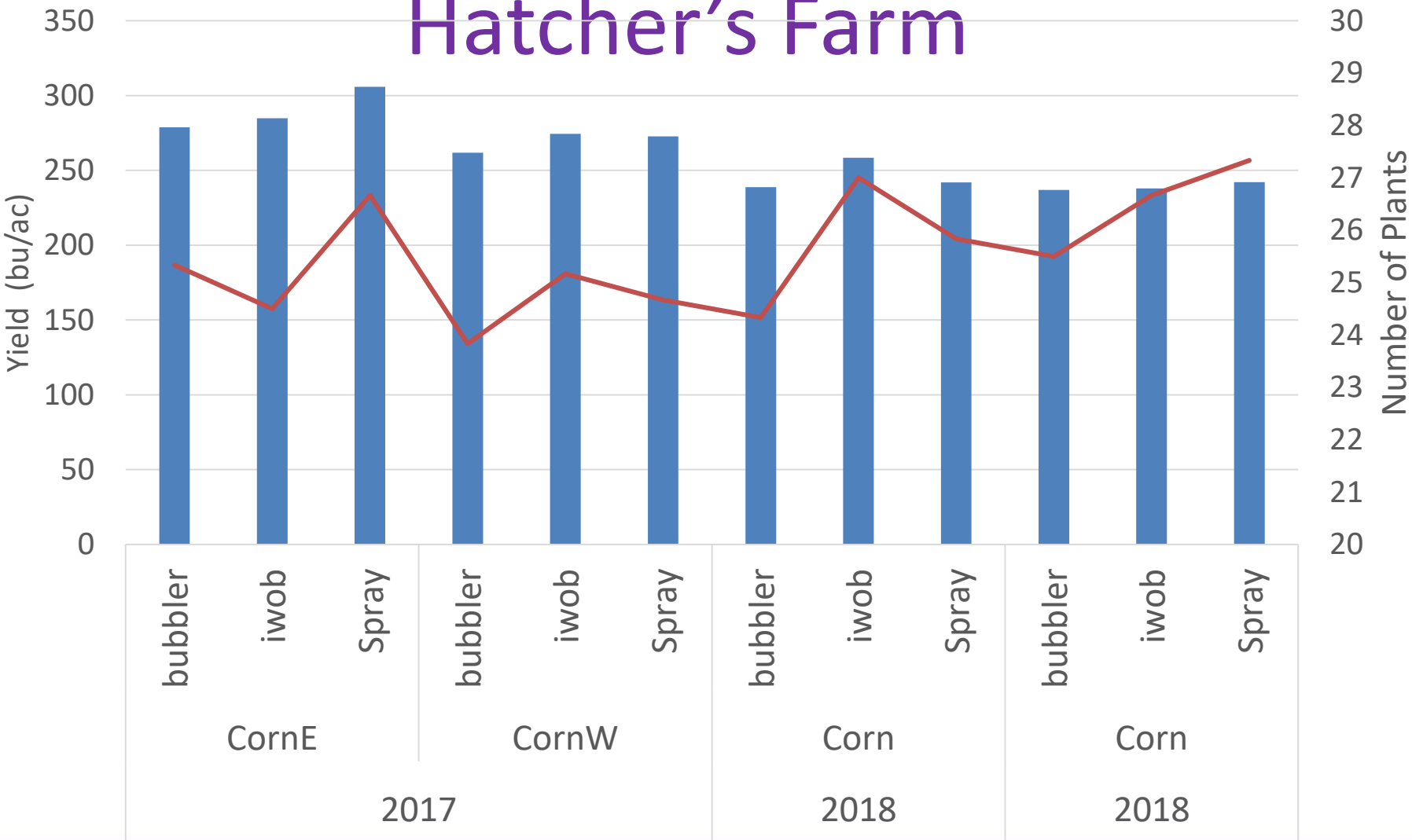
- Yield = 240 bu/ac
- Rain = 16 in
- **Irrigation Applied = 13 in**

Hatcher and Circle C Farms

Circle C Farm



Hatcher's Farm



Hatcher's Farm

Combine (and Hand-harvest) Data

- East Field = 247 (290) bu/ac
- West Field = 244 (270) bu/ac

Hand-harvest Data Per System

- Bubbler = 270 bu/ac
- I-Wob = 280 bu/ac
- Spray = 289 bu/ac

2017 Water Use

341 AF

88 % of yearly WCA average allocation of 385 AF

OR

29 % of 3-year allocation

Circle C Farm

Combine (and Hand-harvest) Data

- Circle 2 = 249 (282) bu/ac
- Circle 5 = 224 (259) bu/ac

Hand-harvest Data Per System

- Bubbler = 272 bu/ac
- I-Wob = 272 bu/ac
- Spray = 269 bu/ac

Circle C Farm

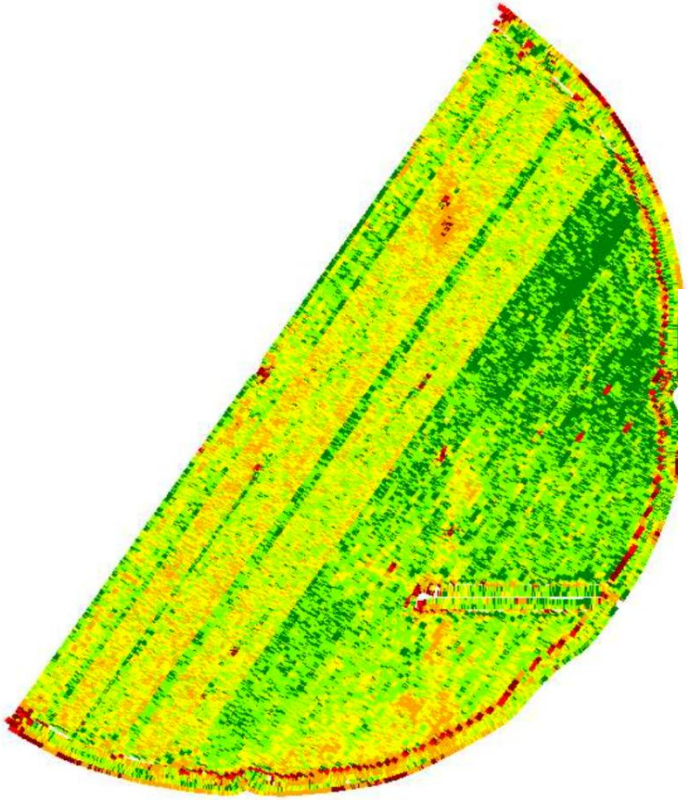
2017 Water Use

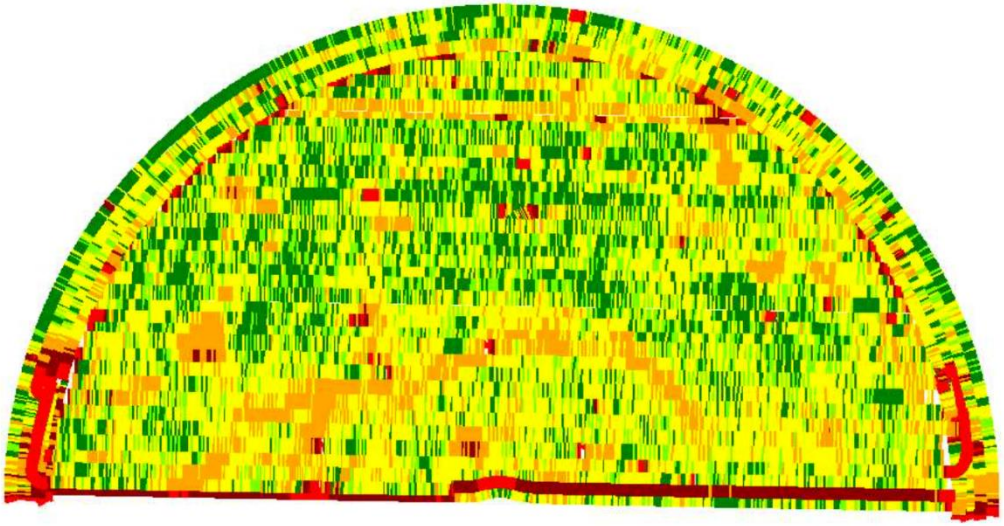
871 AF

99.6% of yearly WCA average allocation of 875 AF

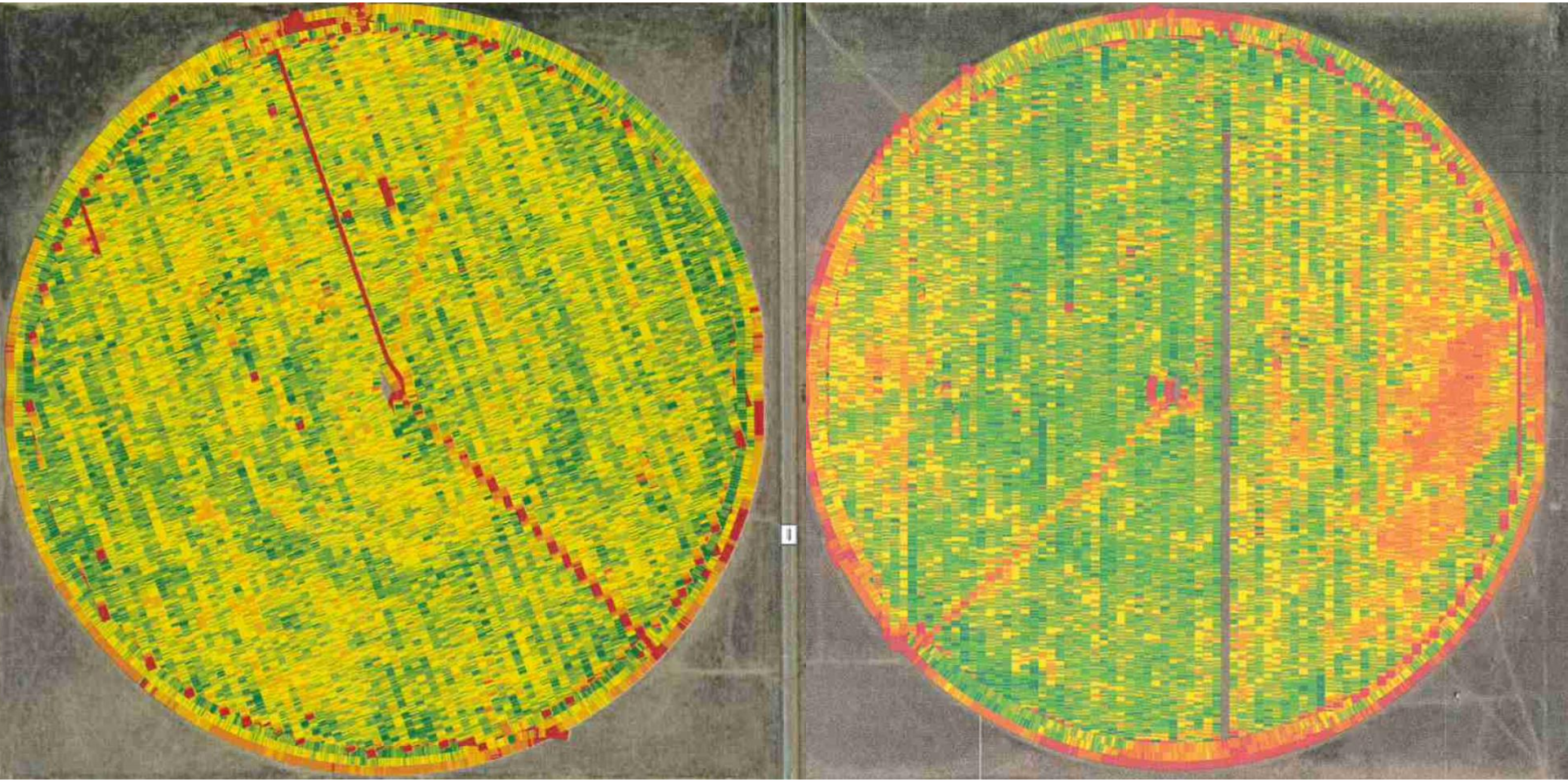
OR

19.9% of 5-year allocation

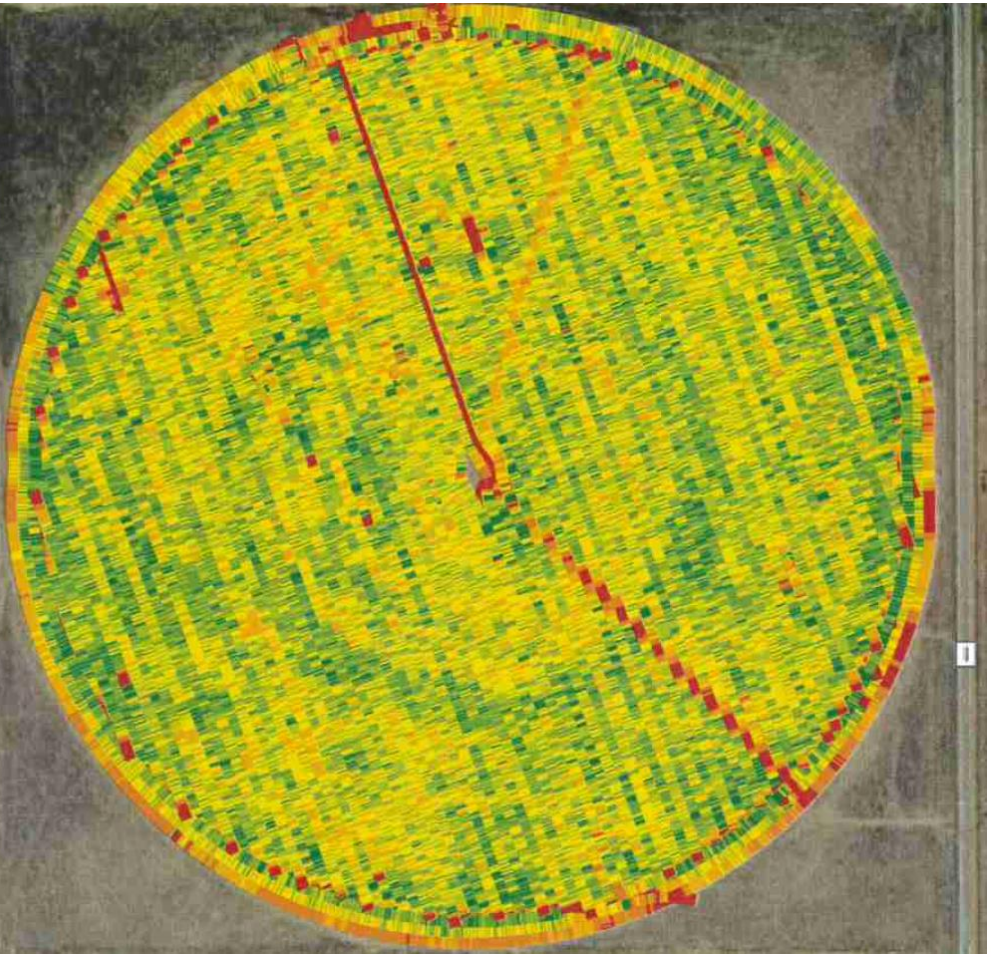




Hatcher's Farm

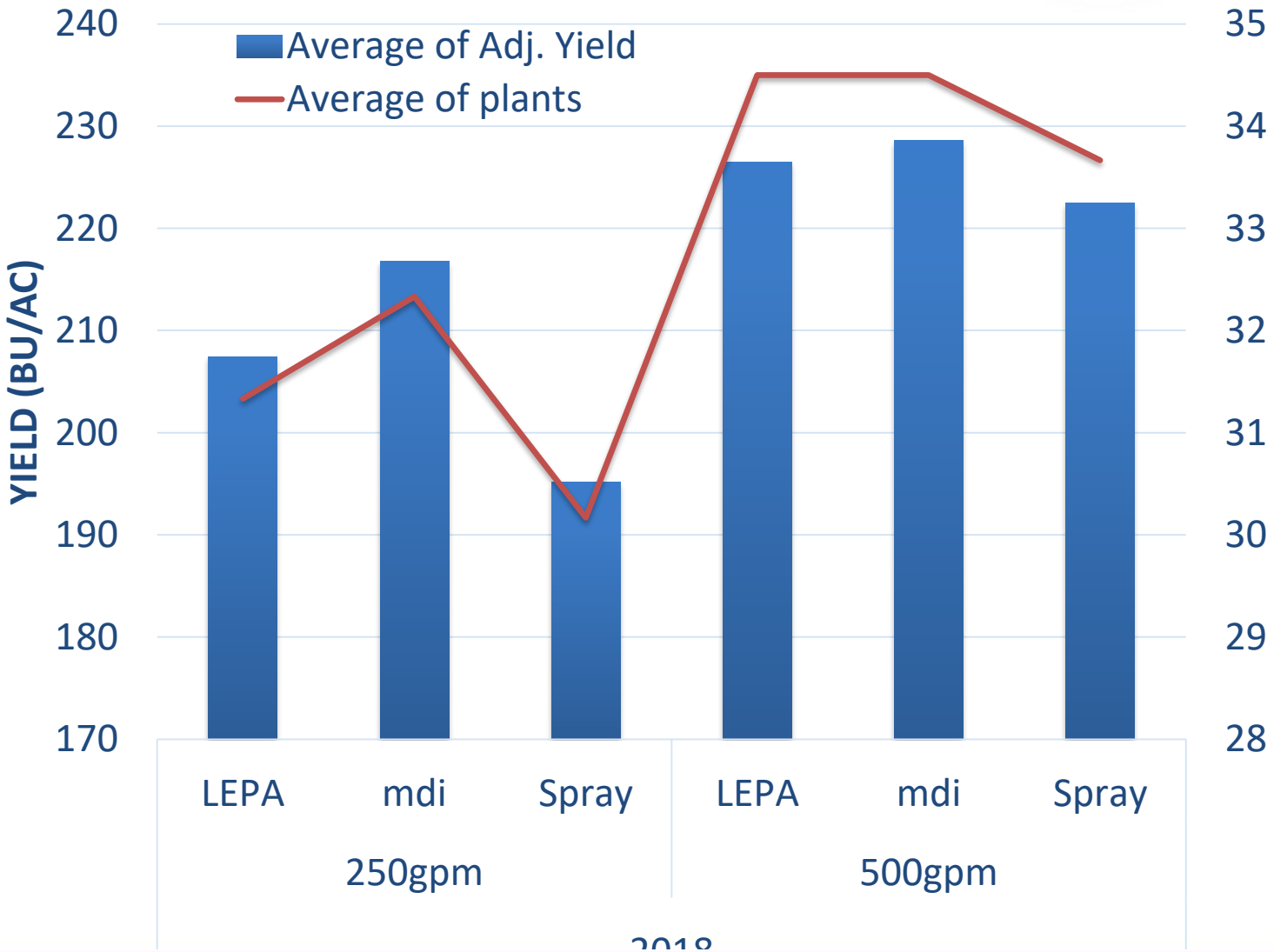


Hatcher's Farm



MC	Spans	Treatment
0.29	7	Moving Plate
0.28	6	Fixed Pads
0.29	5	Bubbler/LEPA
0.26	4	Moving Plate
0.25	3	Bubbler/LEPA
0.26	2	Fixed Pads
	1	

Long Water Tech Farm



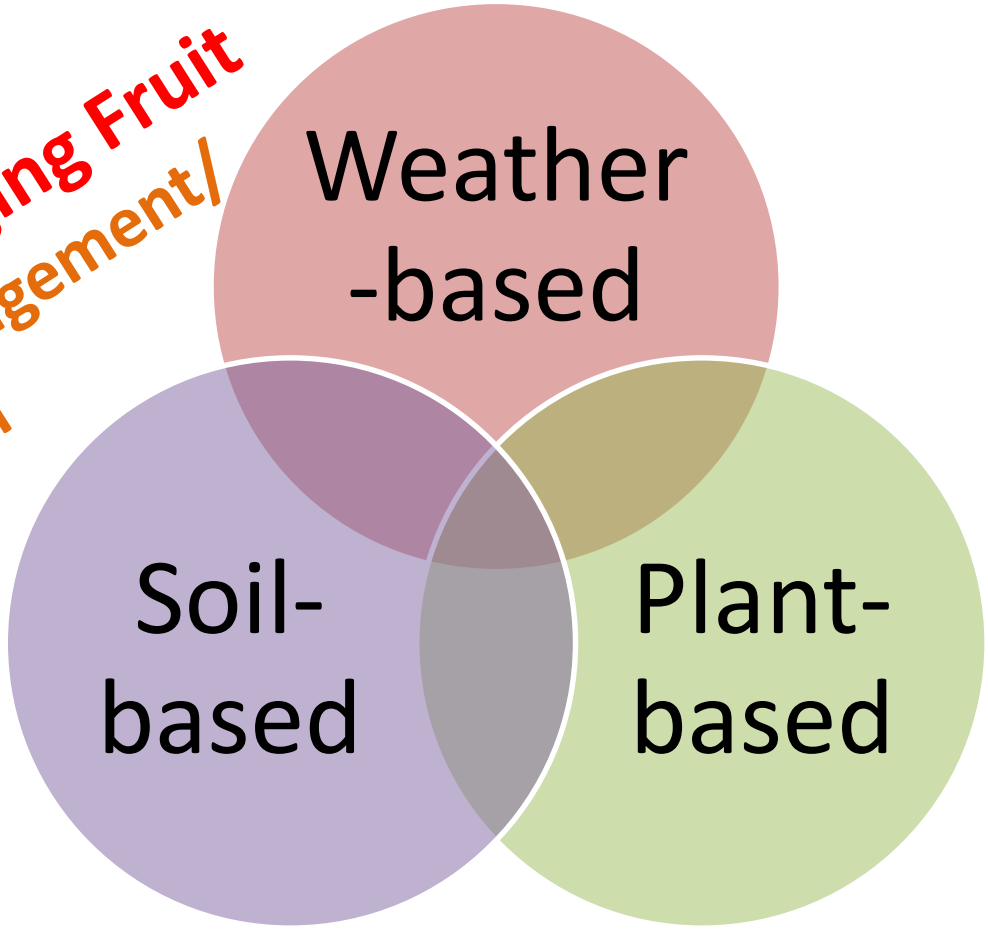
TAKE HOME MESSAGES

- Water Technology Farm is a great way to **showcase** new technologies and MANagement practices "**in your neighborhood**" at their scale
- Field days on these farms foster **good conversation** between farmers and managers
- Starting to **identify advantages and challenges**
- Allowed for a more **holistic understanding** of the technologies

TAKE HOME MESSAGES

Use One or More for Scheduling

The Low Hanging Fruit
In water management/ conservation



THANK YOU

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