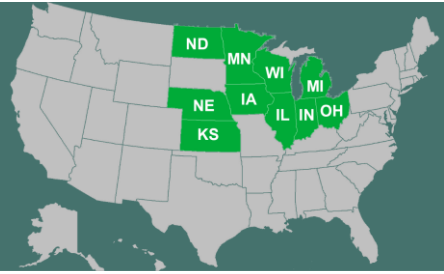# Benchmarking soybean production system in the North-central USA

2016 Project Report

Core team: P. Grassini[1], S.P. Conley[2], J.I. Rattalino Edreira[1], S. Mourtzinis[2], A. Roth[2]

Regional collaborators: S. Casteel[3], I. A. Ciampitti[4], M. Licht[5], H. Kandel[6], L. Lindsey[7], D. Muller[5], S. Naeve[8], E. Nafziger[9], M. Staton[10]

UNL Extension Educators: C. Burr K. Glewen, K. Jarvi, T. Lemons, G. Lesoing, N. Muller, A. Nygren, W. Ohnesorg, R. Pryor, J. Rees, M. Rethwisch, D. Rudnick (UNL Assistant Professor), R. Seymour, S. Stepanovic, A. Timmerman, S. Tonn, A. Vyhnalek, T. Whitney, T. Williams, J. Wilson

NE Natural Resources Districts: Central Platte, Lewis & Clark, Lower Big Blue, Little Blue, Lower Elkhorn, Lower Niobrara, Lower Republican, Tri-Basin, Upper Big Blue

[1]*University of Nebraska-Lincoln,* [2]*University of Wisconsin,* [3]*Purdue University,* [4]*Kansas State University,* [5]*Iowa State University,* [6]*North Dakota University,* [7]*The Ohio State University,* [8]*University of Minnesota,* [9]*University of Illinois,* [10]*Michigan State University*

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Introduction to the project

United States is the largest soybean producer (35% of total production), and concentrates 80% of soybean production in the North Central (NC) region. Average soybean yield in the NC-USA region during 2010-2014 was 43 bu/acre, yet some producers attained soybean yields near or greater than 80 bushels/acre. This large gap between an average state yield and the very high yield obtained by some producers in that state needs to be explored and better understood.

The primary goal of the project is to "benchmark" current yield and management practices in producer fields across the NC-USA region. That "benchmark data" will help to identify those key management factors across the NC-USA region that can be used by individual producers to increase soybean yield on their farms, and do that with an input-use efficiency that will improve the bottom-line net profit.

The 'benchmarking' project started in October 1st, 2015, with funding support from the North-Central Soybean Research Program (NCSRP) and other state soybean boards such as the Nebraska Soybean Board (NSB) and the Wisconsin Soybean Marketing Board (WSMB). The project is led by University of Nebraska-Lincoln and University of Wisconsin, but includes collaborators in other key eight soybean producing states: IL, IN, IA, KS, MI, MN, ND, and OH. The project is organized in four major activities as described below.
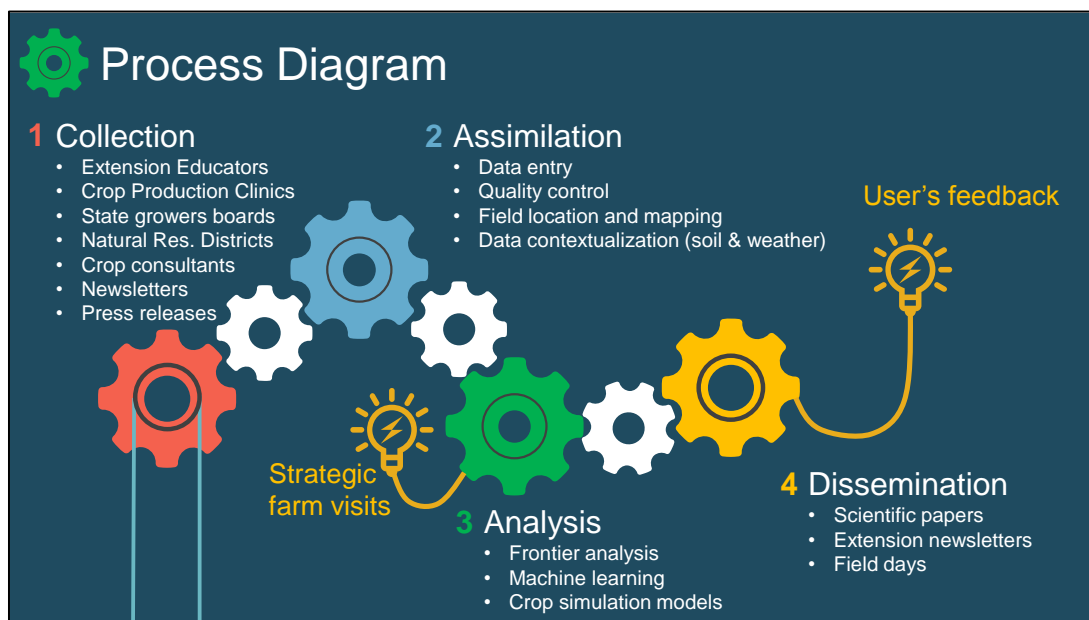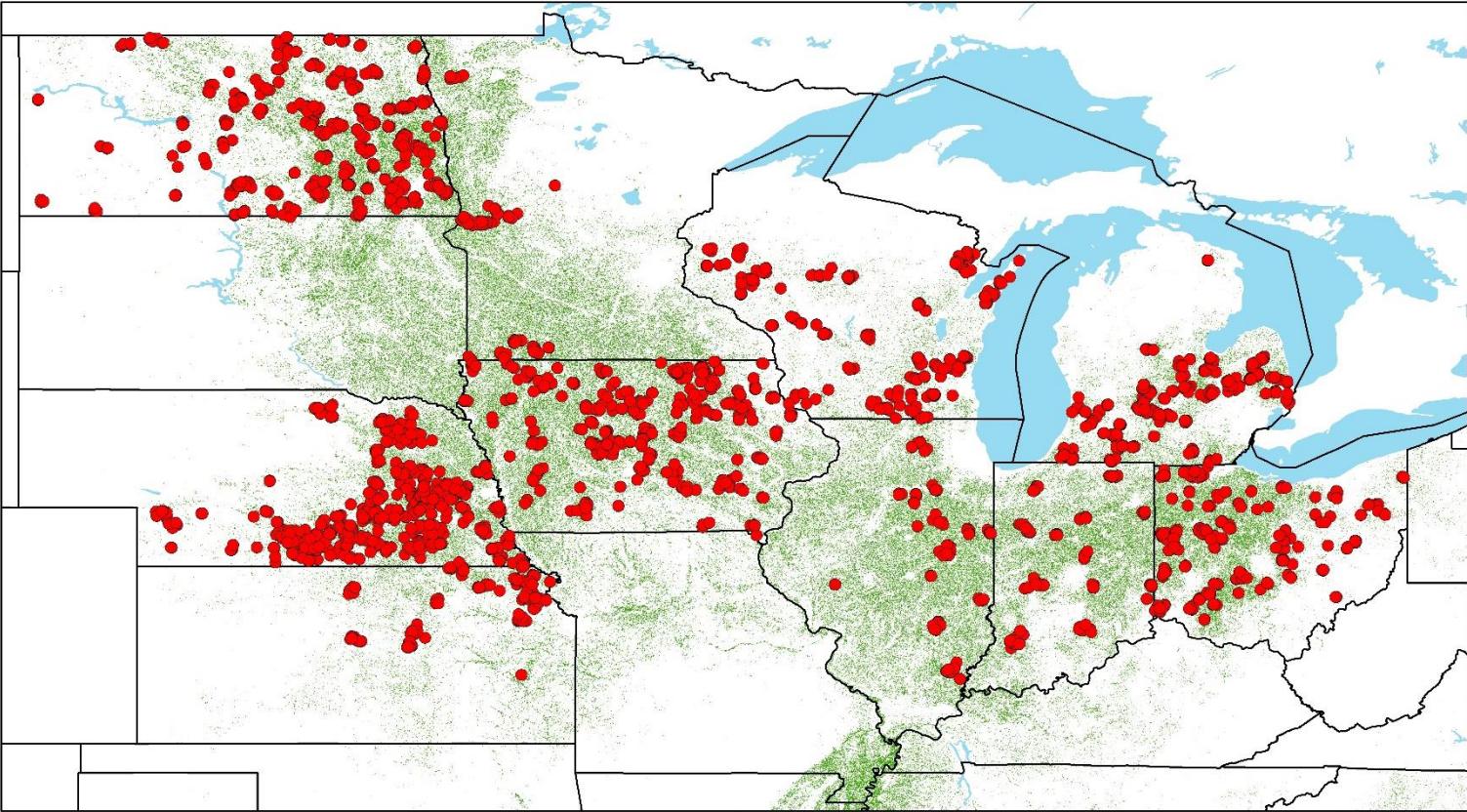

The present report summarizes the producer data collected during the first year of the project. Requested data included yield, management, and applied inputs from dryland and irrigated fields planted with soybean in 2014 and 2015. Data were collected through surveys and an example of a filled survey is shown in the next page.

Example of a survey filled out by a Nebraska producer. Note that contact information and logos were customized for each of the 10 states participating in the project. Data are kept and analyzed under strict confidentiality.

PRODUCER NAME: ~~[redacted]~~ MAILING ADDRESS: ~~[redacted]~~

Please provide information for four SOYBEAN fields on your farm in 2014. If you have questions, contact Professor Patricio Grassini (Phone: 402-472-5554 / e-mail: pgrassini2@unl.edu). Note that all provided info will be kept confidential! An EXAMPLE is shown in red.

|	EXAMPLE:	2014 Soybean	2014 Soybean	2015 Soybean	2015 Soybean
Specify field location by Section: Township: Range. →	NE ¼ 25 : 20N : 26W				
Please sketch-in the boundaries of your field location within the Section →	NW1/4 / NE1/4 / SW1/4 / SE1/4	NW1/4 / NE1/4 / SW1/4 / SE1/4	NW1/4 / NE1/4 / SW1/4 / SE1/4	NW1/4 / NE1/4 / SW1/4 / SE1/4	NW1/4 / NE1/4 / SW1/4 / SE1/4
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 (20ac)	Pivot (84ac)	Dryland (111ac)
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 *Use Irrigated fields yield range if this crop was Irrigated: *Use Dryland fields yield range if this crop was Dryland:	Low: 62 High: 80	Low: 61 High: 90	Low: 55 High: 86	Low: 61 High: 90	Low: 13 High: 66
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 3402 RR2	Channel 3402RR2	Channel 3402RR2	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 Acceleron	yes Acceleron	yes Acceleron	yes Acceleron
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)	P₂O₅: 70 K₂O: 30 Other: S (11 lbs) Time: March-2014	P₂O₅: K₂O: Other: None Time:	P₂O₅: K₂O: Other: None Time:	P₂O₅: K₂O: Other: None Time:	P₂O₅: K₂O: 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)

NCSRP   Soybeans Nebraska Soybean Board   Nebraska Lincoln

Surveyed fields distribution

Soybean fields per year

State	2014	2015	Total
IA	368	431	799
IL	41	47	88
IN	51	56	107
KS	68	70	138
MI	150	173	323
MN	31	38	69
ND	257	267	524
NE	430	494	924
OH	124	165	289
WI	130	177	307
Total	1650	1918	3568

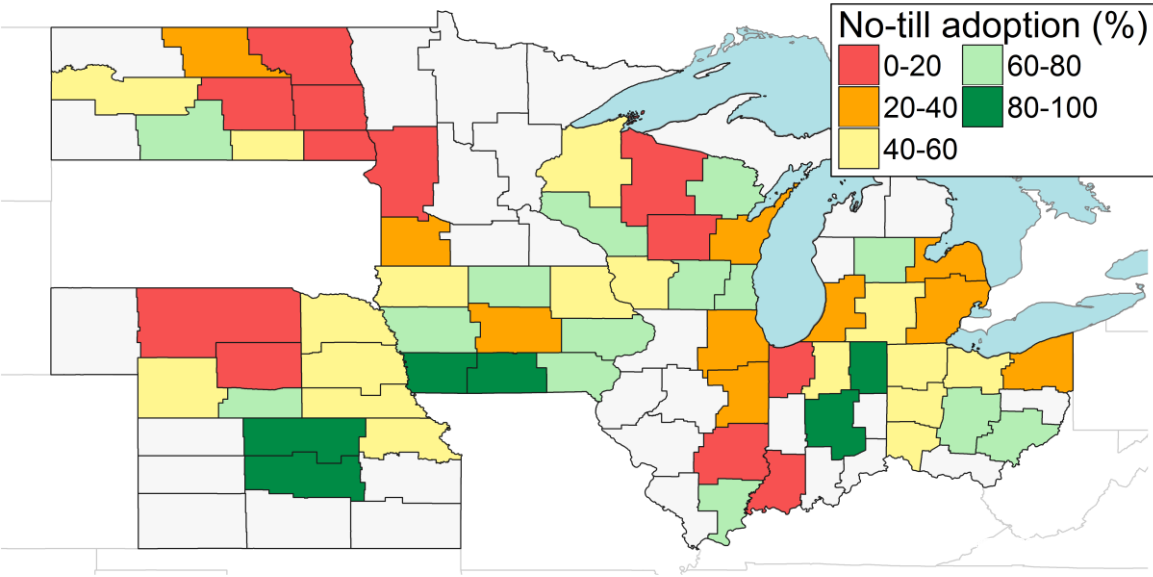# Average dryland soybean yield (bu/ac)
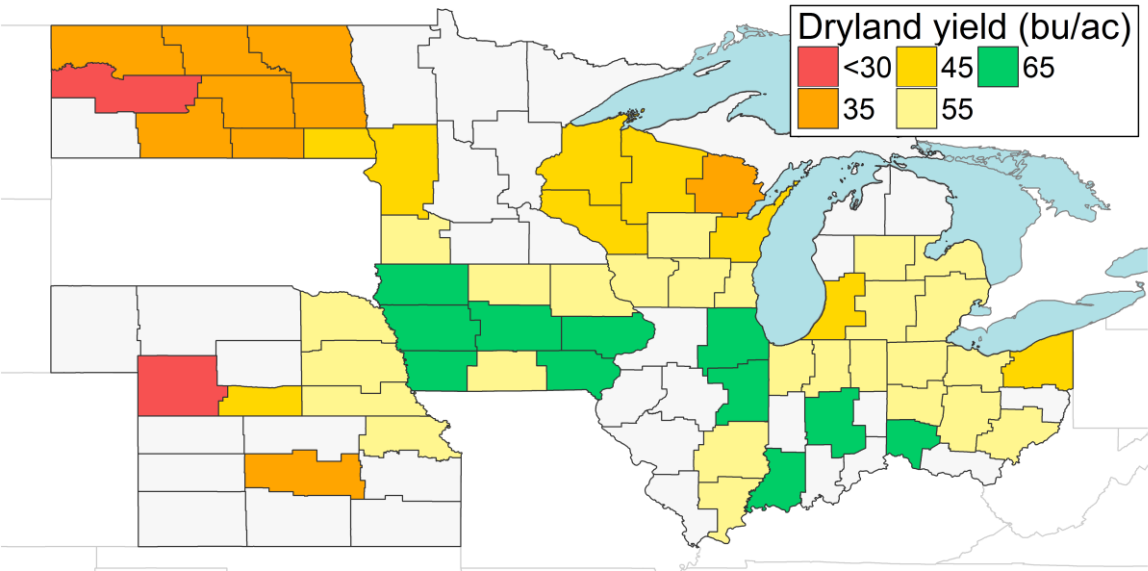
Dryland soybean yield (bu/ac)
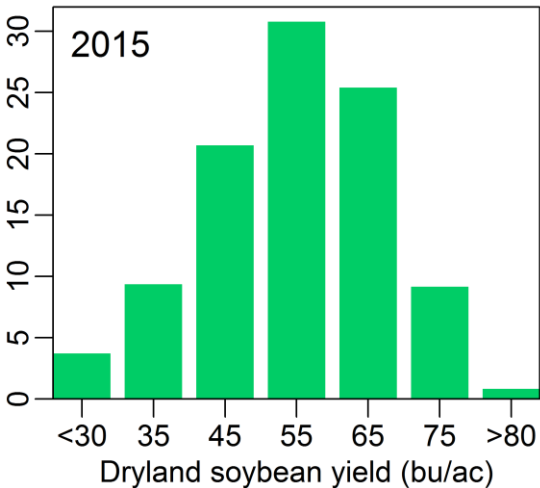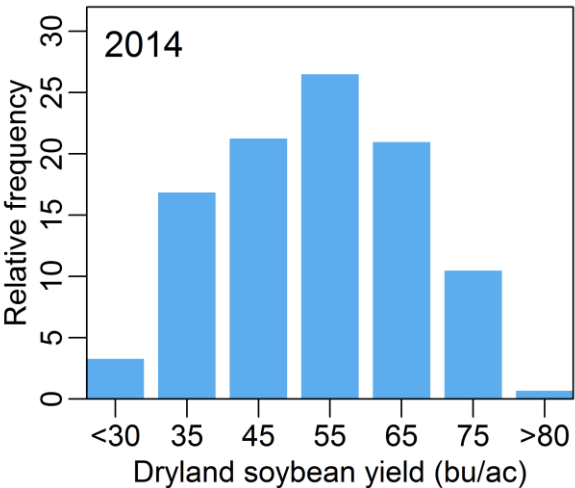
Average irrigated soybean yield (bu/ac)

Irrigated soybean yield (bu/ac)

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% of no-tilled fields

No-till adoption (%)
- 0-20
- 20-40
- 40-60
- 60-80
- 80-100
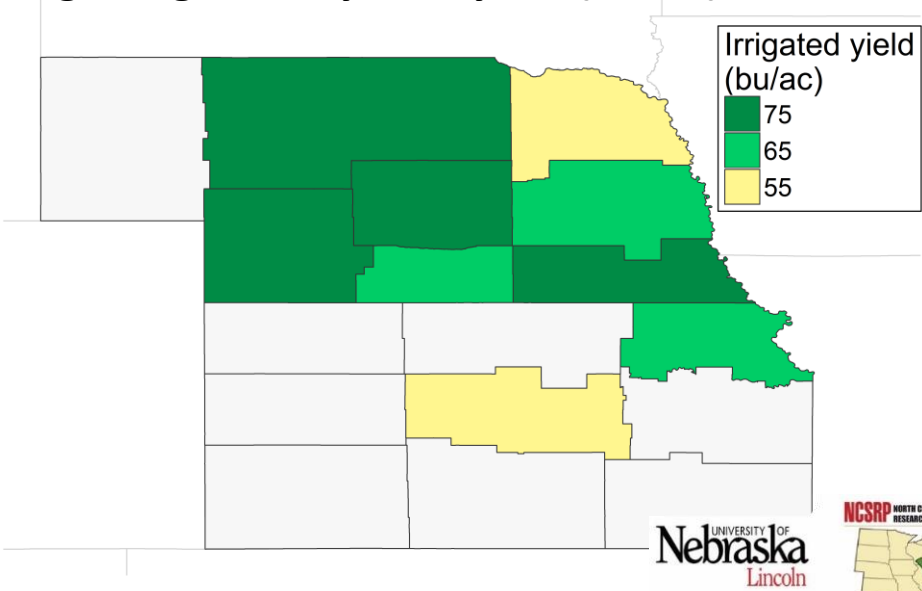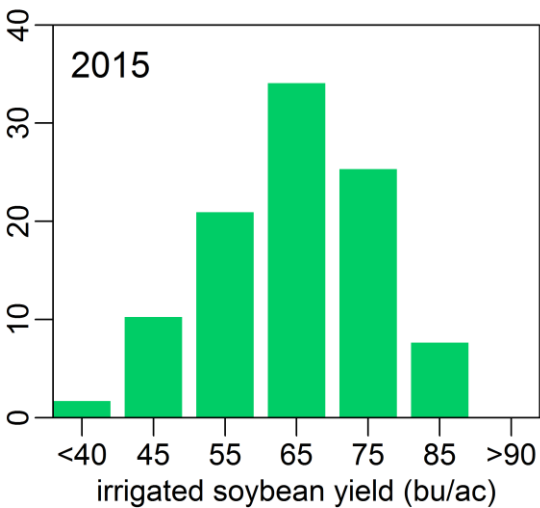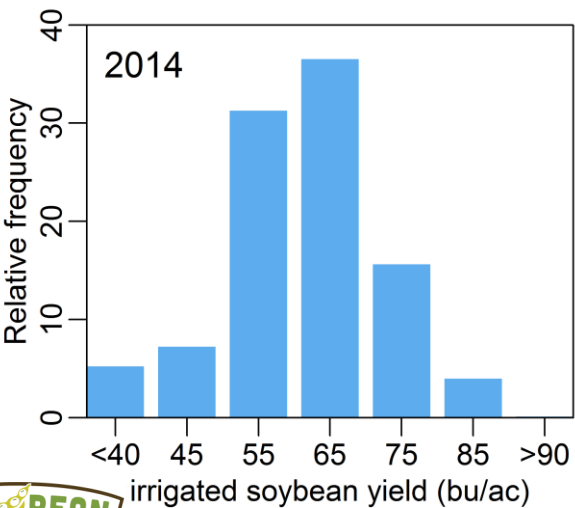
Proportion of tillage system

No-till (48%)
Ridge or Strip (3%)
Other (4%)
Vertical (12%)
Disk (14%)
Chisel (19%)
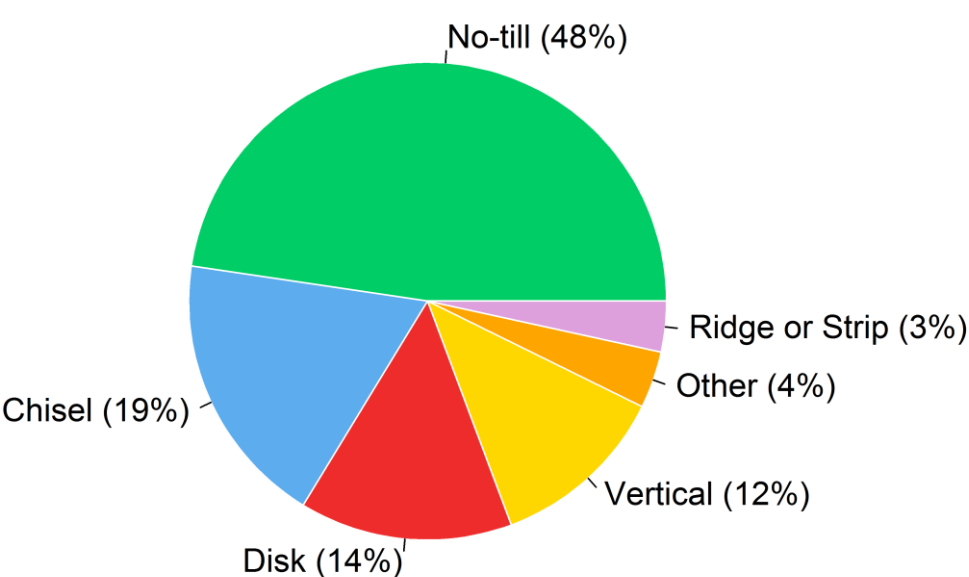
% of fields with drainage system

Drainage system (%)
- 0-20
- 20-40
- 40-60
- 60-80
- 80-100
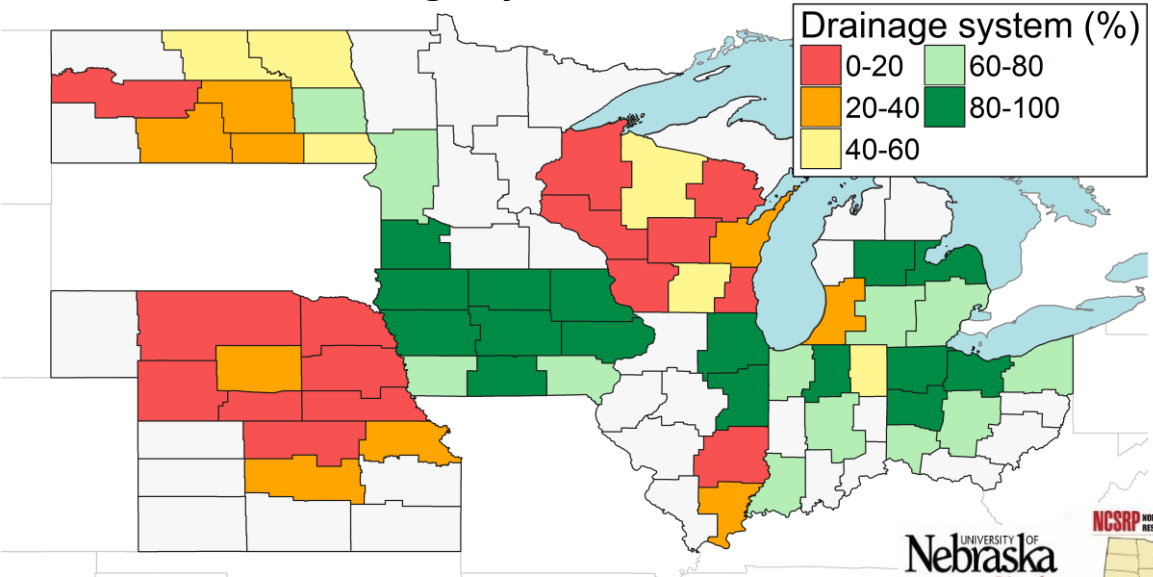
Proportion of drainage system

no drainage system (40%)
surface (9%)
other (10%)
old clay tile (16%)
new systematic tile (26%)

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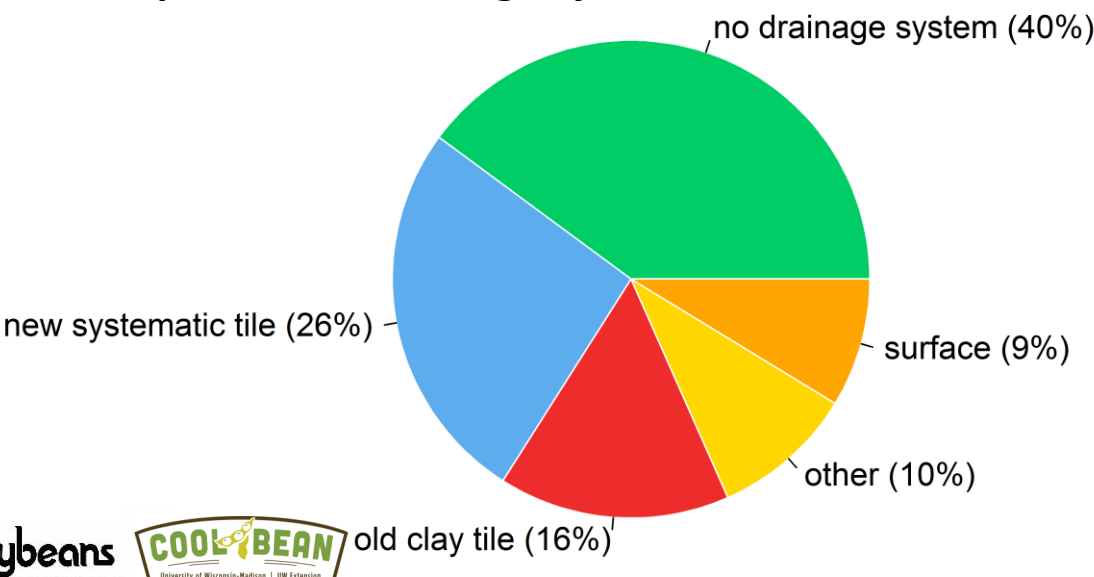
% of fields with irrigation

Irrigated field (%)
- 80-100
- 60-80
- 40-60
- 0-20
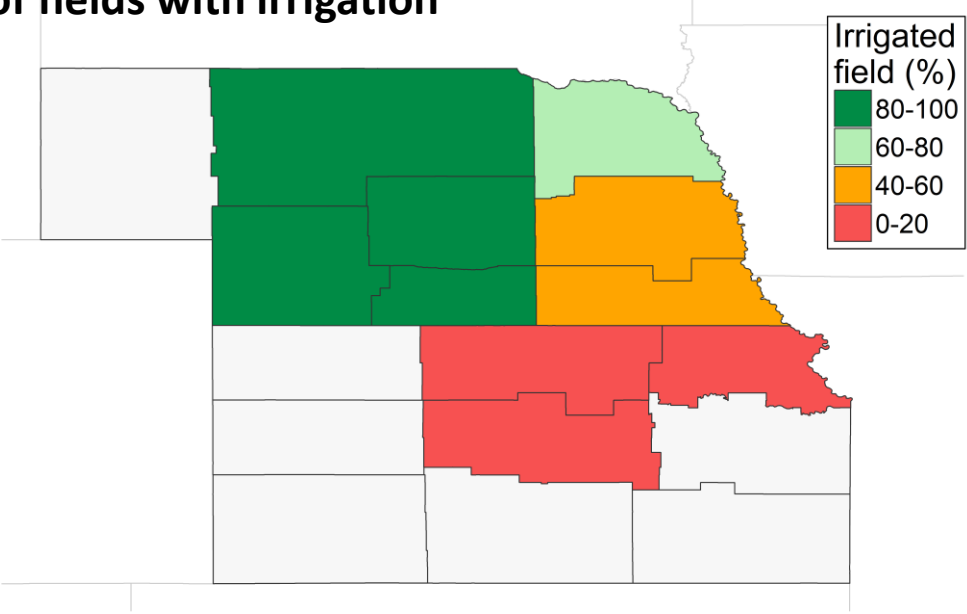
Proportion of irrigation system

Dryland (63%)

Gravity (6%)

Pivot (32%)
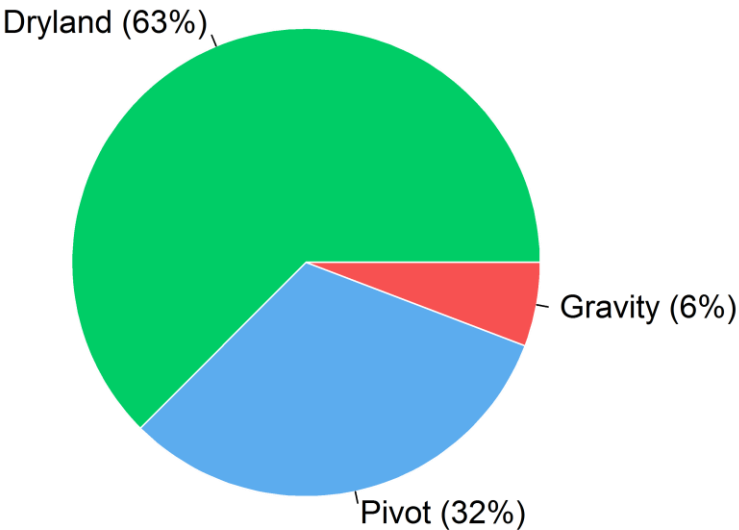
Average irrigation (in)

Irrigation (inches)
- 8-10
- 6-8
- 4-6
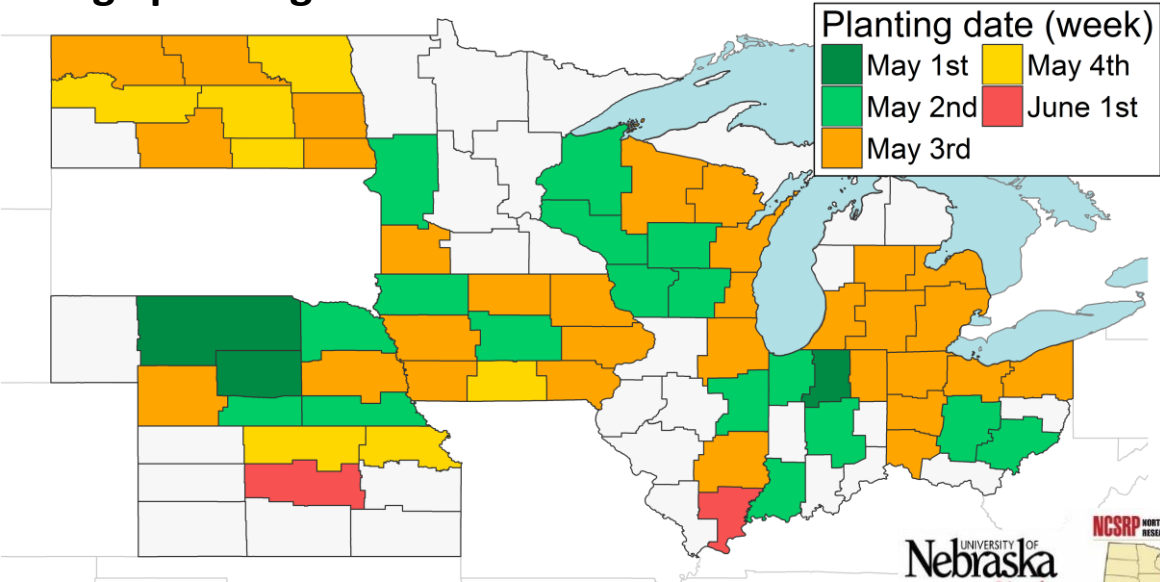- 2-4
- 0-2

Irrigation (in)
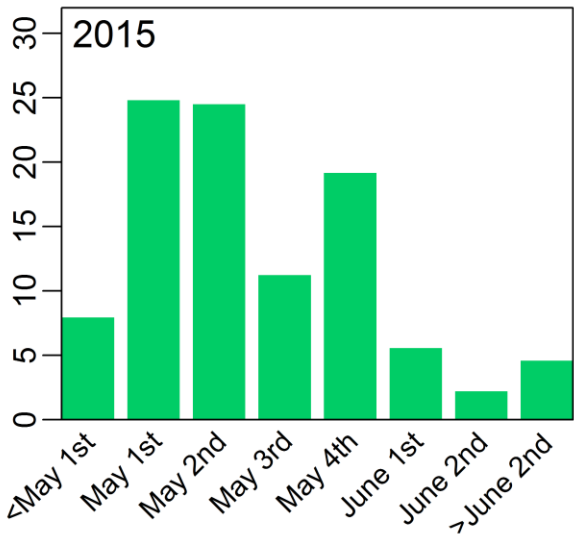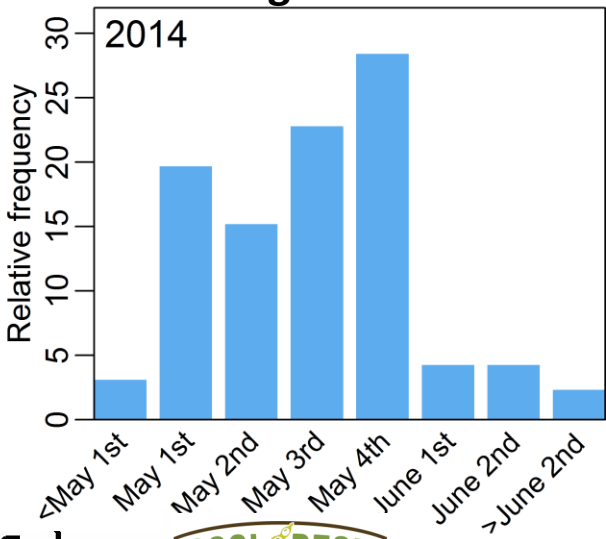

2014

2015

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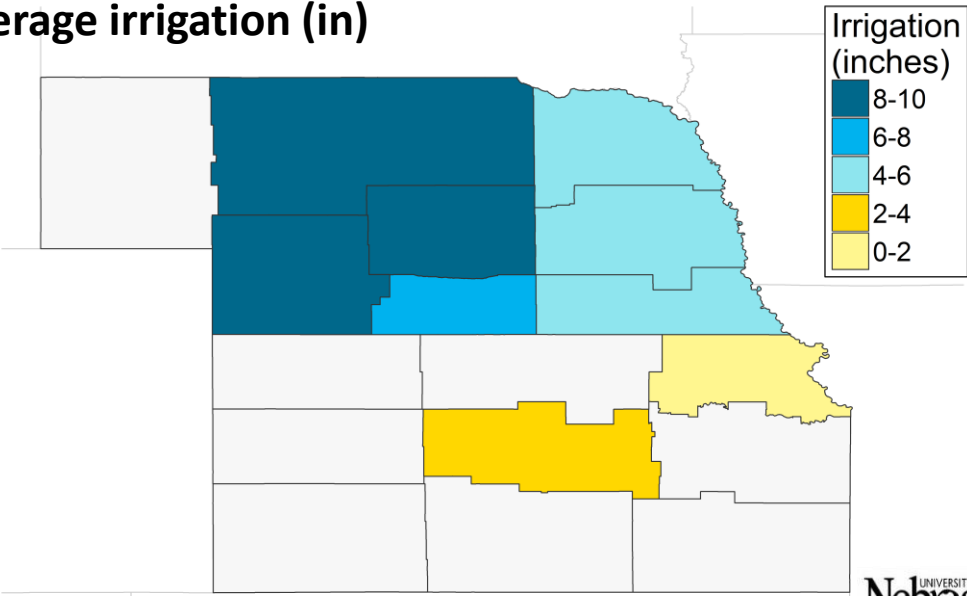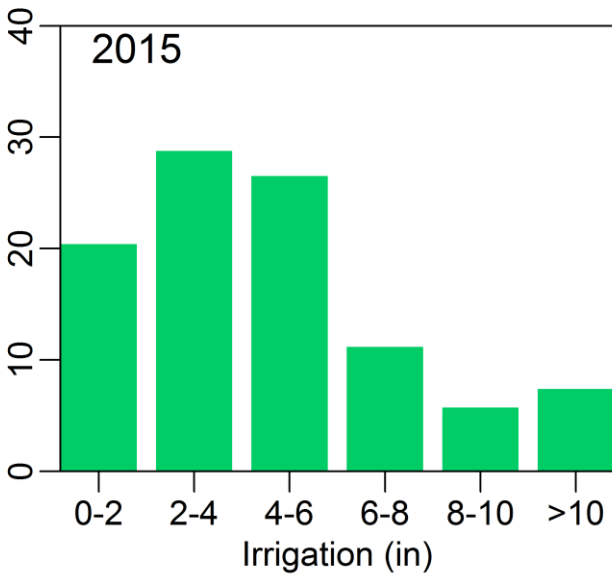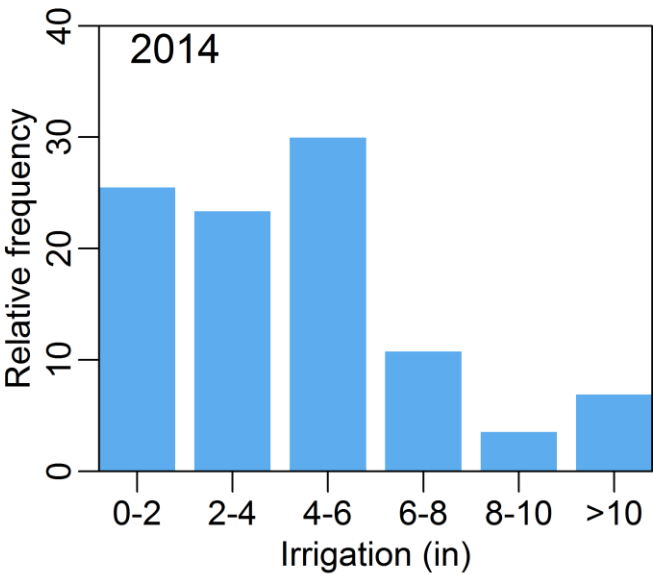
Prevalent previous crop
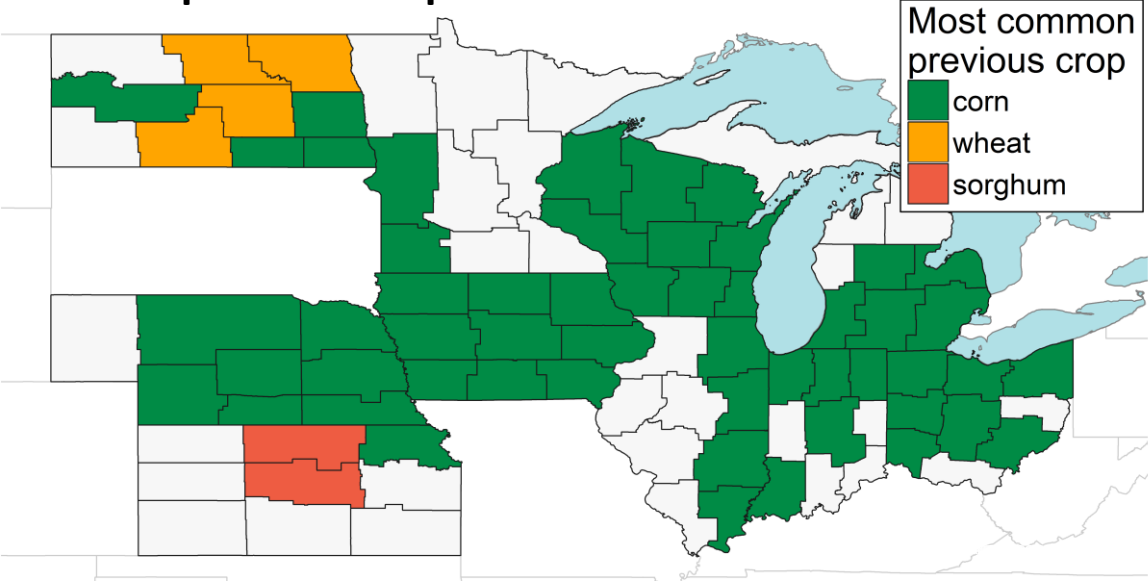
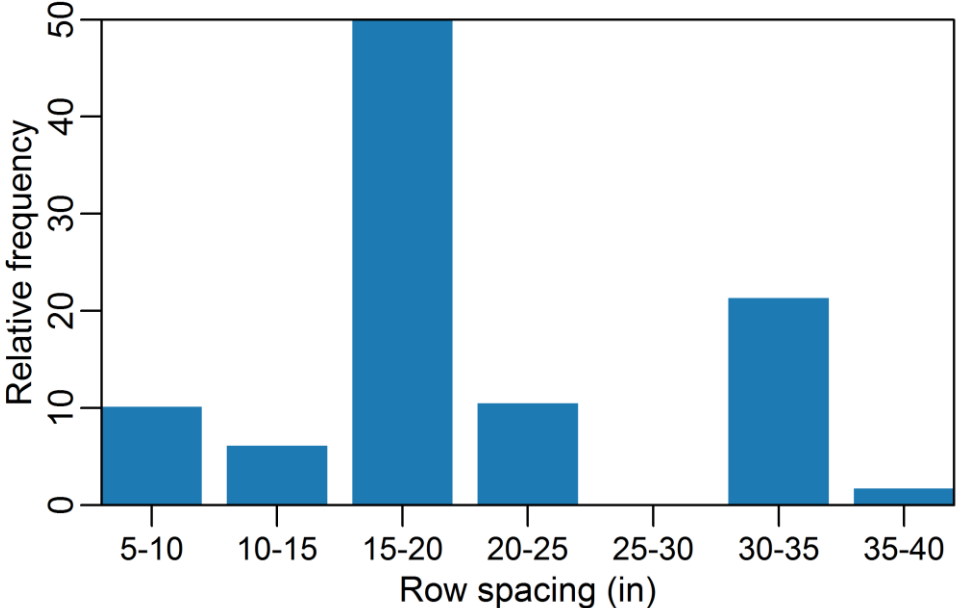**Proportion of previous crop**
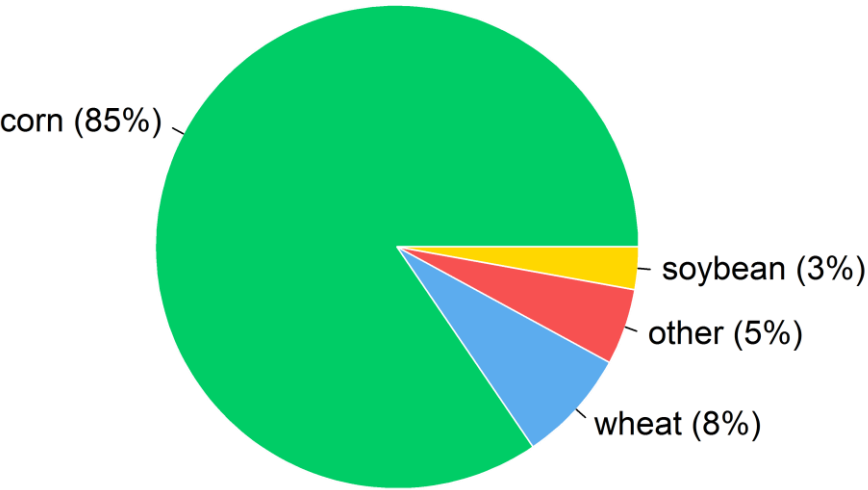
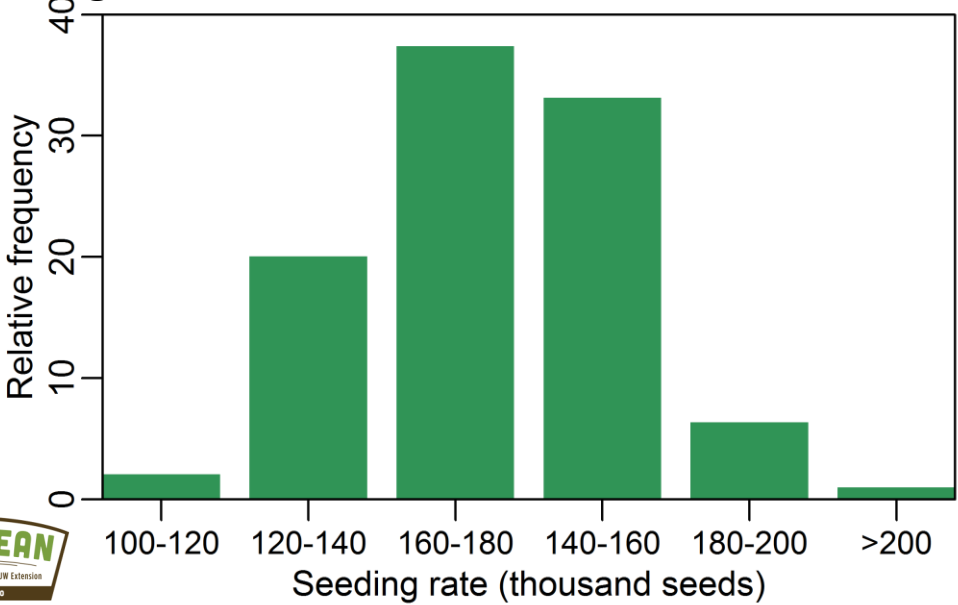**Average planting date**

Planting date

Prevalent row spacing (in)

Most common row spacing (in)
- 7
- 7.5
- 10
- 15
- 22
- 30
- 36

Row spacing (in)

Relative frequency vs Row spacing (in): 5-10, 10-15, 15-20, 20-25, 25-30, 30-35, 35-40
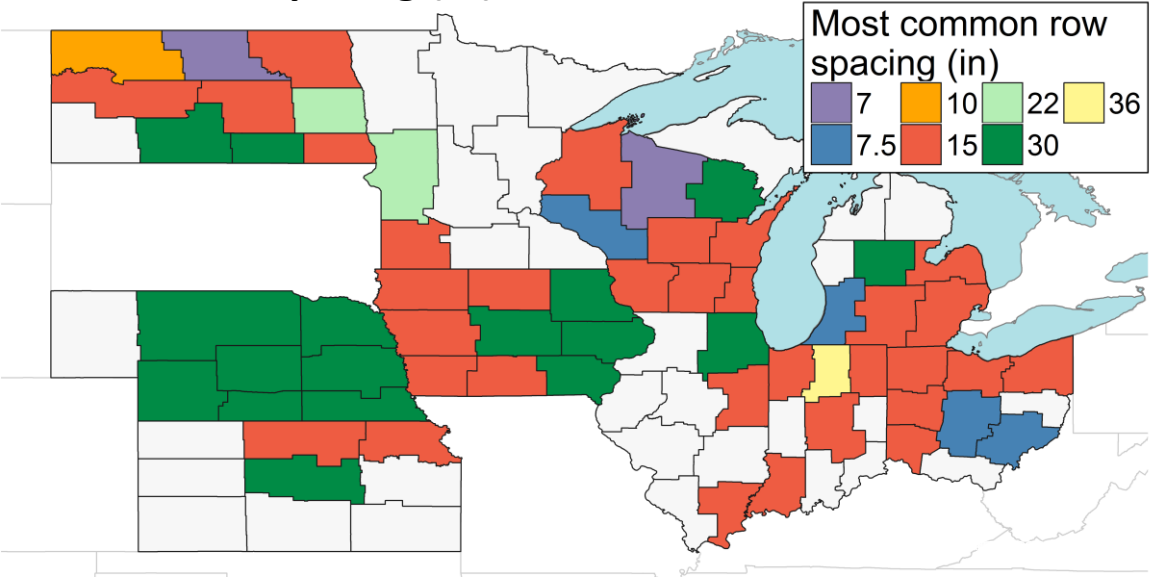
Average seeding rate (thousand seeds/ac)

Seeding rate (seeds/ac)
- 120-140
- 140-160
- 160-180
- 180-200

Seeding rate

Relative frequency vs Seeding rate (thousand seeds): 100-120, 120-140, 160-180, 140-160, 180-200, >200

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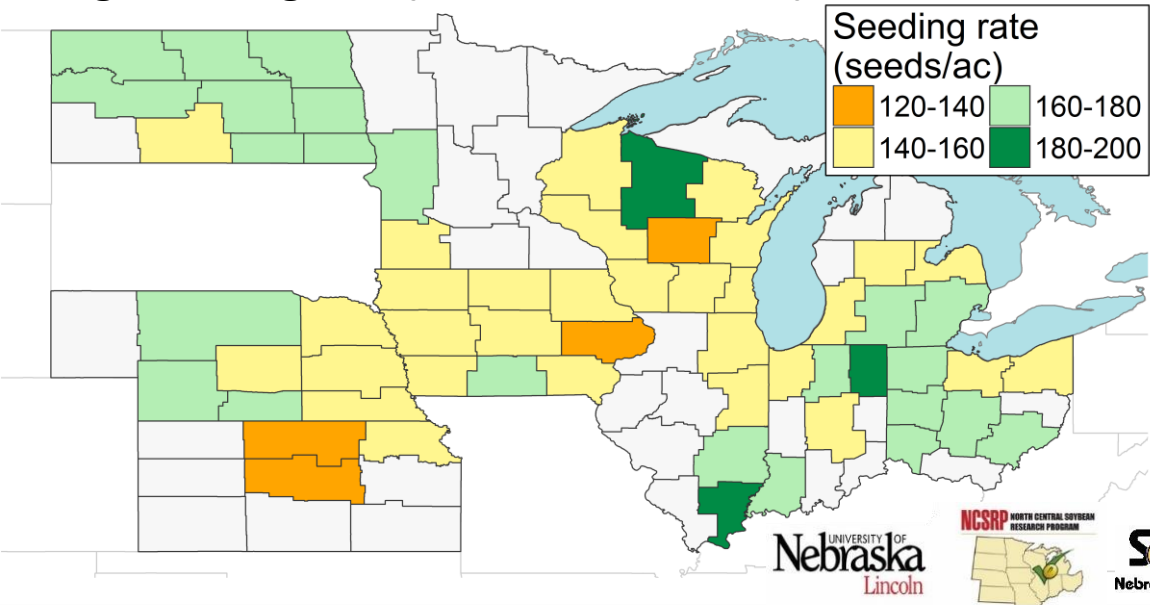
Average maturity group

Maturity group
- MG 0
- MG I
- MG II
- MG III
- MG IV

Maturity group

- MG III (37%)
- MG 00 (1%)
- MG IV (4%)
- MG I (8%)
- MG 0 (20%)
- MG II (31%)
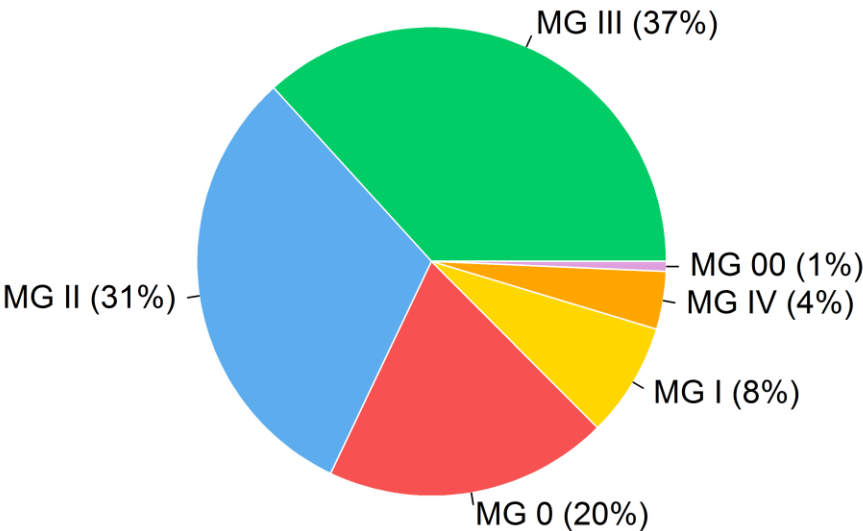
Adoption of herbicide-resistance soybean

Herbicide-resistance adoption (%)
- 20-40
- 40-60
- 60-80
- 80-100

Soybean trait adoption

- herbicide-resistant (95%)
- conventional (5%)

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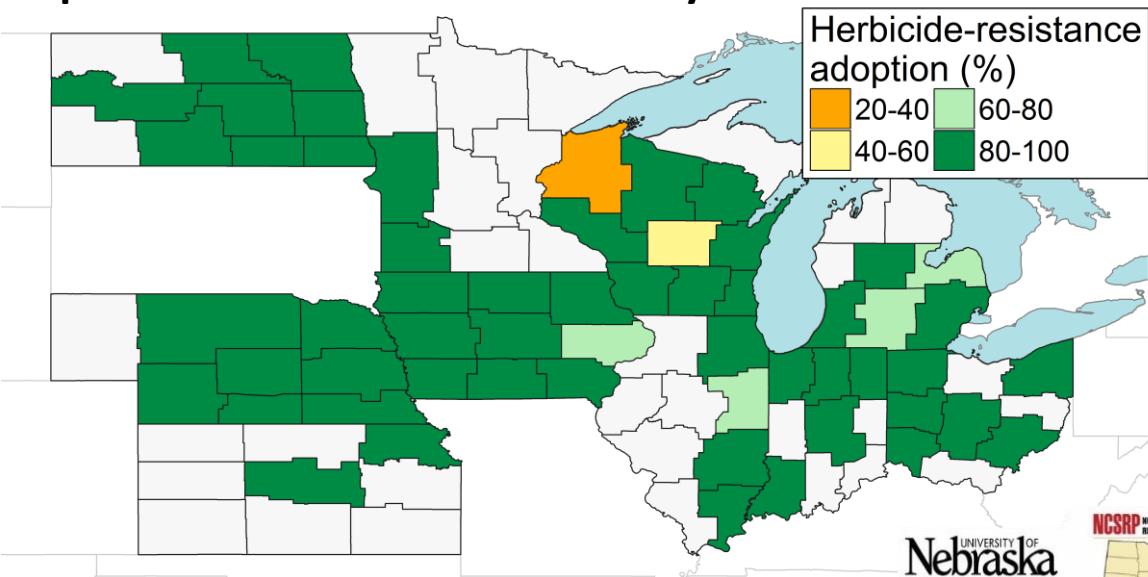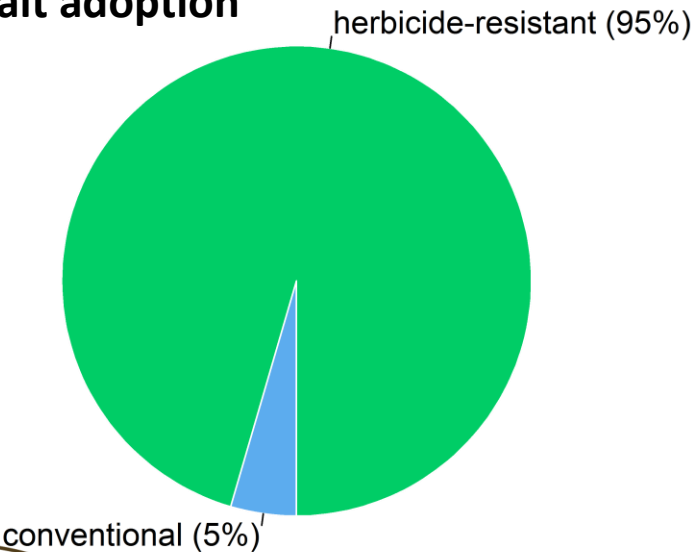
% of herbicide-treated fields

Herbicide application (%)
60-80
80-100

Herbicide application

both (76%)
none (1%)
pre-emergent (2%)
post-emergent (20%)
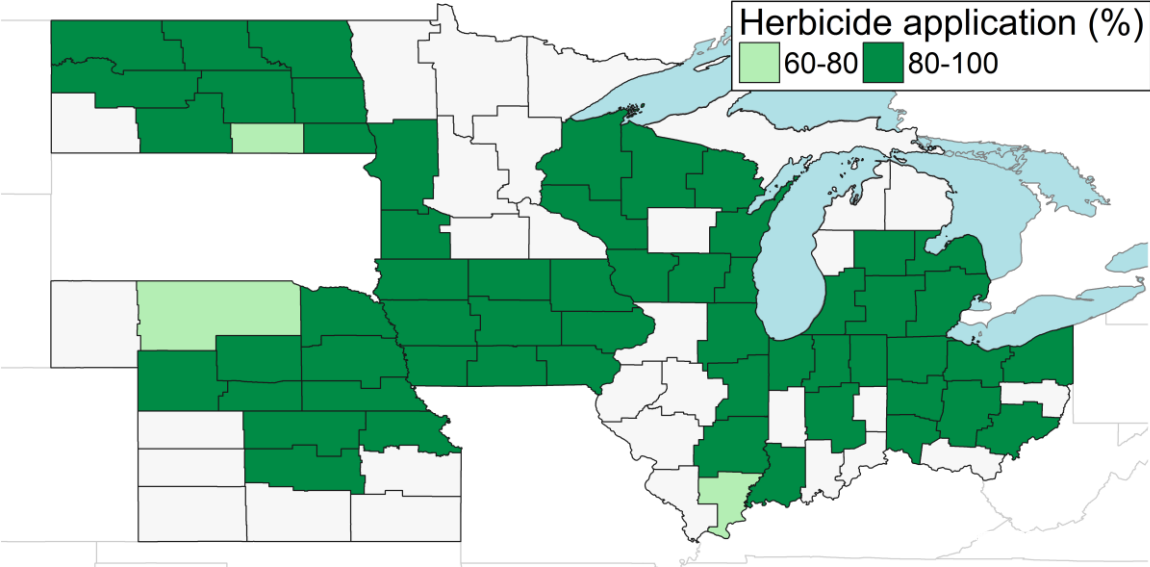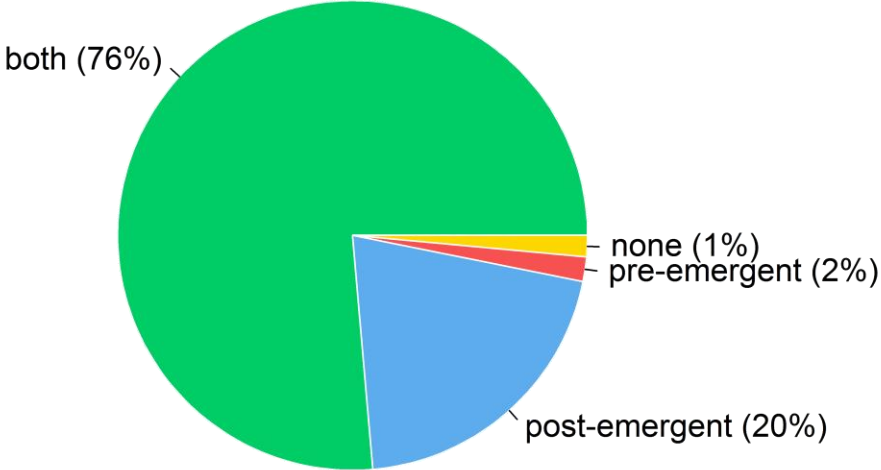
% of fungicide or insecticide-treated fields

Fungicide or insecticide-treated
0-20
20-40
40-60
60-80
80-100
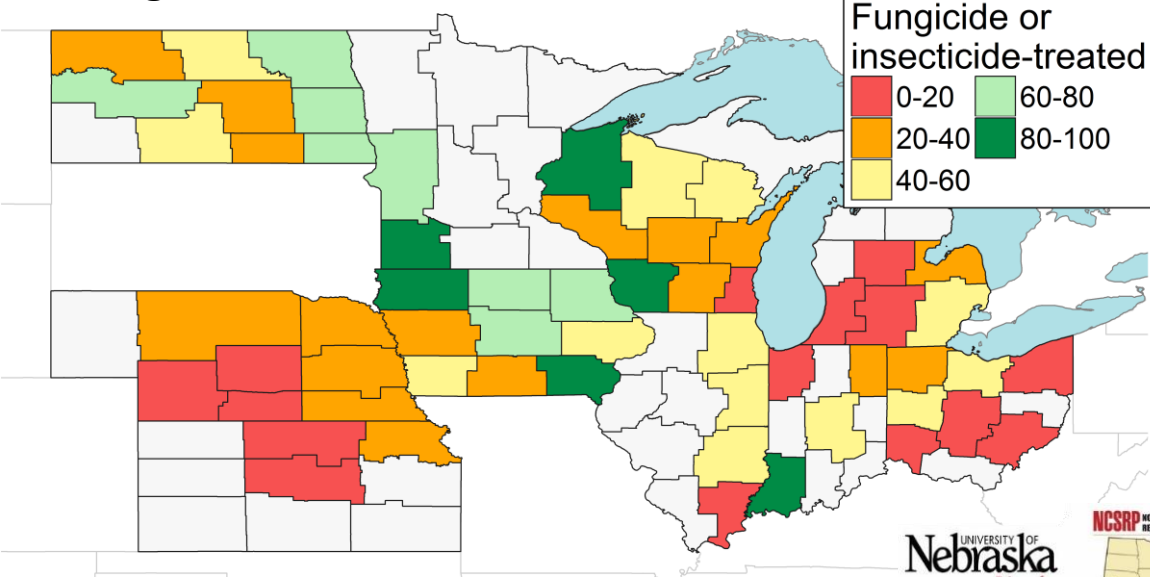
Fungicide and/or insecticide application
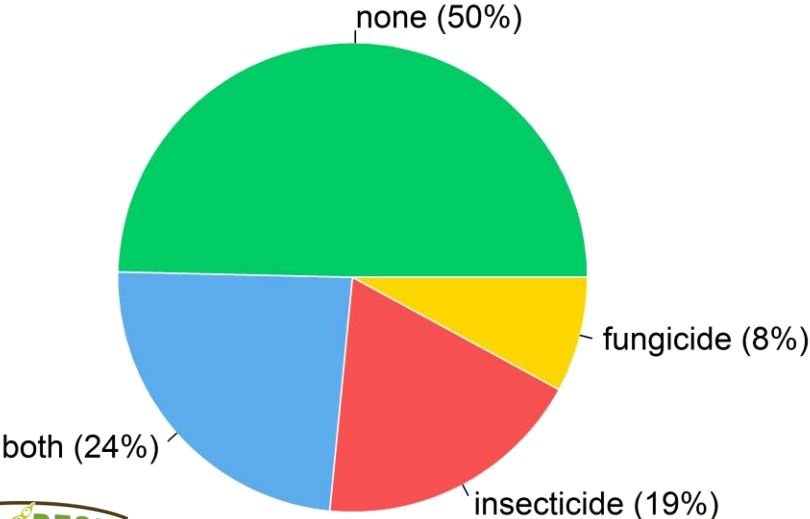
none (50%)
fungicide (8%)
insecticide (19%)
both (24%)

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% of phosphate-treated fields

Phosphate treated fields (%)
- 0-20
- 20-40
- 40-60
- 60-80
- 80-100

% of starter-treated fields

Starter treated fields (%)
- 0-20
- 20-40
- 40-60
- 60-80

% of potash-treated fields
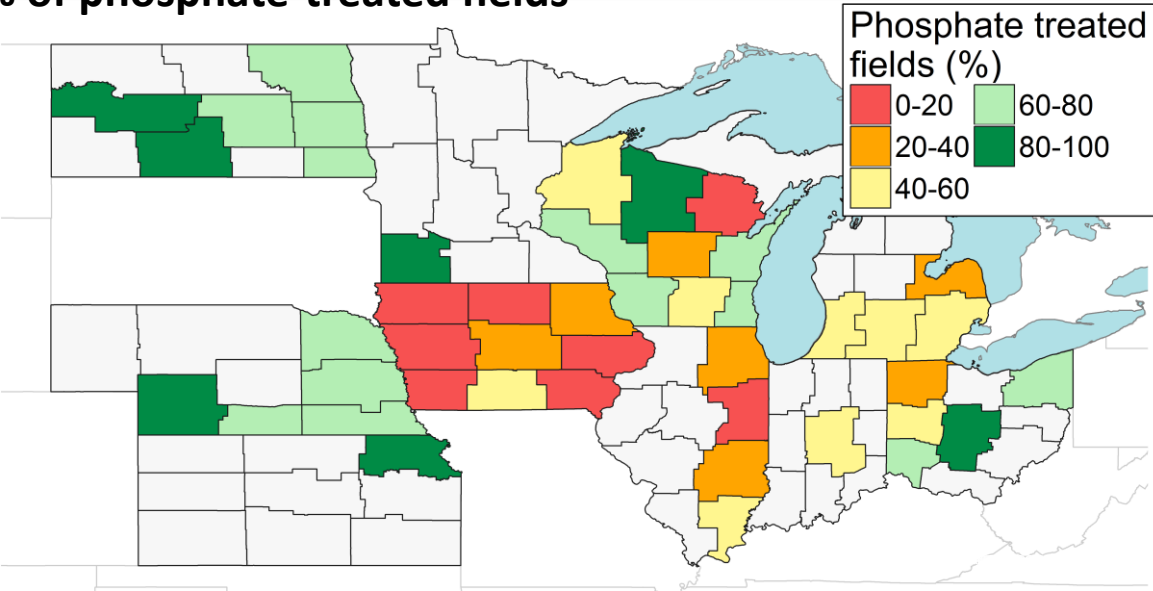
Potash treated fields (%)
- 0-20
- 20-40
- 40-60
- 60-80
- 80-100
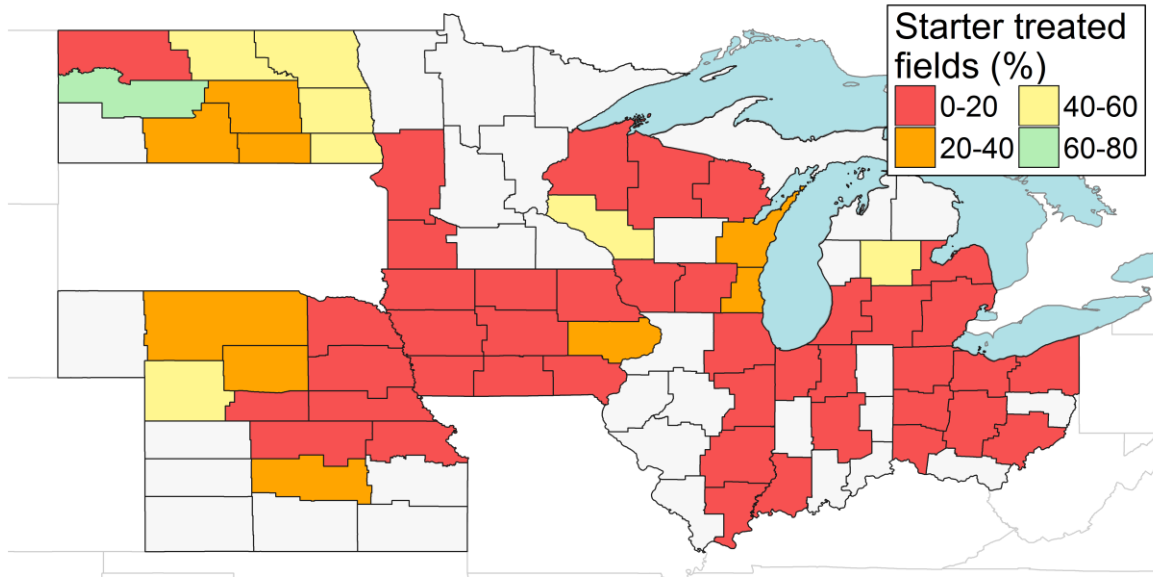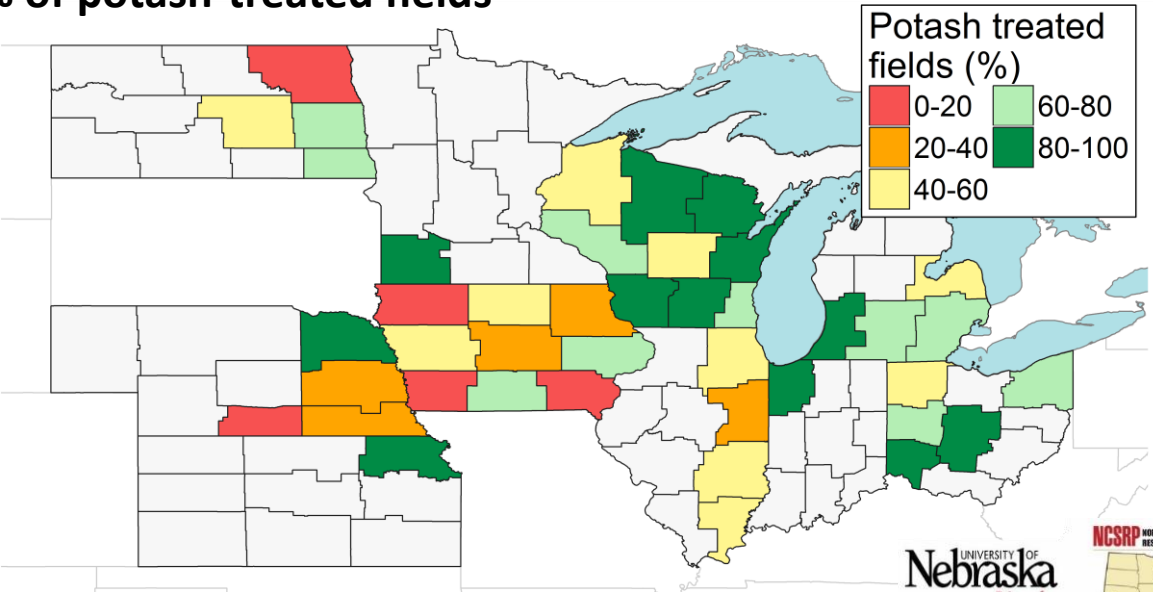
% of fields with seed treatment

Field with seed treatment (%)
- 20-40
- 40-60
- 60-80
- 80-100

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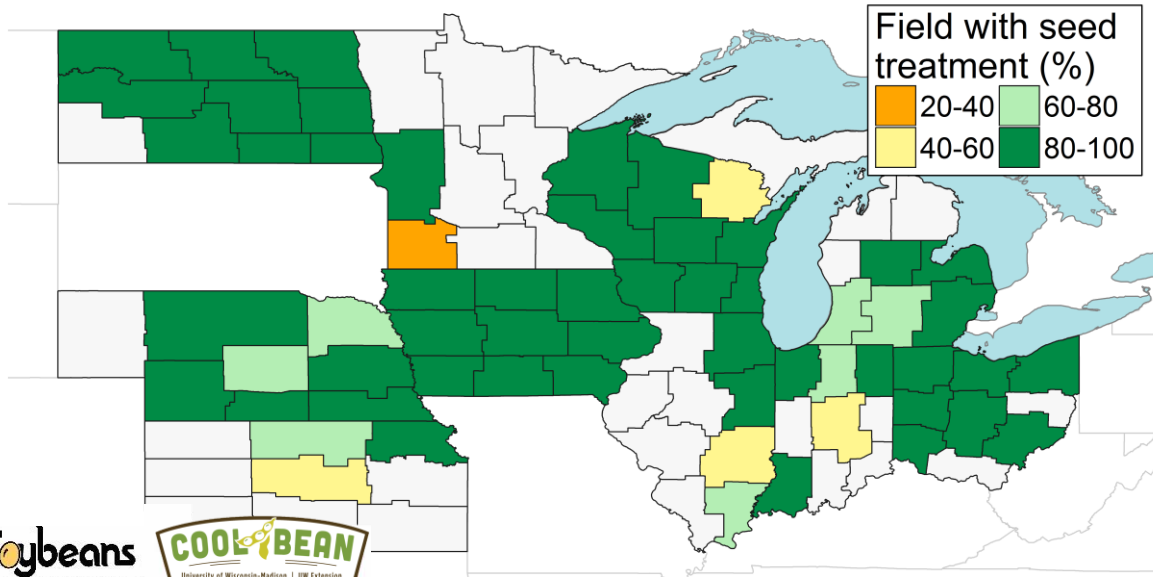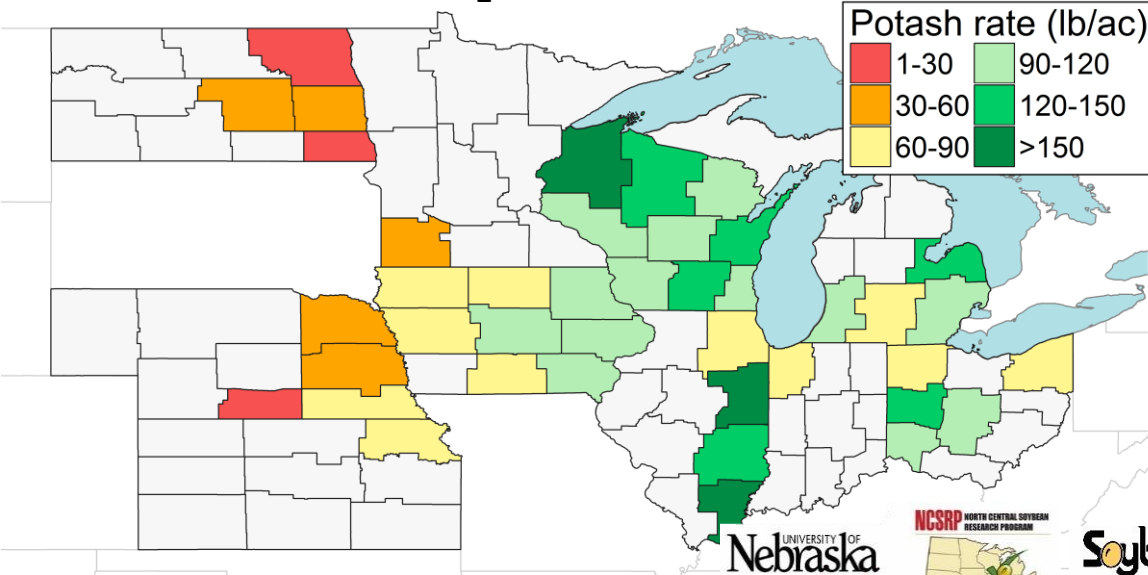
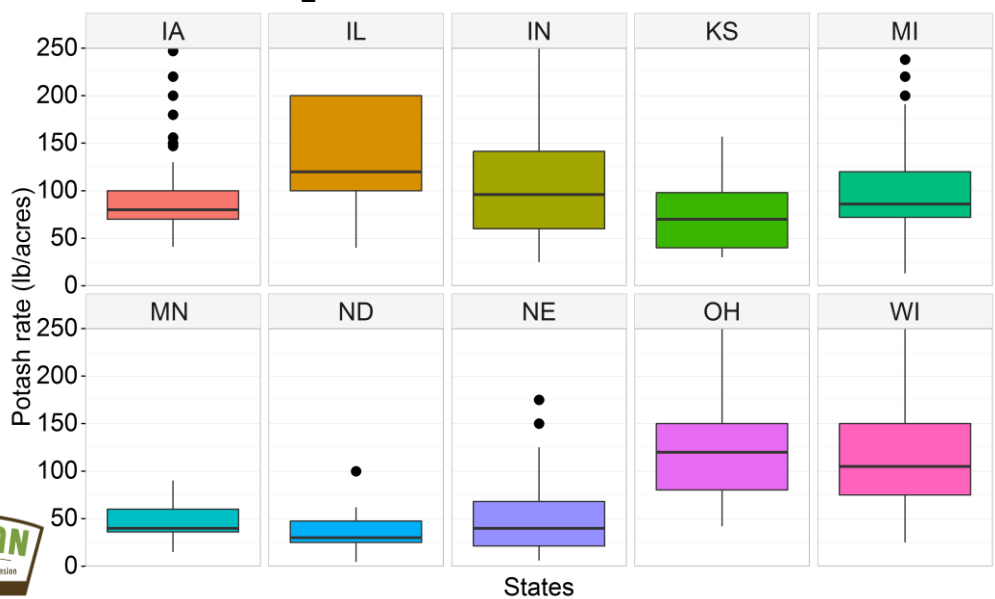# Average phosphate rate (lb P₂O₅/treated acre)
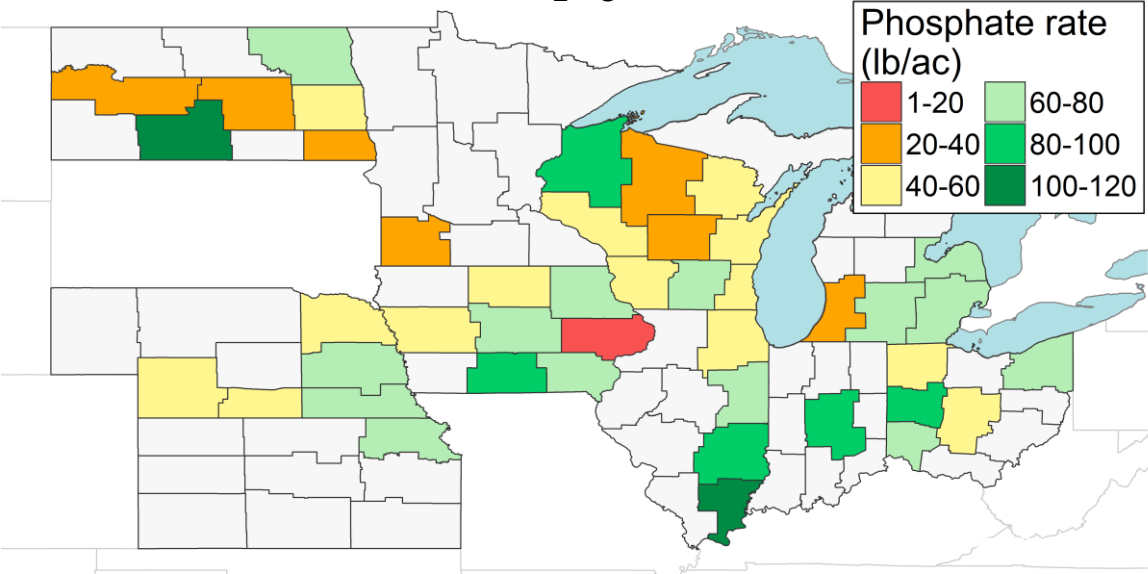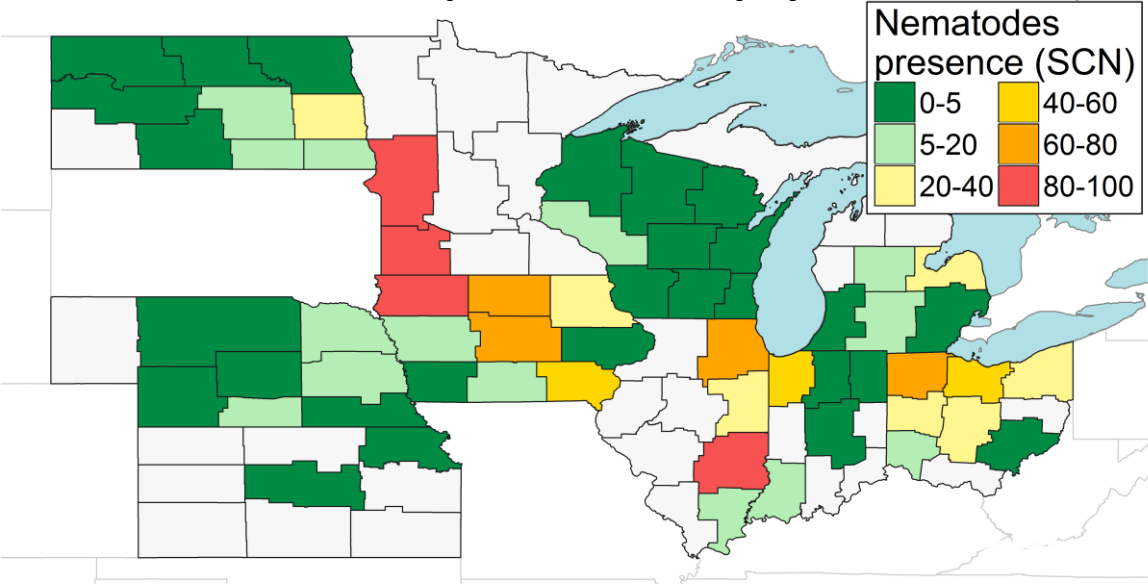

Phosphate rate (lb P₂O₅/treated acre)
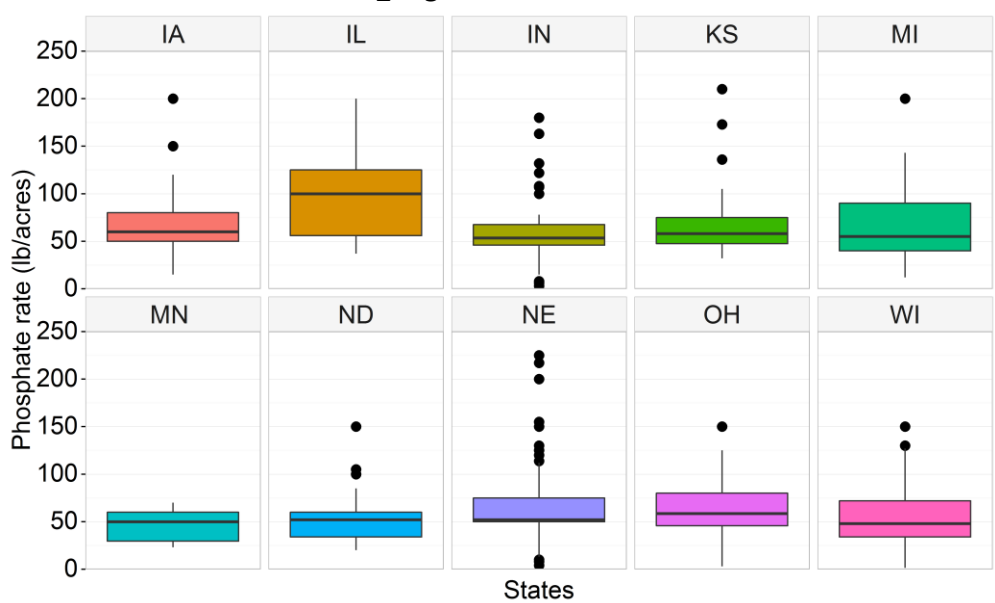
Average potash rate (lb K₂O/treated acre)

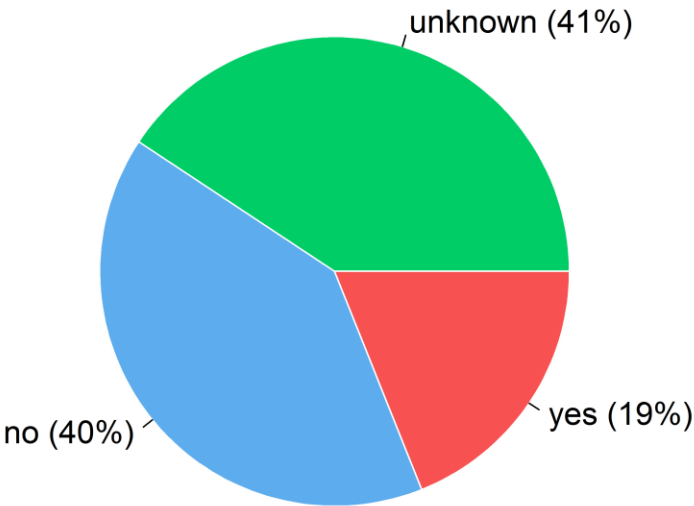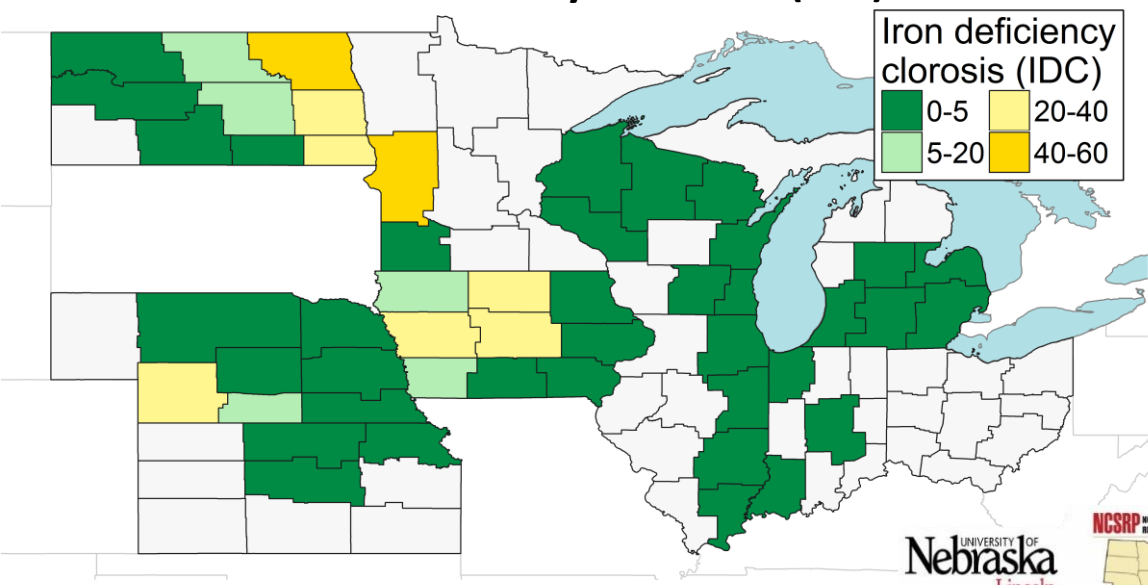# Potash rate (lb K₂O/treated acre)

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% of fields with known presence of soy cyst nematode (SCN)

Nematodes presence (SCN)
- 0-5
- 5-20
- 20-40
- 40-60
- 60-80
- 80-100

Fields with soy cyst nematode (SCN)

unknown (41%)

no (40%)

yes (19%)

% of fields with iron deficiency Chlorosis (IDC)

Iron deficiency clorosis (IDC)
- 0-5
- 5-20
- 20-40
- 40-60

Fields with iron deficiency chlorosis (IDC)

no (86%)

unknown (1%)

yes (13%)

13