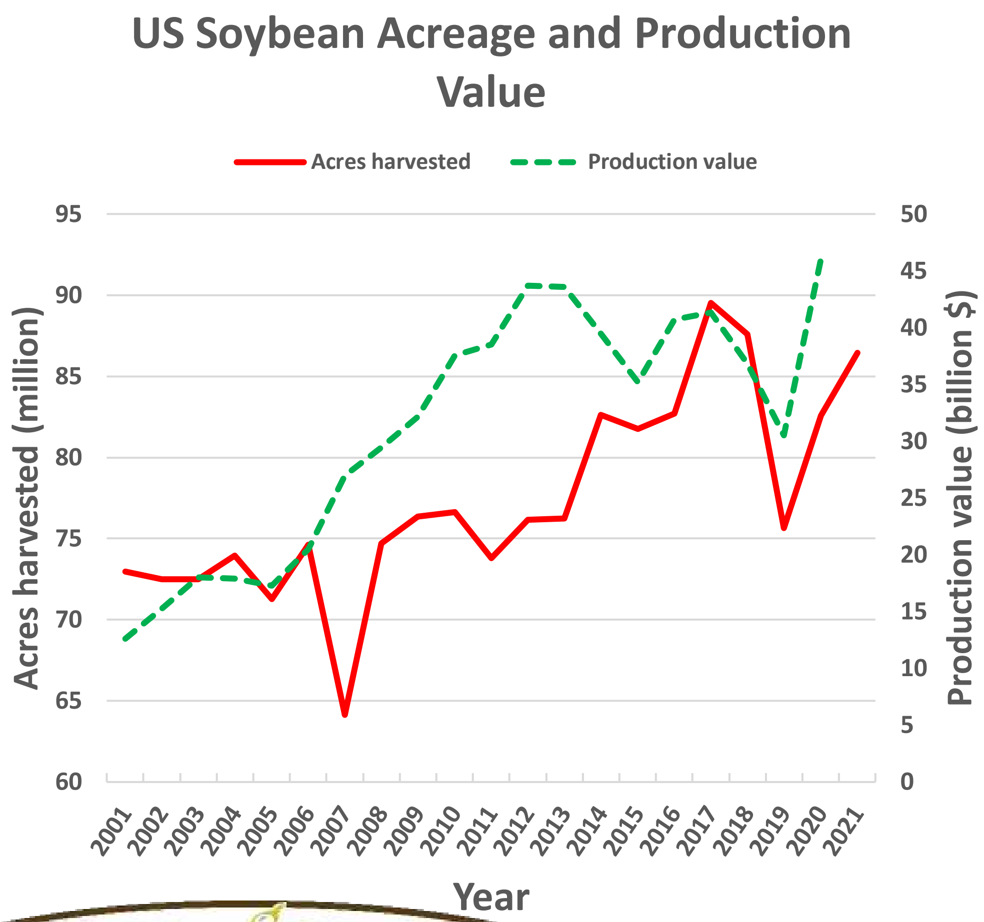
Agronomy Update Meetings 2022

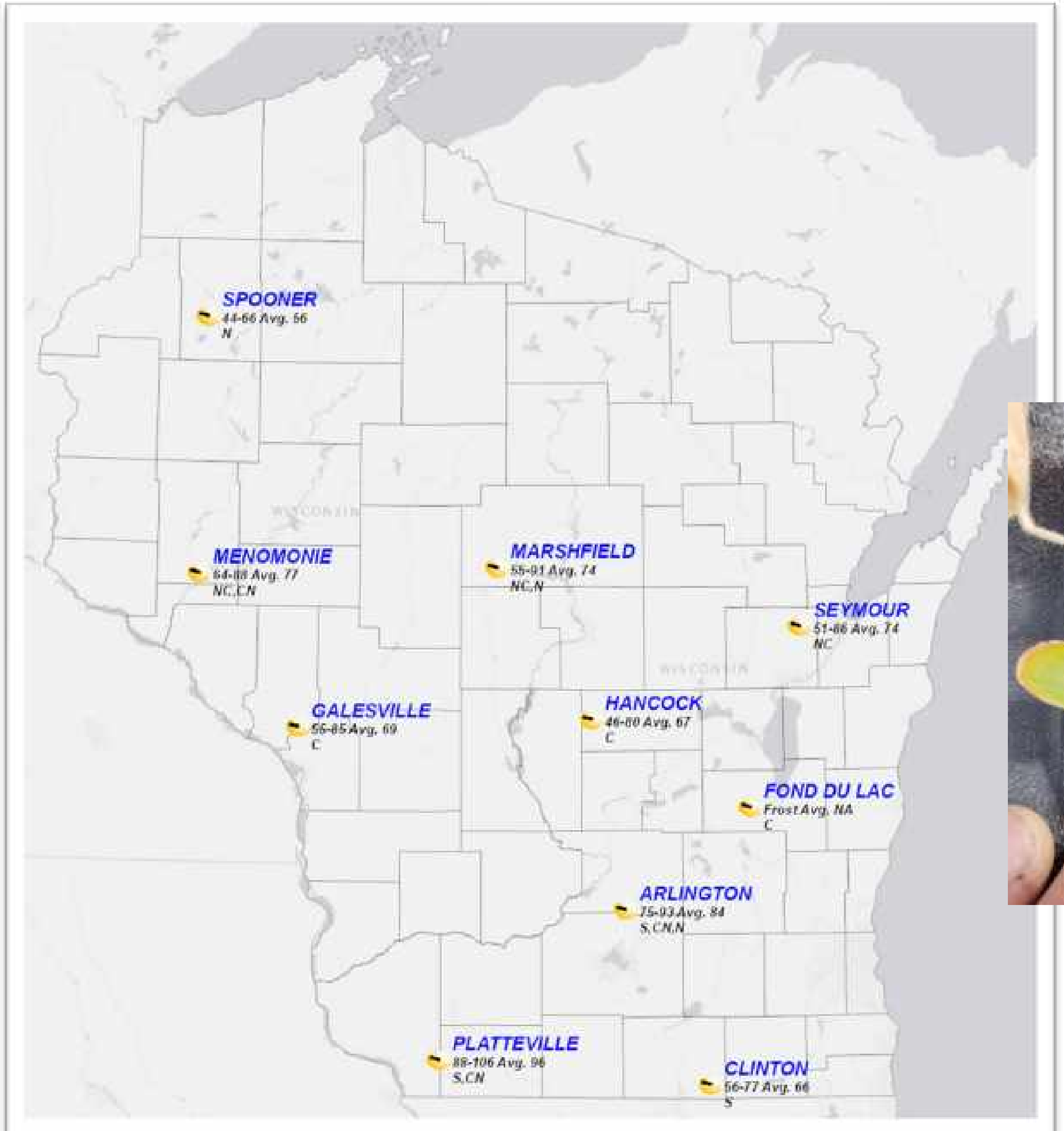
S.P. Conley, Mourtzinis, S., J. Gaska, A. Roth, et al.
Professor of Agronomy and State Soybean Specialist
College of Agricultural and Life Sciences, UW-Madison

UW BeanTeam Soybean Program in Review

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



COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO



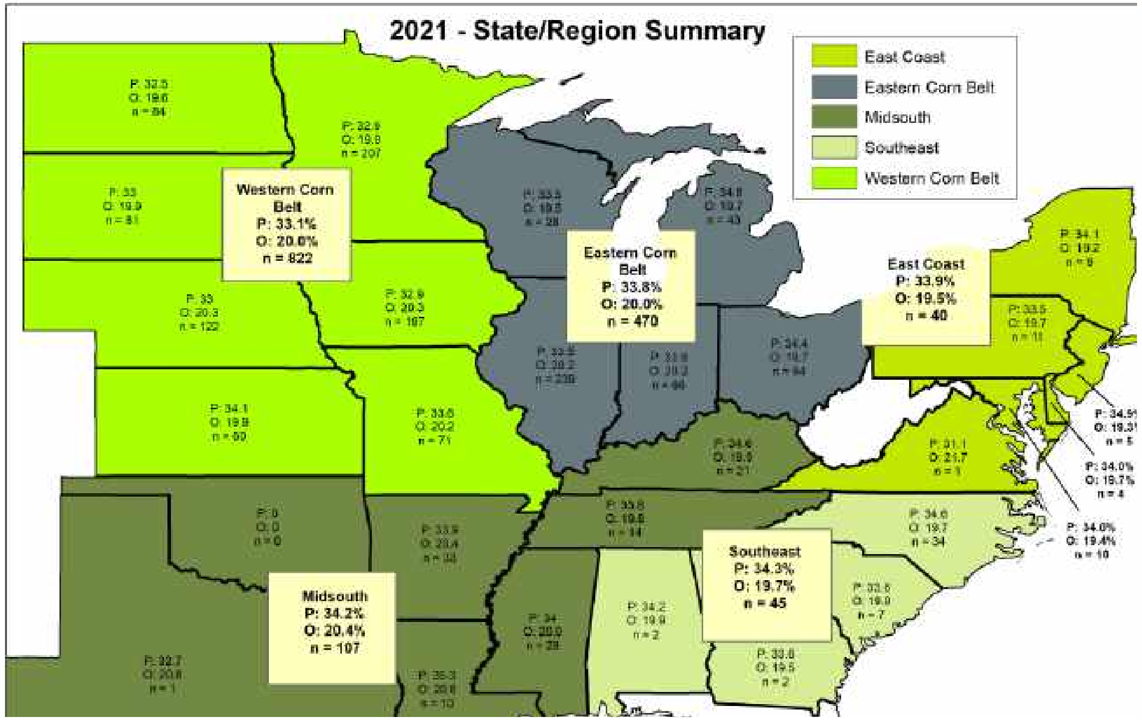
Quality of the United States Soybean Crop: 2021

Seth Naeve and Jill Miller-Garvin
University of Minnesota

University of Minnesota
Driven to Discover®

Seed Quality and Seed Size (10.9%↑)

QUALITY REPORT: 2021

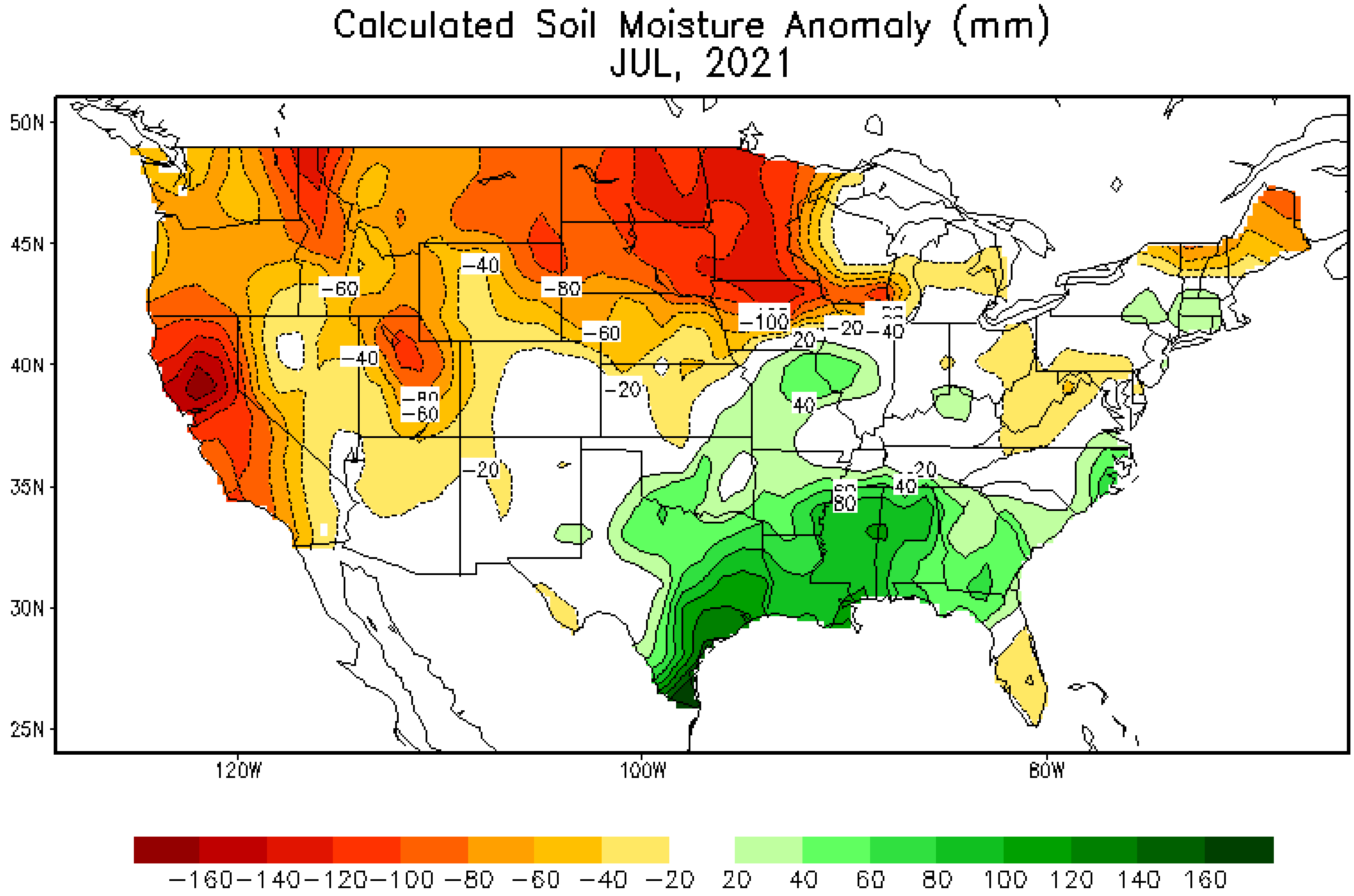


QUALITY REPORT: 2021

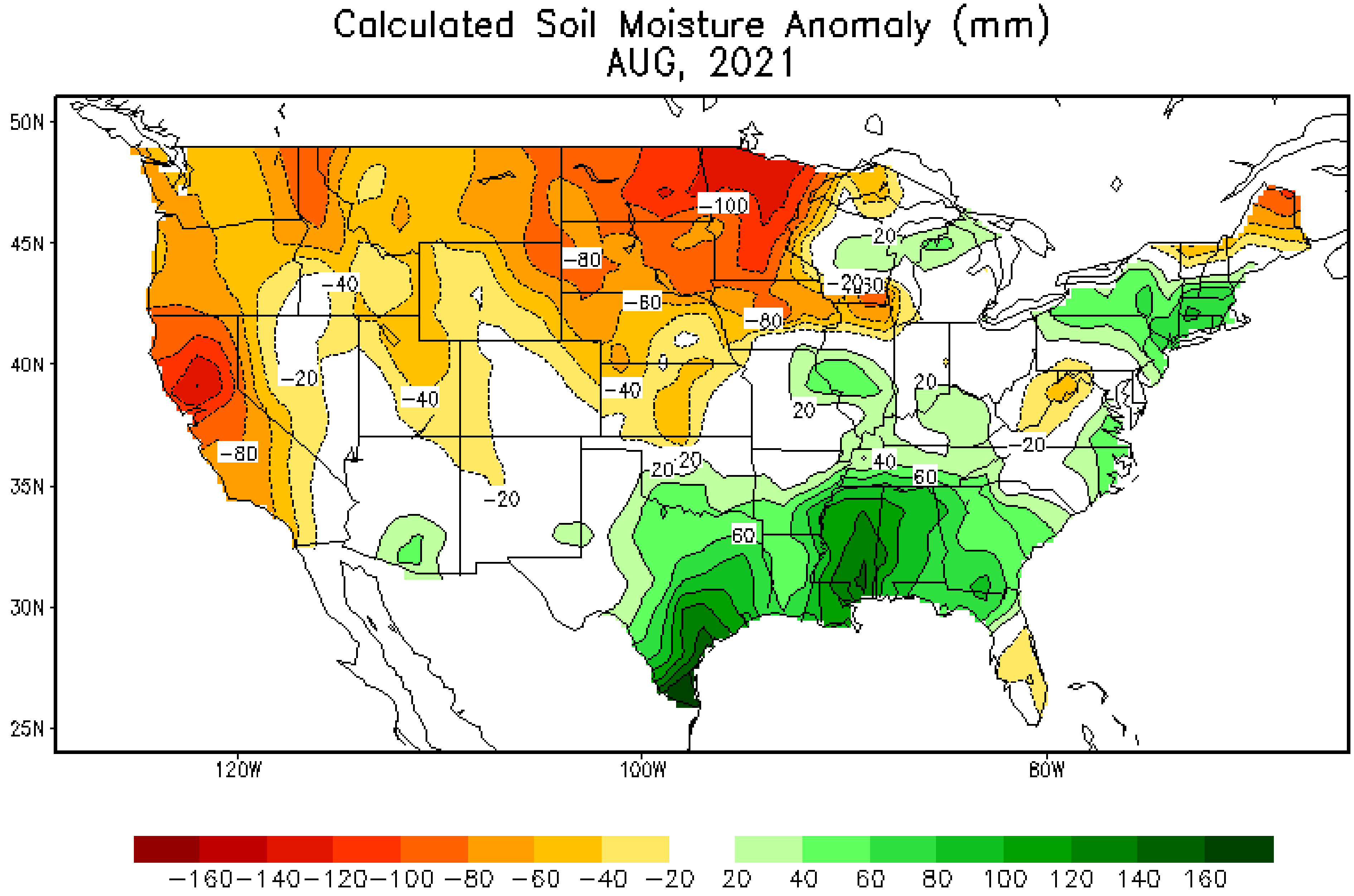
Table 3. USB 2021 Soybean Quality Survey Seed Data

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				

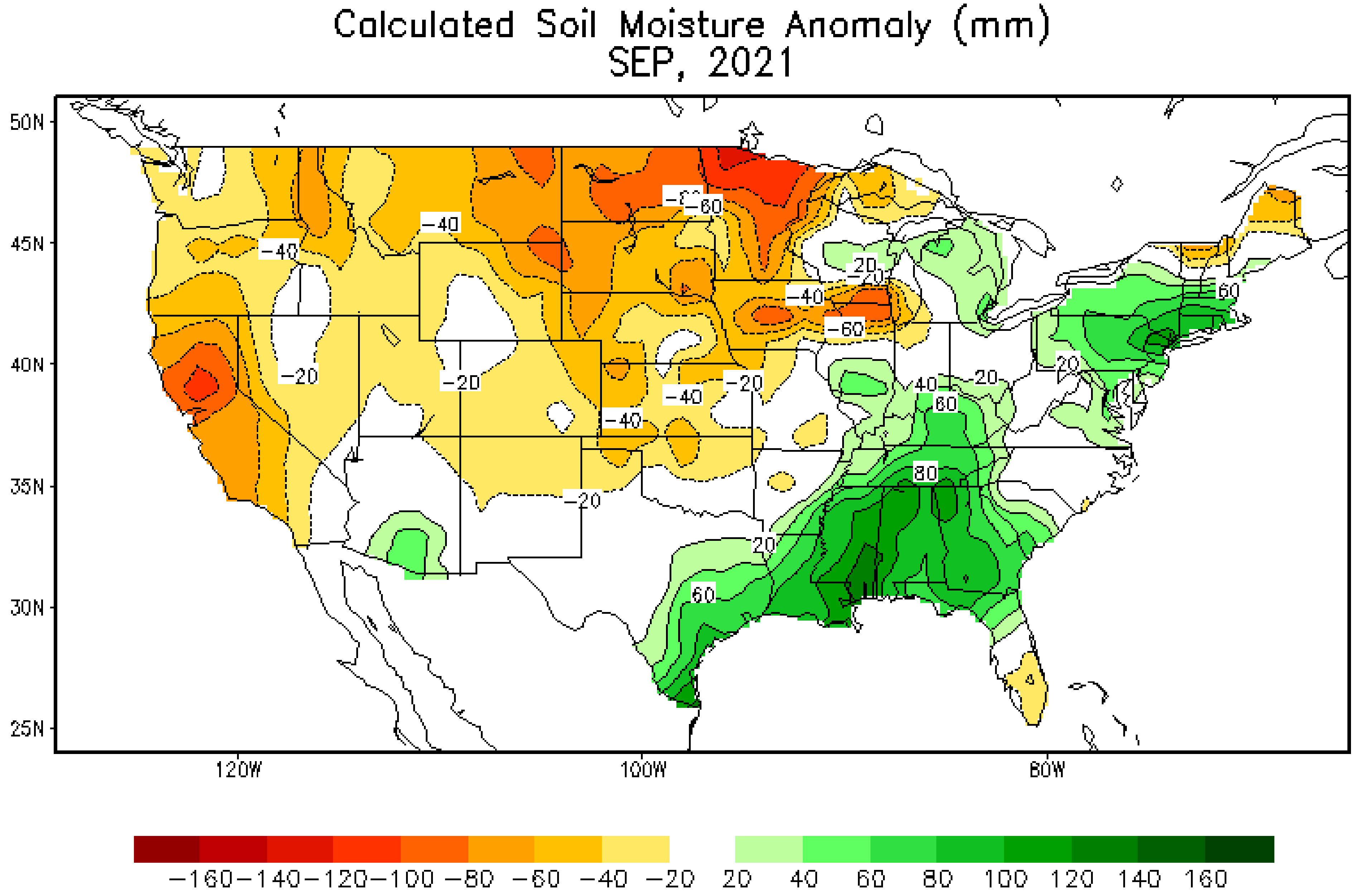
COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO



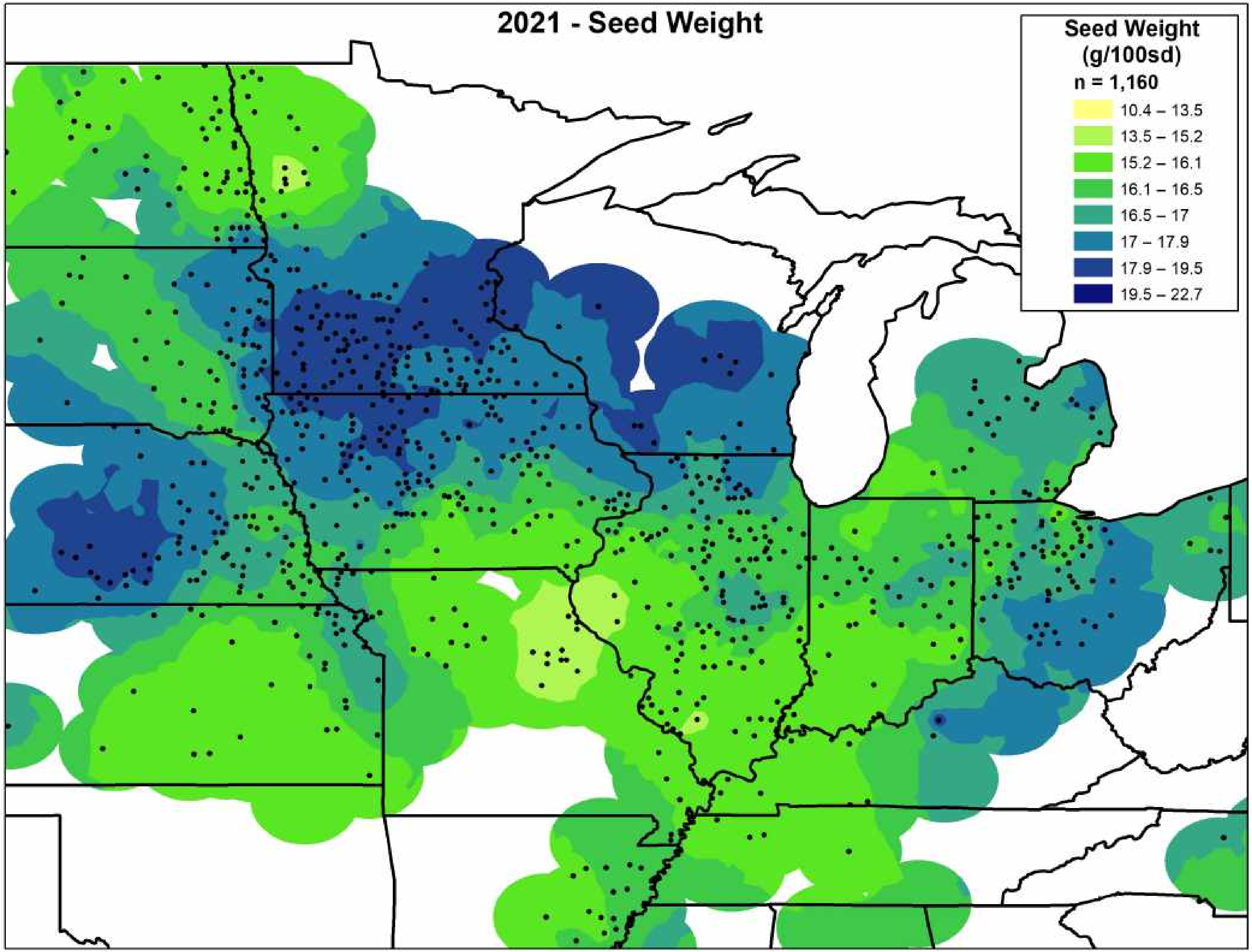
https://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/US_Soil-Moisture-Monthly.php



https://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/US_Soil-Moisture-Monthly.php



https://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/US_Soil-Moisture-Monthly.php


2021 - Seed Weight
Seed Weight
(g/100sd)
n = 1,160
10.4 – 13.5
13.5 – 15.2
15.2 – 16.1
16.1 – 16.5
16.5 – 17
17 – 17.9
17.9 – 19.5
19.5 – 22.7

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**			

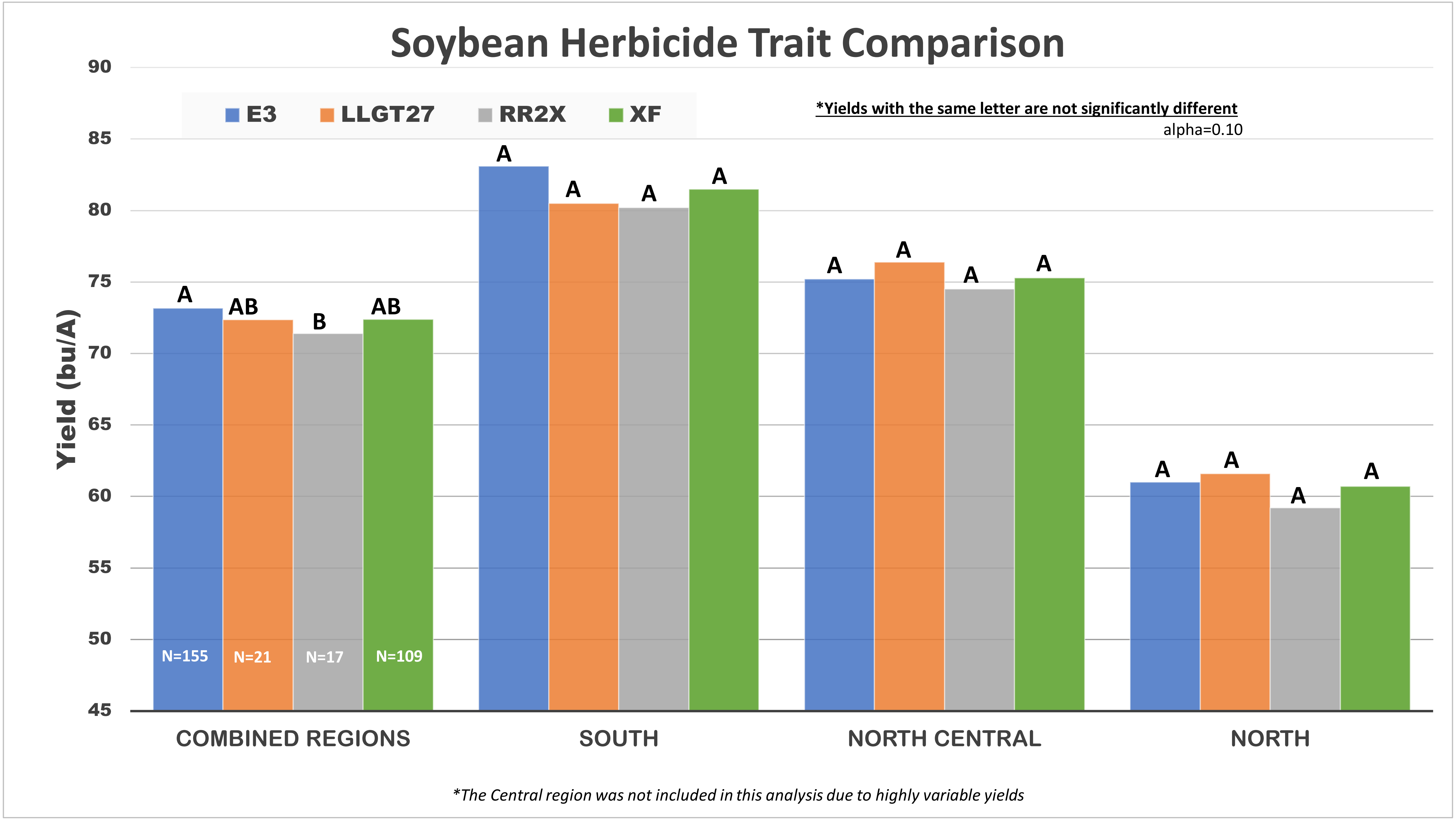
* Varieties shown are not significantly different (0.10 level) than the highest yielding cultivar. Three test average included Arlington, Clinton, and Platteville.

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
E3
LLGT27
RR2X
XF
*Yields with the same letter are not significantly different
alpha=0.10
Yield (bu/A)
90
85
80
75
70
65
60
55
50
45
A
AB
B
AB
N=155
N=21
N=17
N=109
A
A
A
A
A
A
A
A
A
A
A
A
COMBINED REGIONS
SOUTH
NORTH CENTRAL
NORTH
*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?

We need your help!

A Survey	Field Scouting	Enhancing	Data analysis
Grower survey 1000 WI fields Information about your field management, costs, and yields Completely confidential States participating: WI, PA OH, MI, IA, ND, MN, NE	10 scouted fields Weekly scouting by UW BeanTeam Soil and SCN sampling Insect sweeps Disease monitoring Growth staging and weather monitoring	Adding: Soil data Weather data Satellite image data Yield data	Develop AI Tool: Goal: to generate, profitable management recommendations from the data collected in the survey and scouted fields

COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO

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

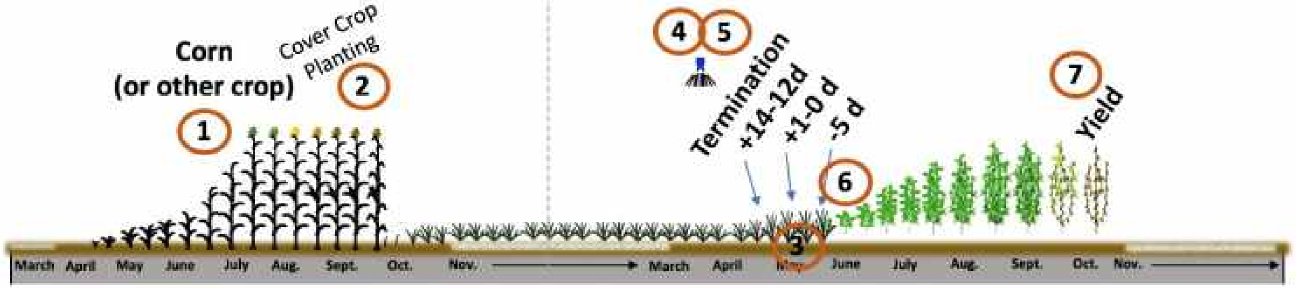

Tweet
Shawn Conley
Can we use machine learning and Artifical Intelligence (A.I.) to tailor farm gate soybean recommendations? @WISoybean funded our research to test this theory out. Seeking farmers to do on-farm strip trials and test our hypothesis! coolbean.info/wp-content/upl...

COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO

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

Rye Cover Crops and Arthropods in Soybean

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. 25th**	**~April 24th**	**~May 8th**	**~May 15th**	**~May 22nd**

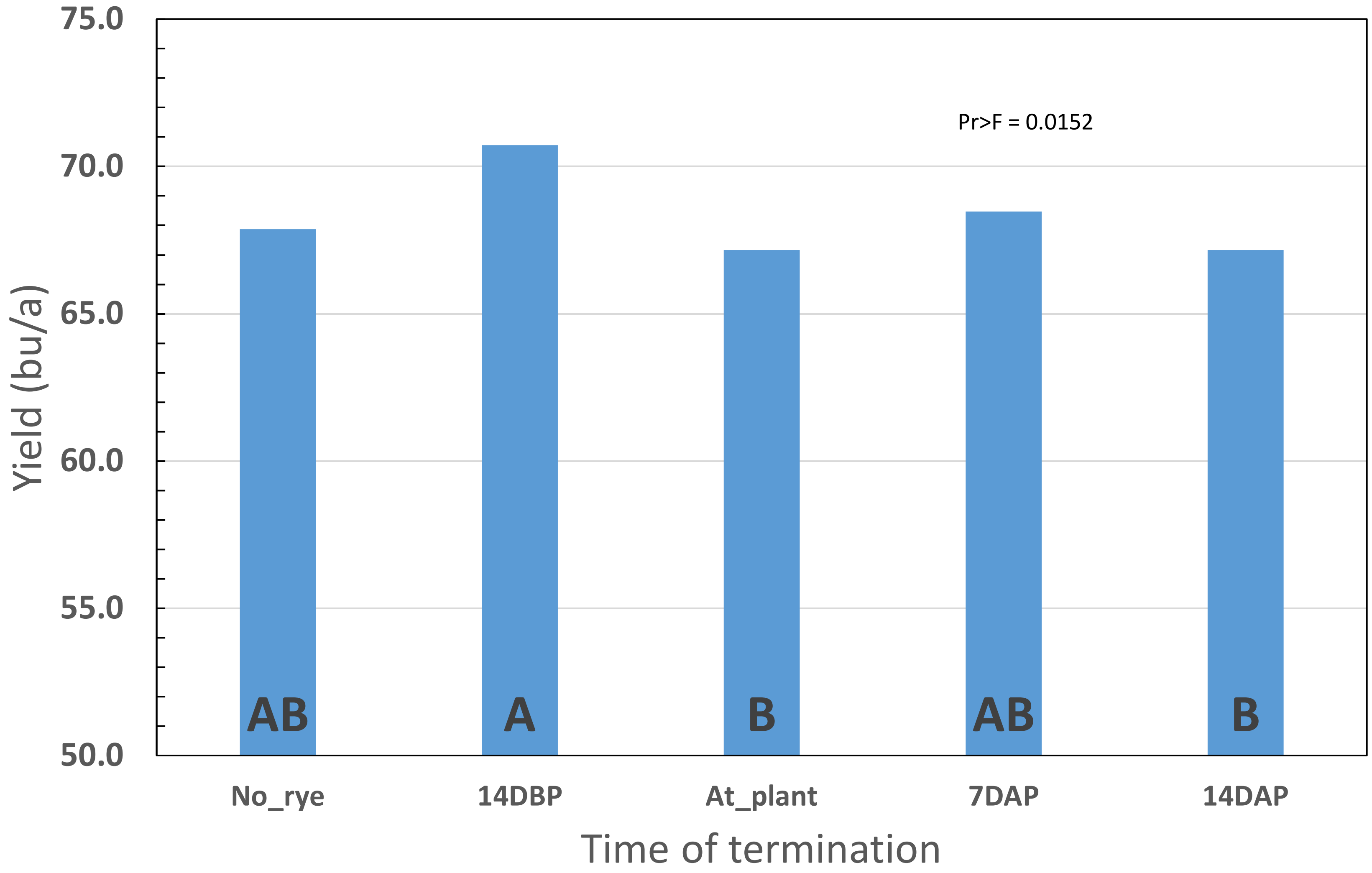
All years:
RM 2.0, untreated, 140,000 seeds/acre
Previous crop: Corn silage

Precision Tillage Technology
Sabre Tooth Planter Disc Opener

COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO

Wisconsin Soybean Yield

Rye cover crop – 2019 to 2021 average

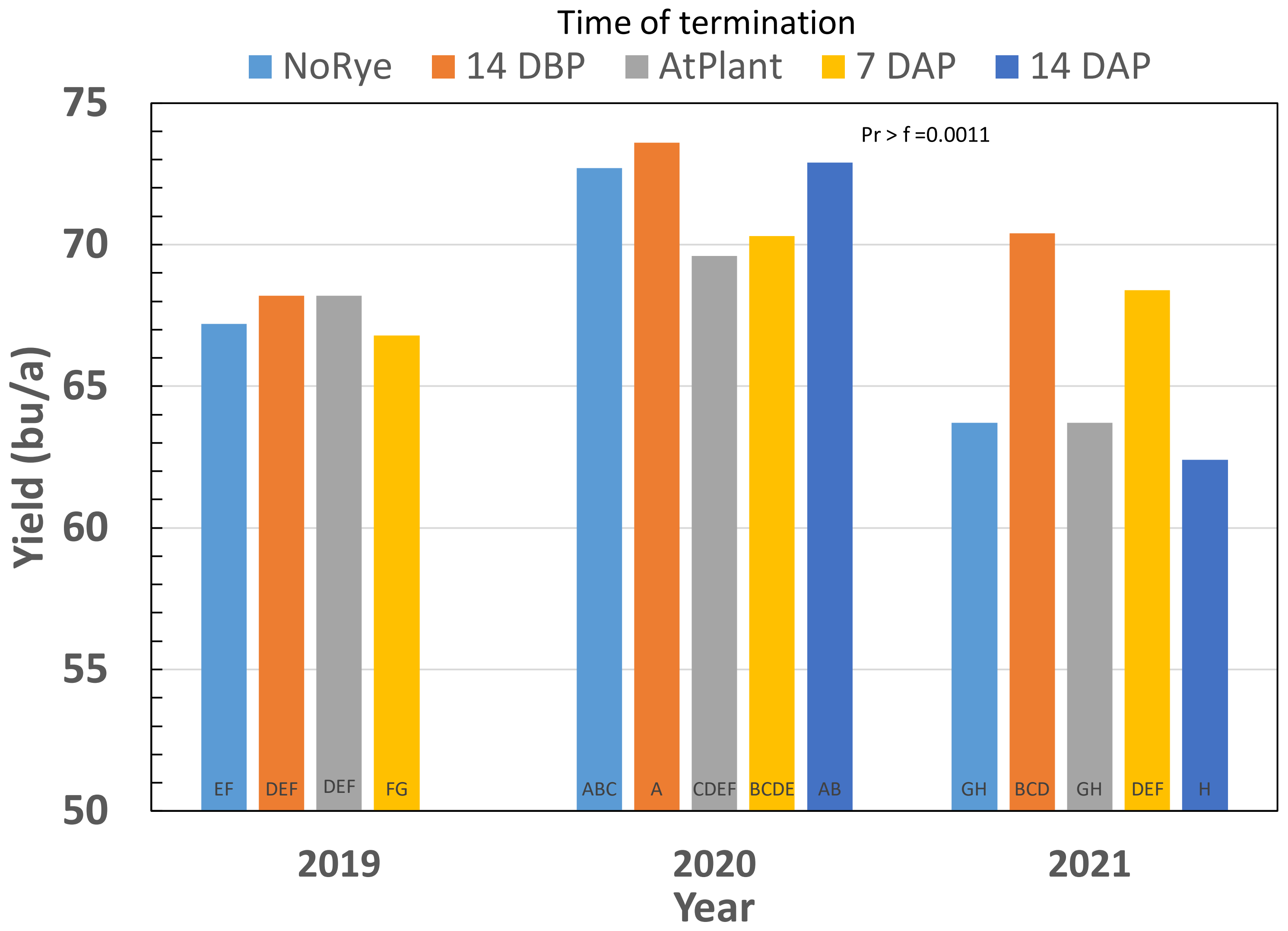


University of Wisconsin-Madison | UW Extension

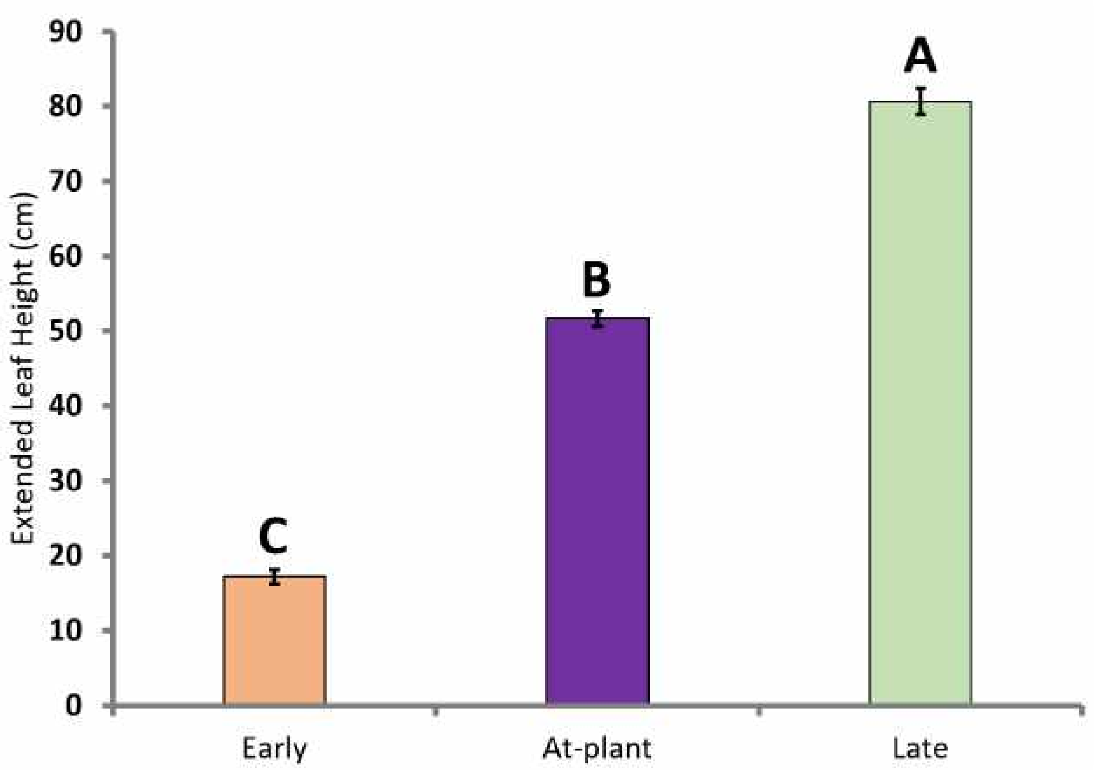
WWW.COOLBEAN.INFO

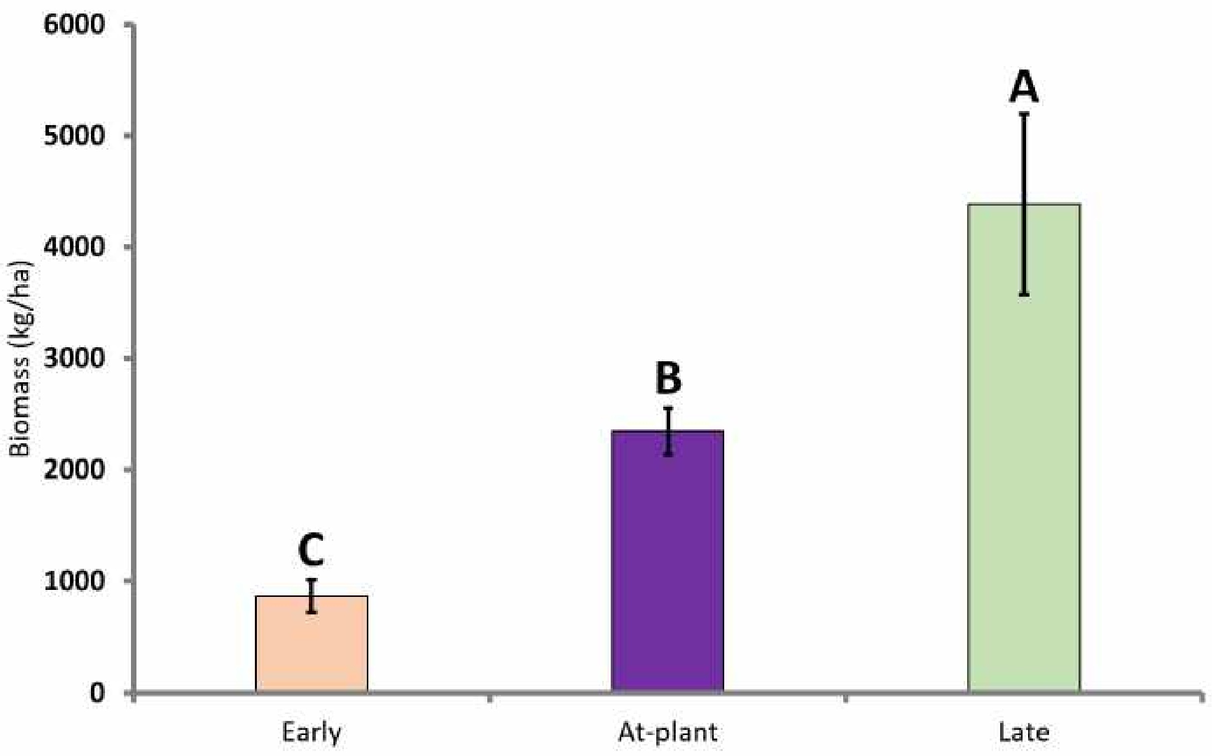
Wisconsin soybean yield

Rye cover crop – 2019-2021



Wisconsin Cover Crop Height and Biomass 2021





University of Wisconsin-Madison | UW Extension

WWW.COOLBEAN.INFO

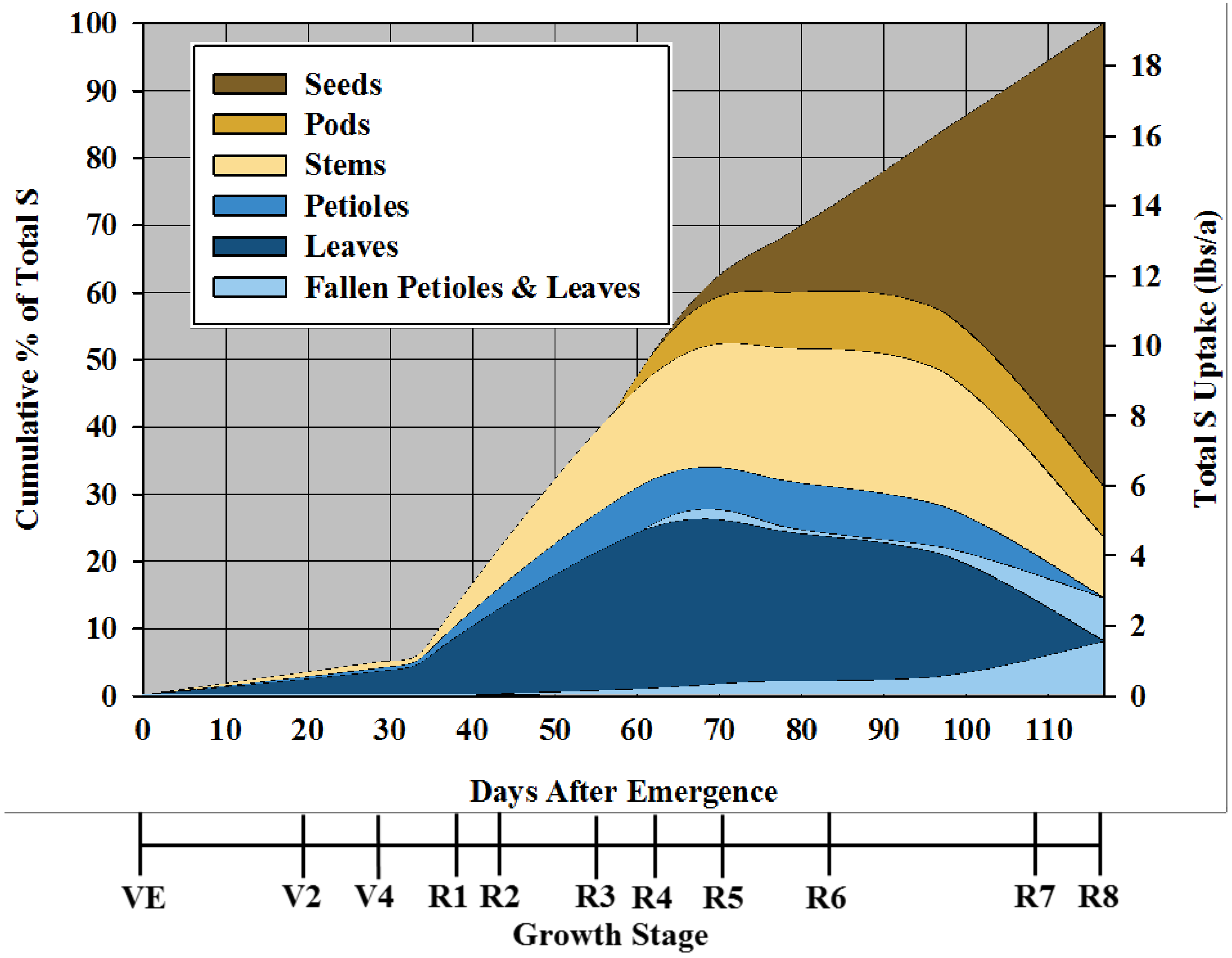
Bars with different letters are significantly different P≤0.05

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

COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO

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
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

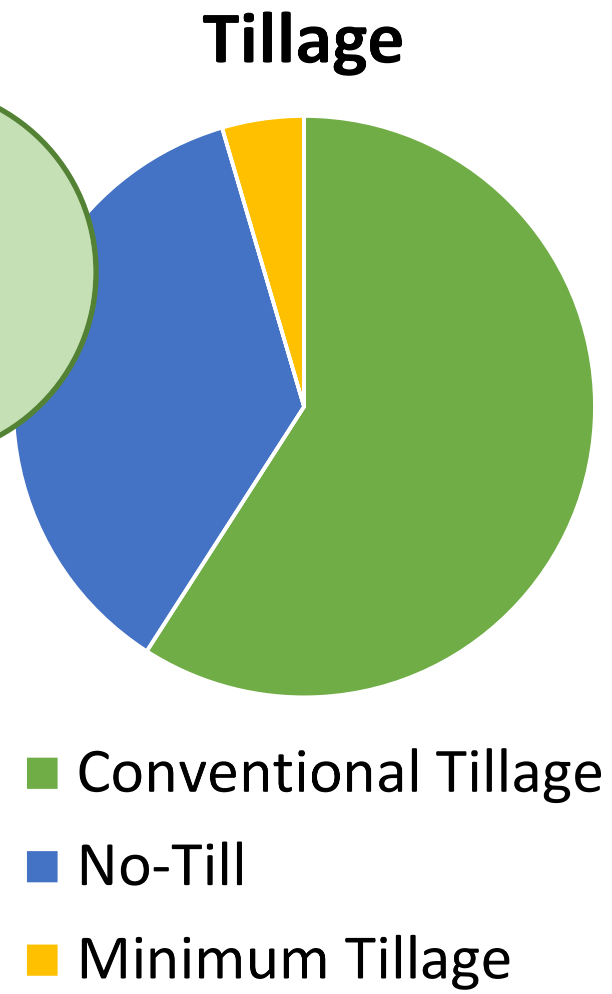
COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO

Sulfur Rate and Source Trials at a Glance

43 Sites

2019 & 2020

9 States



Most Common Soil Texture:
silt loam (22 sites)

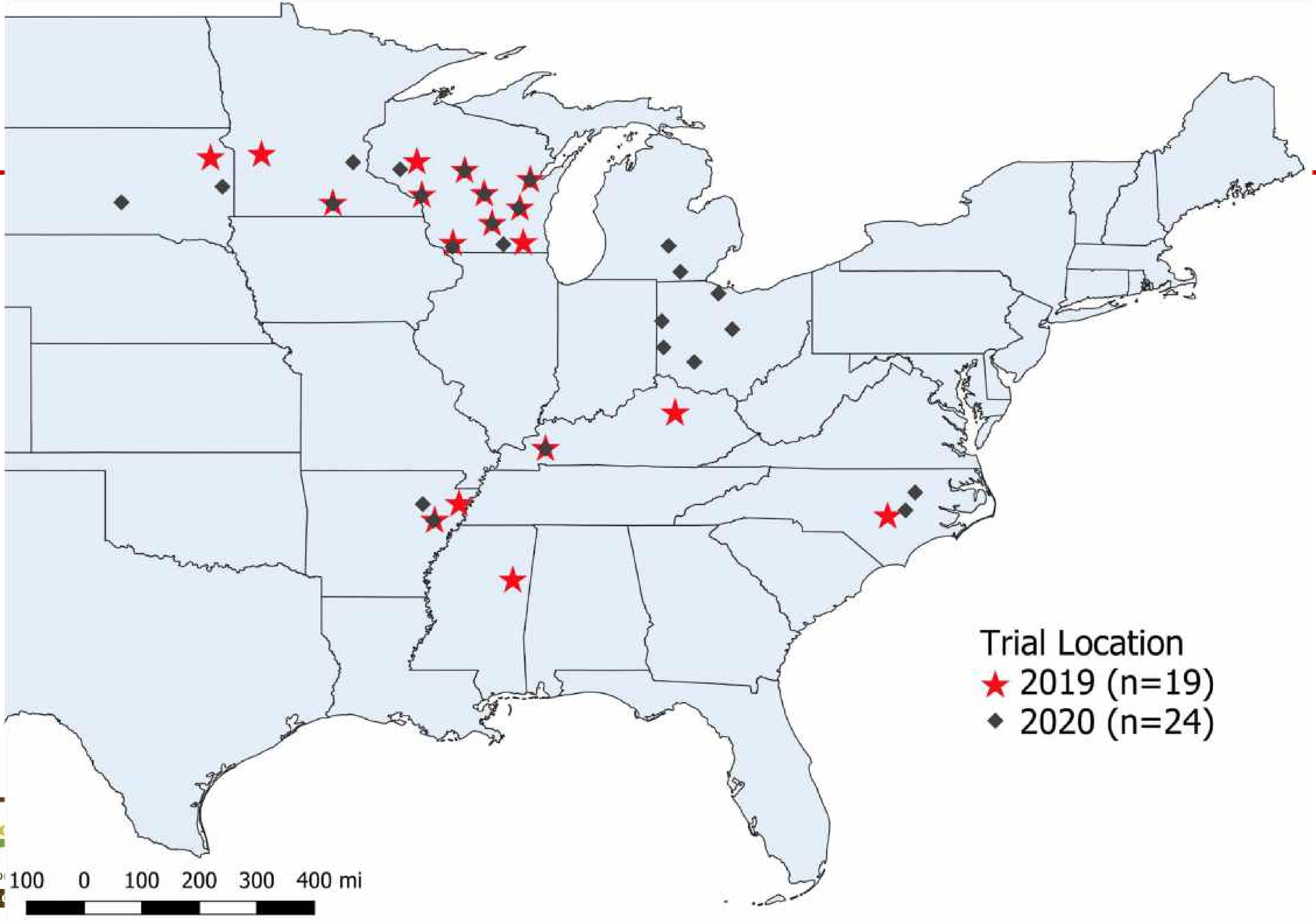
Coarsest Soil Texture:
sand (Hancock, WI)

Finest Soil Texture:
Clay (Holgate, OH)

Earliest Planting Date:
April 28th, 2020 (Hancock, WI)

Latest Planting Date:
June 16th, 2020 (Pinetree, AR)

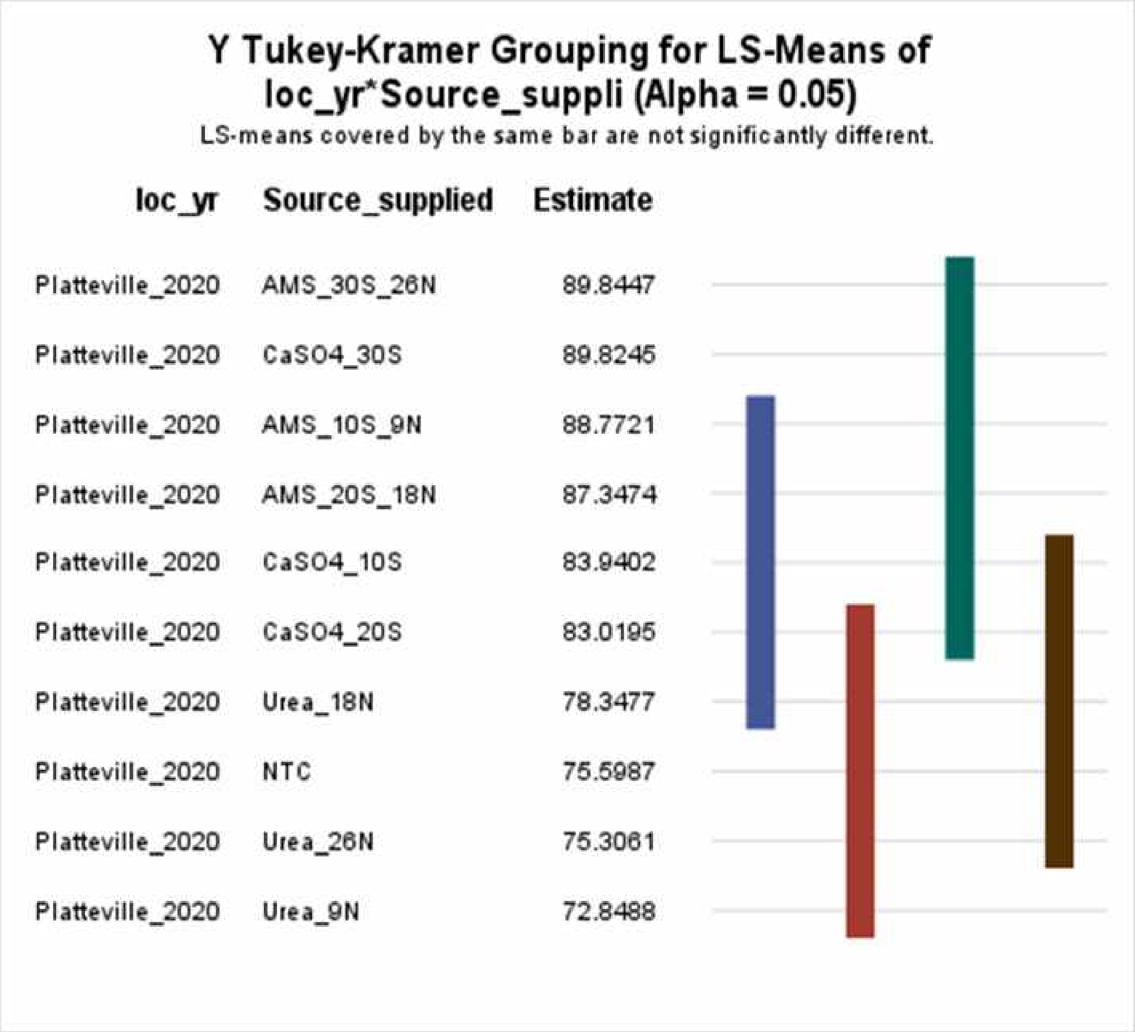
COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO


Trial Location
2019 (n=19)
2020 (n=24)
100 0 100 200 300 400 mi
University of Wisco

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
AMS	125	30	26.25
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



COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO

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.

60 | Calculate

Total Nutrient uptake in lbs/ac

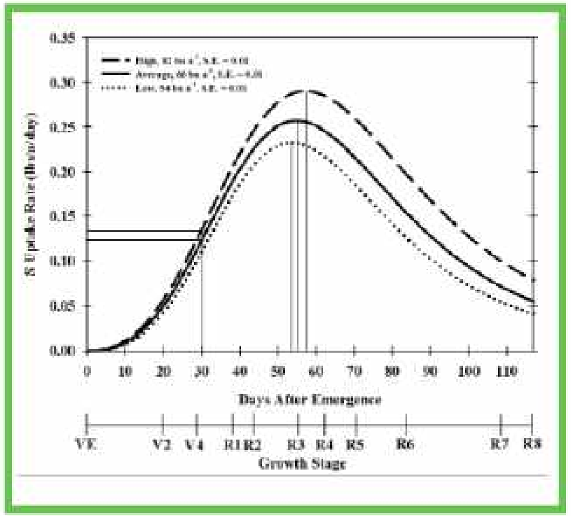
NUTRIENT	TOTAL UPTAKE(LBS/AC)	SE (+/-)	R^2
N	226.94	20.0	0.80
P_2O_5	55.01	6.7	0.70
K_2O	153.62	23.7	0.53
S	14.43	2.1	0.58
Mg	33.59	7.4	0.39
Ca	63.54	17.6	0.28
Zn	0.027	0.05	0.33

COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO

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
- Seed S accrual relied heavily on both vegetative remobilization and

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.

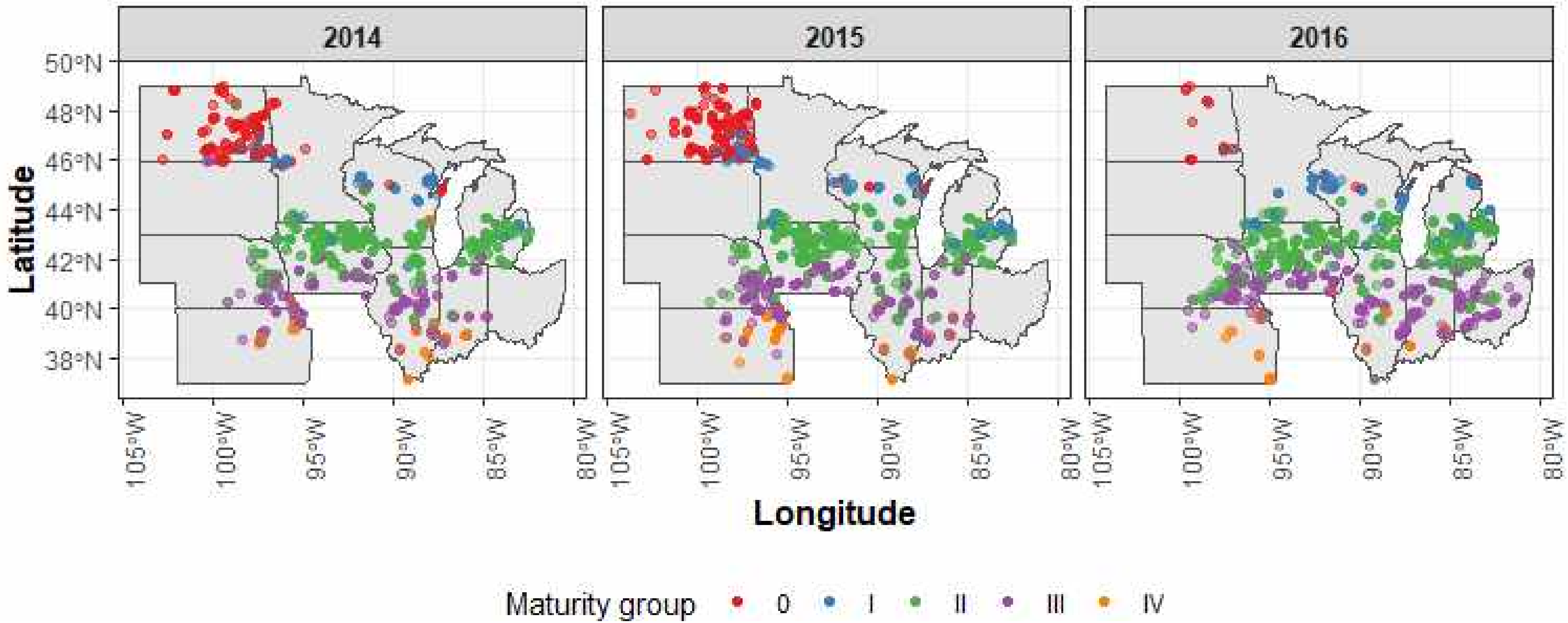
COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO

THE UNIVERSITY of WISCONSIN MADISON

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.

COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO

THE UNIVERSITY of WISCONSIN MADISON

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, nematicidal, 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.

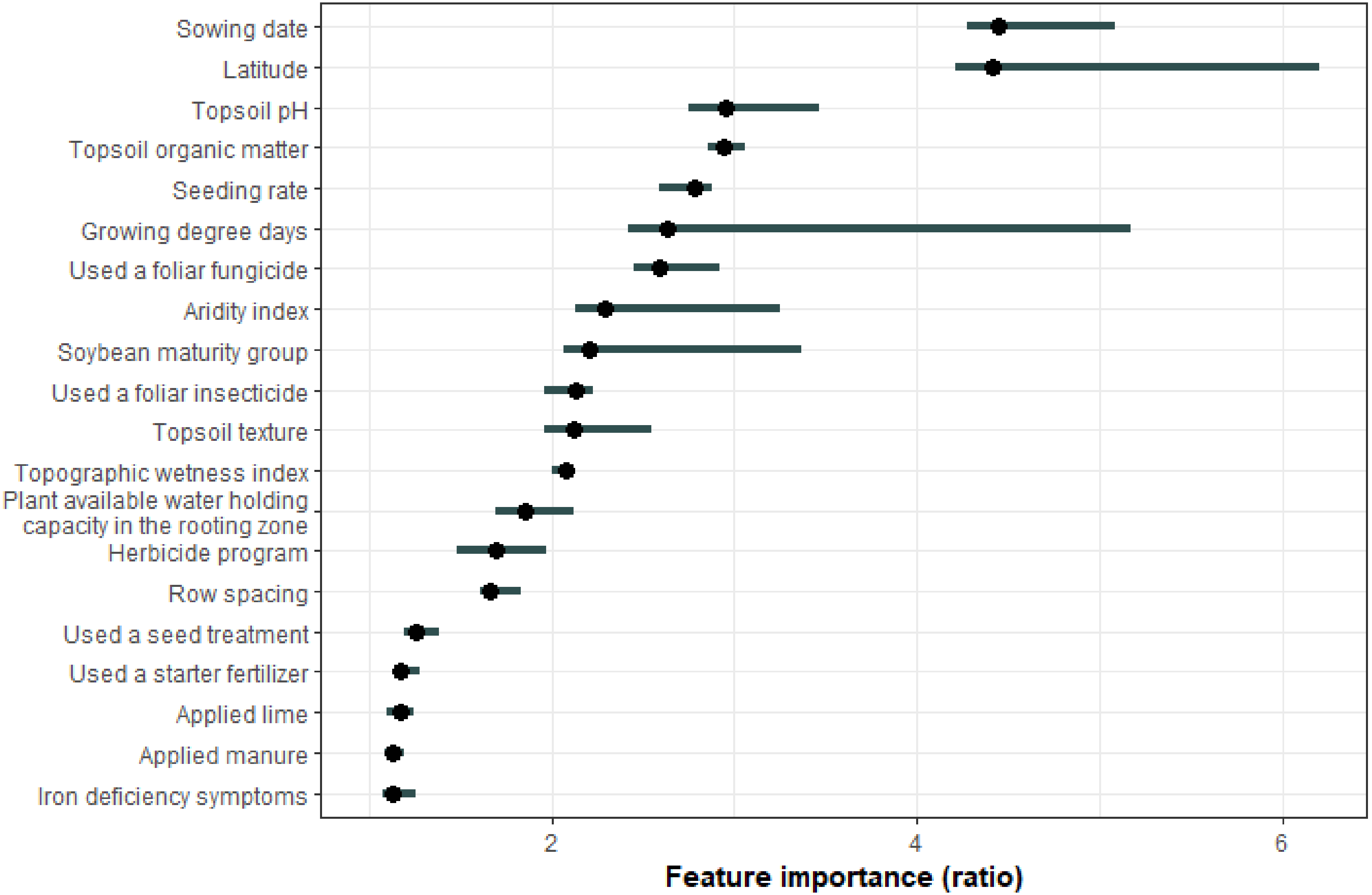
- For any one observation, the Shapley values (φ) values are an estimate of how much a predictor contributed to the difference between an individual field's predicted yield and the predicted yield averaged across all fields in the data.

COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO

THE UNIVERSITY of WISCONSIN MADISON

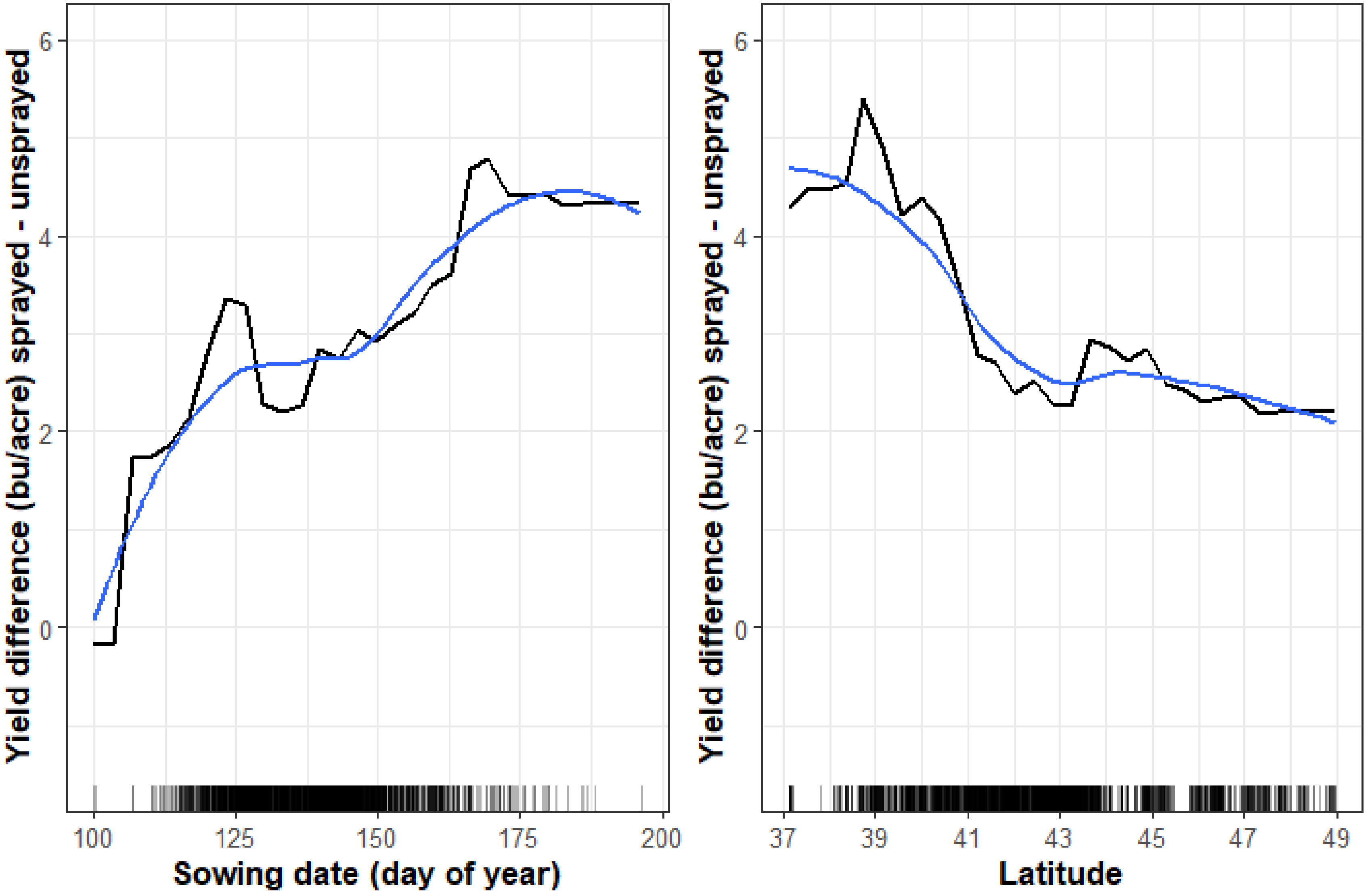
Results

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?

We need your help!

A Survey

- Grower survey
- 1000 WI fields
- Information about your field management, costs, and yields
- Completely confidential
- States participating:
- WI, PA
- OH, MI, IA, ND, MN, NE

Field Scouting

- 10 scouted fields
- Weekly scouting by UW BeanTeam
- Soil and SCN sampling
- Insect sweeps
- Disease monitoring
- Growth staging and weather monitoring

Enhancing

- Adding:
- Soil data
- Weather data
- Satellite image data
- Yield data

Data analysis

- Develop AI generate, profitable management recommendations from the data collected in the survey and scouted fields

COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO

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

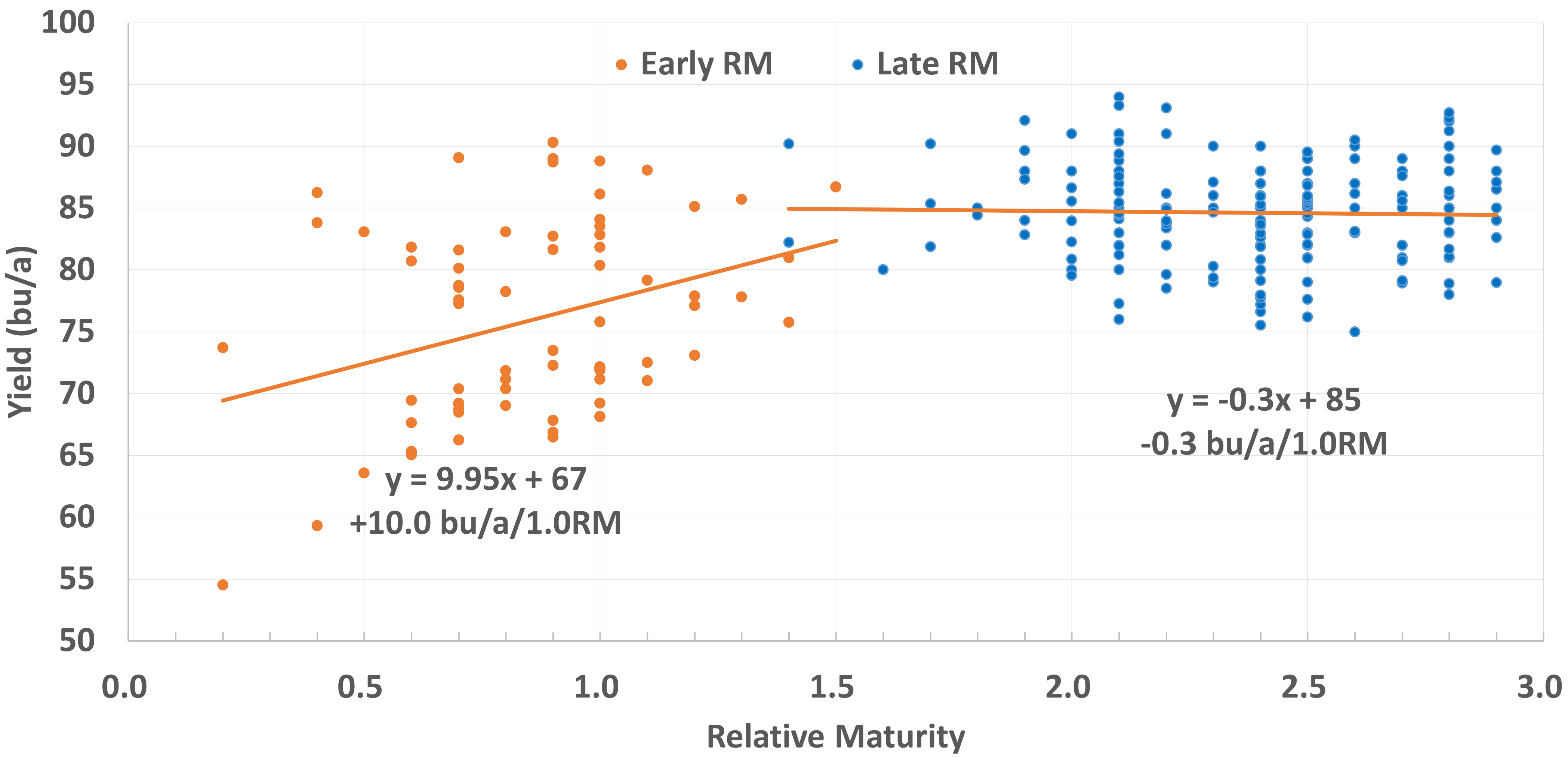
Registration questions

- 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

COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO

Relative Maturity vs Yield

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



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

COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO

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

COOL BEAN University of Wisconsin-Madison | UW Extension WWW.COOLBEAN.INFO

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**

COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO

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

COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO

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

COOL BEAN
University of Wisconsin-Madison | UW Extension
WWW.COOLBEAN.INFO

www.coolbean.info

@badgerbean

thesoyreport.blogspot.com

UW Extension
University of Wisconsin-Extension

Wisconsin Soybean Marketing Board

Wisconsin
University of Wisconsin–Madison