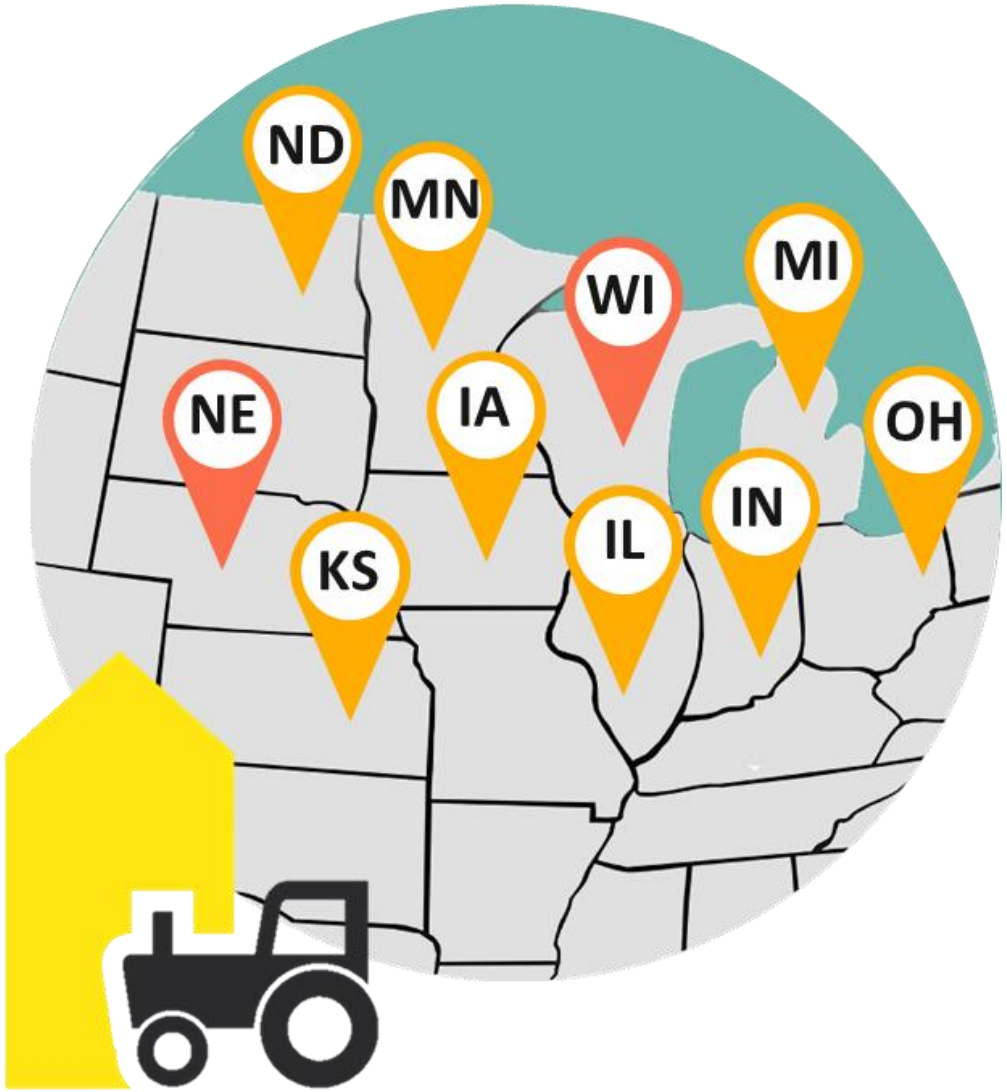
Management Strategies for Early- and Late-Planted Soybeans

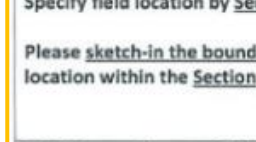
Emma Matcham and Shawn Conley

Agenda

- Benchmarking Surveys
- Early- and Late-Planting Management Survey Data
- Boots on the Ground Field Trials



- Planting Date
- Row Spacing
- Seed Treatment
- Previous Crop
- Tillage History
- Fertilizer
  - Type
  - Rate
  - Timing
- Lime
- Manure
- Foliar Fungicide
- Foliar Insecticide
- Herbicides

	EXAMPLE:	2014 Soybean	2014 Soybean	2015 Soybean	2015 Soybean
Specify field location by Section: Township: Range. → Please sketch-in the boundaries of your field location within the Section →	NE¼ 25 : 20N : 26W 				
OR GPS coordinates of field centroid: OR County & field location relative to Rd Intersection:	41.678, -100.257 Saunders Co, SW of Rd 11 & N	[redacted]	[redacted]	[redacted]	[redacted]
Dryland? OR Pivot, Gravity? Indicate field size (acres)	Pivot (130 ac)	Pivot (137ac)	Gravity (30ac)	Pivot (84ac)	Dryland (11ac)
Does this field have drainage? (no, old clay tile, new systematic tile, surface drainage, other)	No	No	No	No	No
Total Inches of Irrigation Applied to crop?	5 inches	3.5 in.	4.5 in	3.5 in	0
SOYBEAN YIELD (bushels/acre) for this FIELD:	70	80	70	85	39
Lowest/Highest Yield (bu/ac) of your soy fields that year	Low: 62 High: 80	Low: 61 High: 90	Low: 55 High: 86	Low: 61 High: 90	Low: 13 High: 66
*Use Irrigated fields yield range if this crop was Irrigated: *Use Dryland fields yield range if this crop was Dryland:					
Planting Date in this FIELD (Month/Day/Year):	5/15/2014	4/28/2014	5/2/2014	4/29/2014	5/4/2014
Variety Name (Brand & Number):	Pioneer P93M11	Channel 5402 RR2	Channel 5402RR2	Channel 5402RR2	Channel
Seeding Rate (seeds/ac):	125,000	140,000	140,000	140,000	140,000
Row spacing (inches):	30	30	30	15	15
Seed Treated (Yes/No)? What Brand Name Product(s)?	Yes (Cruiser-Max)	yes Acceleson	yes Acceleson	yes Acceleson	yes Acceleson
Prior Crop in this FIELD? Residue harvested or grazed?	Corn - Grazed	Corn - Grazed	Corn - No	Corn - Grazed	Corn - No
Tillage after prior crop? No-Till (NT); Ridge (RT); Strip (ST); Disk (D); Chisel (C); Vertical (V) – Indicate timing (month-year)	ST (March-2014)	NT	D (April 2014)	NT	NT
Any (non-starter) fertilizer after prior crop? Specify rate (pounds NUTRIENT/ac) and timing (month-year)	P_2O_5: 70 K_2O: 30 Other: S (11 lbs) Time: March-2014	P_2O_5: K_2O: Other: None Time:	P_2O_5: K_2O: Other: None Time:	P_2O_5: K_2O: Other: None Time:	P_2O_5: K_2O: Other: None Time:
Any STARTER fertilizer (Yes/No)? If Yes, specify nutrients	Yes (N, P, Zn)	No	No	No	No
Any Lime (L) or Manure (M)? If yes, specify timing (mm-yy)	M (Nov-2013)	No	No	No	No
PRE- or POST-emergence herbicide program or BOTH?	Both	Both	Both	Both	Both
~~Any in-season foliar fungicide (F) / insecticide (I)?~~	~~F and I~~	No	No	No	No
Soy Cyst Nematodes (Yes/No/I don't know)?	No	No	No	No	No
Iron Deficiency Chlorosis (Yes/No)?	No	No	No	No	No
Any significant yield loss due to Insects, Diseases, Weeds, Frost, Hail, Flood, Lodging? Specify problem	Frost (Sept-2014)	None	None	None	yes Hail (July 2014)

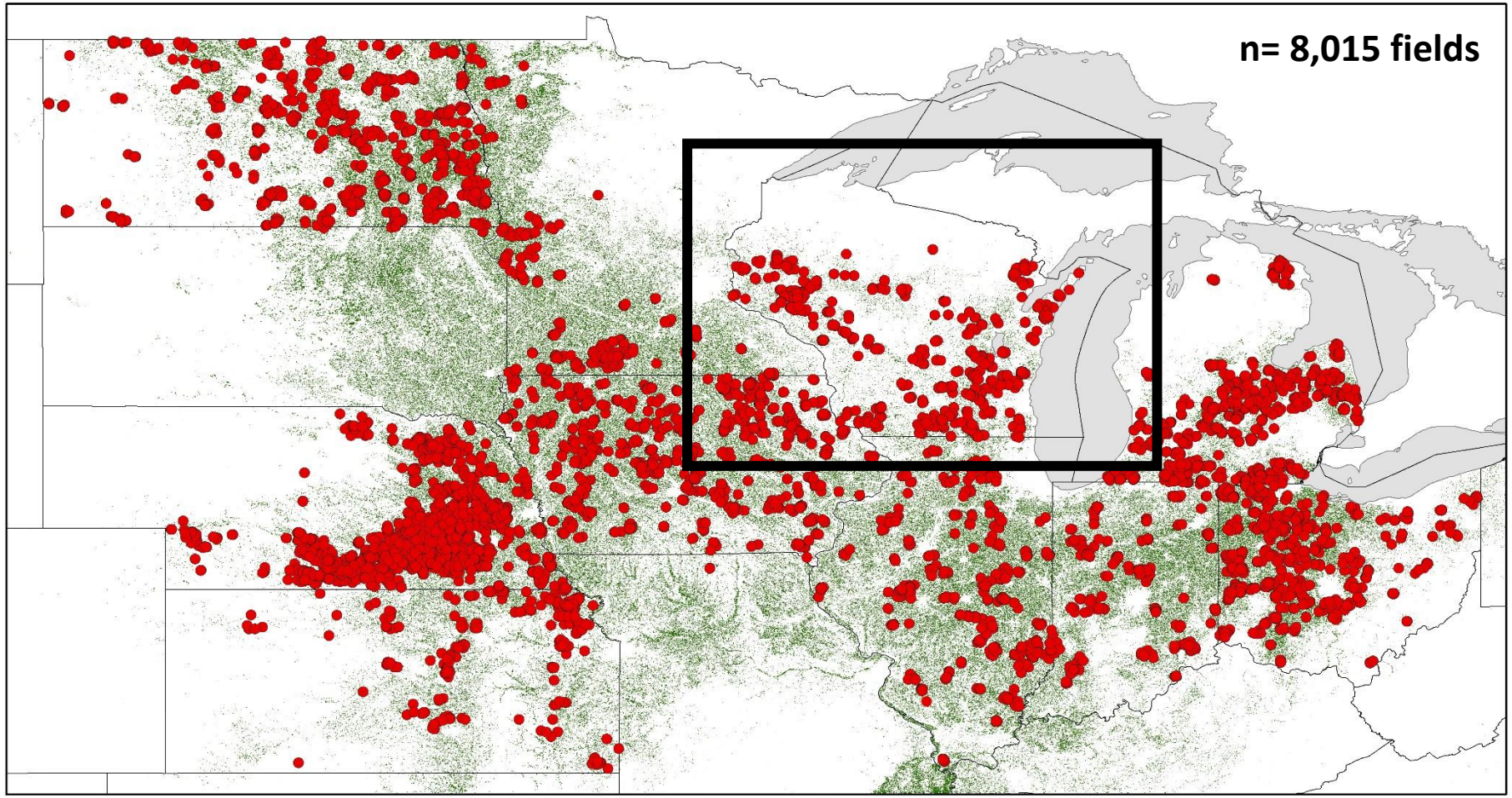
Location

Drainage and Irrigation

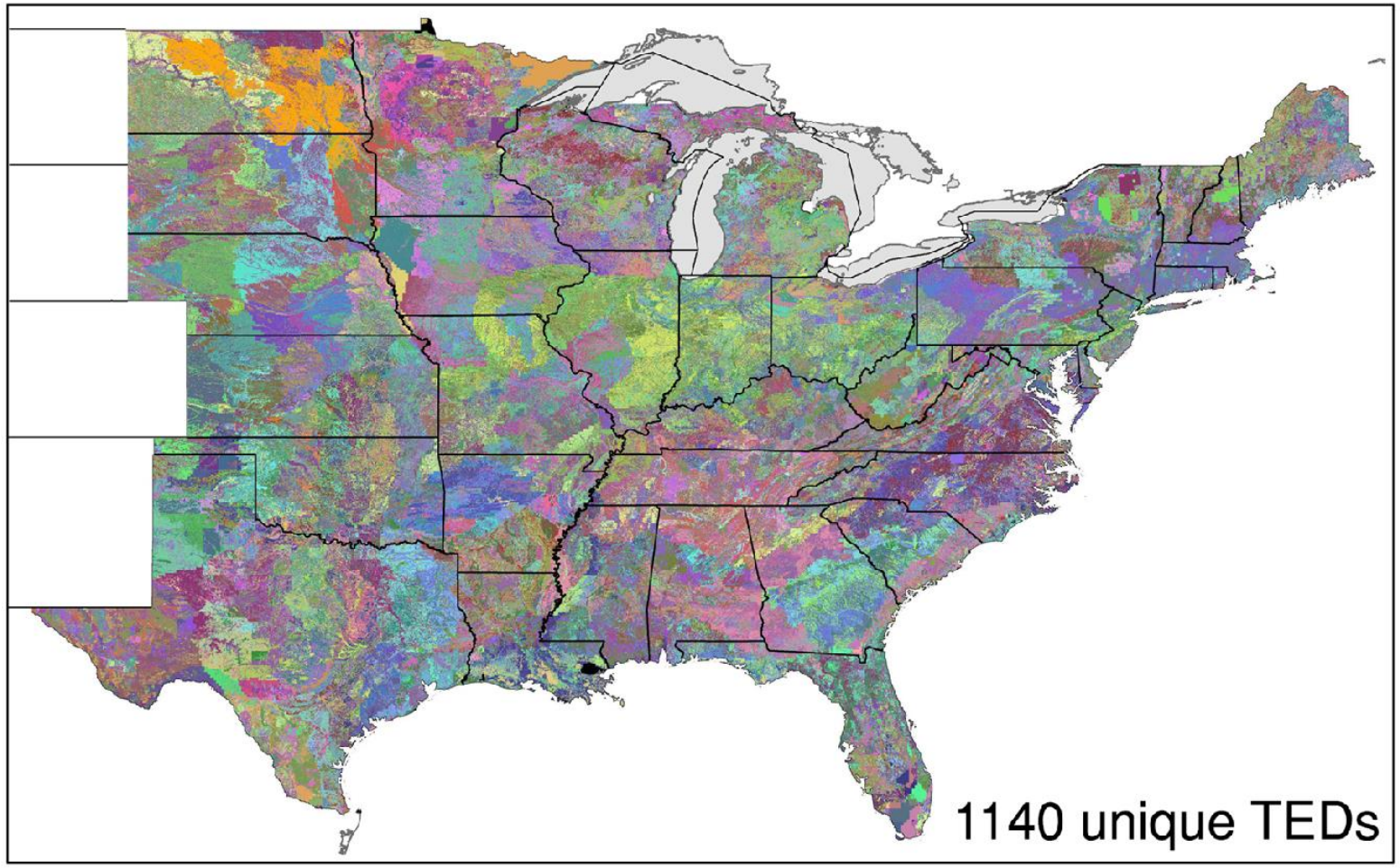
Yield

Adverse Events

Collected Surveys

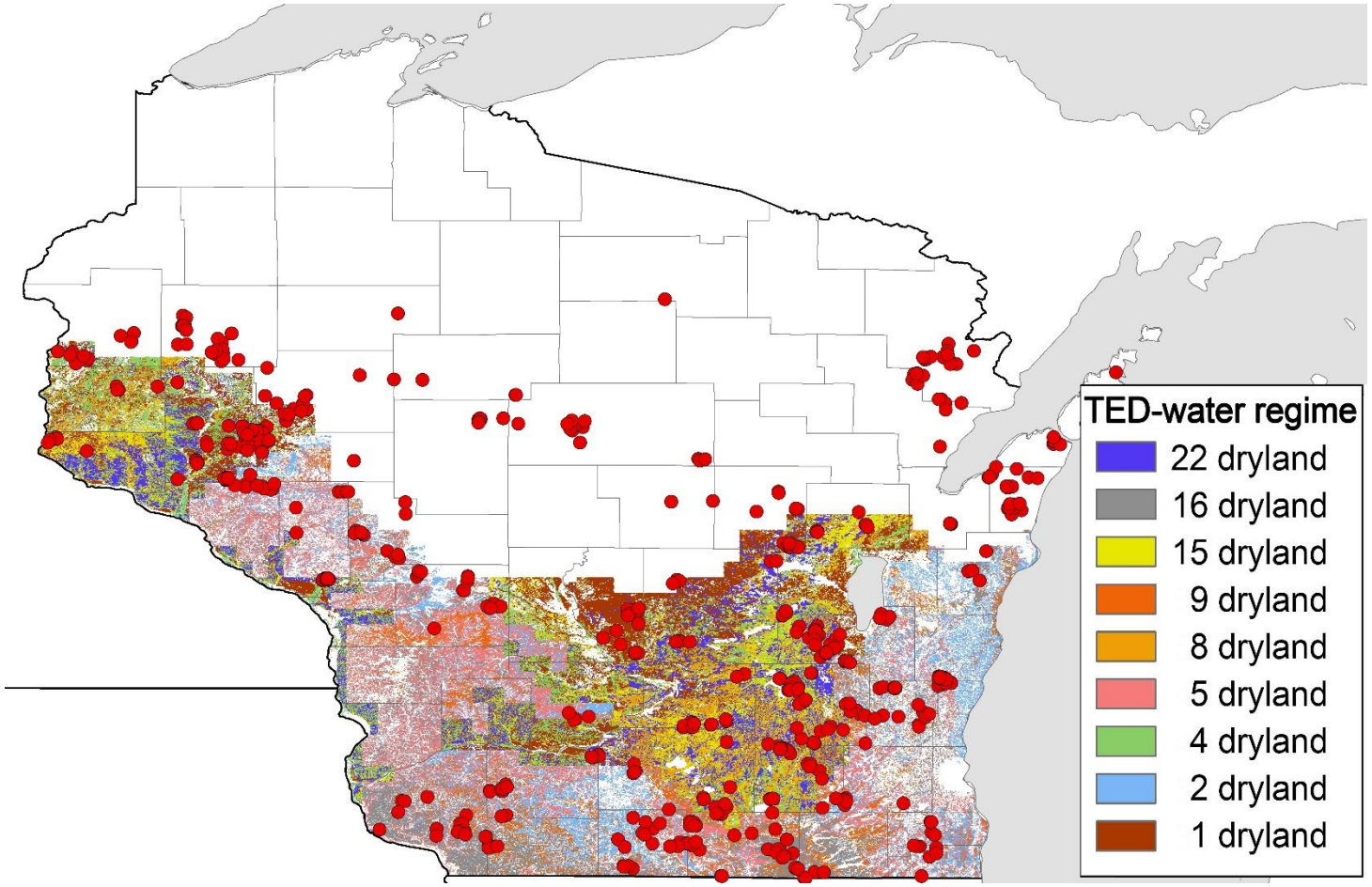


Field Grouping– Technology Extrapolation Domains (TEDs)

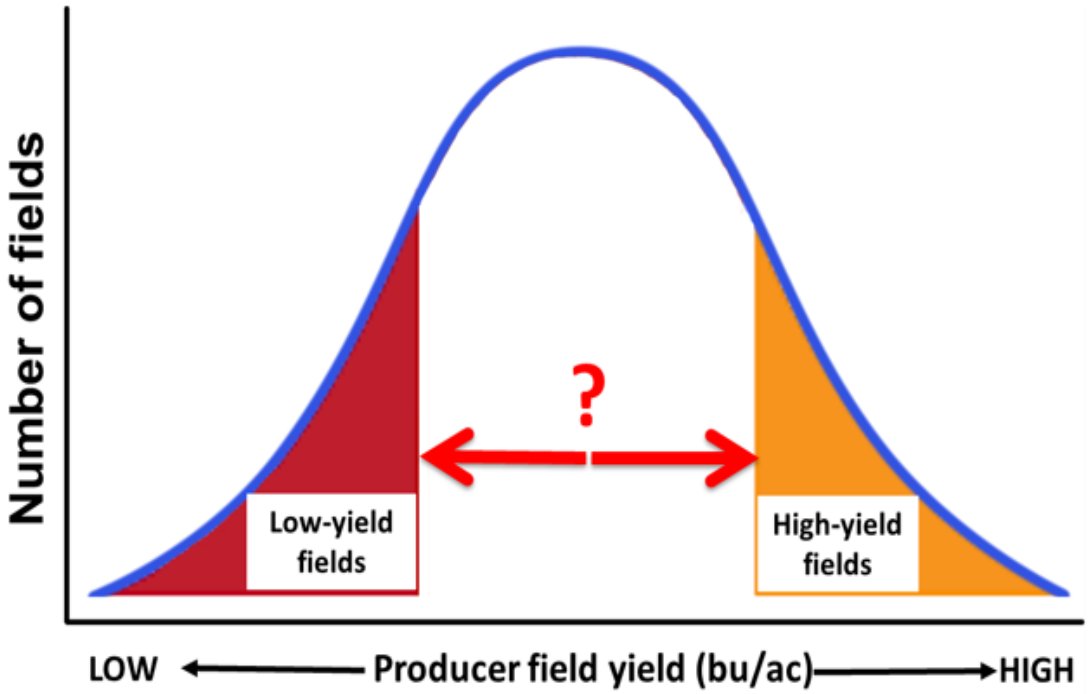


1. Annual Growing Degree-Days
2. Aridity Index
3. Annual Temperature Seasonality
4. Plant-available Water

Wisconsin TEDs



Which management practices are different in high- *versus* low-yield fields within a TED?

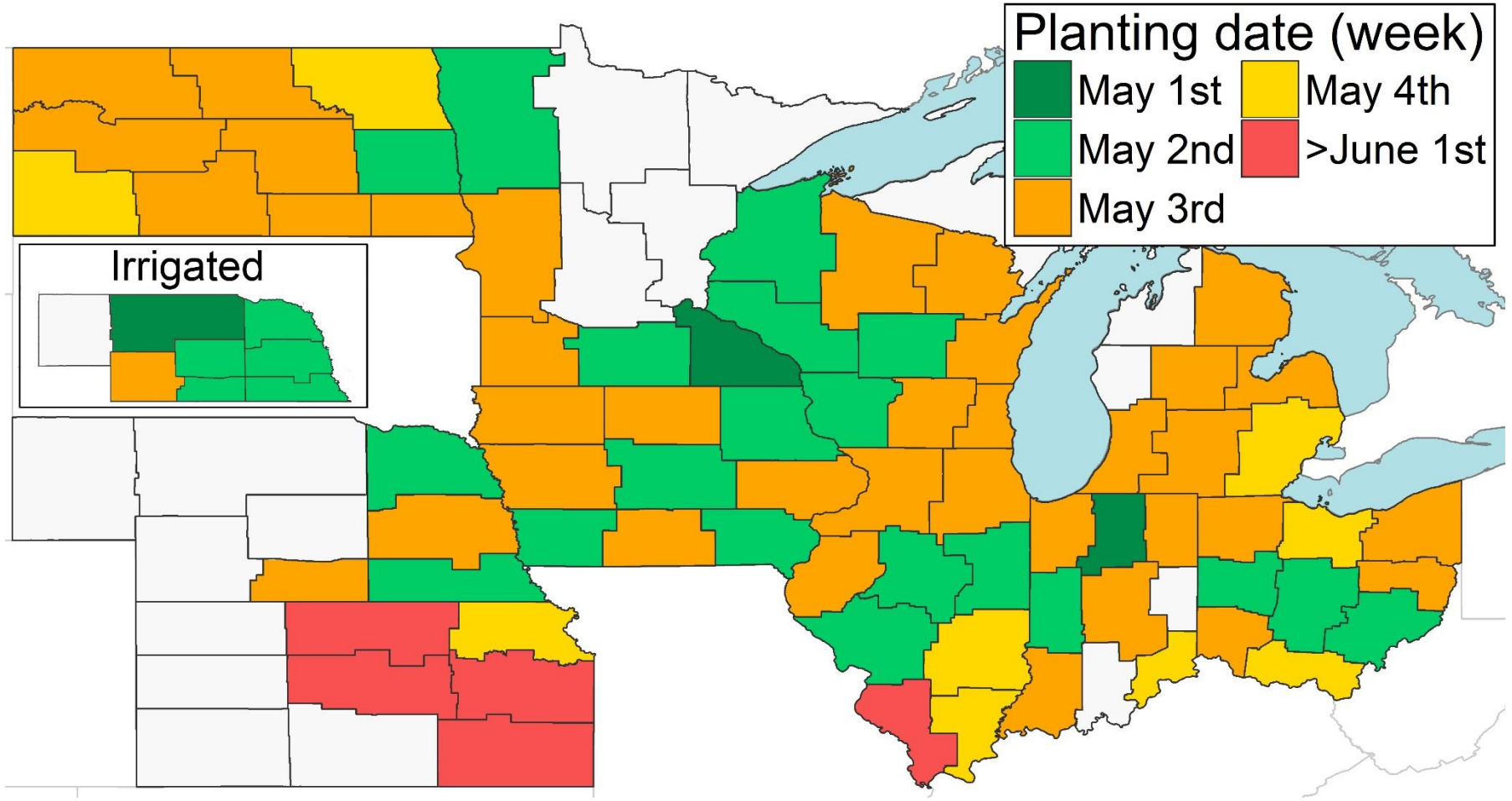


Management Practices for Wisconsin TEDs

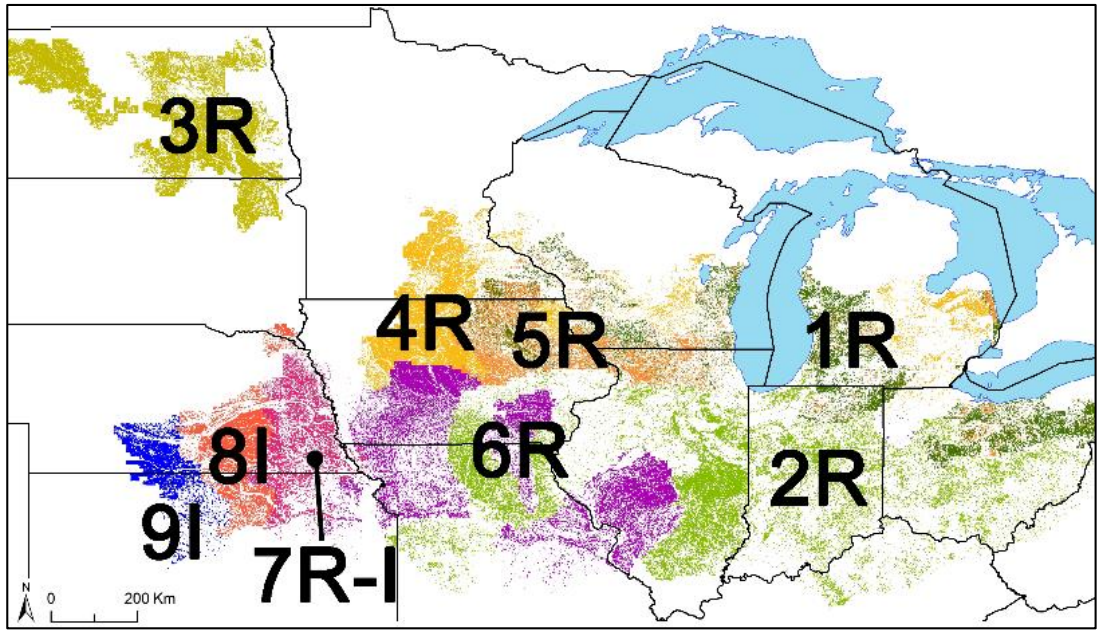
Management Practices	TED																	
	1D		2D		4D		5D		8D		9D		15D		16D		22D	
Yield category	HY	LY	HY	LY	HY	LY	HY	LY	HY	LY	HY	LY	HY	LY	HY	LY	HY	LY
Average bu/A	63	42	65	41	64	43	64	40	66	47	67	45	68	48	69	49	67	47
Planting date			May 17	May 23	May 14	May 22	May 14	May 19	May 15	May 22	May 13	May 18	May 15	May 19	May 13	May 17		
Seeding rate (x1000 seeds ac^{-1})					156	165					149	154	149	154				
Row spacing																		
% Fields with artificial drainage	80	65	77	62			60	36										
% Fields with tillage					62	43					67	24	74	61	53	40		
% Fields with foliar insecticide and/or fungicide	28	10	47	11	41	11	29	14			56	12	57	30	54	35		

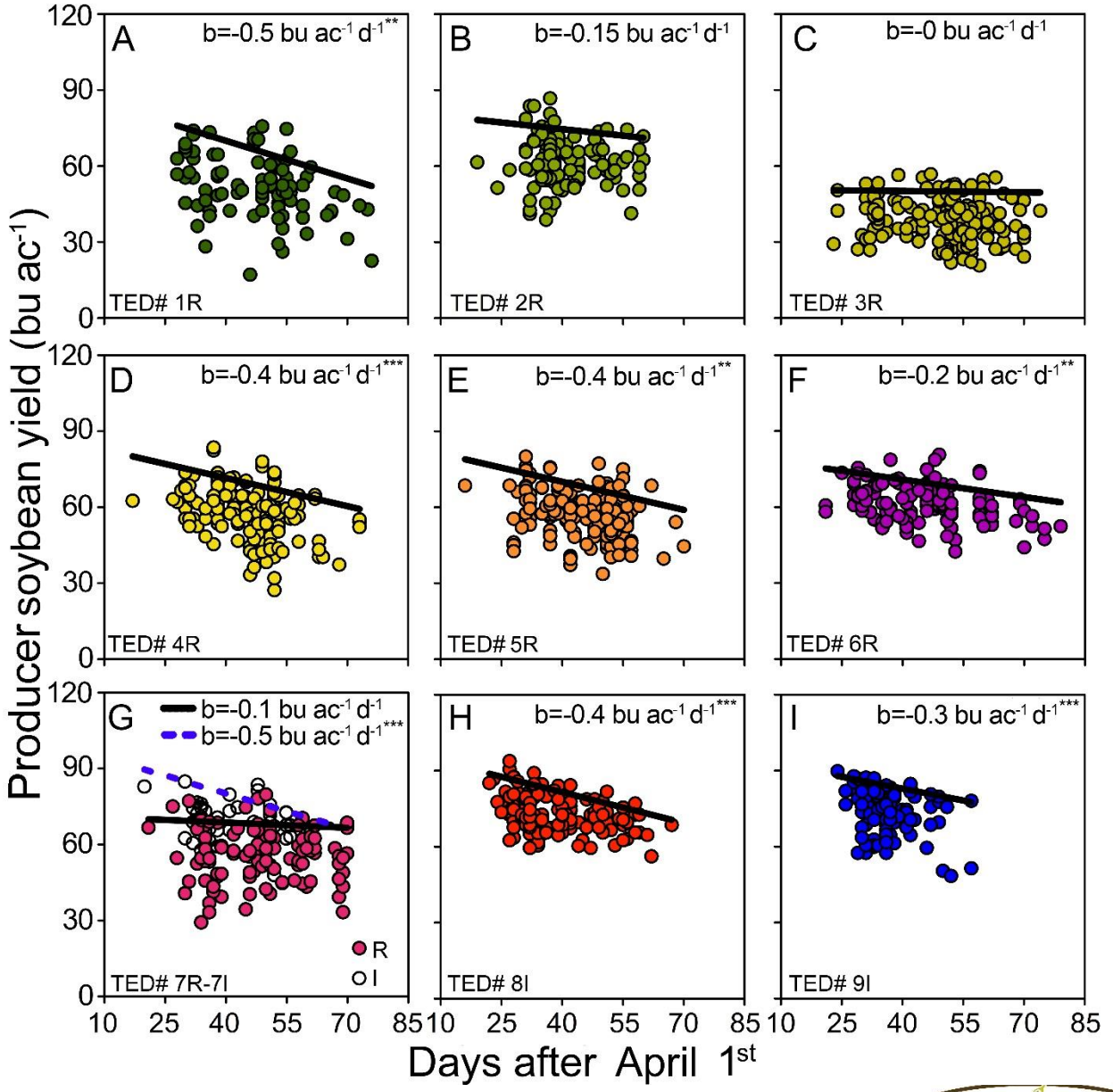
Planting date was significant at 7 out of 9 WI TEDs

Average Planting Date



After April 25th, yield decreases by **0.4 bushes/acre** every day!



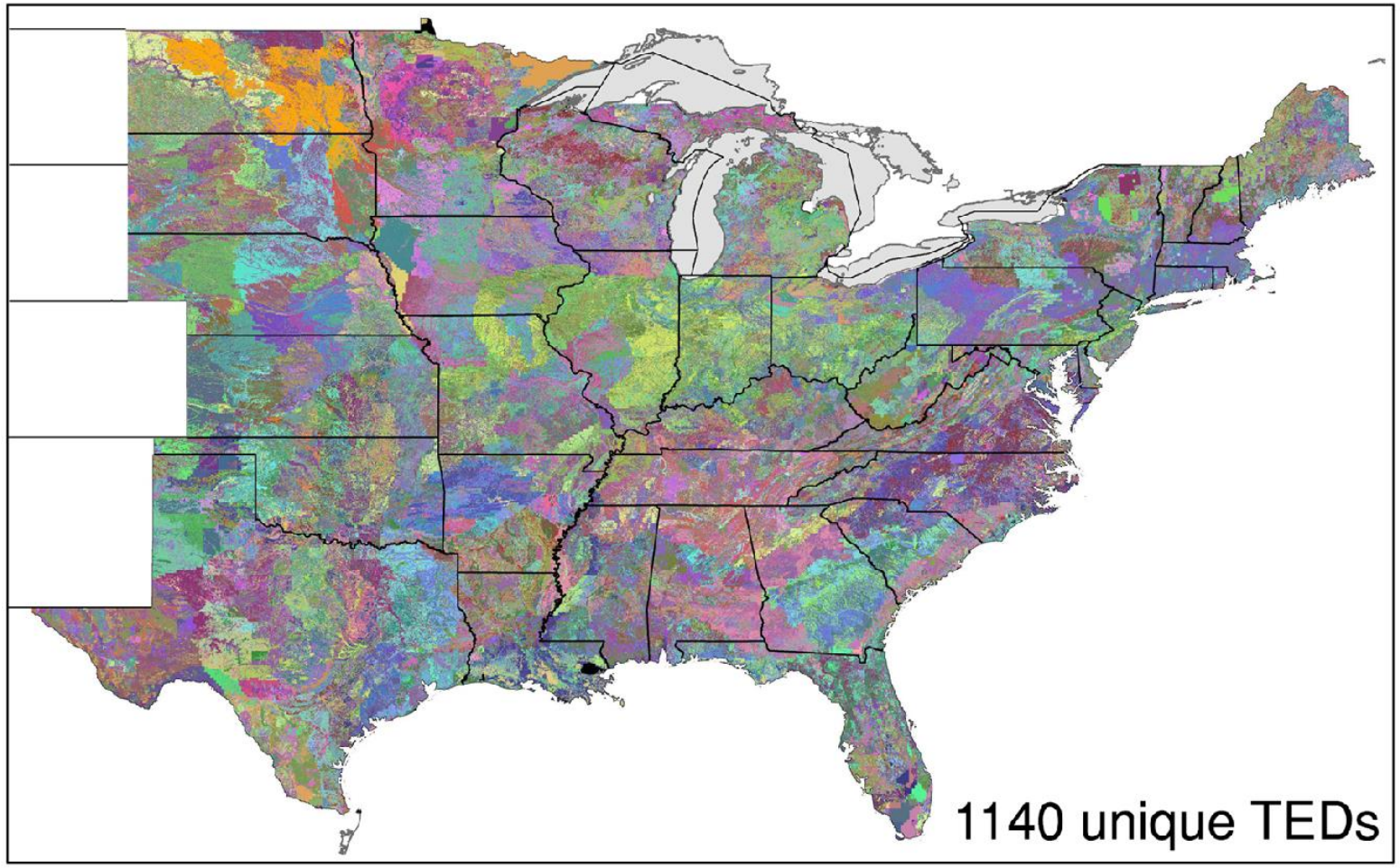


Managing Late-Planted Fields

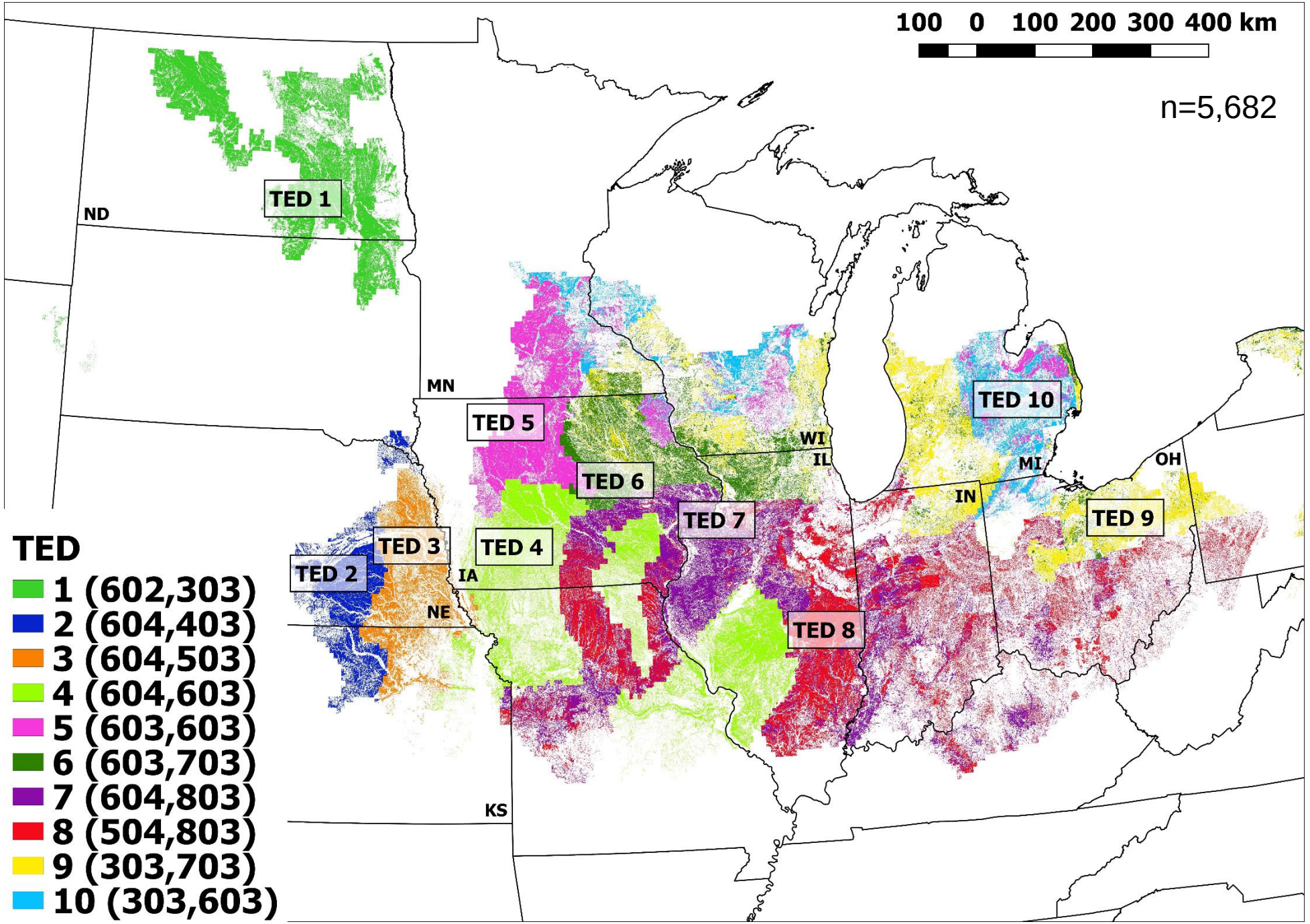
- Fields planted later have a lower yield potential
- Many management decisions have different affects in high-yielding and low-yielding environments

Should we be managing early-planted fields differently than late-planted fields?

Field Grouping– Technology Extrapolation Domains (TEDs)

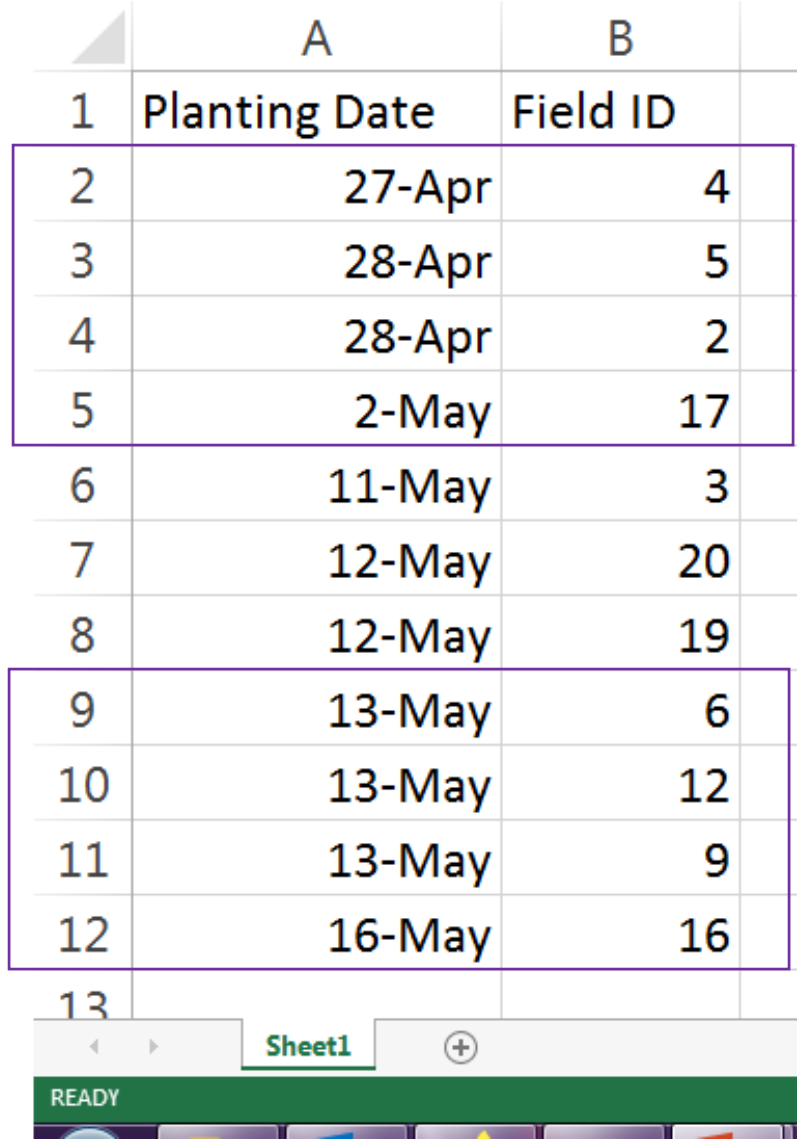


1. Annual Growing Degree-Days
2. Aridity Index
3. Annual Temperature Seasonality
4. Plant-available Water


100 0 100 200 300 400 km
n=5,682
TED 1
ND
MN
TED 5
WI
IL
TED 6
TED 7
TED 10
MI
OH
IN
TED 9
TED 3
TED 4
TED 2
IA
NE
TED 8
KS
TED
1 (602,303)
2 (604,403)
3 (604,503)
4 (604,603)
5 (603,603)
6 (603,703)
7 (604,803)
8 (504,803)
9 (303,703)
10 (303,603)

Planting Date Timeframes

1. Sort all fields by planting date
2. Separate into thirds



	A	B
1	Planting Date	Field ID
2	27-Apr	4
3	28-Apr	5
4	28-Apr	2
5	2-May	17
6	11-May	3
7	12-May	20
8	12-May	19
9	13-May	6
10	13-May	12
11	13-May	9
12	16-May	16
13		

Planting Date Timeframes

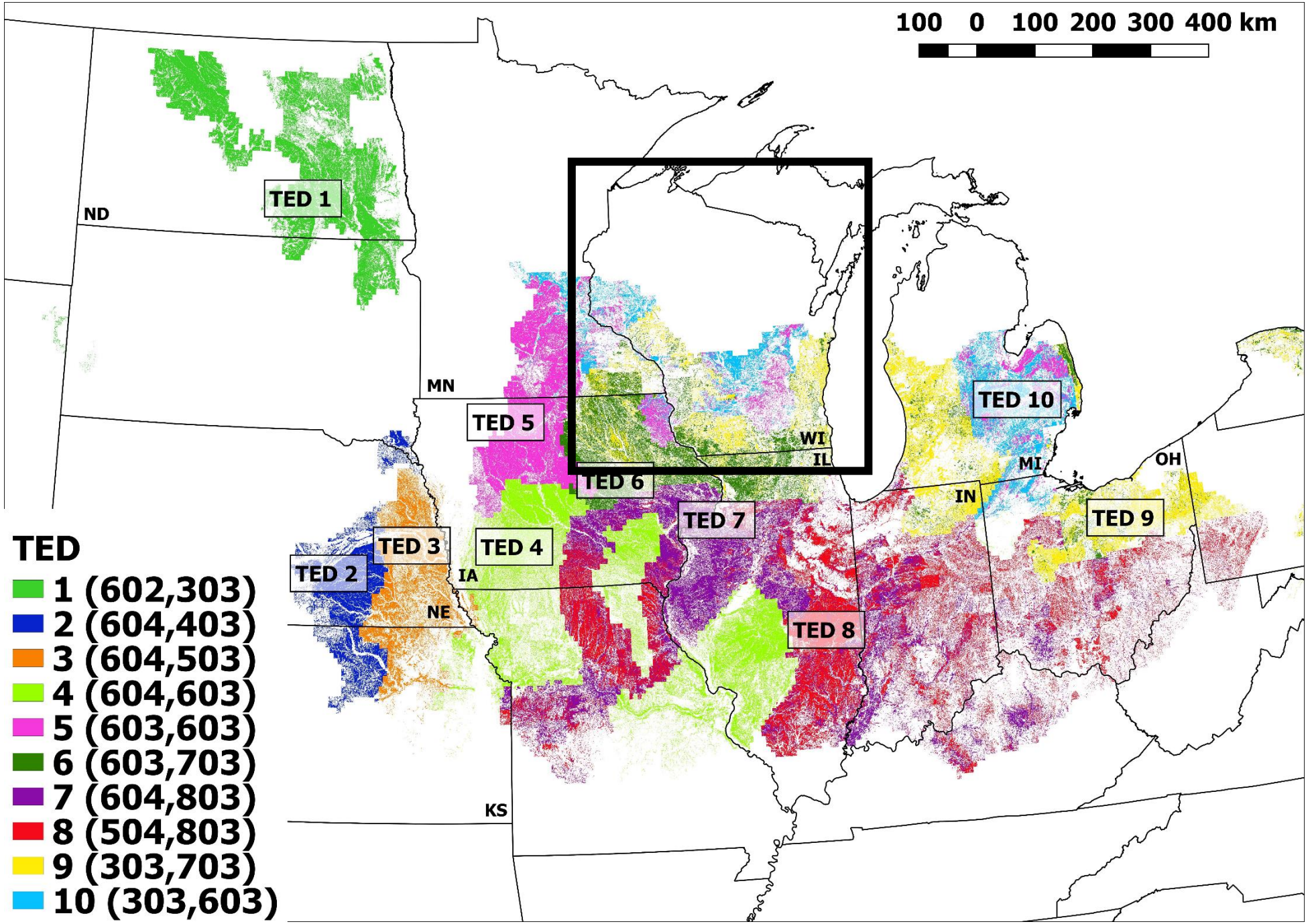
TED	Early			Late			Minimum difference between early- and late-planted fields†
	Date range	Average date	Number of fields	Date range	Average date	Number of fields	days
1	24 Apr - 18 May	8 May	65	26 May – 14 Jun	30 May	71	8
2	6 Apr - 6 May	1 May	105	17 May – 6 Jul	21 May	111	11
3	21 Apr – 14 May	7 May	59	22 May – 1 Jul	5 June	64	8
4	22 Apr – 7 May	3 May	79	20 May – 30 Jun	30 May	85	13
5	18 Apr – 11 May	6 May	90	22 May – 13 Jun	26 May	84	11
6	17 Apr – 8 May	4 May	89	21 May – 10 Jun	25 May	99	13
7	10 Apr – 7 May	1 May	54	22 May – 23 Jun	27 May	59	15
8	10 Apr – 8 May	2 May	89	22 May – 19 Jun	28 May	84	14
9	29 Apr – 15 May	6 May	56	26 May – 16 Jun	31 May	62	11
10	26 Apr – 16 May	8 May	53	25 May – 15 Jun	31 May	54	9

†Minimum difference between early and late-planted fields is the number of days between the last early-planted field and the first late-planted field.

Identifying Significant Management Decisions

- Focused on in-season management decisions
- Used decision trees to identify management decisions associated with higher yield

Decision trees identify the most important decision(s)– not all potentially significant decisions.


100 0 100 200 300 400 km
TED 1
ND
MN
TED 5
WI
IL
TED 6
TED 7
TED 10
MI
OH
IN
TED 9
TED 3
TED 4
TED 2
IA
NE
TED 8
KS
TED
1 (602,303)
2 (604,403)
3 (604,503)
4 (604,603)
5 (603,603)
6 (603,703)
7 (604,803)
8 (504,803)
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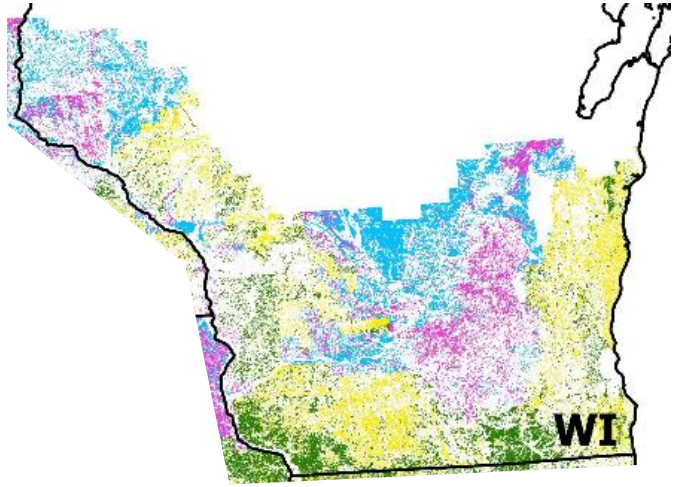
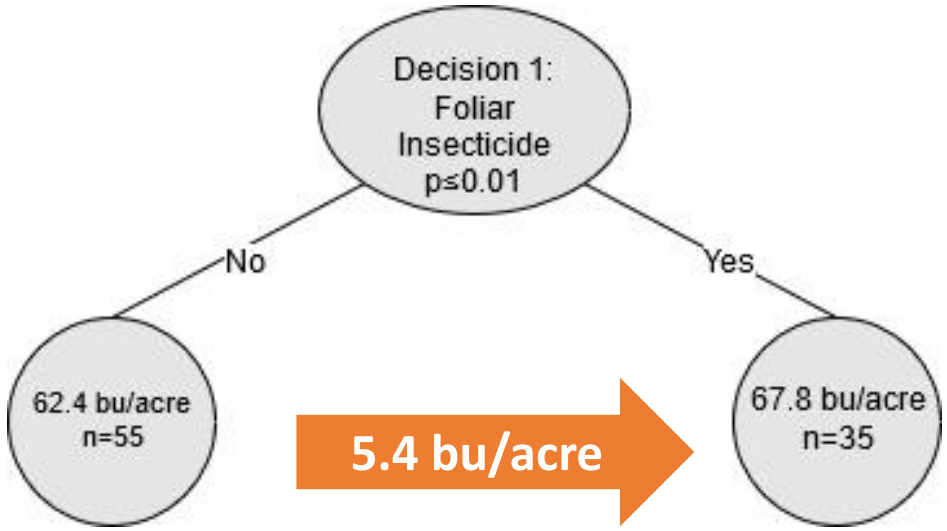
10 (303,603)

TED 5

Before 11 May



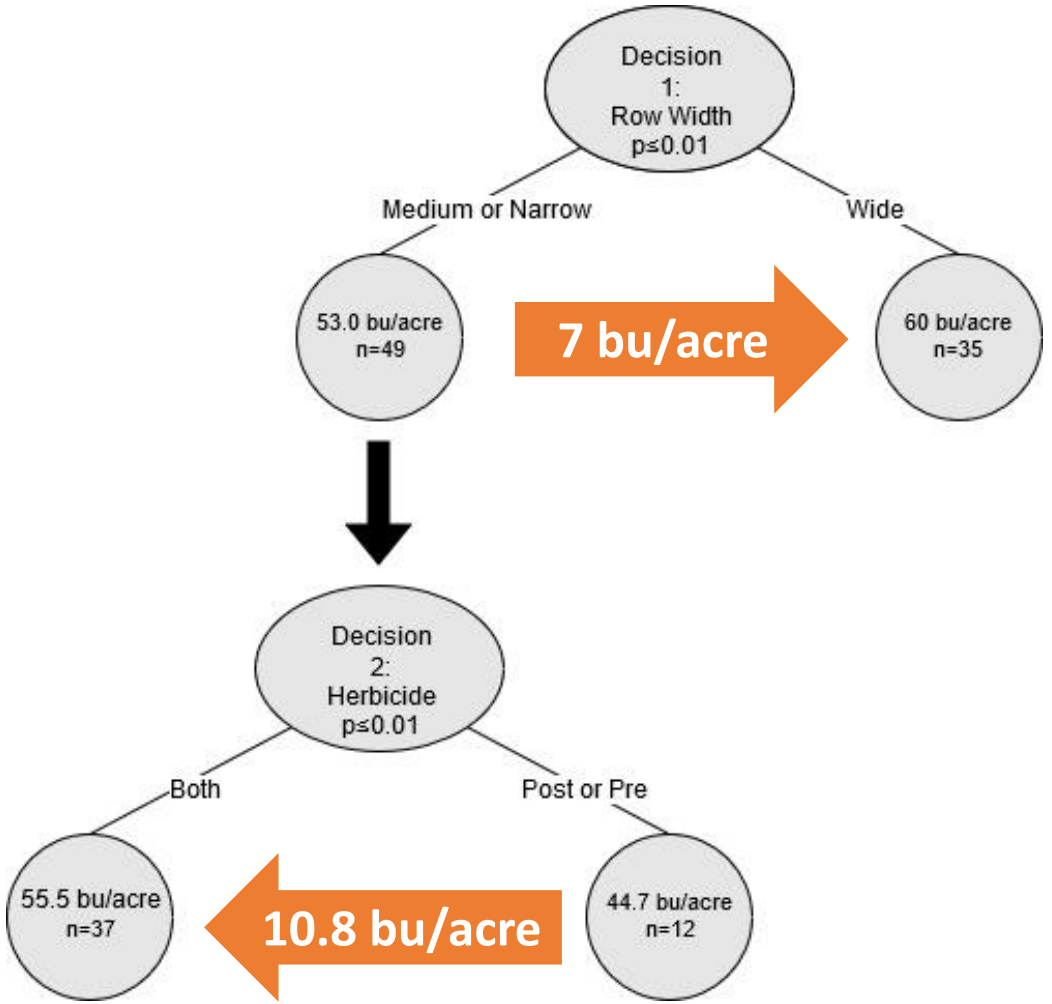
Early-Planted Fields

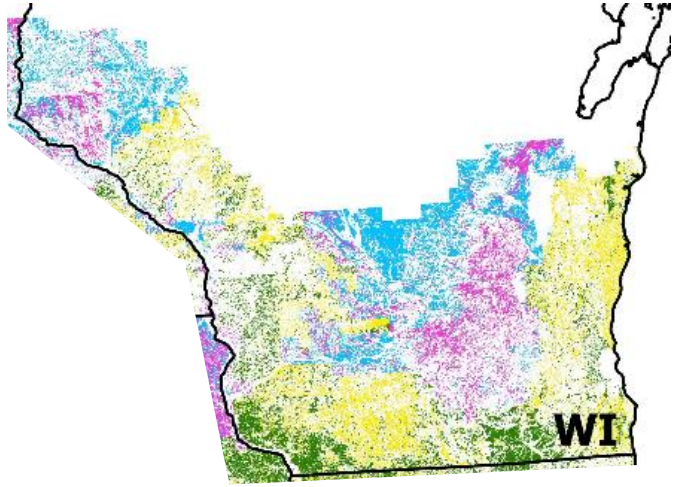


TED 5

After 22 May

Late-Planted Fields





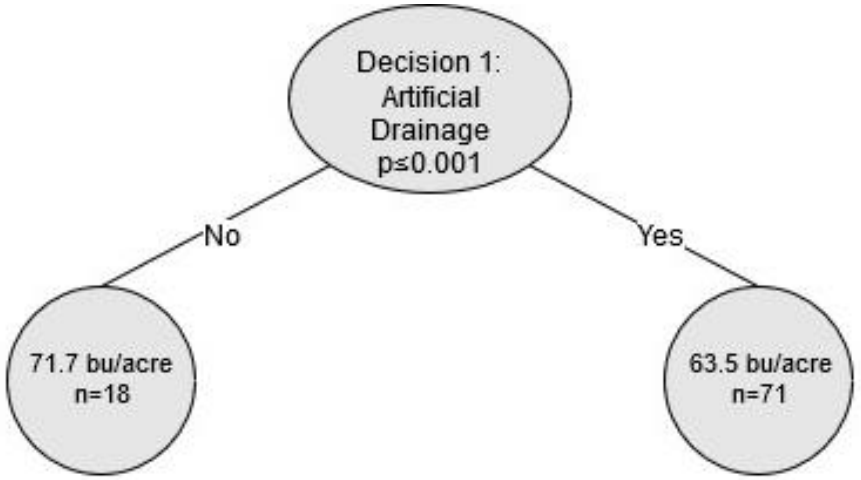
Canopy Closure Varies by Planting Date

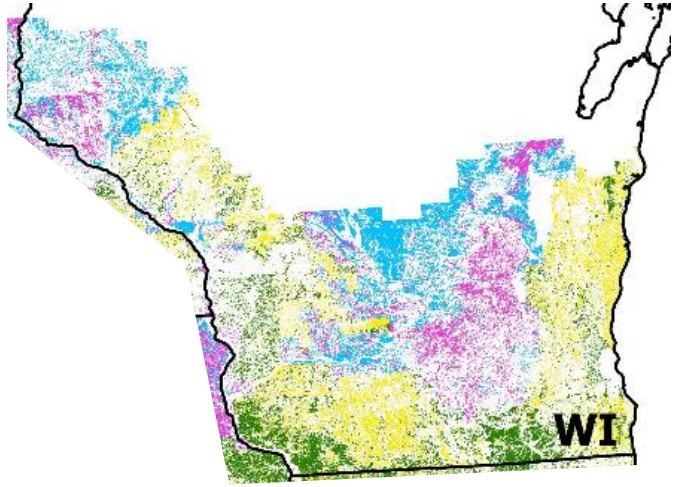
https://cropwatch.unl.edu/2016/early-bird-gets-worm-benefits-early-soybean-planting

TED 6

Before 8 May

Early-Planted Fields

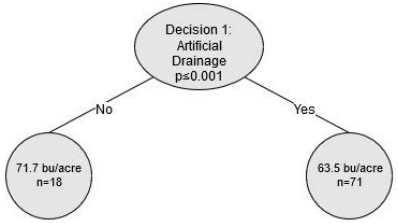


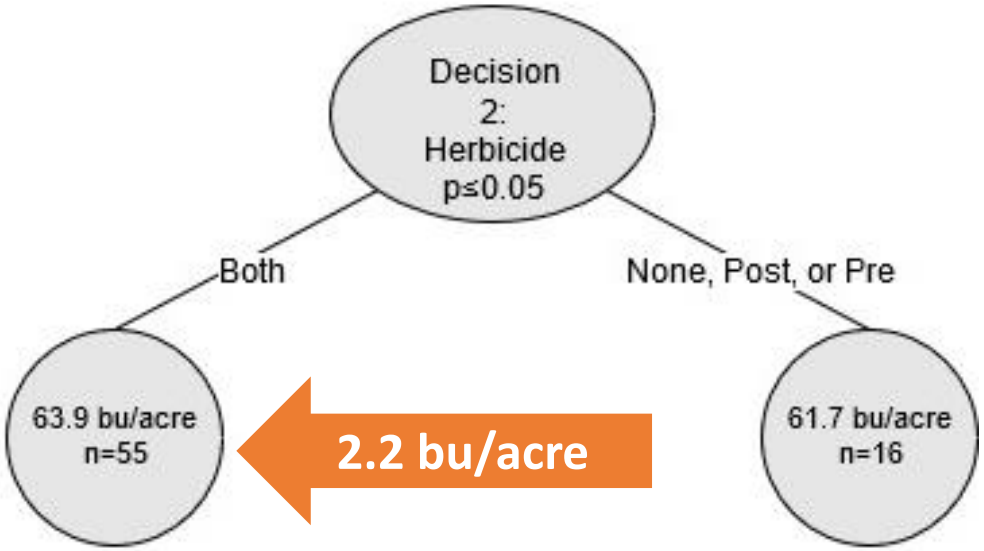


Early-Planted Fields

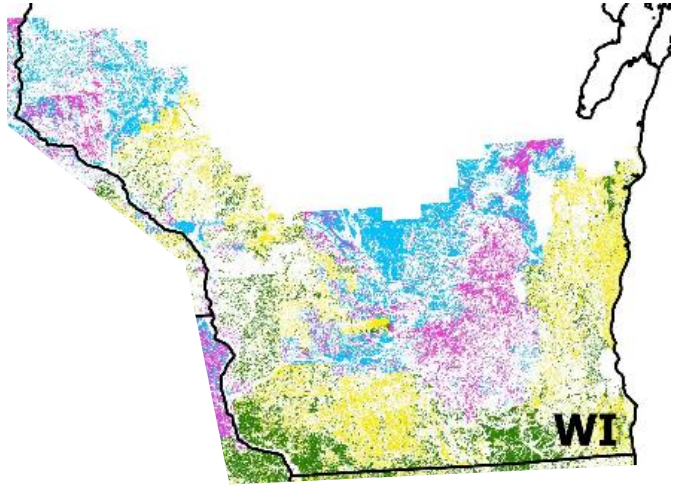
TED 6

Before 8 May





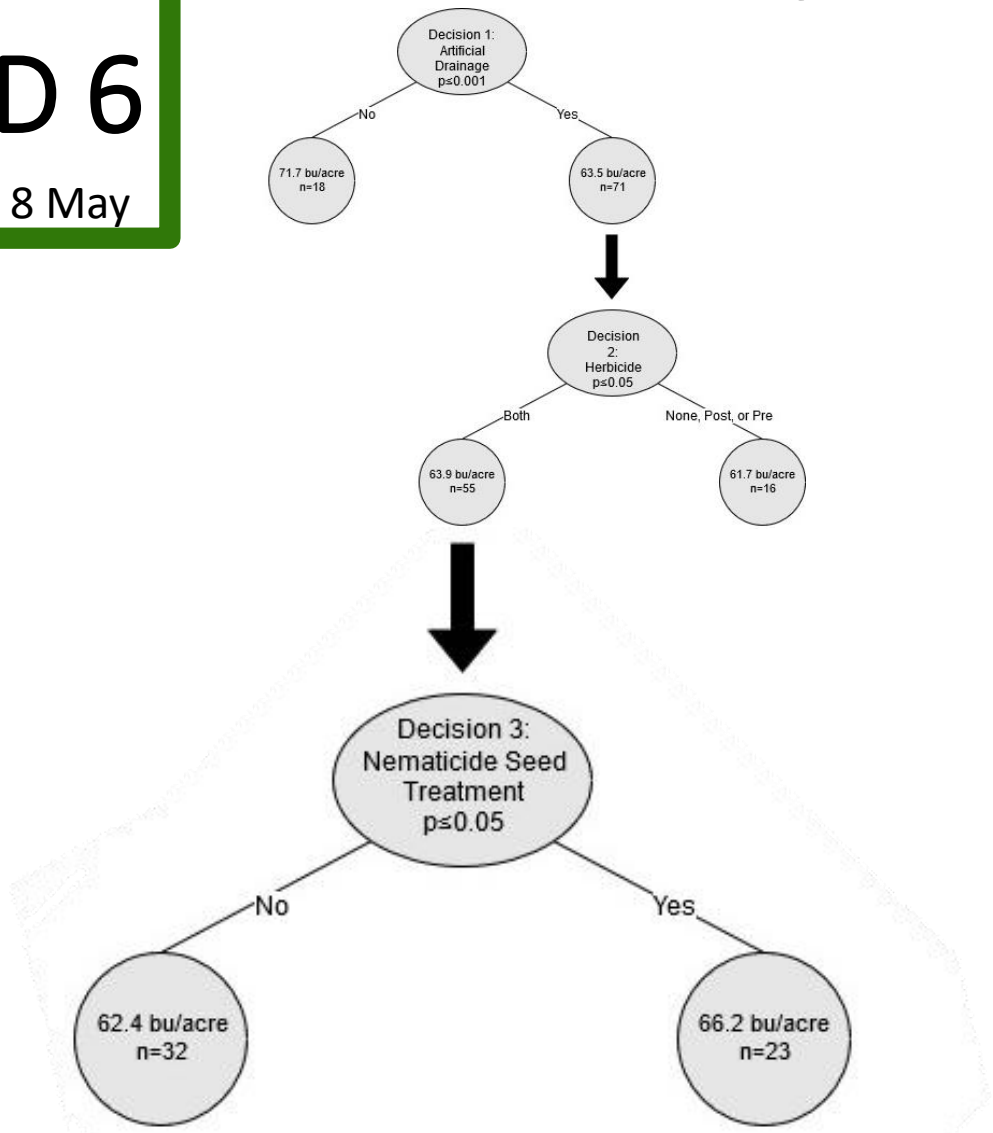
2.2 bu/acre

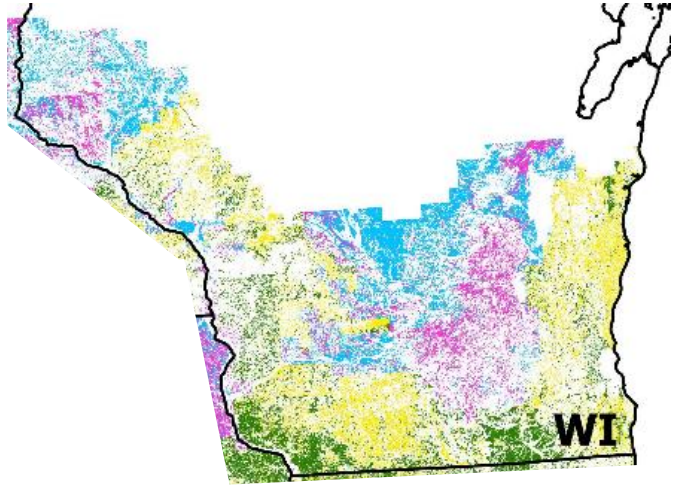


Early-Planted Fields

TED 6

Before 8 May

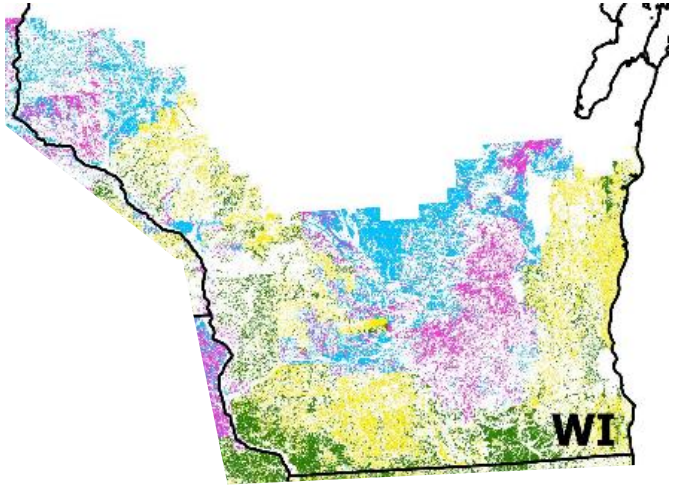


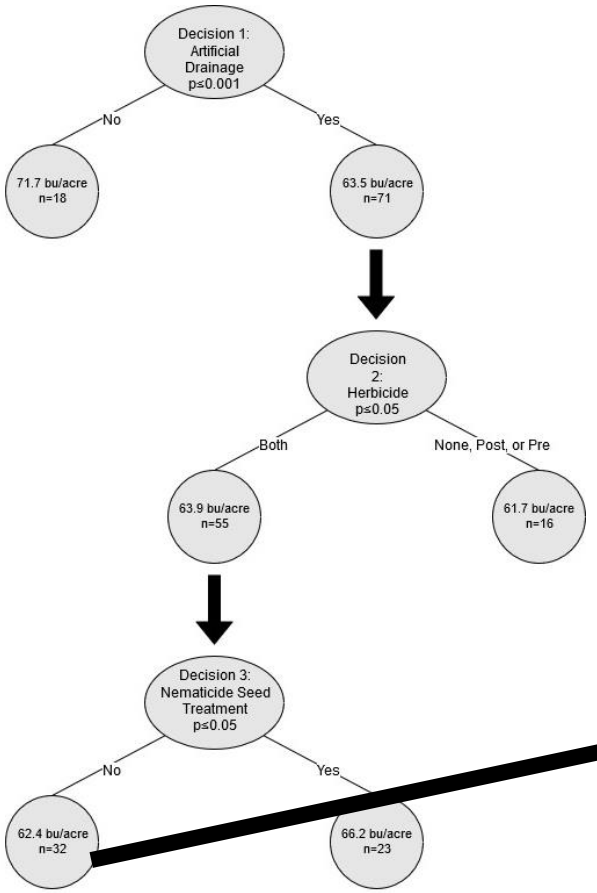


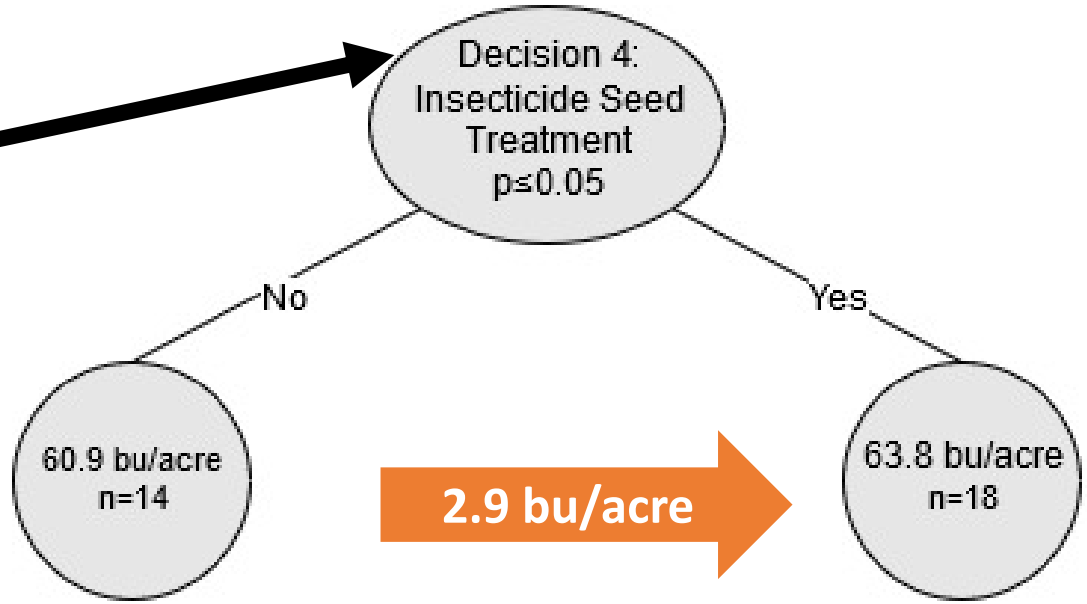
Early-Planted Fields

TED 6

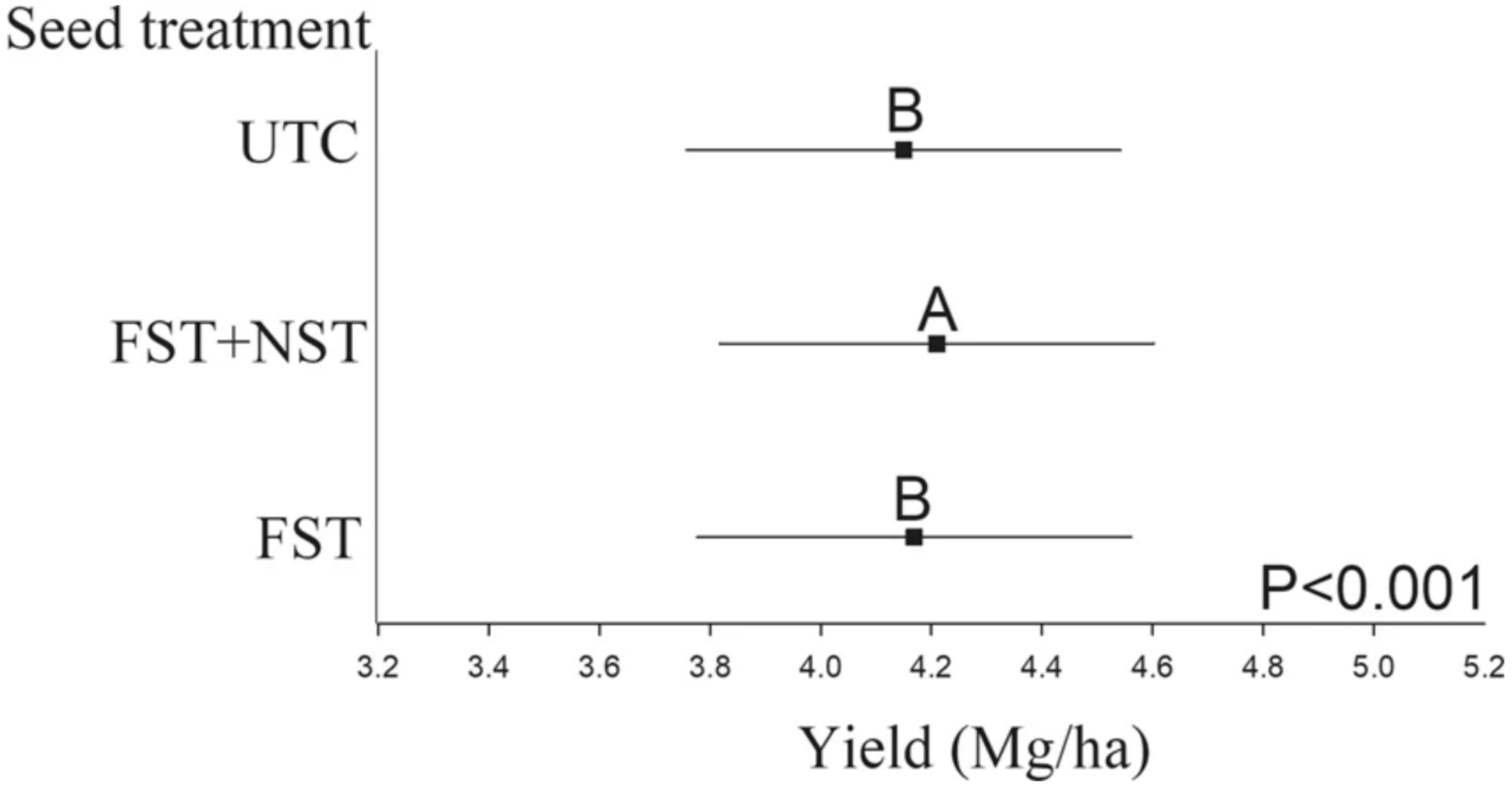
Before 8 May





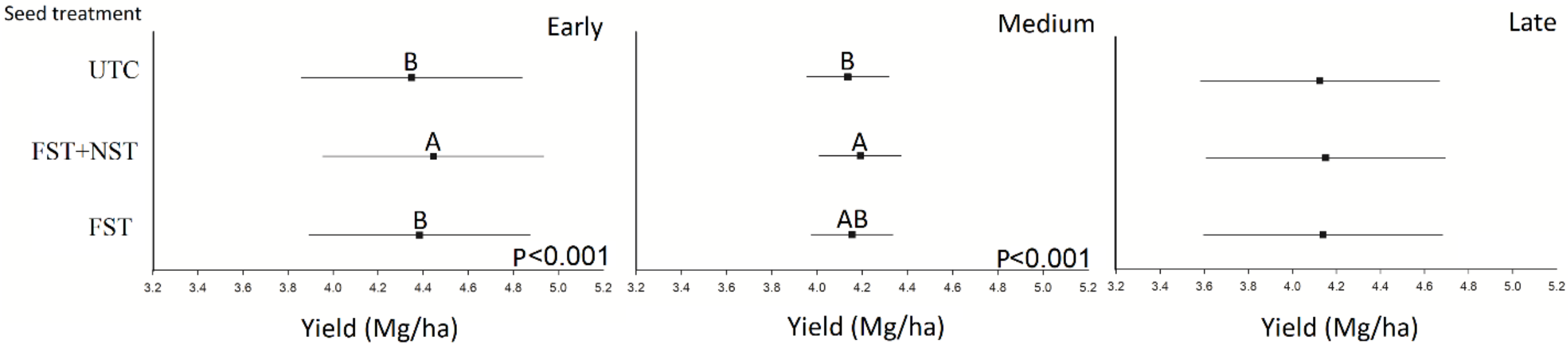


Insecticide Seed Treatments



Mourtzinis, S., Krupke, C.H., Esker, P.D. *et al.* Neonicotinoid seed treatments of soybean provide negligible benefits to US farmers. *Sci Rep* **9,** 11207 (2019)

Variable Effects Between Planting Dates

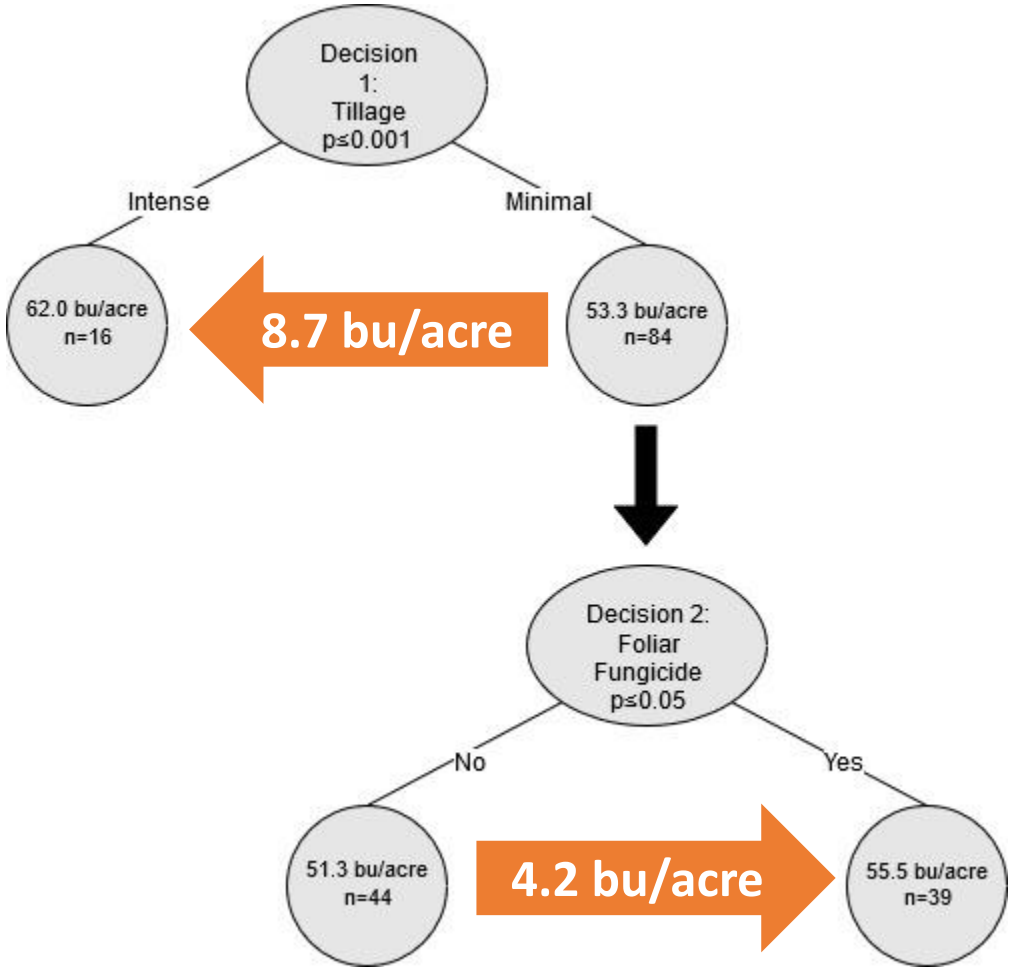


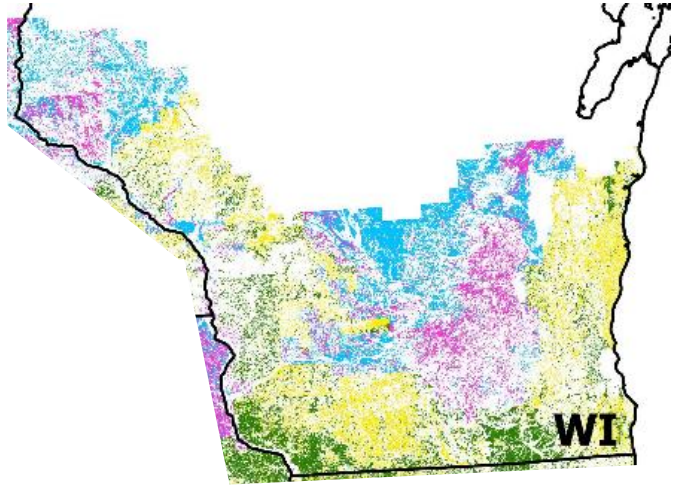
Mourtzinis, S., Krupke, C.H., Esker, P.D. *et al.* Neonicotinoid seed treatments of soybean provide negligible benefits to US farmers. *Sci Rep* **9,** 11207 (2019)

TED 6

After 21 May

Late-Planted Fields



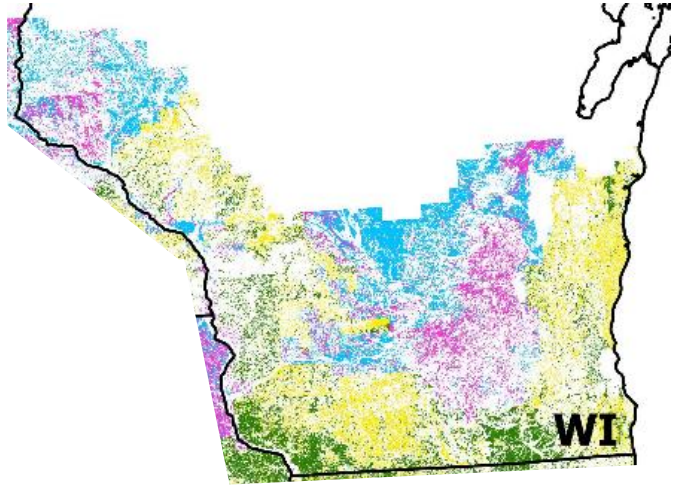


Leaf Area and Fungal Diseases

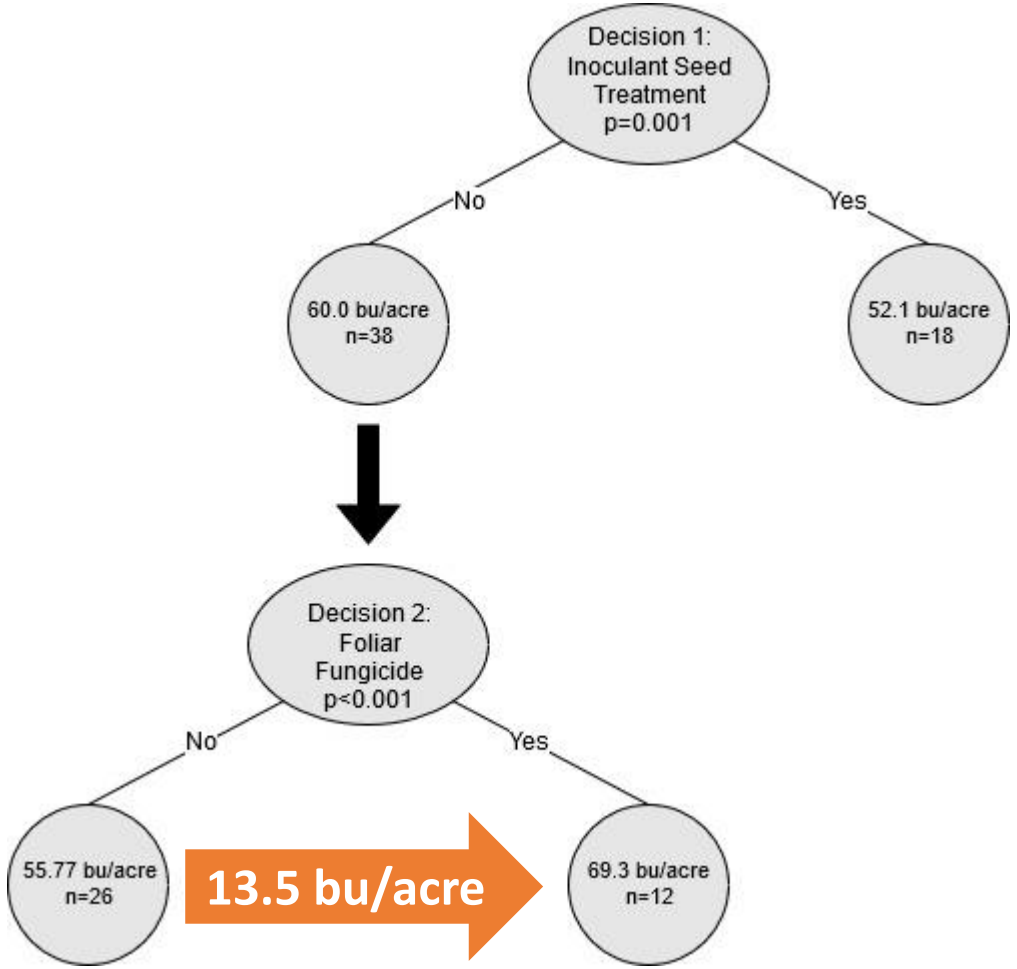
https://ohioline.osu.edu/factsheet/AC-18

TED 9

Before 15 May

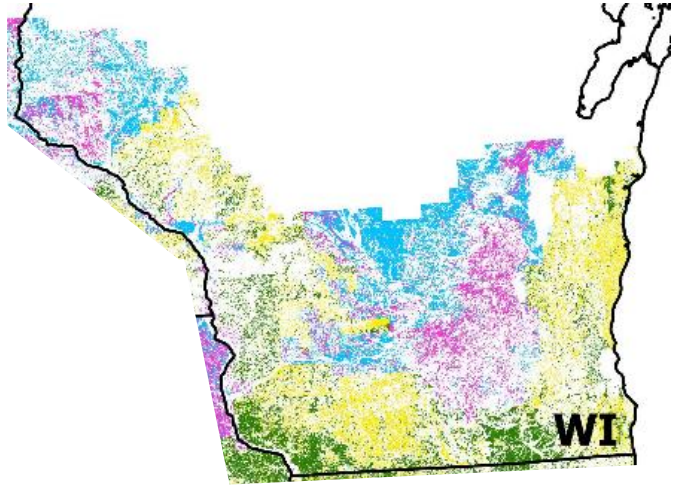


Early-Planted Fields

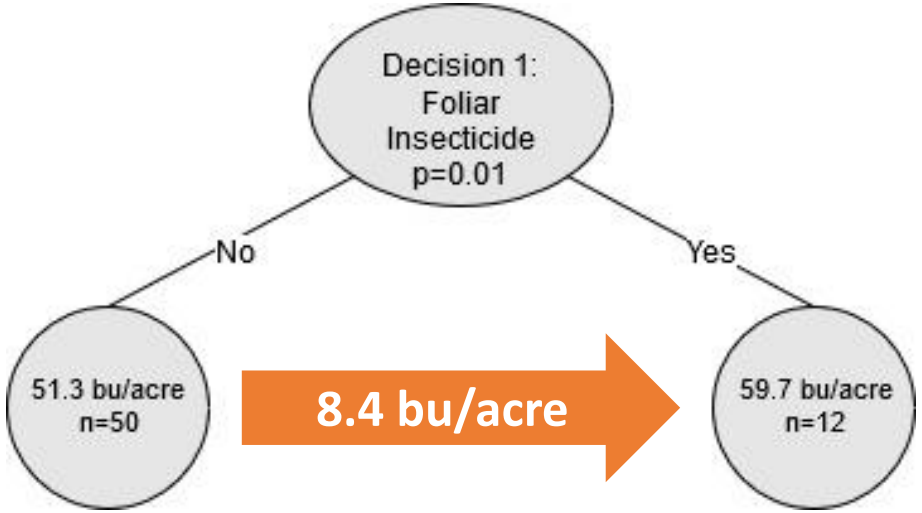


TED 9

After 26 May



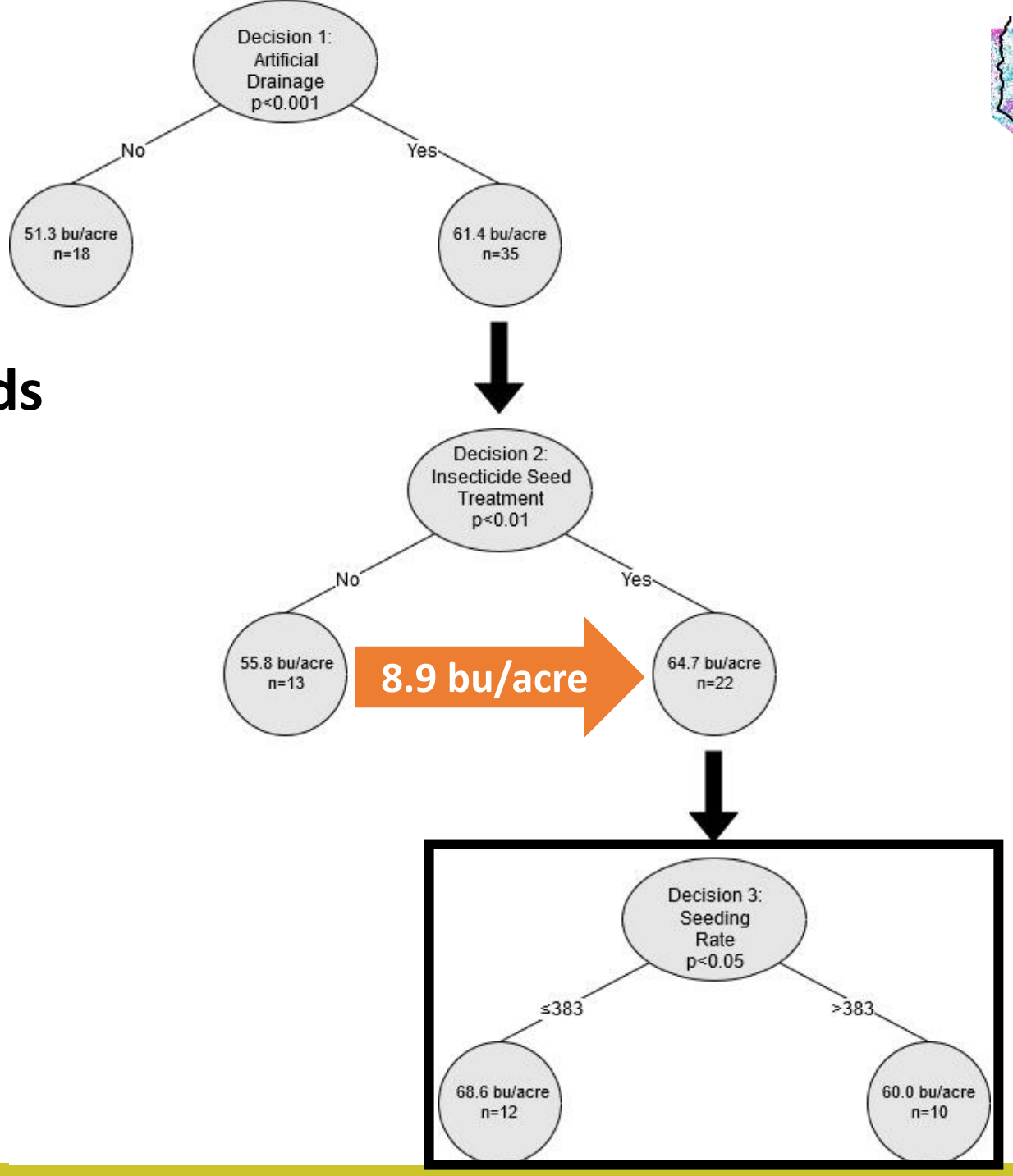
Late-Planted Fields

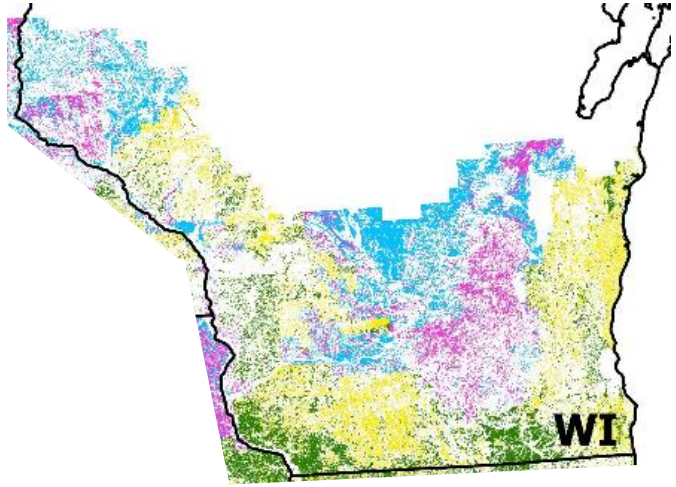


TED 10

Before 16 May

Early-Planted Fields





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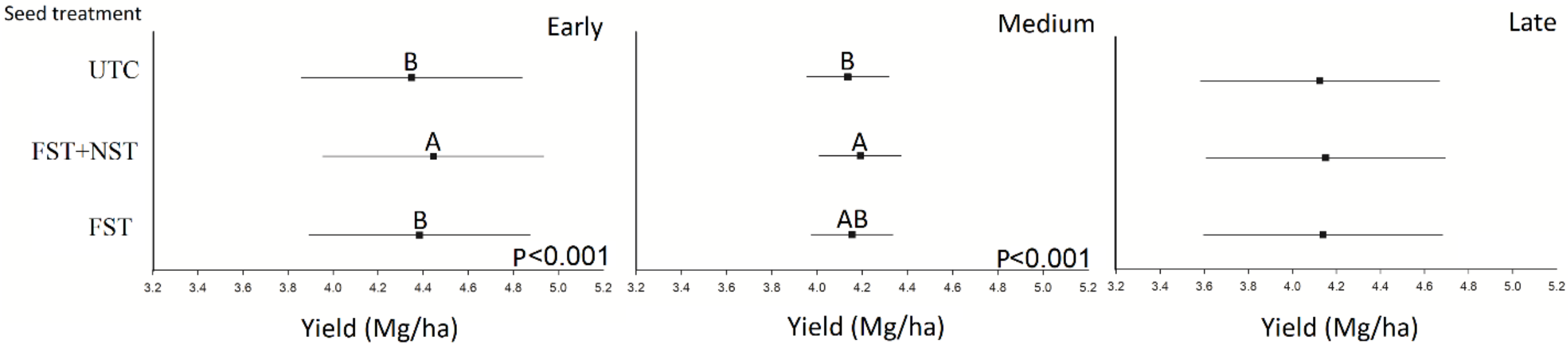
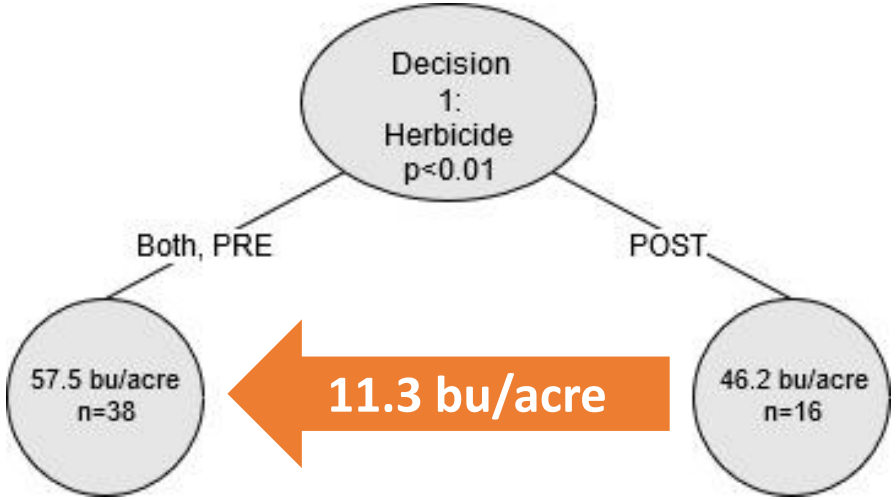


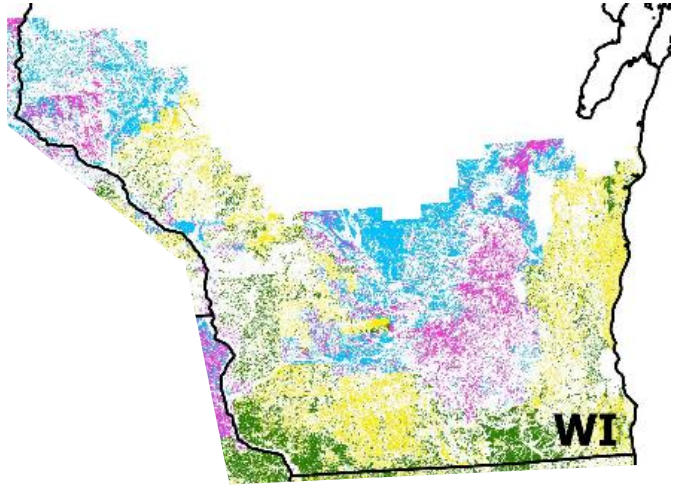
Mourtzinis, S., Krupke, C.H., Esker, P.D. *et al.* Neonicotinoid seed treatments of soybean provide negligible benefits to US farmers. *Sci Rep* **9,** 11207 (2019)

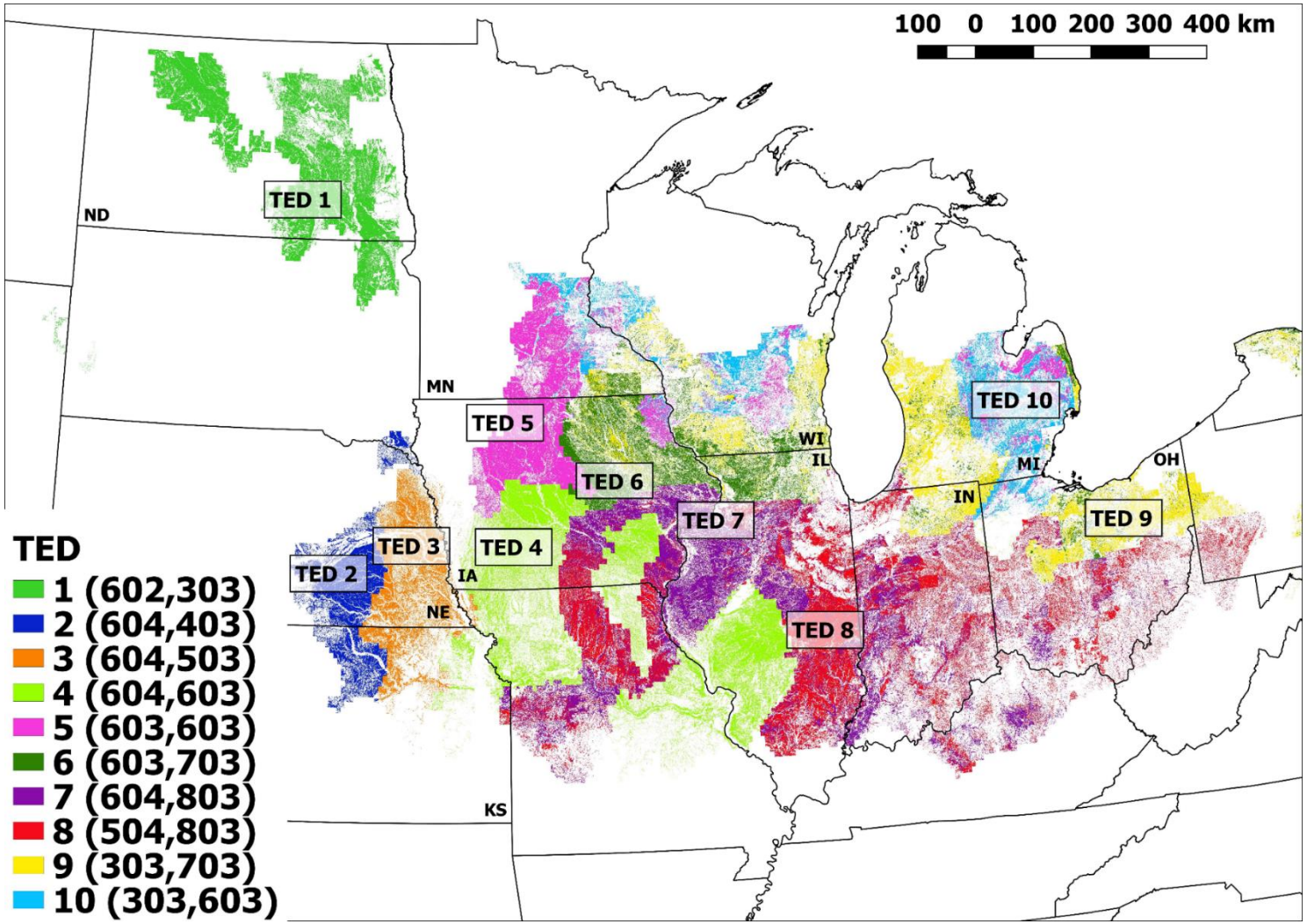
TED 10

After 25 May

Late-Planted Fields







Important Management Decisions

Early fields:

Artificial drainage (3/10 TEDs)

Insecticide seed treatment (3/10 TEDs)

Seeding rate (3/10 TEDs)

Late fields:

Herbicide application timing (3/10 TEDs)

Tillage intensity (2/10 TEDs)

Management decisions that improved yield were region- and planting-date-specific.

No individual management decision consistently increased seed yield across the entire region.

Prophylactic application of pesticides was not justified in any part of the region.

Grain price and pest pressure should be considered when deciding the use of pesticide inputs.

Survey data was cost effective and can complement field research.

Current Research Informed by Survey Data

Boots on the Ground...Bringing the yield gap analysis back to the farm

Soybean Research Protocol: Two Planting Dates

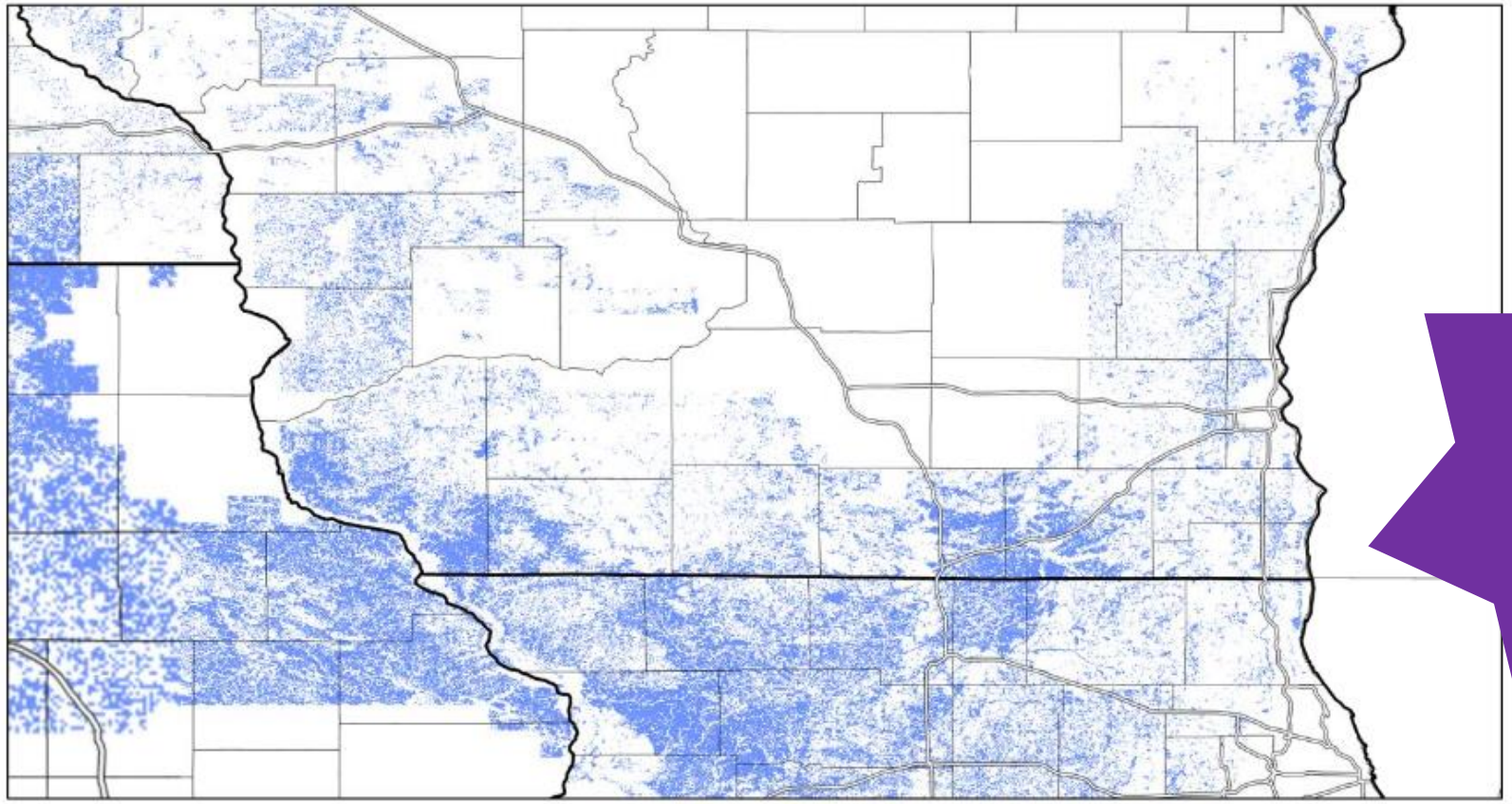
Yield Gap Project: Analysis of producer survey data performed during our previous 3-year NCSRP-funded benchmarking project revealed: (1) an average yield gap of 20-30% between current farmer yield and potential yield as determined by climate, soil, and genetics, and (2) a number of agronomic practices that, for a given soil-climate context, can be fine-tuned to close the gap and improve soybean producer profit.

The goal is to compare the yield and profit for earlier planting dates. Earlier planting dates have been shown higher yields than later planted soybean.

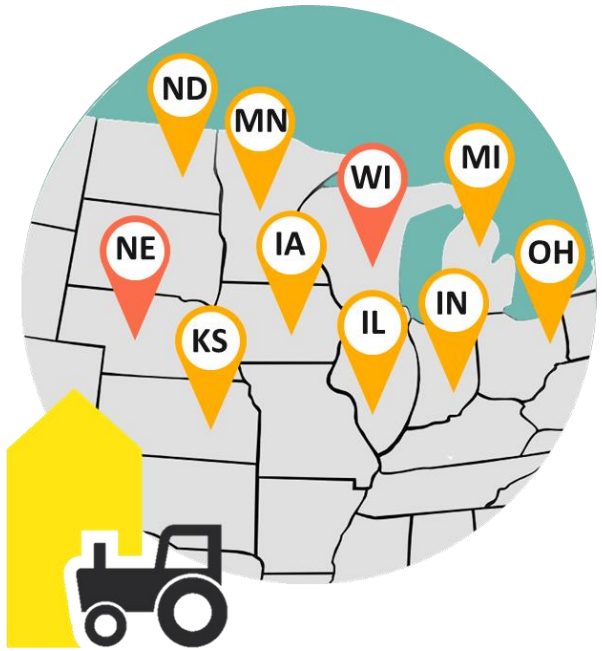
WHAT WE NEED FROM YOU:

- Plant soybeans at two planting dates similar to plot layout shown below
  Planting dates:
  Last week of April or as soon as conditions allow
  Two to three weeks later
- Harvest the plot using a well calibrated yield monitor

Areas of Interest for 2020 Boots on the Ground Sites



See interviews with 2019 participants on Twitter!



Farmer data from 10 states

Core team

Patricio Grassini
(Univ. of Nebraska)

Shawn Conley
(Univ. of Wisconsin)

Juani Rattalino
(Univ. of Nebraska)

Adam Roth & Spyros Mourtzinis
(Univ. of Wisconsin)

Regional collaborators

Shaun Casteel
(Purdue Univ.)

Ignacio Ciampitti
(Kansas State Univ.)

Mark Licht
(Iowa State Univ.)

Hans Kandel
(N. Dakota Univ.)

Laura Lindsey
(Ohio State Univ.)

Daran Mueller
(Iowa State Univ.)

Peter Kyveryga
Iowa Soy Assoc

Seth Naeve
(Univ. of Minnesota)

Emerson Nafziger
(Univ. of Illinois)

Michael Staton
(Michigan State Univ.)

EXTENSION

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University of Nebraska Lincoln

Soybeans
Nebraska Soybean Board

NCSRP NORTH CENTRAL SOYBEAN RESEARCH PROGRAM

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

Emma Matcham

matcham@wisc.edu

@EGmatcham

www.spatiallychallenged.com