



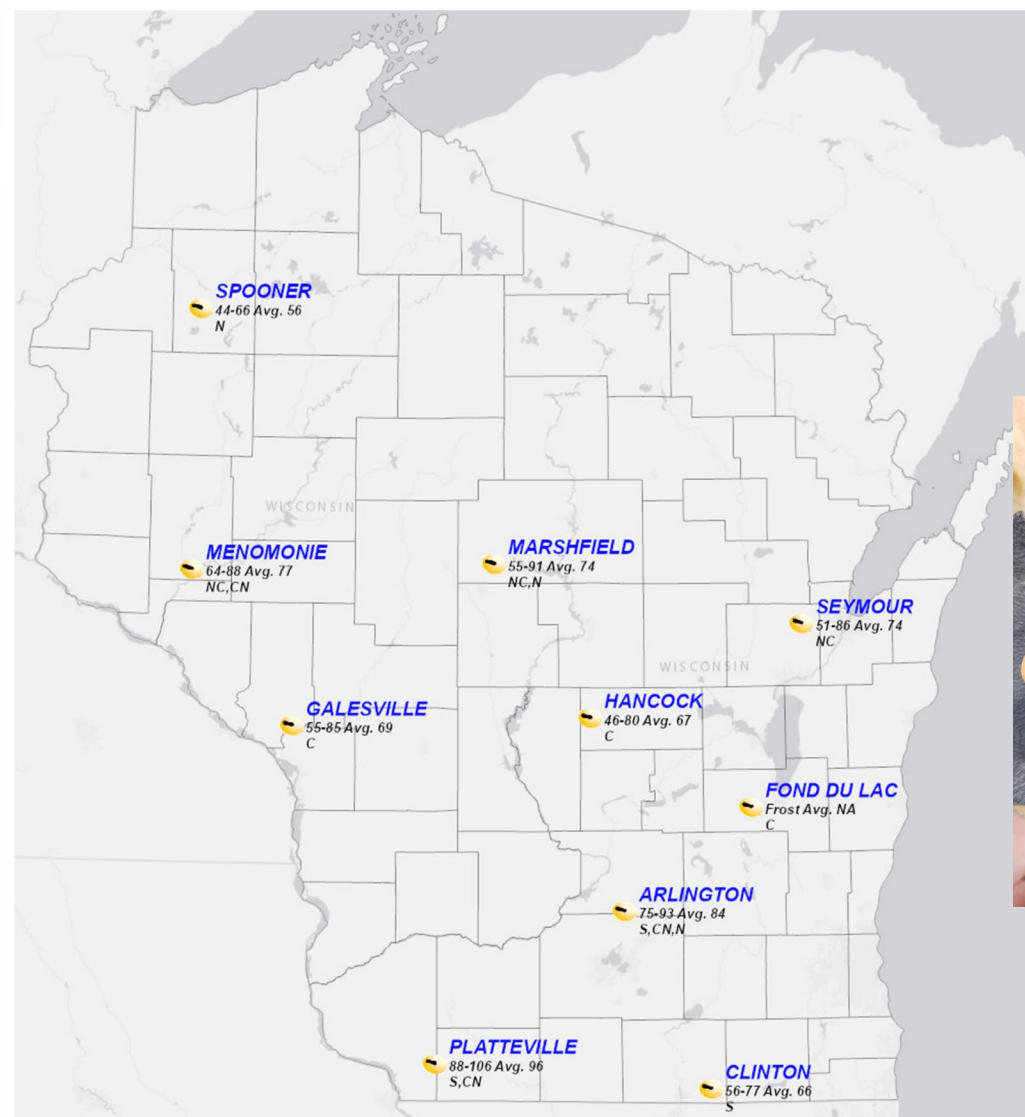
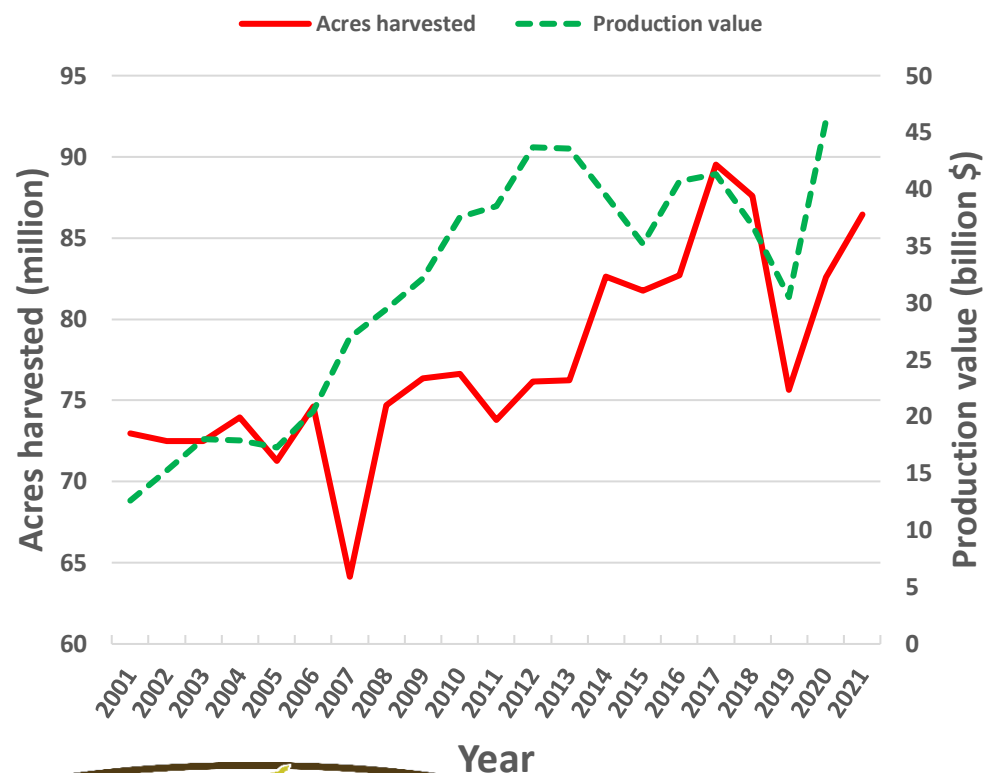
Agronomy Update Meetings 2022

**S.P. Conley, Mourtzinis, S., J. Gaska, A. Roth, et al.
Professor of Agronomy and State Soybean Specialist
College of Agricultural and Life Sciences, UW-Madison**

UW BeanTeam Soybean Program in Review

2021 WI Record Soybean Production: 112,000,000 bu

US Soybean Acreage and Production Value



Quality of the United States Soybean Crop: 2021

Seth Naeve and Jill Miller-Garvin
University of Minnesota

Seed Quality and Seed Size (10.9%↑)

QUALITY REPORT: 2021

QUALITY REPORT: 2021

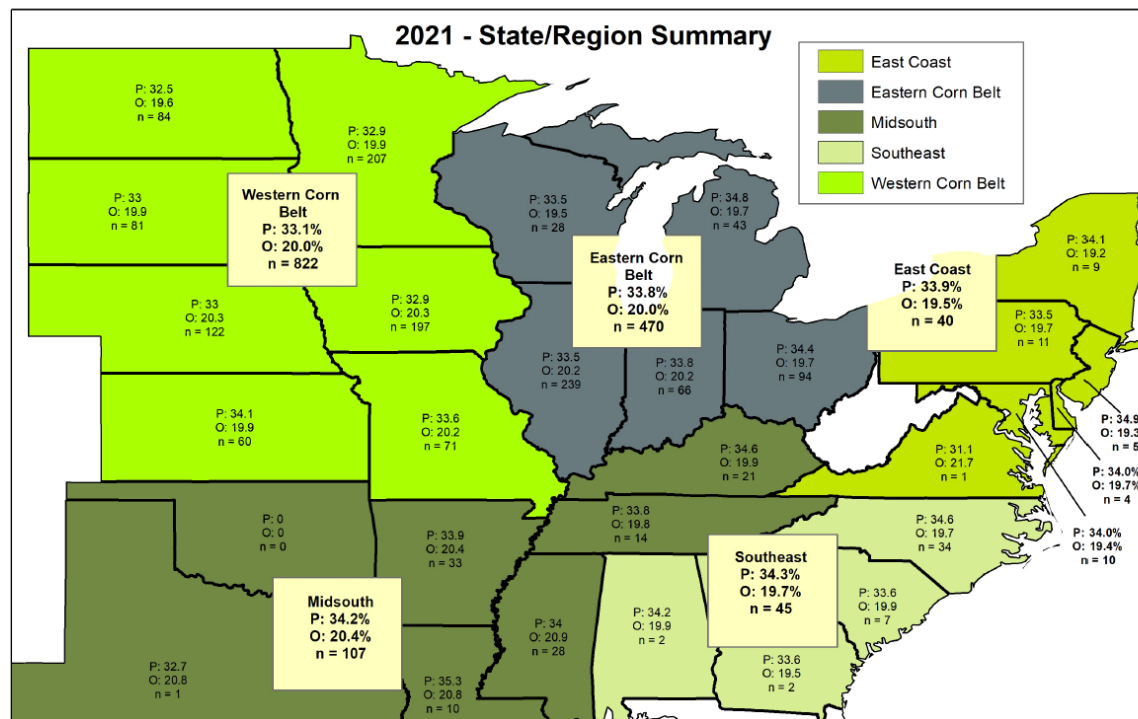
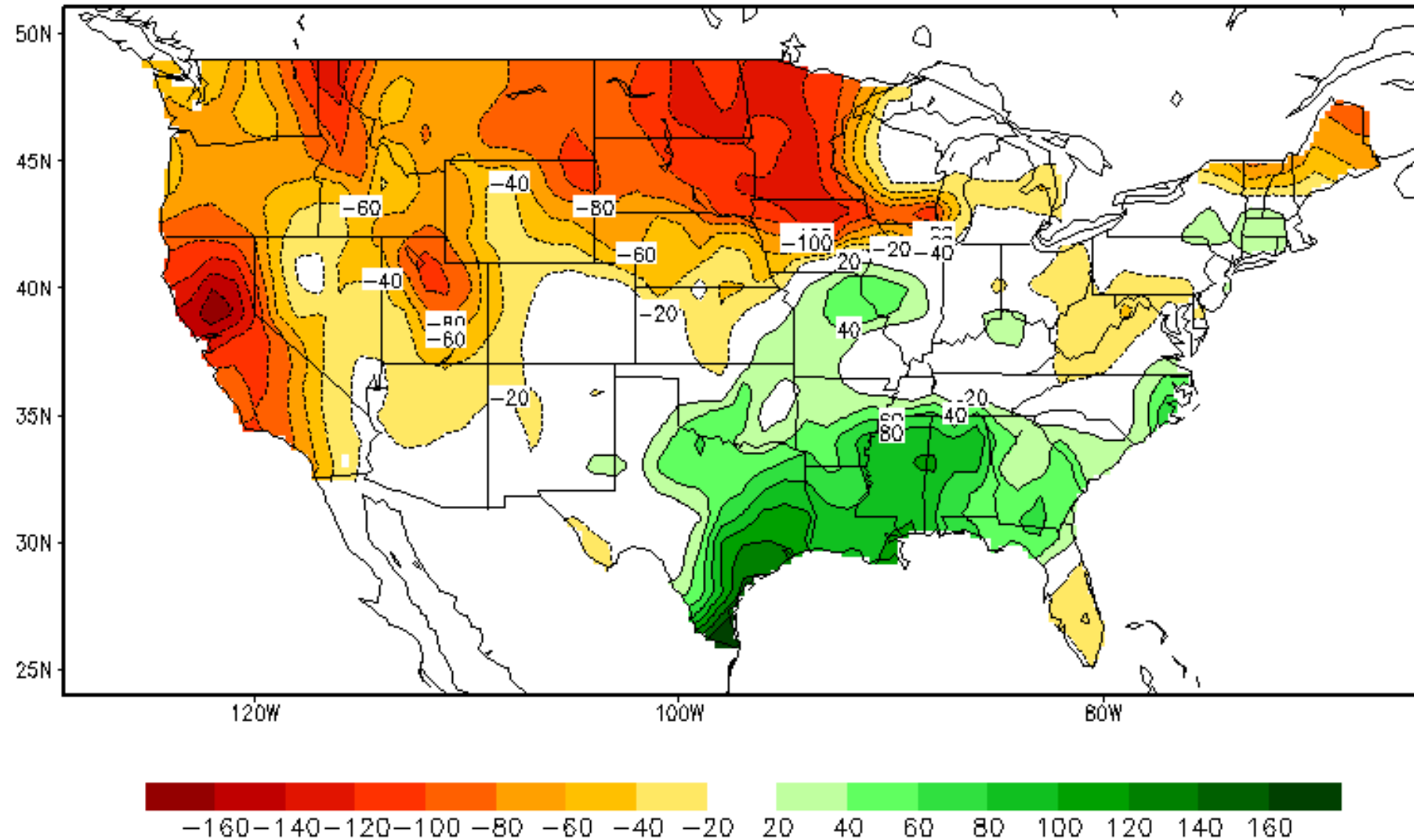


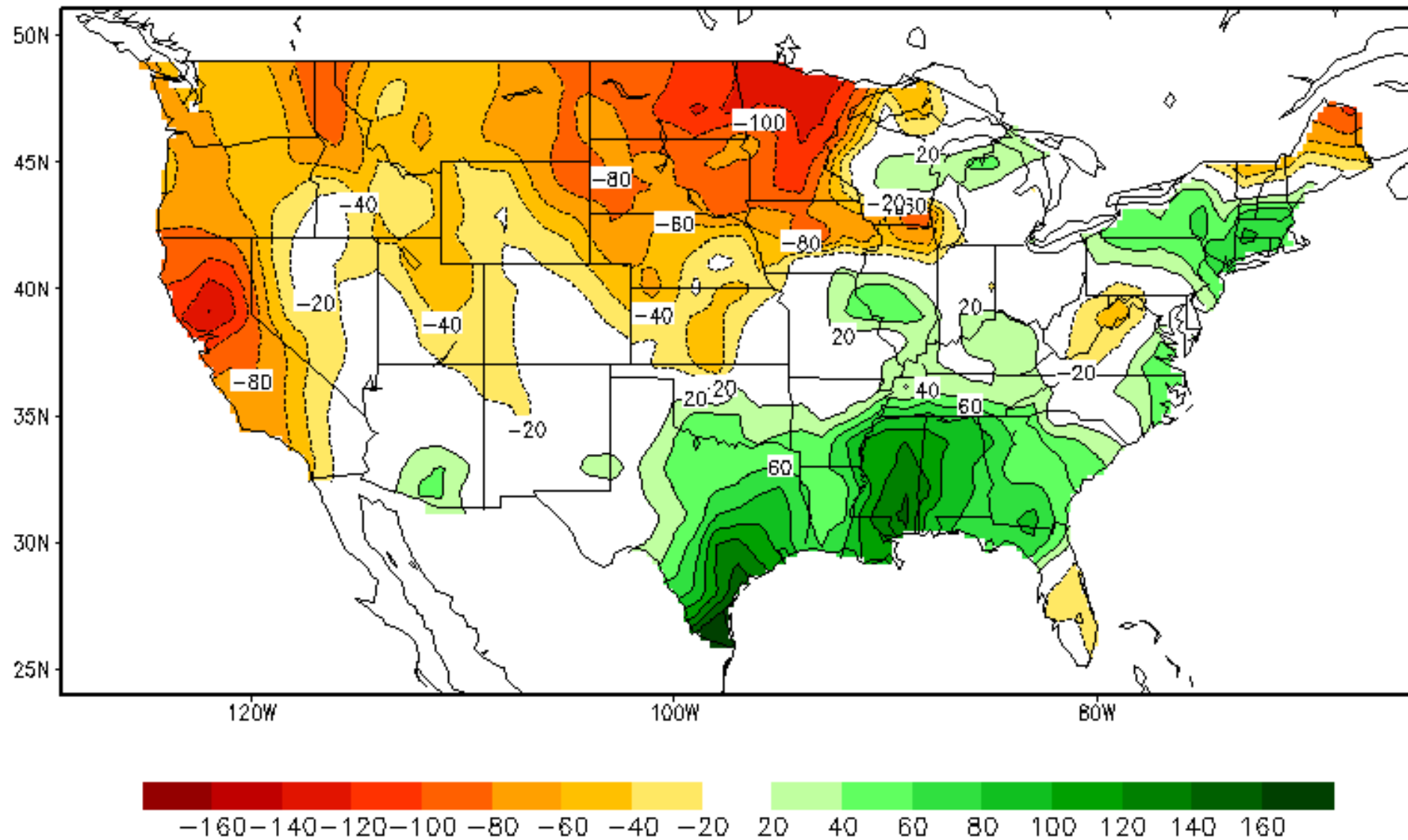
Table 3. USB 2021 Soybean Quality Survey Seed Data

Region	State	Number of Samples	Seed Weight (g 100 seeds ⁻¹)	Test Weight (lb bu ⁻¹)	Foreign Material (%)	Sucrose (db)
Western Corn Belt (WCB)	Iowa	197	17.2	56.5	0.2	5.1
	Kansas	60	16.2	56.3	0.2	4.6
	Minnesota	207	17.8	57.1	0.2	5.4
	Missouri	71	15.5	55.8	0.2	4.6
	Nebraska	122	17.0	56.1	0.3	5.1
	North Dakota	84	16.0	57.5	0.2	5.5
	South Dakota	81	16.8	57.1	0.2	5.2
Averages [†]	Western Corn Belt	822	16.7	56.7	0.2	5.1
Eastern Corn Belt (ECB)	Illinois	239	16.2	55.9	0.2	4.8
	Indiana	66	16.1	56.0	0.2	4.8
	Michigan	43	16.7	57.0	0.2	4.8
	Ohio	94	16.7	56.6	0.1	4.8
	Wisconsin	28	18.3	56.2	0.3	5.2
Averages [†]	Eastern Corn Belt	470	16.5	56.2	0.2	4.8
Midsouth (MDS)	Arkansas	33	16.0	55.2	0.2	4.4
	Kentucky	21	16.1	54.8	0.1	4.4
	Louisiana	10	15.8	52.6	0.6	3.6
	Mississippi	28	16.0	54.3	0.3	4.0
	Oklahoma	0				

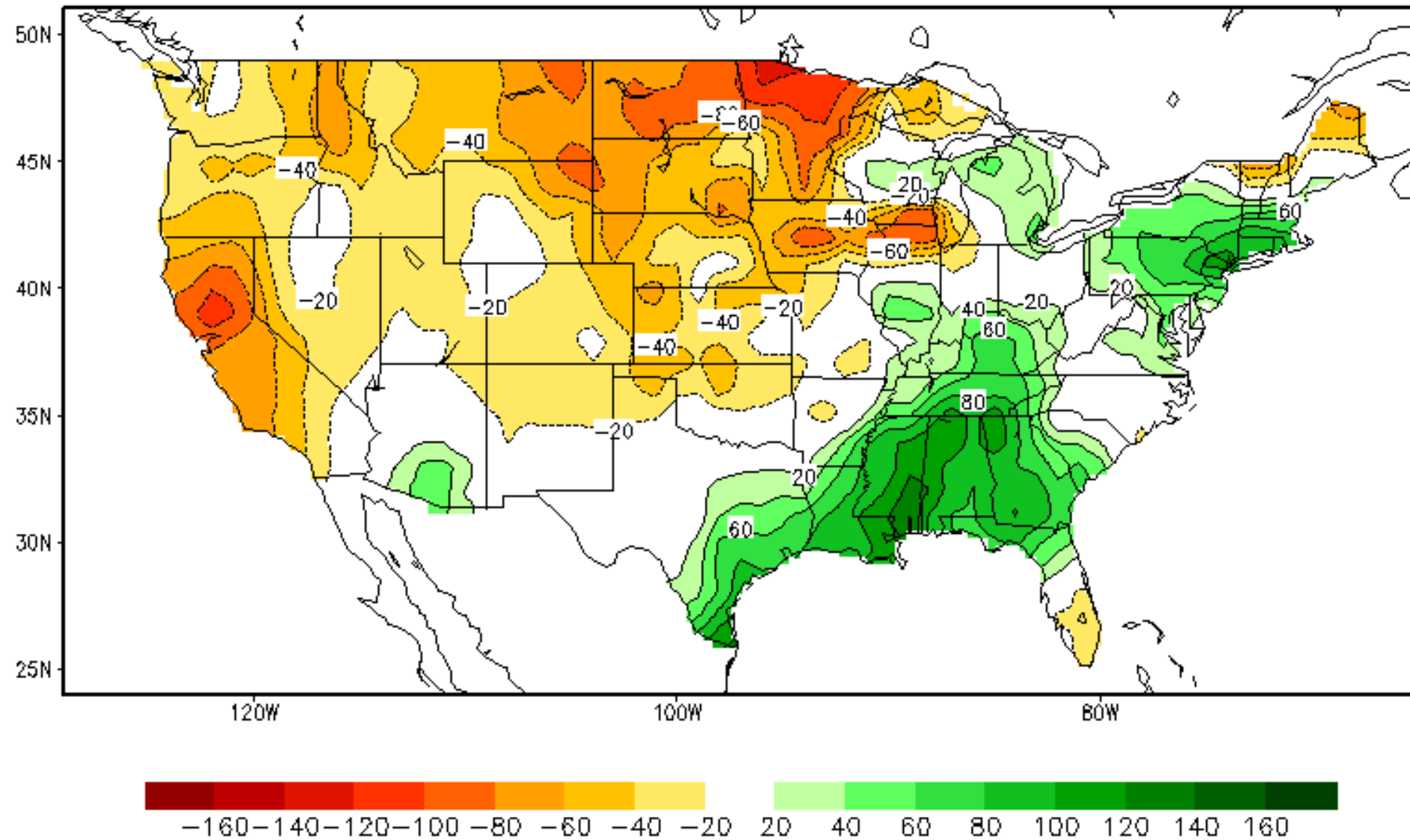
Calculated Soil Moisture Anomaly (mm) JUL, 2021



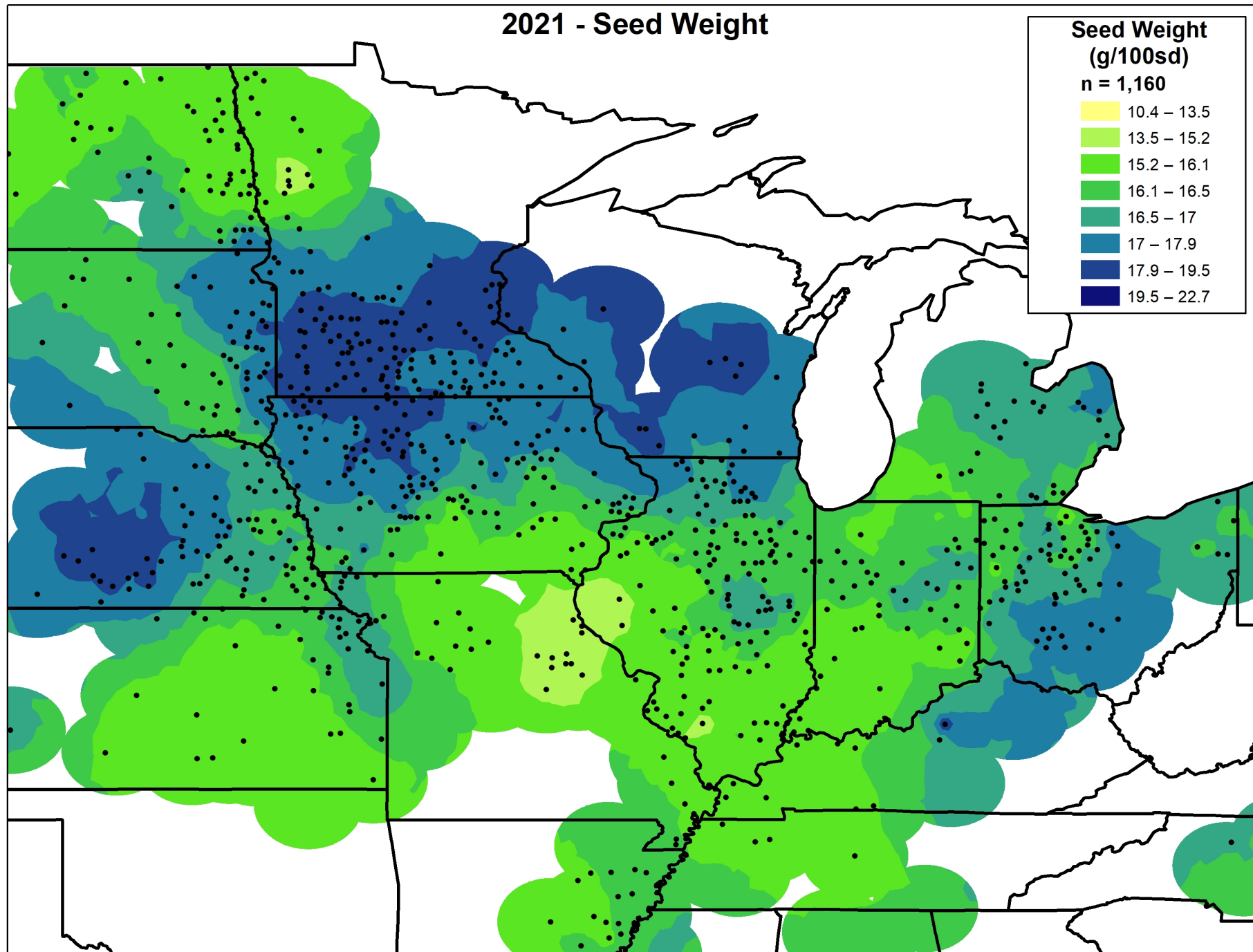
Calculated Soil Moisture Anomaly (mm) AUG, 2021



Calculated Soil Moisture Anomaly (mm) SEP, 2021



2021 - Seed Weight



2021 Southern Region Glyphosate Tolerant Soybean Trial

N = 95
Platteville:
23 Var ≥ 100 bpa

Brand	Entry	Yield (bu a ⁻¹)	Brand	Entry	Yield (bu a ⁻¹)
Dyna-Gro	S21EN81	89	Loyal Brand	L2130E	85
Stine	28EC32	88	Dairyland	DSR-2222E	85
P3 Genetics	2229E	88	AgriGold	G2315XF	85
Genesis	G2550E	87	Asgrow	AG20X9	84
Xitavo	XO 2832E	87	FS HiSOY	HS 19F10	84
FS HiSOY	HS 21F00	87	Dairyland	DSR-2030E	84
NK	NK25-C9XF Brand	87	Dairyland	DSR-2640E	84
P3 Genetics	2126E	87	DONMARIO	DM 28E52	84
Golden Harvest	GH2102XF Brand	87	Stine	19EC12	84
FS HiSOY	HS 21E00	86	FS HiSOY	HS 25E00	84
NK	NK14-C7XF Brand	86	NK	NK17-M2XF Brand	84
Stine	27EA23	86	Golden Harvest	GH2292E3 Brand	84
Credenz	CZ 2760GTLL	85	P3 Genetics	1928E	84
AgriGold	G2220XF	85	NK	NK22-C4E3 Brand	84
Dyna-Gro	S28EN22	85			

* Varieties shown are not significantly different (0.10 level) than the highest yielding cultivar. Three test average included Arlington, Clinton, and Platteville.

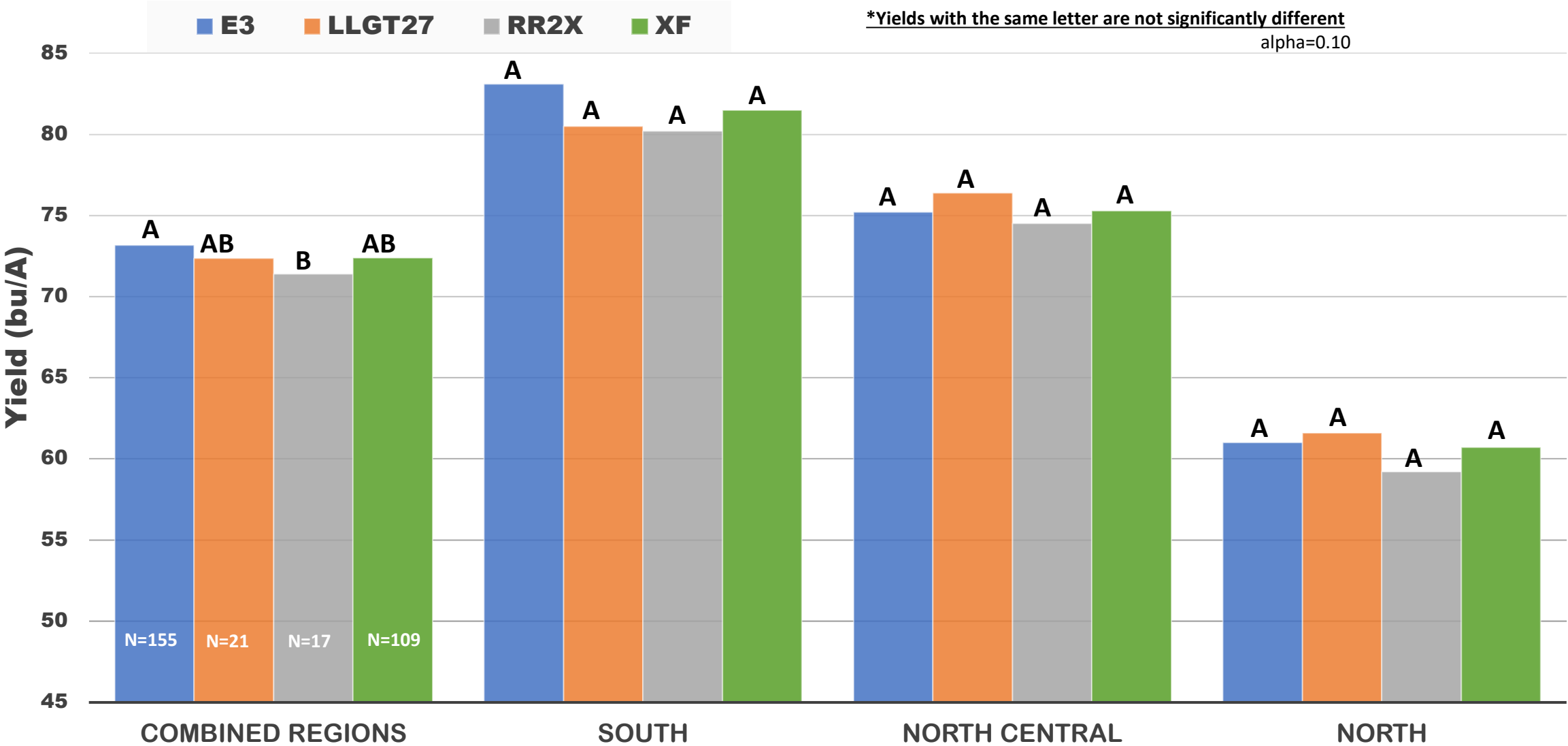
2021 North Central Region Glyphosate Tolerant Soybean Trial

Brand	Entry	Yield (bu a ⁻¹)	Brand	Entry	Yield (bu a ⁻¹)
Xitavo	XO 1372E	86	Dairyland	DSR-1450E	81
NK	NK18-J7E3 Brand	85	Golden Harvest	GH1414X Brand	81
NK	NK17-M2XF Brand	85	Golden Harvest	GH1442XF Brand	80
Golden Harvest	GH1802E3 Brand	83	Legacy Seeds	LS184-21	80
NK	NK14-C7XF Brand	82	NK	NK10-W8XF Brand	79
NK	NK14-W6E3 Brand	82	Xitavo	XO 1632E	79
Dyna-Gro	S15XF82	82	Stine	11EC02	79
Credenz	CZ 1331GTLL	82	Dyna-Gro	S17XF02	79
LG Seeds	LGS1848XF	81	ProHarvest	1638X	78
Loyal Brand	L1230E	81	Loyal Brand	L1940E	78
Apex	AE1300	81	Asgrow	AG13XF0	78

N = 70

* Varieties shown are not significantly different (0.10 level) than the highest yielding cultivar. Three test average included Menomonie, Marshfield, and Seymour.

Soybean Herbicide Trait Comparison

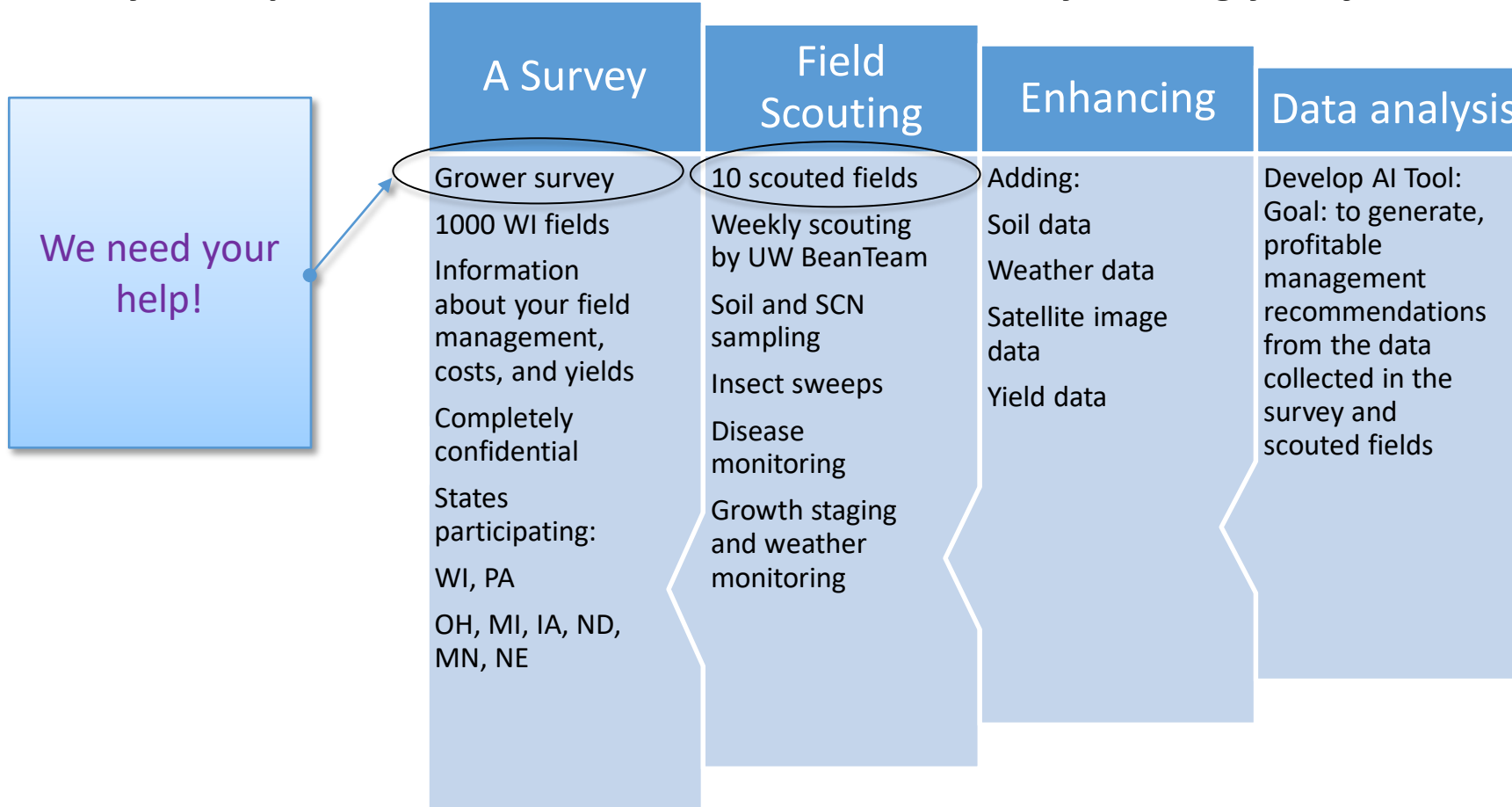


*The Central region was not included in this analysis due to highly variable yields

Recruiting for On-Farm Research in 2022

Do you grow soybeans?

Can you help us develop specific recommendations by sharing your field data?



To participate, contact:
John Gaska
john.gaska@wisc.edu
608-220-2693

Recruiting for On-Farm Research in 2022 (part 2)

Do you grow soybeans?

Can you help us develop specific recommendations by sharing your field data?

We need your help!

To compare yield and profitability of your current soybean cropping systems with AI recommended systems on your farm.

What we need from you

Information about your typical soybean management and changes you can do to that system

Plant soybean in three management systems

Typical
High Yield
High Profit

Harvest the plot using a well calibrated yield monitor

Provide the data and management information to us

What we will do for you

Calculate two management systems for your specific field: One for high yield and one for high profit

Analysis of the data from your farm

Protect the confidentiality of your yield data

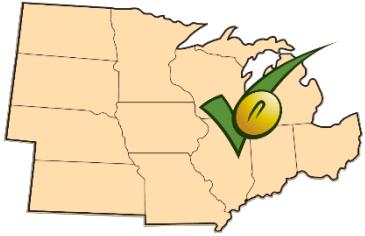
\$500 honorarium for your efforts



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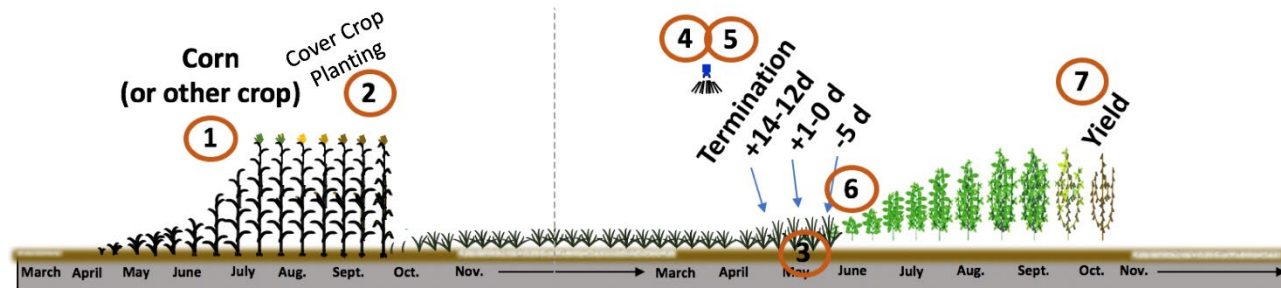
Rye Cover Crops and Arthropods in Soybean

NCSRP NORTH CENTRAL SOYBEAN
RESEARCH PROGRAM



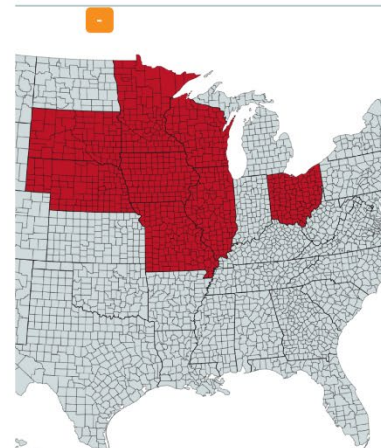
WISCONSIN
SOYBEAN
MARKETING BOARD

Multi-state NCSRP project to evaluate the effects of rye termination timing relative to soybean planting on arthropods in a cover crop (CC) to soybean system



Insects

myriapods (including centipedes and millipedes)
arachnids (including spiders, mites and scorpions)
crustaceans (including slaters, prawn and crabs)



Cover Crop

- 2 Rye following corn
- 3 Termination: Glyphosate

Measurements

- 4 Cover crop biomass
- 5 Extended leaf height
- 6 Plant damage assessment
Pitfall traps
- 7 Soybean yield

Rye Cover Crop Treatments

State	Location	Rye Cover Crop Planting Date 60 lbs/a	14DBP Termination (T1)	At Plant Termination (T2)	7DAP Termination (T3)	14DAP Termination (T4)
Wisconsin	Arlington	~Sept. 25 th	~April 24 th	~May 8 th	~May 15 th	~May 22 nd



All years:
RM 2.0, untreated, 140,000 seeds/acre
Previous crop: Corn silage

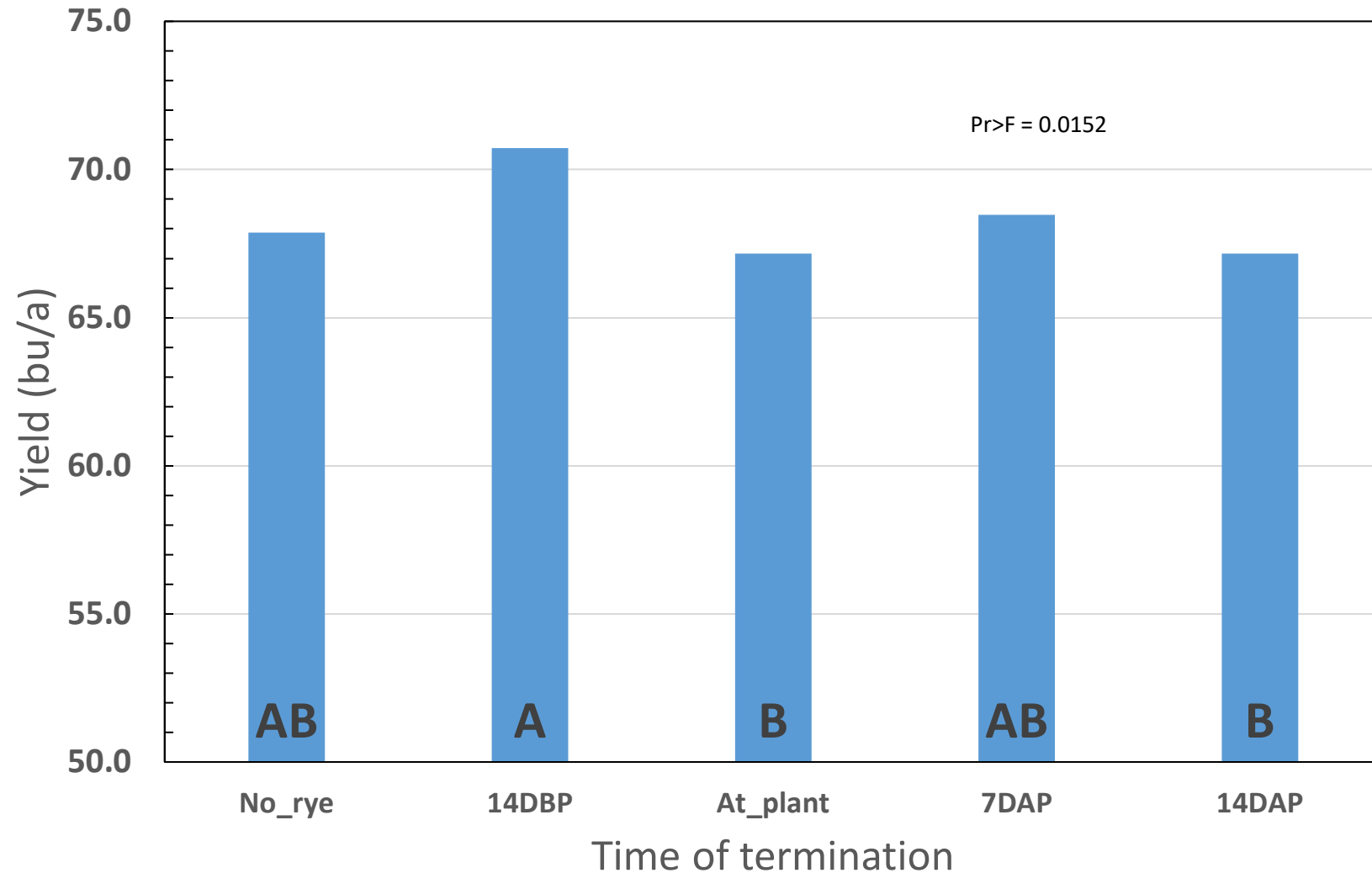
Precision Tillage Technology

Sabre Tooth Planter Disc Opener



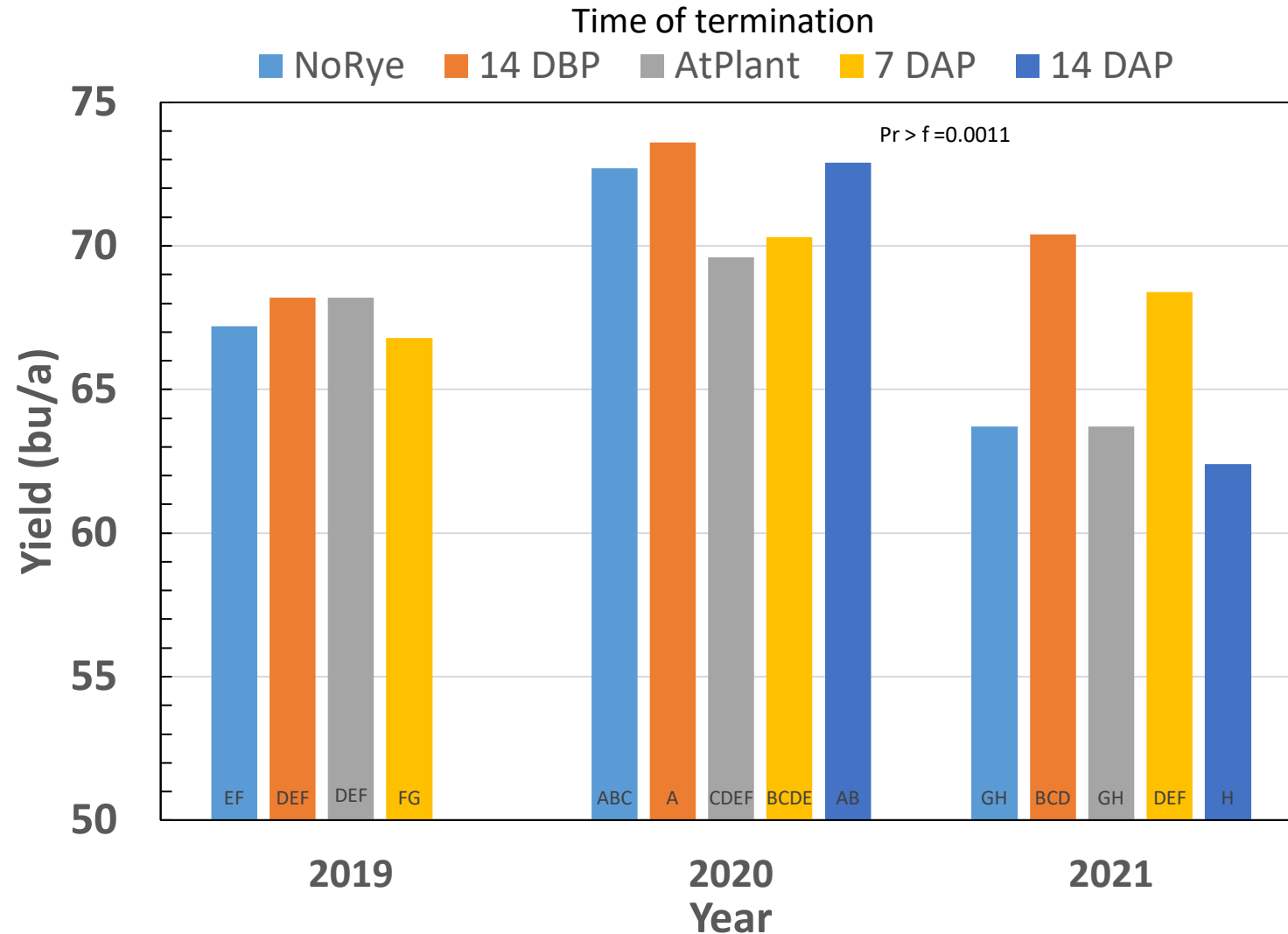
Wisconsin Soybean Yield

Rye cover crop – 2019 to 2021 average

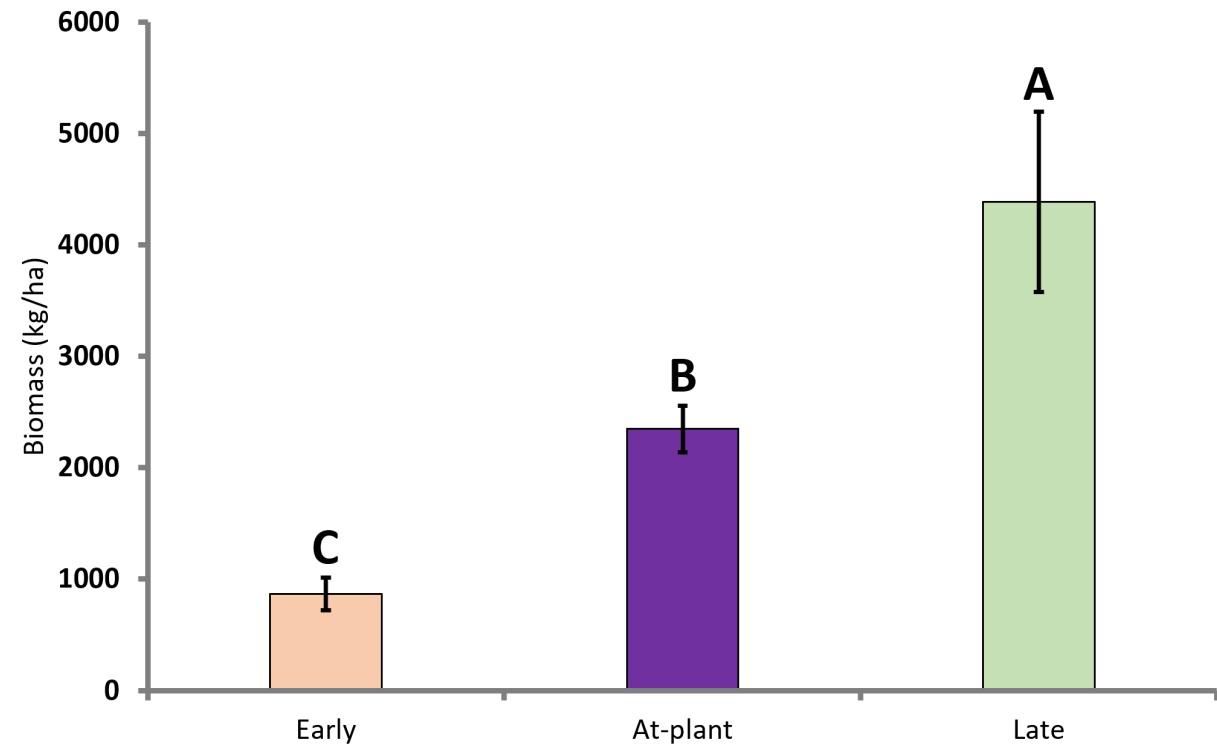
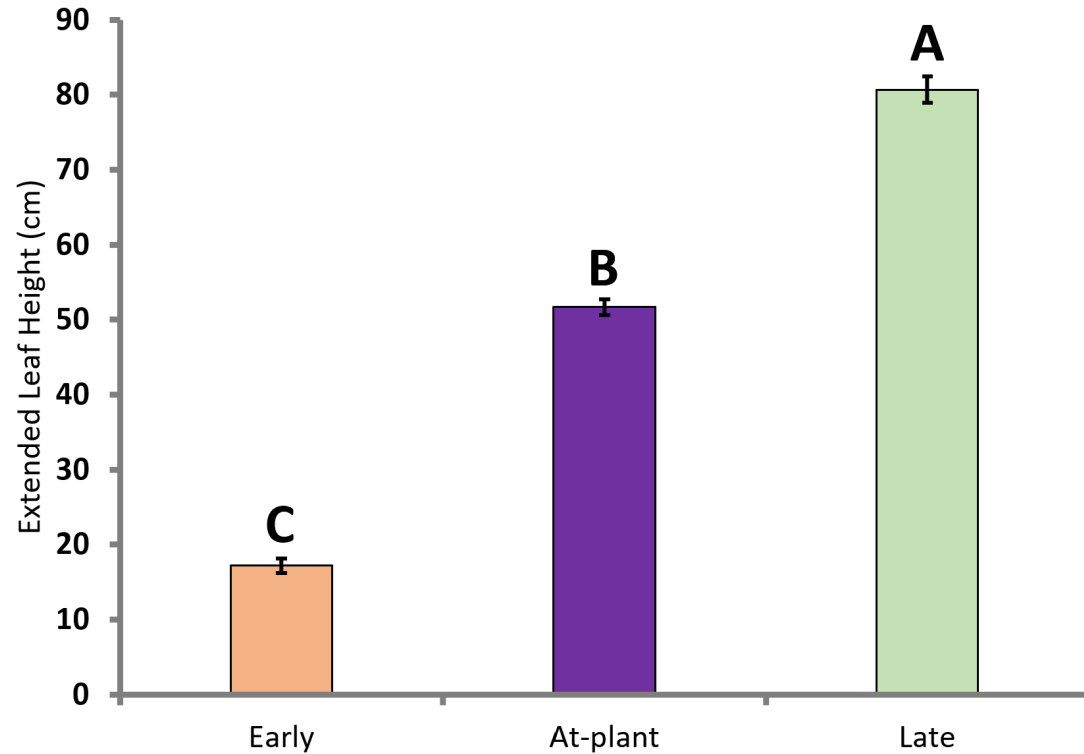


Wisconsin soybean yield

Rye cover crop – 2019-2021



Wisconsin Cover Crop Height and Biomass 2021

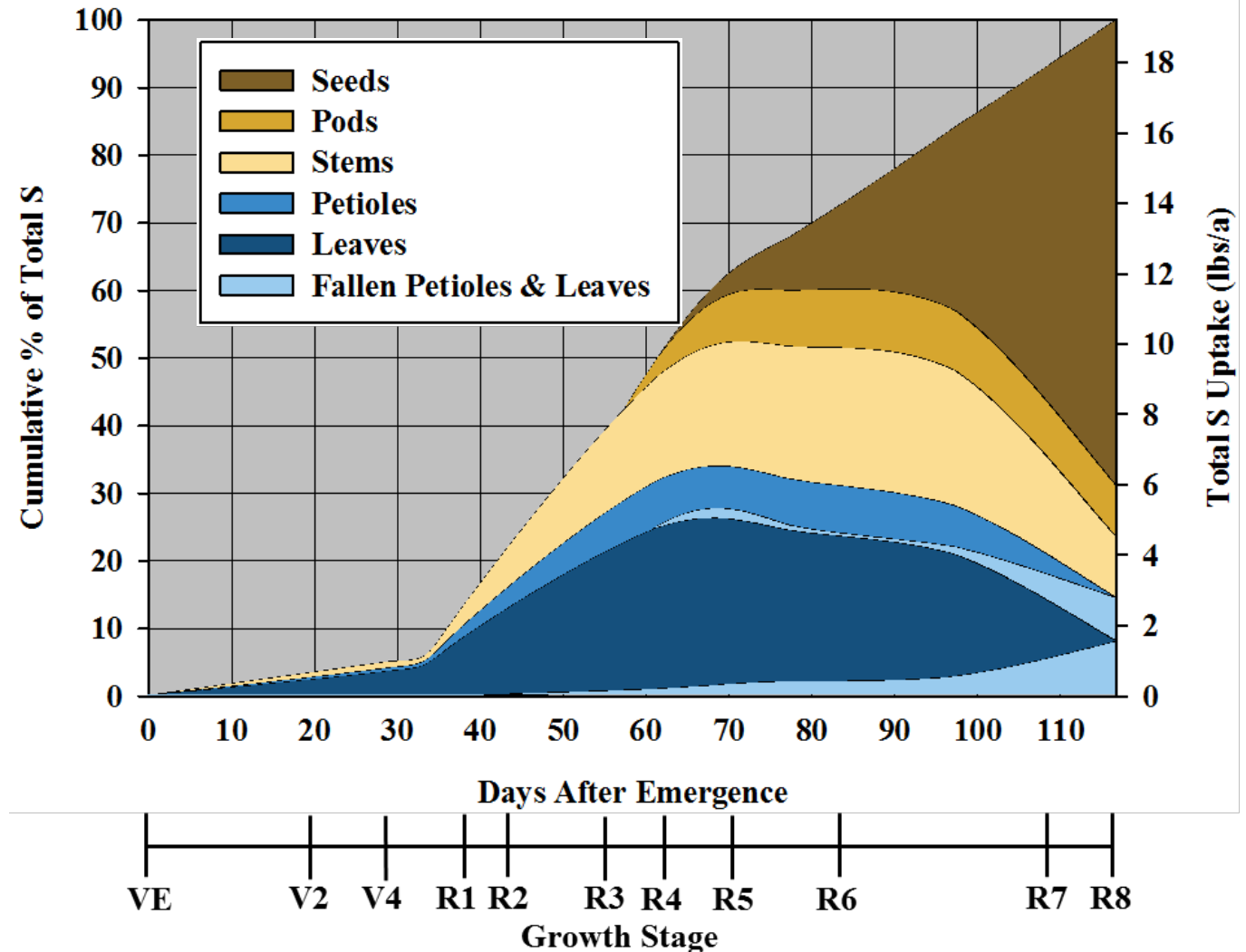


Conclusions and Significance

- Pest pressure was low over all states, locations, and years
- Arthropod response was variable between location and year
 - Increase in some arthropod groups with later terminations (more biomass)
 - Principal component analysis (PCA) will be needed to accurately determine arthropod group responses
- Soybean yield response was driven by year
- Project contributes to understanding risks and benefits of using a cover crop in a soybean system

Sulfur Questions in Soybean

- Critical for formation of some amino acids
 - Methionine, cysteine, homocysteine, and taurine
- 59% of seed S was acquired after R5.5.
- Vegetative S remobilization was <50% (N was almost 70%)
- Agronomic challenges with testing for and applying S fertilizer



Comparison of sulfur sources

	Pelletized mined gypsum	AMS	Pelletized synthetic gypsum	Elemental S
Total sulfur	17%	24%	16-18%	90%
Plant available sulfate	17%	24%	17%	0
Nitrogen	0	21%	0	0
Calcium	21%	0	21%	0
Rate of S release	moderate/ tapering	very rapid early	low/moderate all season	very slow
Soil acidification	none	high	none	moderate

Response of soybean to sulfur fertilization

Locations: (9) 2019-2020

- Southern region: Platteville, Arlington, East Troy
- Central region: Galesville, Hancock, Fond du Lac
- North central region: Chippewa Falls, Marshfield, Seymour

Application timing: Surface applied at planting

Sulfur sources (2):

- Ammonium sulfate (21-0-0-24S)
- Calcium sulfate dihydrate (mined gypsum, 0-0-0-17S)

		Supplied	Supplied
Form	Product (lbs/a)	S (lbs/a)	N (lbs/a)
UTC		0	0
AMS	42	10	8.75
AMS	83	20	17.5
AMS	125	30	26.25
CaSO ₄	59	10	0
CaSO ₄	118	20	0
CaSO ₄	176	30	0
Urea	19	0	8.74
Urea	39	0	17.94
Urea	56	0	25.76

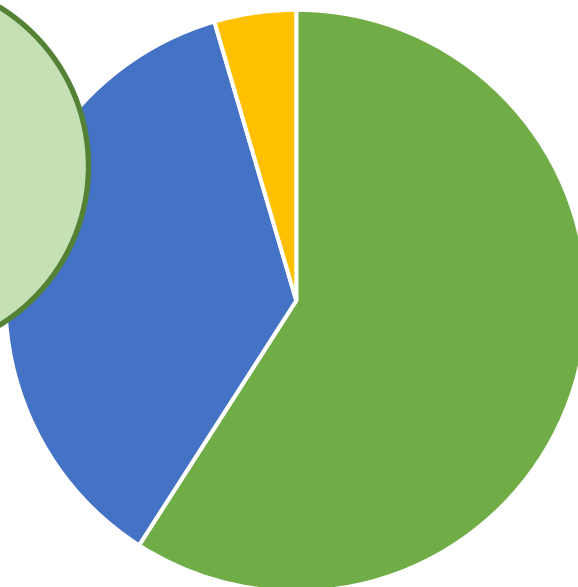
Sulfur Rate and Source Trials at a Glance

43
Sites

2019
&
2020

9
States

Tillage



■ Conventional Tillage

■ No-Till

■ Minimum Tillage



Most Common Soil Texture:

silt loam (22 sites)

Coarsest Soil Texture:

sand (Hancock, WI)

Finest Soil Texture:

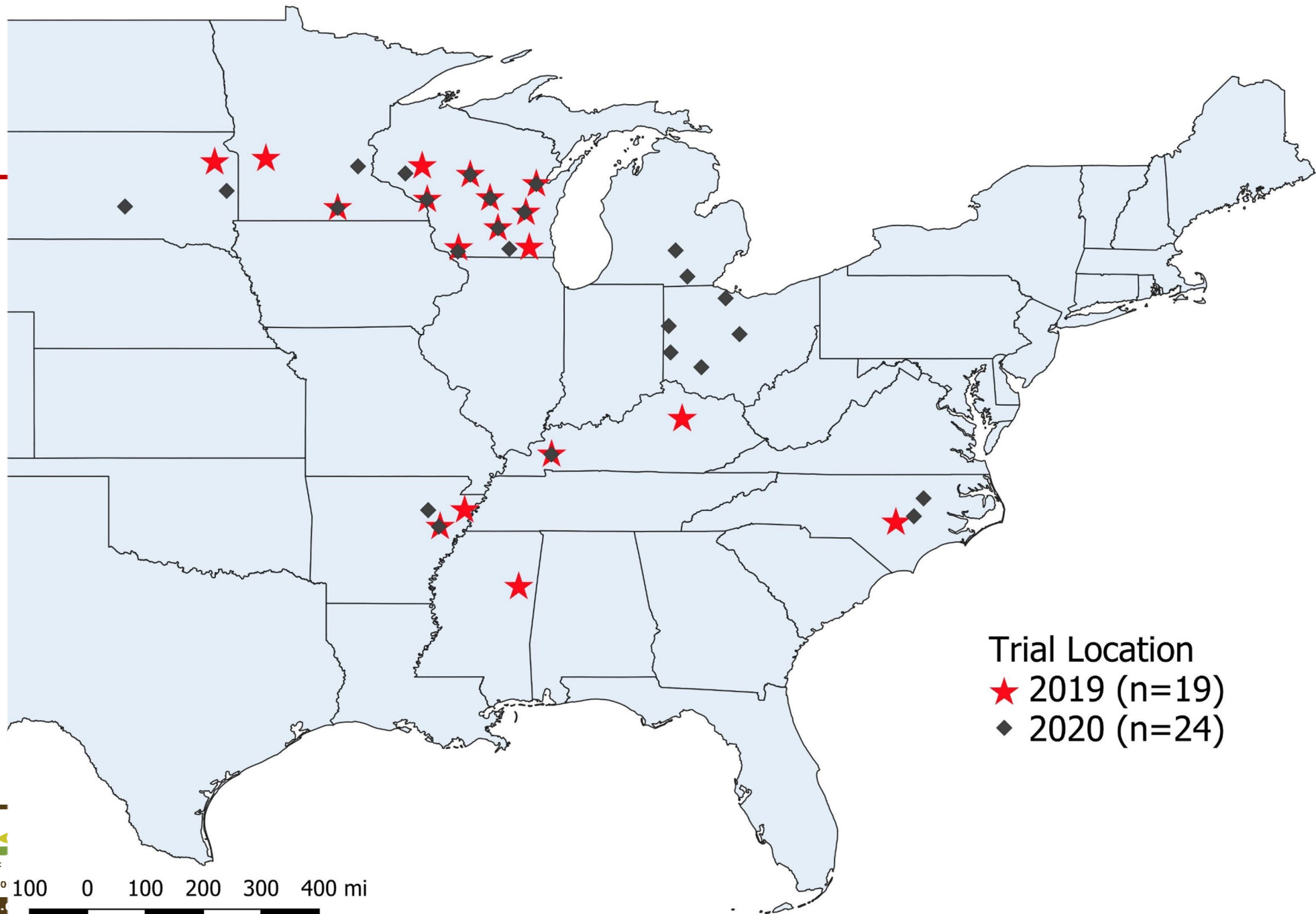
Clay (Holgate, OH)

Earliest Planting Date:

April 28th, 2020 (Hancock, WI)

Latest Planting Date:

June 16th, 2020 (Pinetree, AR)



Does Soybean Respond to Sulfur in WI?

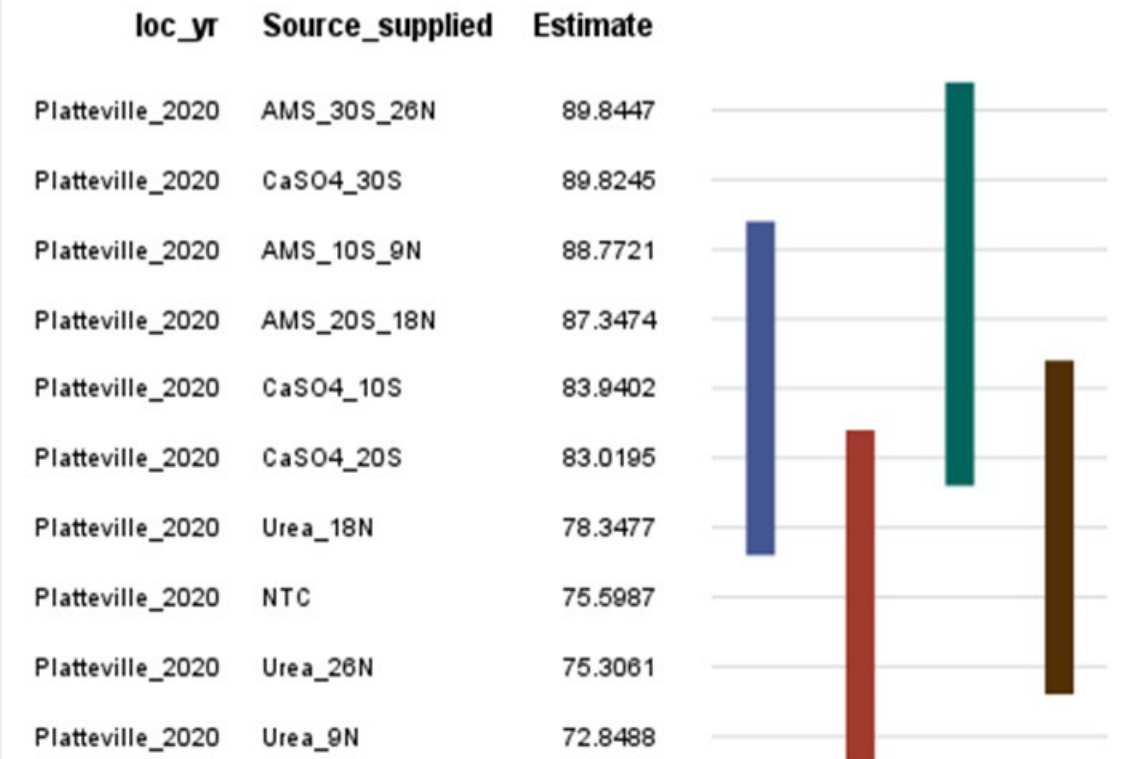
		Supplied	Supplied
Form	Product (lbs/a)	S (lbs/a)	N (lbs/a)
UTC		0	0
AMS	42	10	8.75
AMS	83	20	17.5
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CaSO4	59	10	0
CaSO4	118	20	0
CaSO4	176	30	0
Urea	19	0	8.74
Urea	39	0	17.94
Urea	56	0	25.76

- 18 environments (2019/20)
- Across environment ($p=0.22$)
- Loc x year ($p<0.001$); 5/18 had treatment differences
- 1/18 saw the NTC differ from the highest treatment



Y Tukey-Kramer Grouping for LS-Means of loc_yr*Source_suppli (Alpha = 0.05)

LS-means covered by the same bar are not significantly different.



Nutrient Uptake and Partitioning Resources

BADGER BEAN

Soybean Nutrient Calculator

Enter your expected or actual soybean yield in bu/acre to see what your soybean crop uptake and removal rates are.

^ Total Nutrient uptake in lbs/ac

NUTRIENT	TOTAL UPTAKE(LBS/AC)	SE (+/-)	R ²
N	226.94	20.0	0.80
P ₂ O ₅	55.01	6.7	0.70
K ₂ O	153.62	23.7	0.53
S	14.43	2.1	0.58
Mg	33.59	7.4	0.39
Ca	63.54	17.6	0.28
Zn	0.027	0.05	0.33

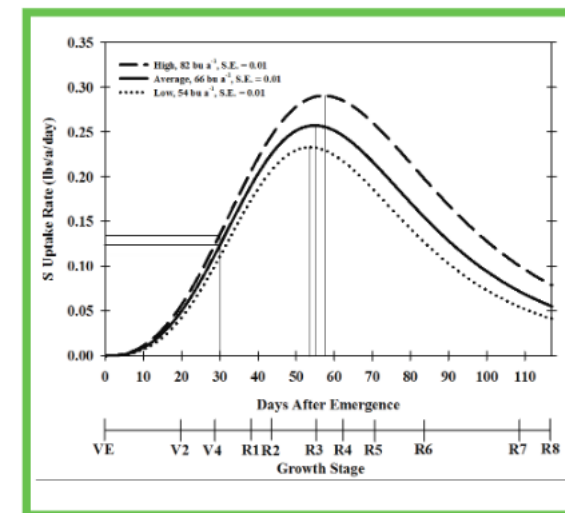


SULFUR

SULFUR

UPTAKE:

- Total S uptake prior to R1 was less than 2 lbs. S/A. for all three yield levels.
- Early season uptake accelerated after V2 to peak uptake rates shortly after R3 of approximately 0.3 lbs. S/A./day depending upon the yield level.
- Like that of N, the amount of total S taken up after R5.5 differed between the high (32 percent), average (29 percent) and low (25 percent) yield levels, showing the importance of season-long soil S supply as yield increases.



PARTITIONING:

- Leaf and stem tissue were major storage organs of S for subsequent remobilization to the seed after R5.5
- Seed S accrual relied heavily on both vegetative remobilization and continued S uptake after R5, however

A machine learning interpretation of the contribution of foliar fungicides to soybean yield in the north-central United States

Denis A. Shah, Thomas R. Butts, Spyros Mourtzinis, Juan I. Rattalino Edreira, Patricio Grassini, Shawn P. Conley & Paul D. Esker

Introduction

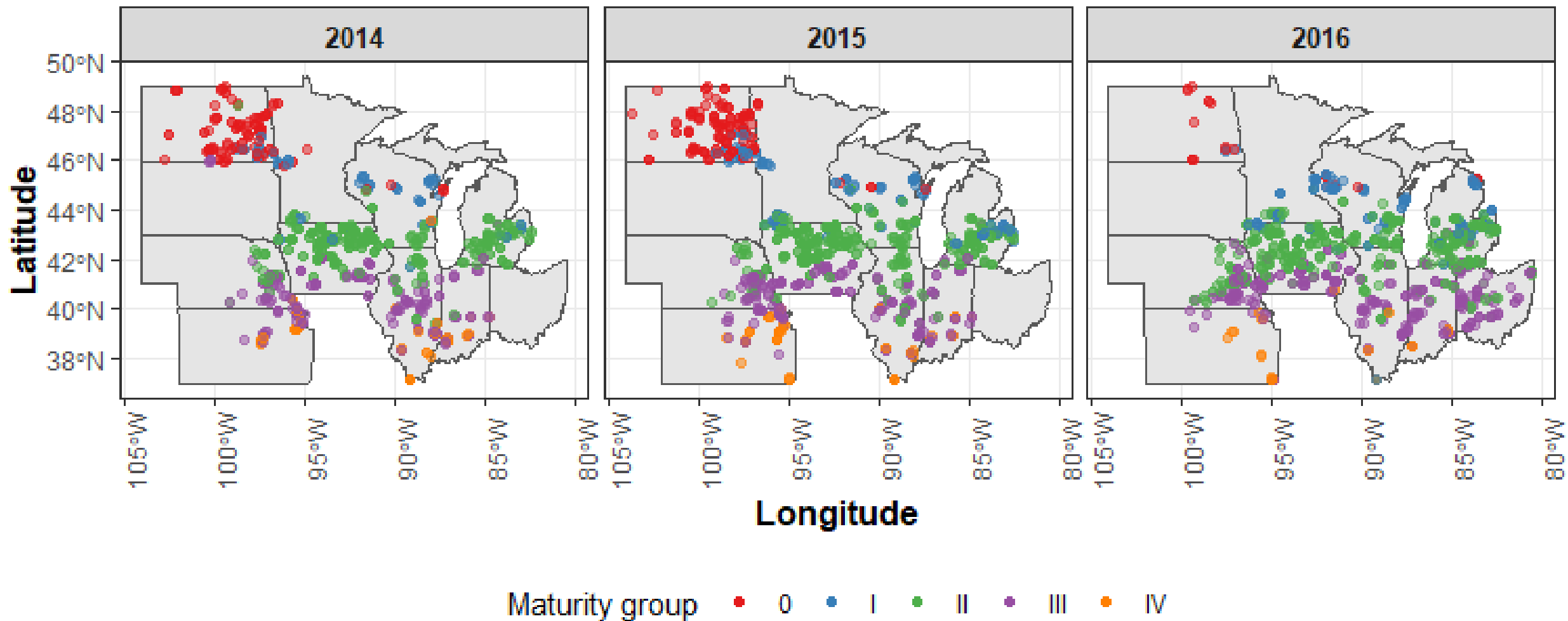
- The decade from 2005 to 2015 saw the use of foliar fungicides in U.S. soybeans double on a per unit area basis, and almost triple in terms of total product applied across all so-treated fields.
- Foliar fungicide applications are not necessarily made in response to the actual threat or presence of diseases and Prophylactic applications may be made to the perceived future possibility of disease (sometimes as an insurance spray) or for so-called plant health benefits (e.g., a “greening effect”).
- Foliar diseases in soybean are, except in a few circumstances, rarely severe when compared to losses due to soilborne pathogens.

Introduction *cont.*

- When foliar diseases are absent or at low levels, the consensus from recent field trials is that the yield response to foliar fungicides (including the plant health benefit effect) are not sufficient to offset the interventional costs
- The increase in foliar fungicide use in U.S. soybeans does therefore seem to contradict the scientific research showing low economic returns when disease levels are low or absent.
- A partial explanation may be that the myriad of soybean crop management choices makes it impossible to account for complexity beyond three- way interactions in designed field trials.

Objective

- A novel complementary approach to traditional field experiments, given their limited design and inferential space, uses grower-supplied data linked in a spatial framework to other data layers representing soil properties and weather.
- Using grower-supplied data, the objective was to understand how foliar fungicides fit into overall soybean production practices in the north-central U.S. and their contribution to yield from an economic standpoint.



Locations of soybean fields for which surveyed growers supplied self-reported data on their management practices and yields, 2014 to 2016. Field locations are colored by soybean maturity group.

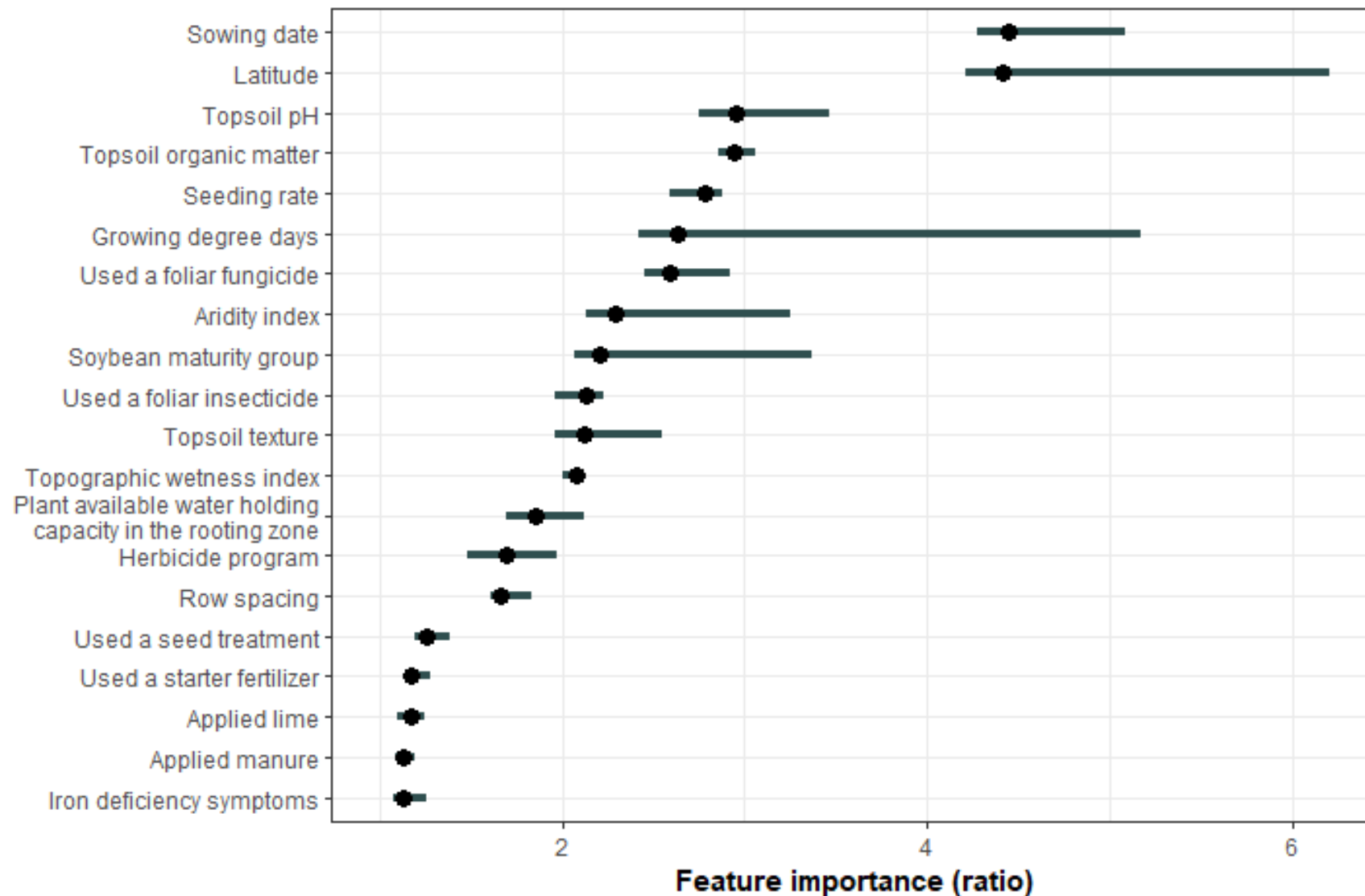
Methods

- Soybean grower-supplied agronomic practices and average yield for 2738 non-irrigated soybean fields in the years 2014 to 2016 across 11 states in the U.S. north-central region were collected.
- The grower-supplied data were augmented with variables representing technology extrapolation domains (TEDs) which define regions with similar climate and soils; as well with soil properties data.
- Growers did not report on product name, chemistry, or rates of application for any of the pest control inputs they used (fungicidal, insecticidal, nematocidal, whether seed or foliar applied), and therefore the only level of detail available was whether such products were used or not.

Methods *cont.*

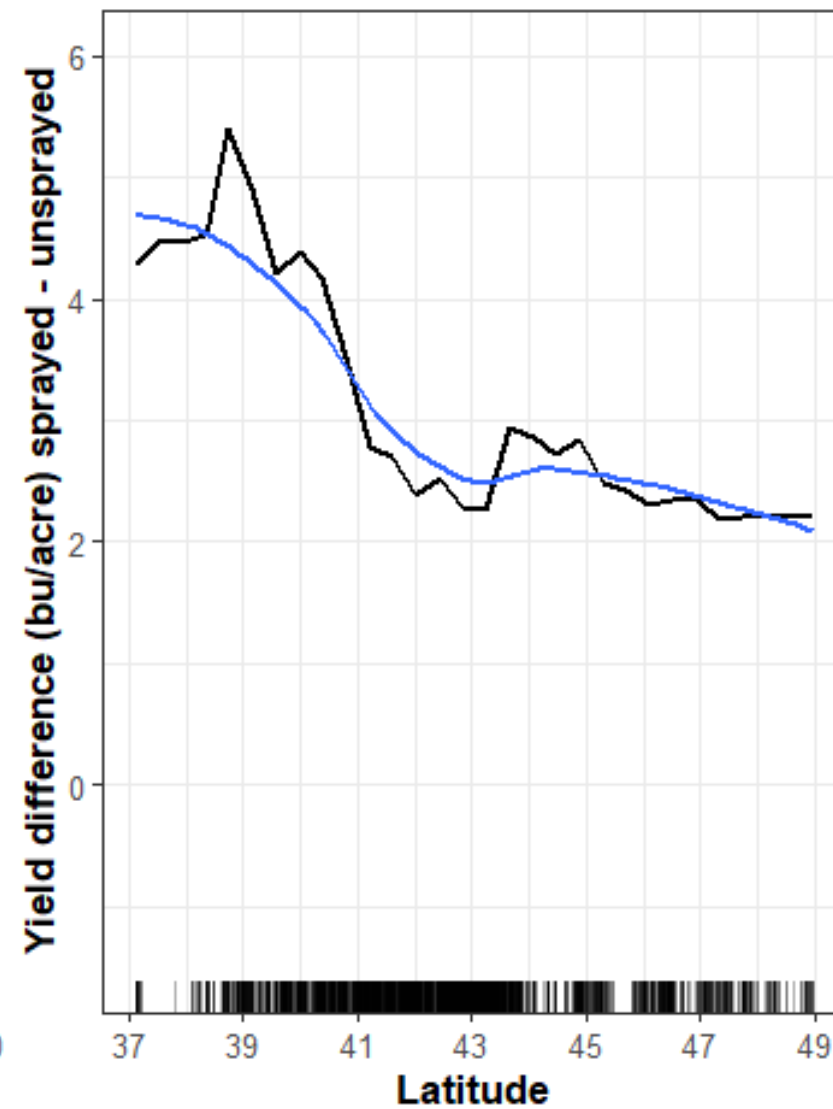
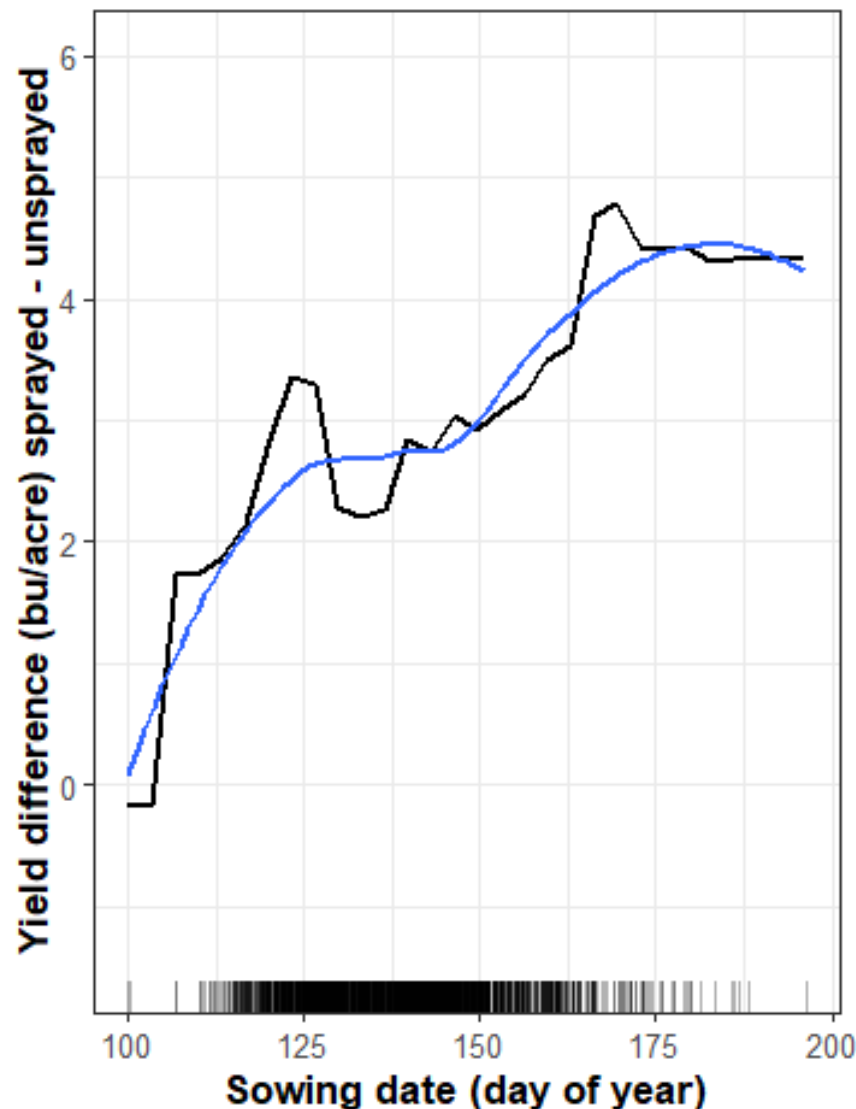
- A machine learning model was developed and then interpreted feature importance was summarized visually.
- The goal was to compute the contributions of the features based on the difference between the predicted yield for a single field and the global average, with an emphasis on the impact of foliar fungicide use in soybean fields.
- For any one observation, the Shapley values (ϕ) values are an estimate of how much a predictor contributed to the difference between an individual field's predicted yield and the predicted yield averaged across all fields in the data.

Importance of
management-based
variables in a random
forest model
predicting soybean
yield



Results *cont.*

Two-way partial dependence plots of the global effects of (i) foliar fungicide use and sowing date (left panel), and (ii) foliar fungicide use and latitude (right panel) on soybean yield. The black plotted curves are the yield differences between fields that were sprayed or not sprayed with foliar fungicides.



Conclusions

- Foliar fungicides ranked 7th out of 20 factors in terms of relative importance explaining soybean yield.
- Using foliar fungicides in late-planted fields and in lower latitudes realized a larger yield benefit.
- Less than a 1.5 bu/ac yield penalty for not using foliar fungicides was observed in high-yielding environments.
- Except in a few production environments, yield gains due to foliar fungicides sufficiently offset the associated costs when soybean prices are near-to-above average.

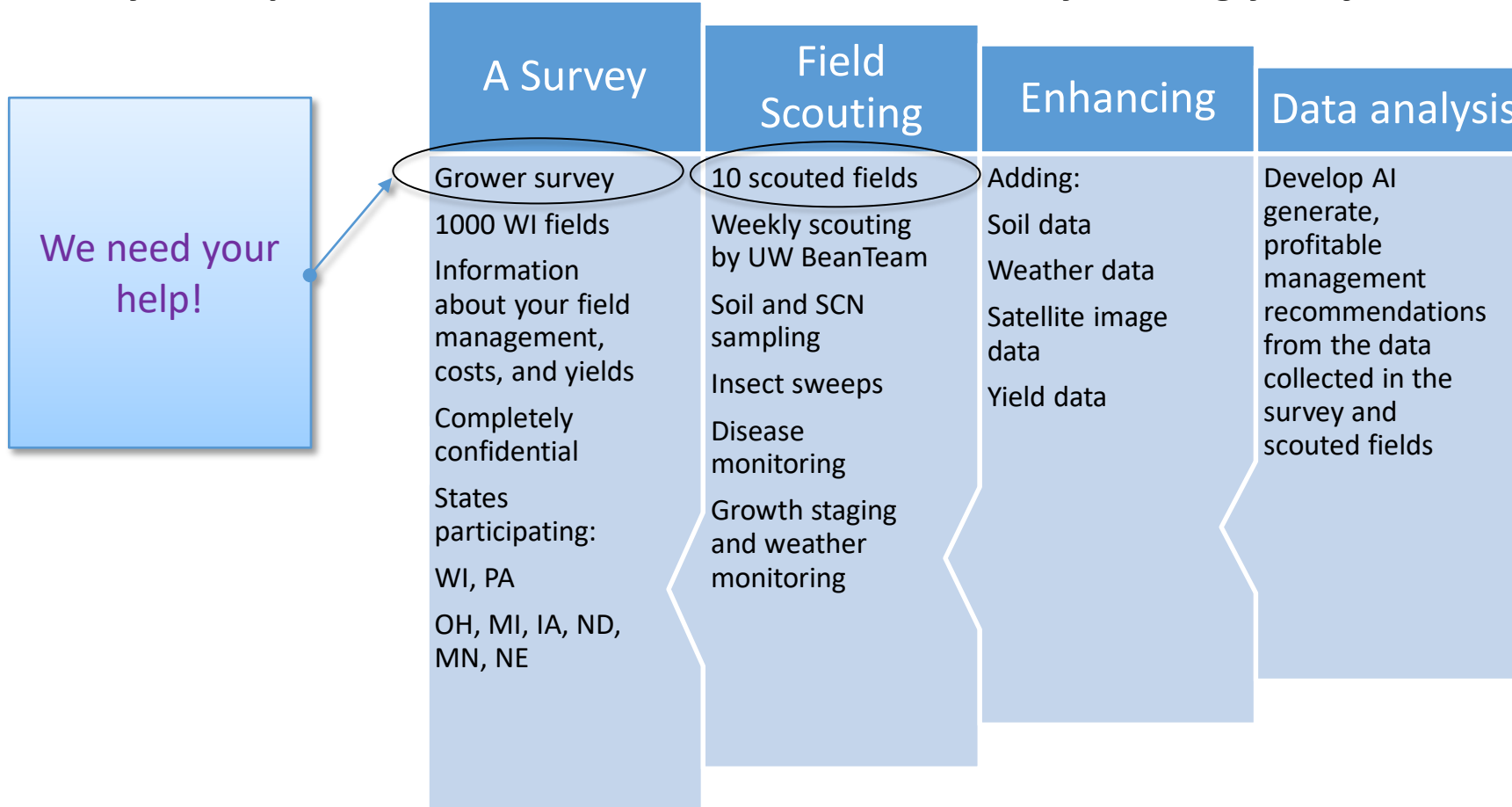
Registration questions

- What's the future of dicamba? My co-op won't spray it.
- How can be actively participated in a project related to the plant water deficit in soybean
- If planted, what were the results of short-season soybean varieties (i.e. 0.4) compared to other varieties such as 1.8.
- Risk of inter-seeding cover crops into standing soybeans?
- How do we get handle on slug pressure with all the residue

Recruiting for On-Farm Research in 2022

Do you grow soybeans?

Can you help us develop specific recommendations by sharing your field data?



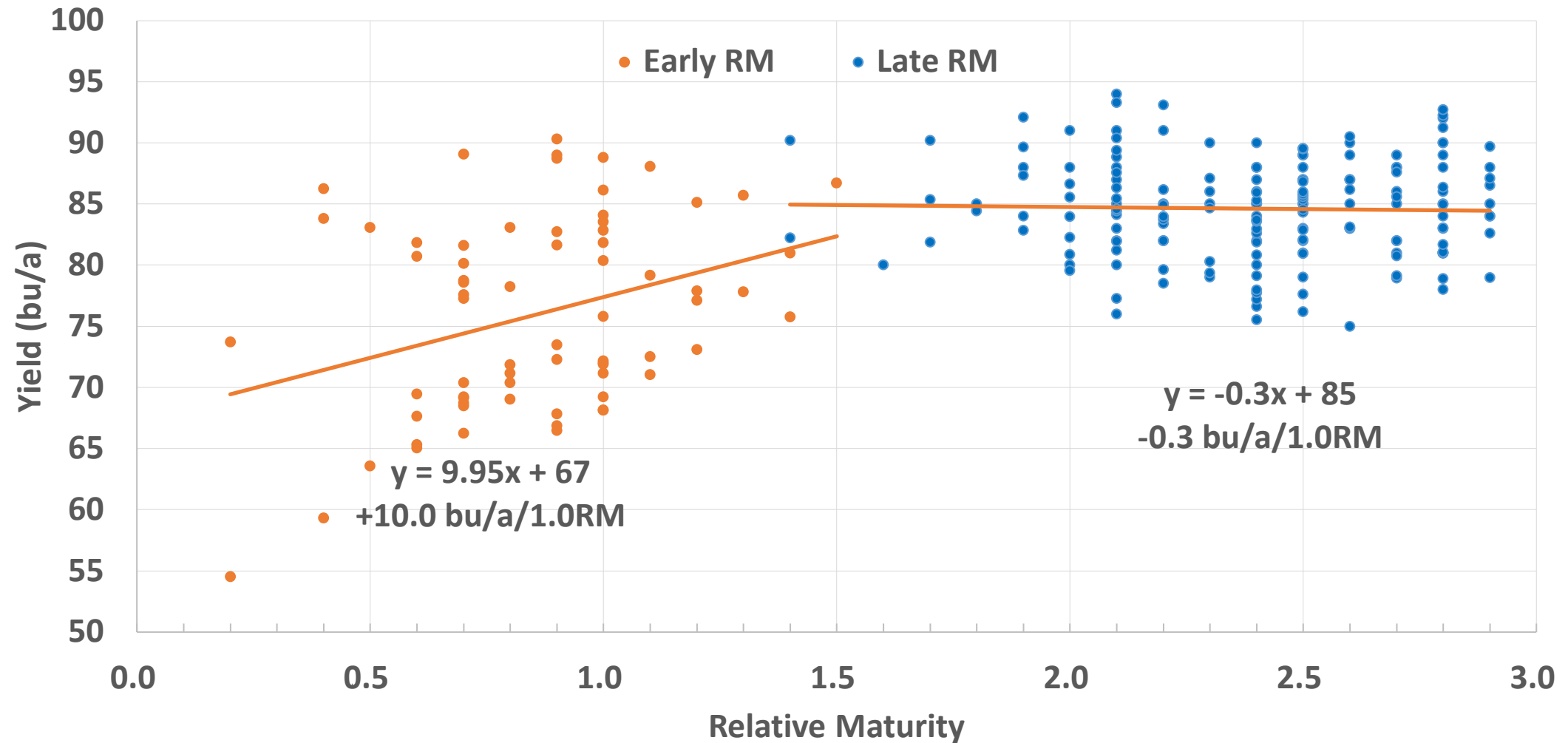
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Relative Maturity vs Yield

Southern and Northern region variety trial data
Planted at Arlington, WI - 2020 and 2021



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Aerially Seeding Cover Crops into Soybean

- More time & heat for growth compared to drilling after harvest
- Timing is important – near but **before** leaf drop
- Best option in our study:
 - 10% - 60% cover in the fall
 - 25% to 80% cover in the spring (rye only)



Oat

Rye

Registration questions

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- **How do we get handle on slug pressure with all the residue**

SLUGS IN A CEREAL RYE COVER CROP

Posted on September 1, 2017



BRYAN JENSEN, UW EXTENSION AND IPM PROGRAM

As the growing season winds down, some growers will be considering a broadcast planting of cereal rye seed over unharvested crops to establish an early cover. Consider scouting for slugs prior to broadcasting the cereal rye. Slugs can severely reduce stands by feeding on the seed

Slugs

#1 question I get

- Many farmers believe that cover crops are part of the problem
- Cover crops can be helpful in the fight against slugs
- Cover crops can help diversify rotations and will promote better populations of beneficial arthropods, which in turn can help control
- Some farmers plant green to help with their slug challenges
- Slugs prefer the dying cover crop, often cereal rye, over the growing cash crop
- Fostering improved, natural-enemy populations, particularly ground beetles helps suppress slug populations
- Natural enemy populations can be suppressed by insecticide use, including seeds treated with insecticides

Resources

- [2021 Wisconsin Soybean Variety Performance Trials](#)
- [Understanding Nutrient Requirements and Utilization for High Yielding Soybeans](#)
- [A machine learning interpretation of the contribution of foliar fungicides to soybean yield in the north-central United States](#)
- [Use of data science to optimize farm-specific cropping systems](#)



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