Basics of successful soybean management in western ND

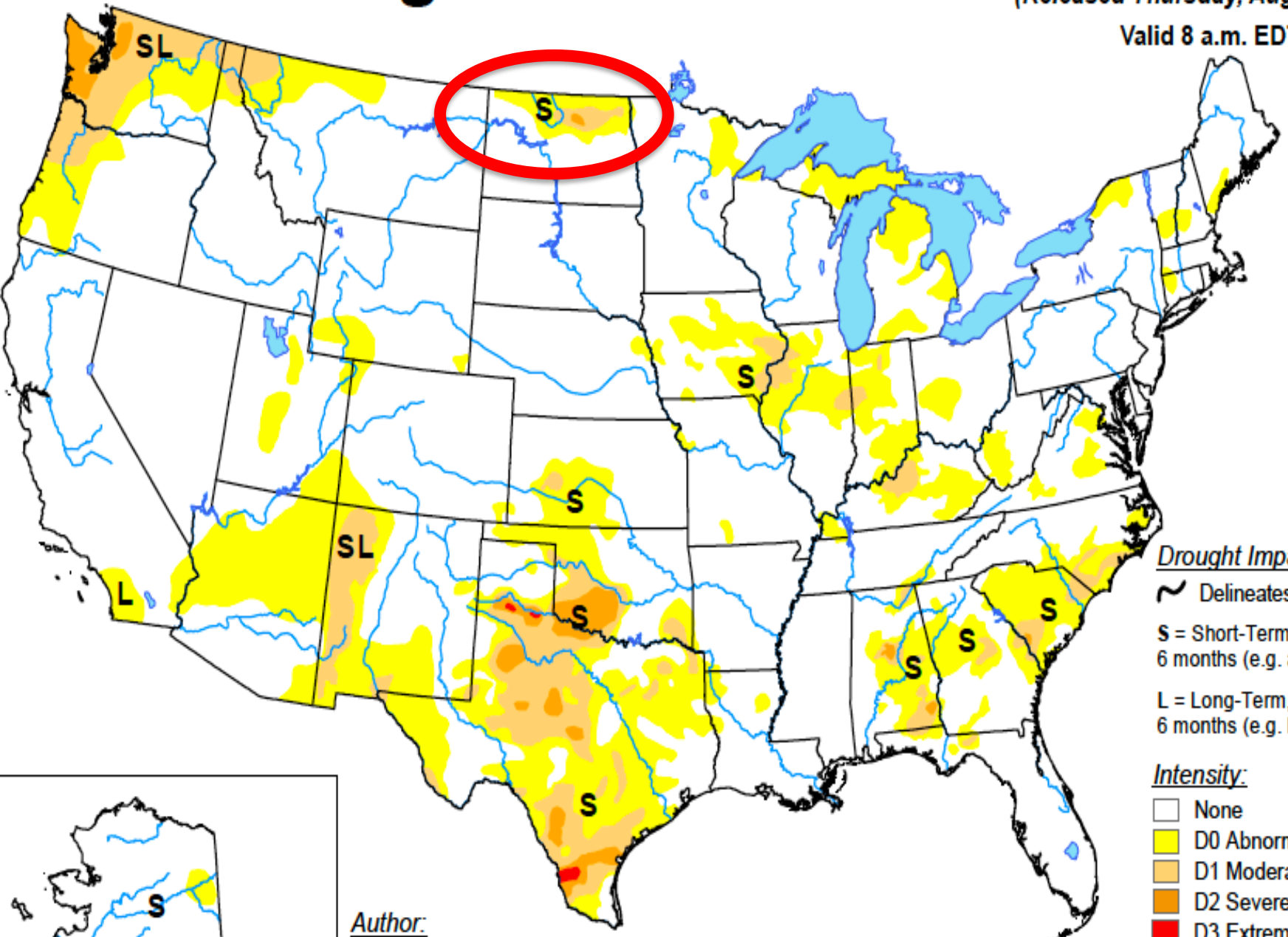
Hans Kandel
Extension Agronomist
NDSU | EXTENSION

U.S. Drought Monitor

August 20, 2019

(Released Thursday, Aug. 22, 2019)

Valid 8 a.m. EDT



Author:
Jessica Blunden

Drought Impact Types:

~ Delineates dominant imp

S = Short-Term, typically less
6 months (e.g. agriculture, gra

L = Long-Term, typically great
6 months (e.g. hydrology, ecol

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

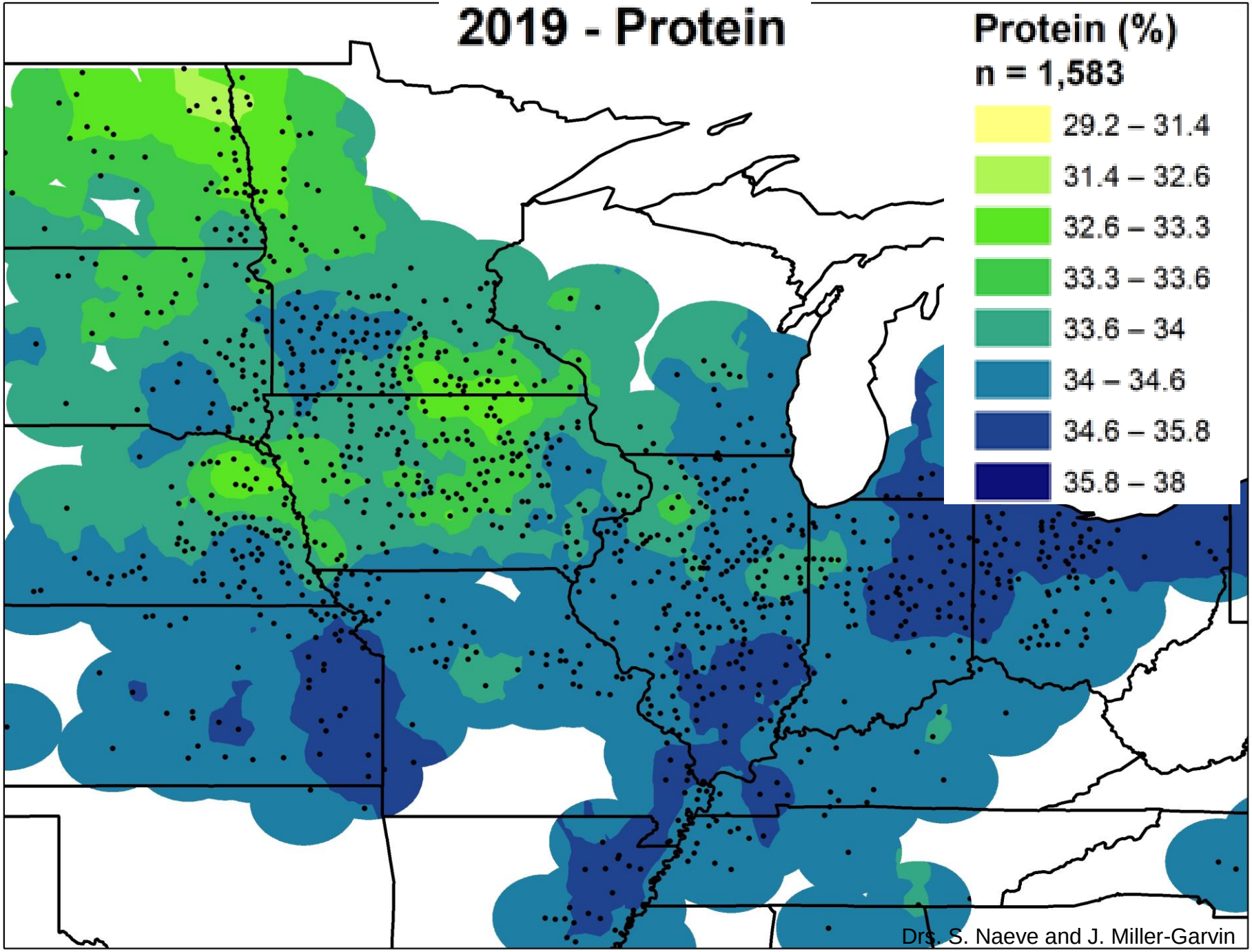
A843-19

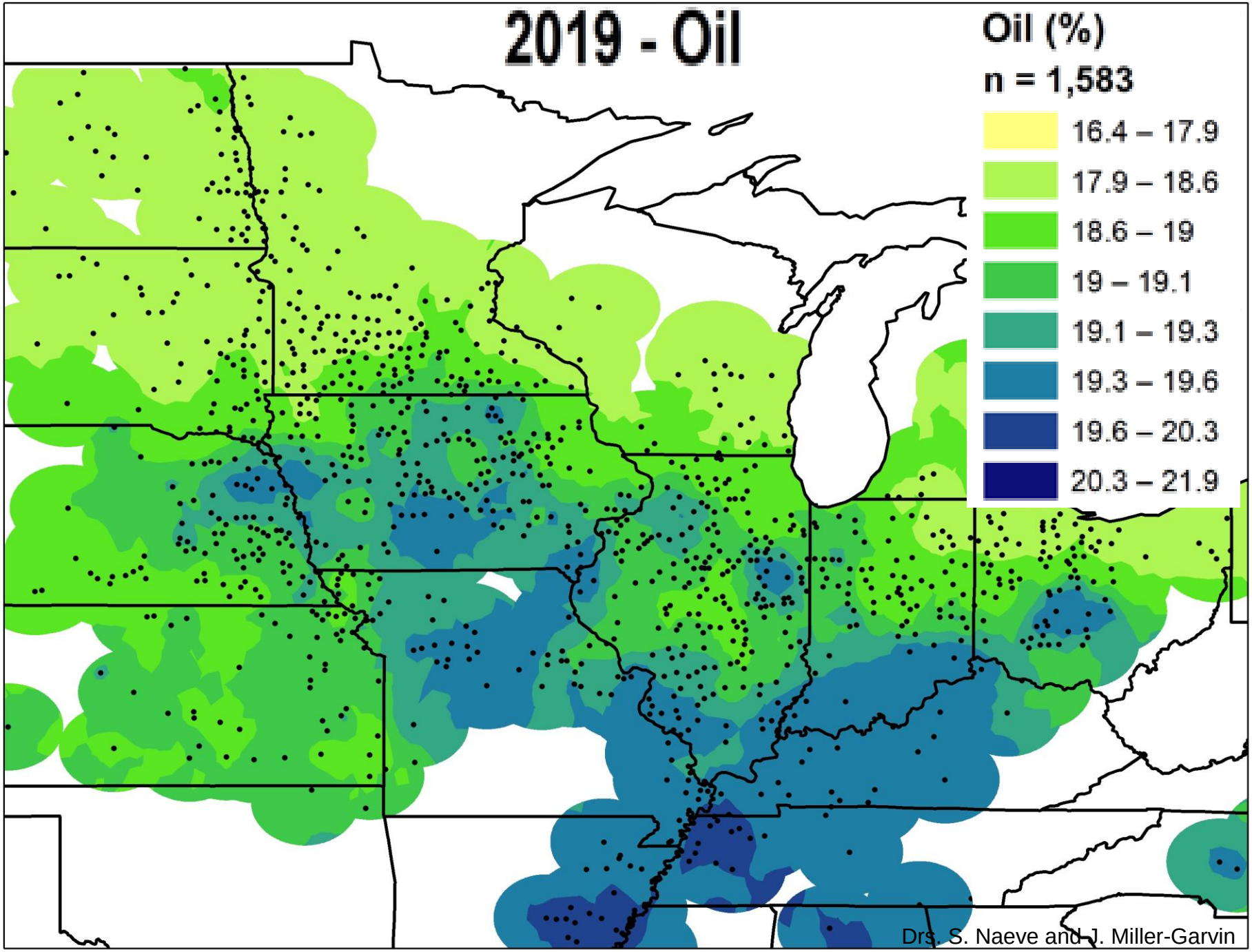
North Dakota Soybean

Variety Trial Results for 2019 and Selection Guide

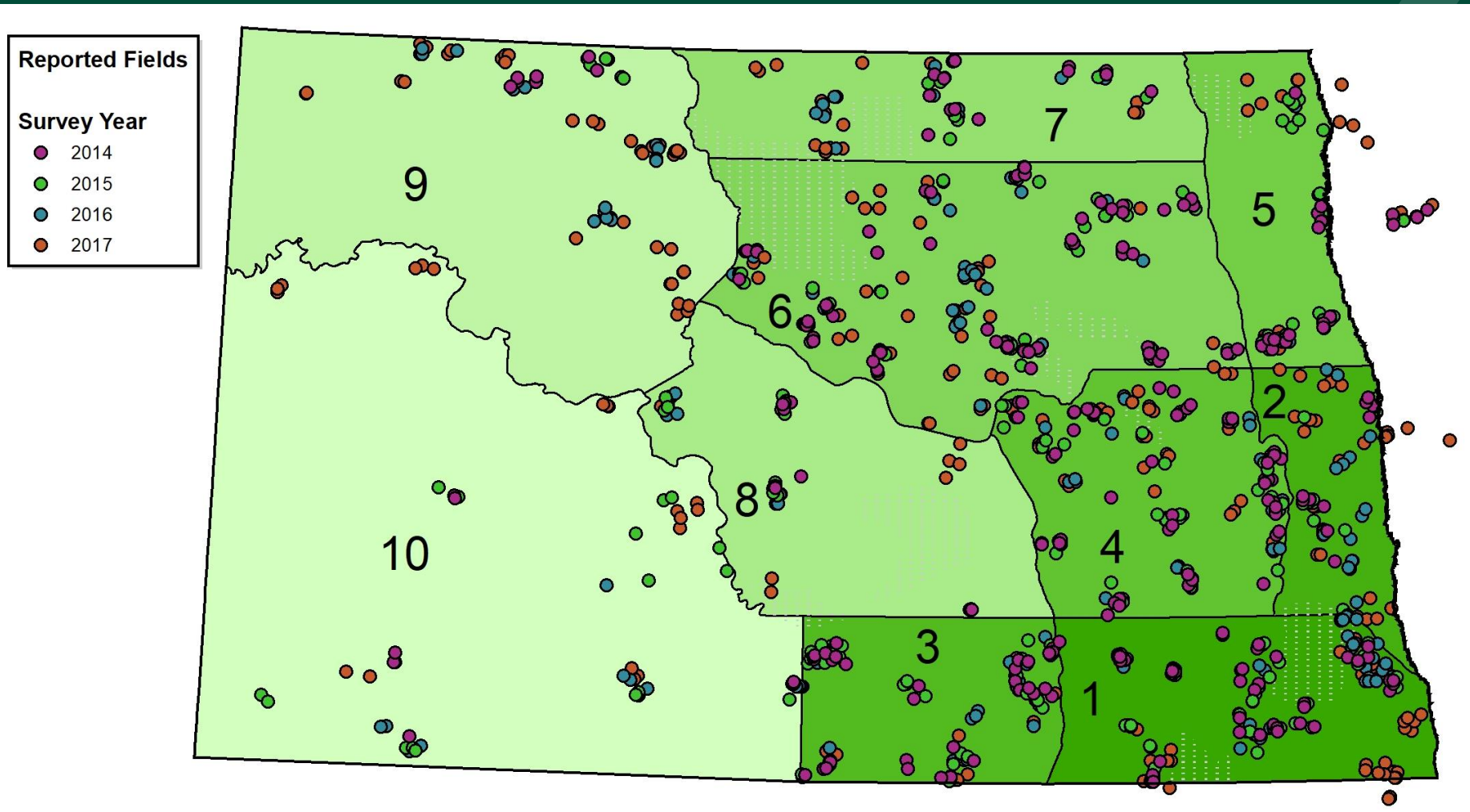
Main Factors in Variety Selection

- Maturity
- Yield
- Disease
- Iron Chlorosis
- SCN resistance
- Herbicide tolerance
- Specialty markets
- Protein and Oil


2019 - Protein
Protein (%)
n = 1,583
29.2 – 31.4
31.4 – 32.6
32.6 – 33.3
33.3 – 33.6
33.6 – 34
34 – 34.6
34.6 – 35.8
35.8 – 38
Drs. S. Naeve and J. Miller-Garvin

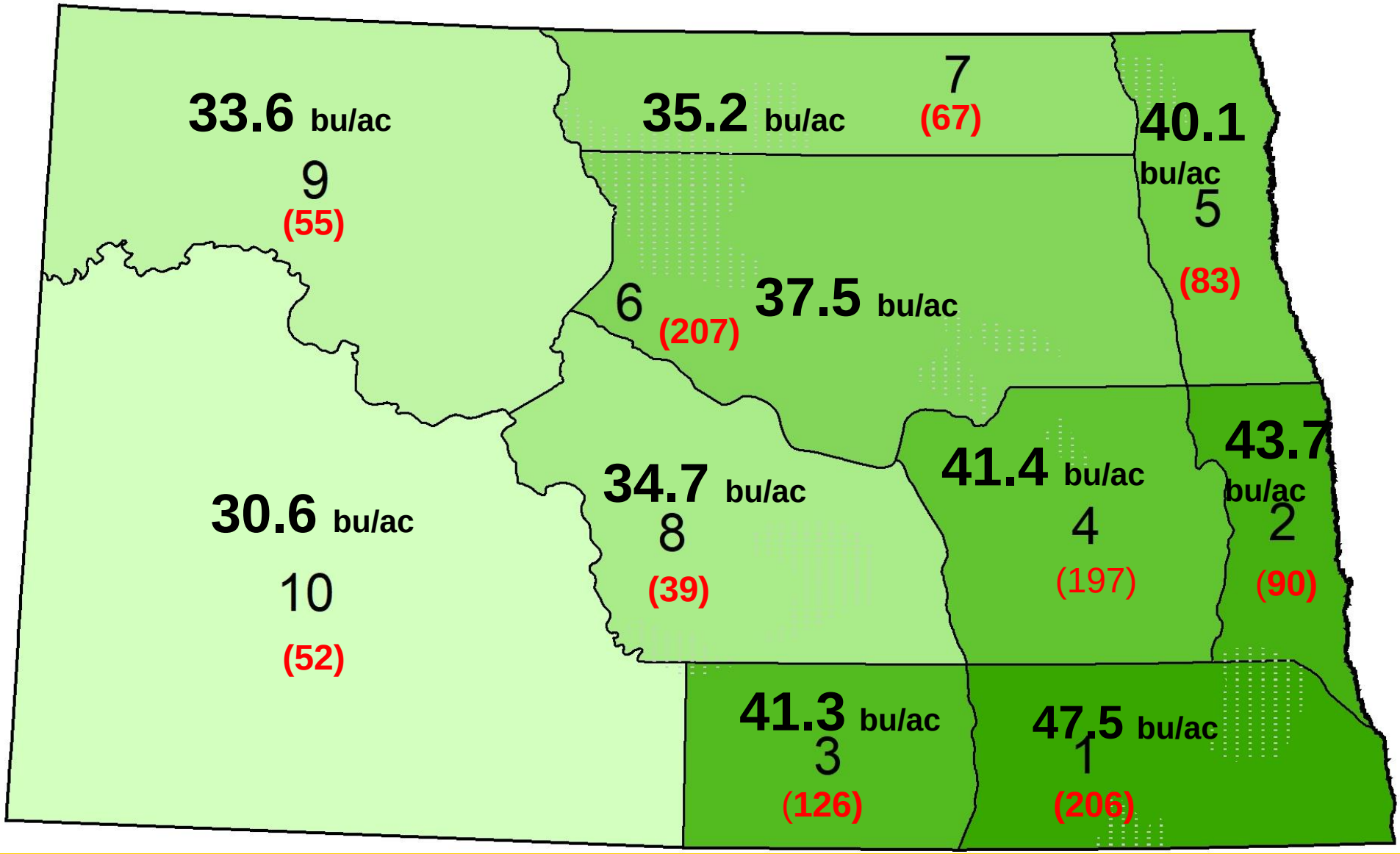

2019 - Oil
Oil (%)
n = 1,583
16.4 – 17.9
17.9 – 18.6
18.6 – 19
19 – 19.1
19.1 – 19.3
19.3 – 19.6
19.6 – 20.3
20.3 – 21.9
Drs. S. Naeve and J. Miller-Garvin

ND Soybean Growing Regions and observations 2014-2017



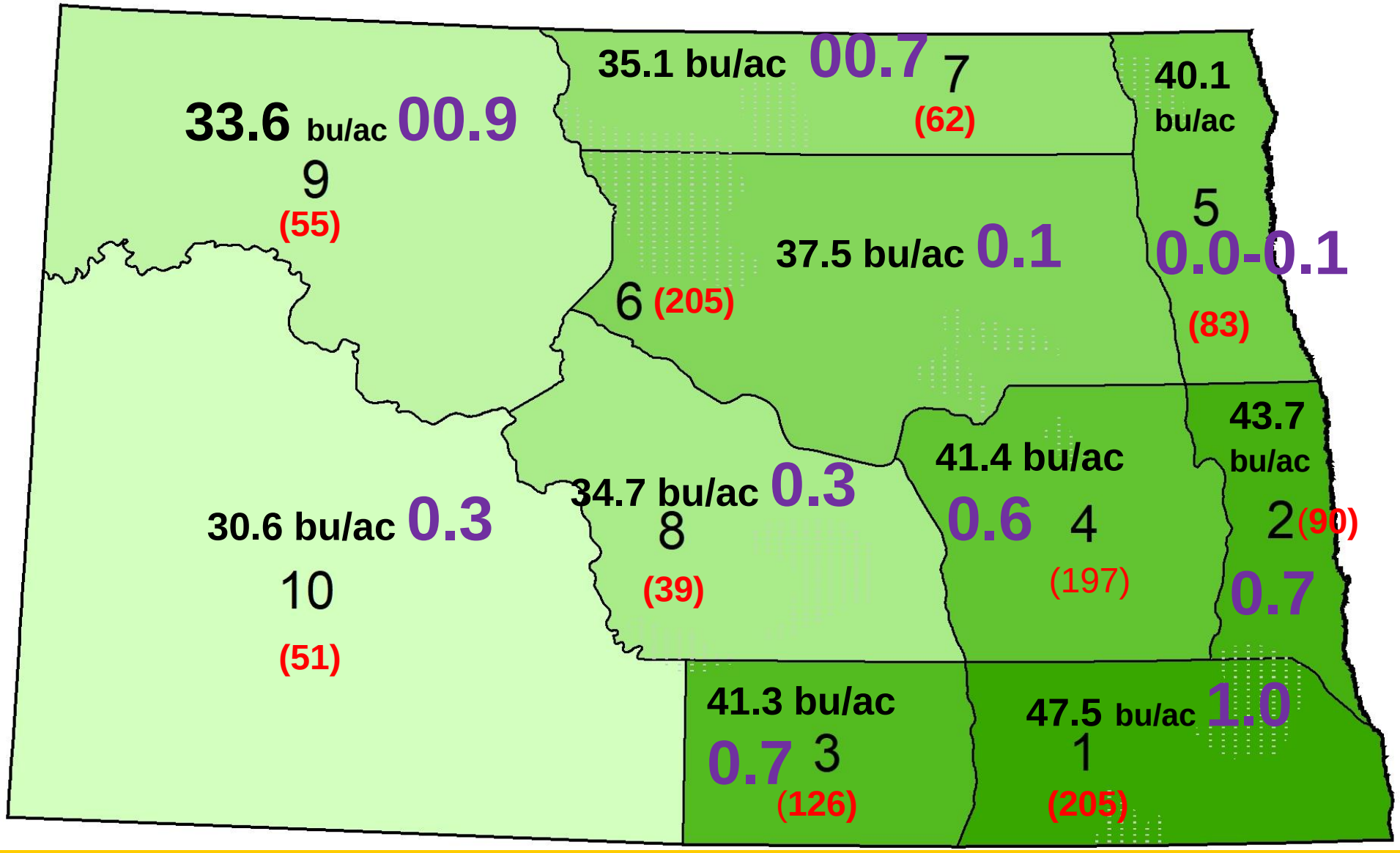
Cartographer: J. Stanley

Soybean Yield by Growing Region 2014-2017



Cartographer: J. Stanley

Soybean Yield by Growing Region and Maturity Group 2014-2017



Cartographer: J. Stanley

Public Soybean Varieties Suitable for North Dakota Production.

Variety	Maturity Group	Height	Hilum Color	Remarks[1]
ND18008GT	00.8	Med.	Black	1,2,7,9
ND17009GT	00.9	Med.	Black	7
ND Rolette	00.9	Med.	Buff	1,2,8
ND Henson	0.0	Med.	Black	1,2
ND Benson	0.4	Med.	Buff	1,2,6,8
ND Stutsman	0.7	Med.	Yellow	1,3,8
Prosoy	0.8	Tall	Yellow	4,5

1 Remarks: 1 = Good iron chlorosis resistance; 2 = Resistant to races 1-4 of Phytophthora root rot; 3 = Resistant to races 1 - 3 of Phytophthora root rot; 4 = Susceptible to Phytophthora root rot; 5 = Tofu bean; 6 = resistant to Soybean Cyst Nematode (SCN); 7 = Glyphosate resistant; 8 = Tolerant to metribuzin herbicide; 9 = tolerance to soybean aphid.

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SOYBEAN HILUM COLOR

A B C D E

A. white, yellow, clear*
B. buff
C. brown
D. imperfect black
E. black

*These descriptors are used interchangeably and represent the only hilum color considered a “white hilum” soybean.

https://www.gipsa.usda.gov/vri/Images/Soybeans/soybeanhilumcolor.jpg

Public Soybean Varieties Suitable for North Dakota Production.

	Maturity			
Variety	Group	Remarks[1]		
ND18008GT	00.8	Farmers cannot save their own seed		
ND17009GT	00.9	Farmers can save their own seed		

Public Soybean Varieties Suitable for North Dakota Production.

	Maturity			
Variety	Group	Remarks[1]		
ND18008GT	00.8	Farmers cannot save their own seed		
ND17009GT	00.9	Farmers can save their own seed		

Public Soybean Varieties Potentially Suitable for North Dakota Production.

	Maturity
Variety	Group
ND18008GT	00.8
ND17009GT	00.9
M06R-614008GT in trials	00.8

Estimated Seed Cost per unit

- Conventional - ~$24 / unit (140k)
- Glyphosate tolerant ~$28 / unit
- RR2 ~$45/unit
- Liberty ~$42 / unit
- Xtend ~ $50 /unit

2019 Soybean - Enlist, GT, RR and Xtend - Minot (North Central REC) - Authors, E. Eriksmoen, J. Effertz and A. Kraklau.

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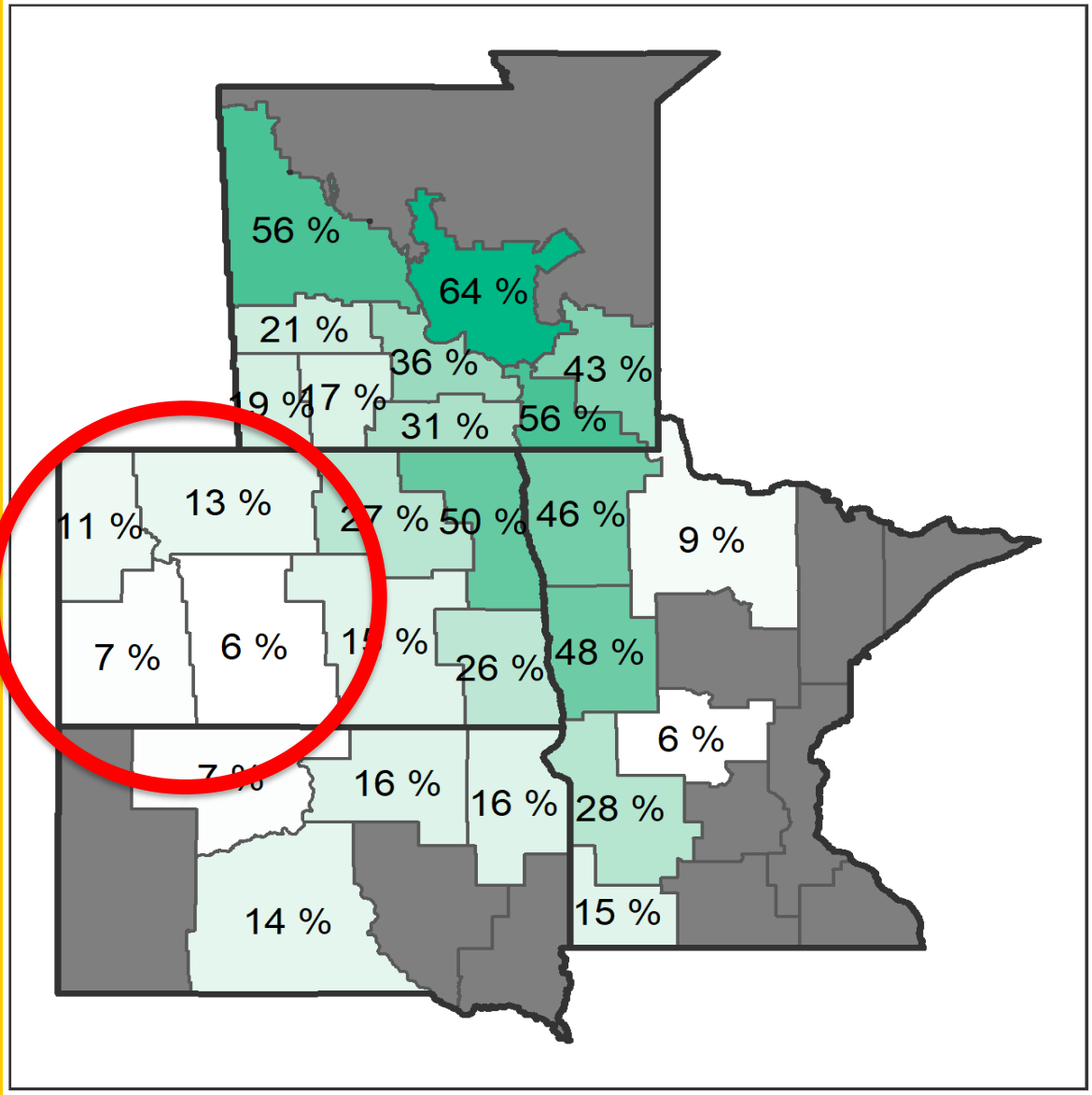
Soil samples with high risk of soybean iron deficiency chlorosis (IDC) in 2019

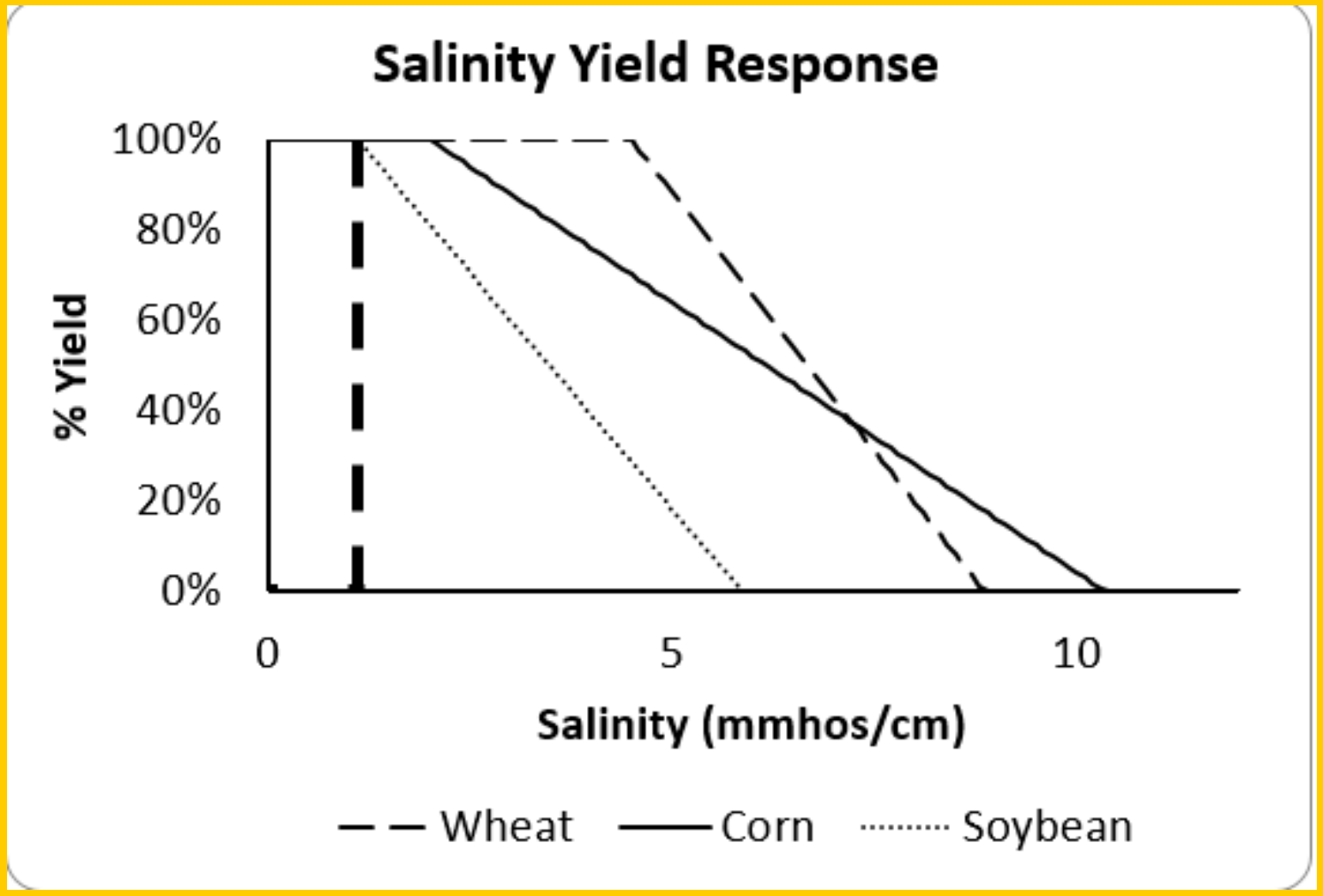


AGVISE LABORATORIES

Field risk of IDC based on carbonate and soluble salts soil test levels

Soluble Salt	Carbonates (%)		
(mmhos/cm)	0 to 2.5	2.6 to 5	>5
0 to 0.25	Low	Low	Moderate
0.26 to 0.50	Low	Moderate	High
0.51 to 1.0	Moderate	High	Very High
> 1.0	High	Very High	Extreme

http://www.ag.ndsu.edu/bioeconomics/Library/tools/salinity-economics-tool



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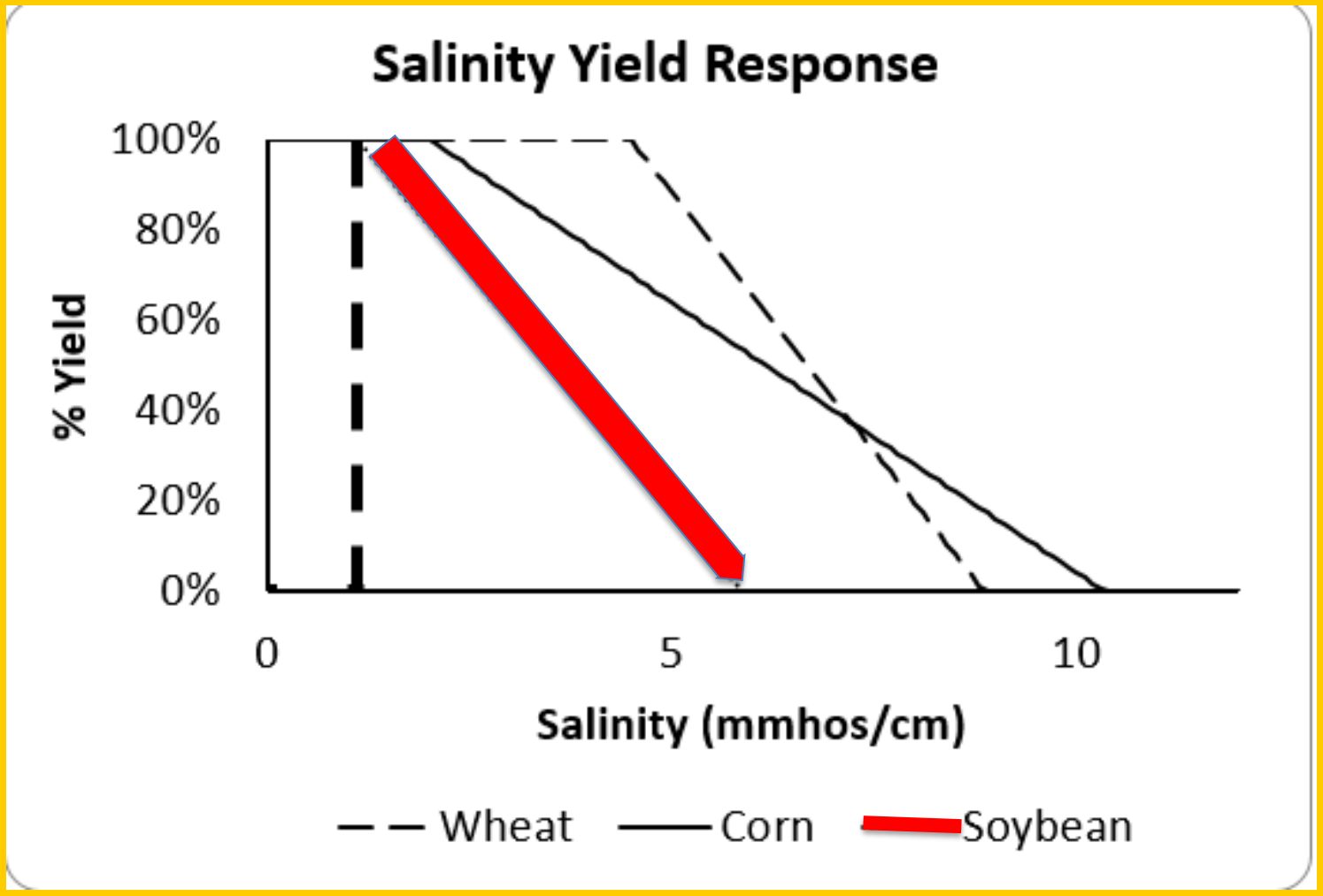


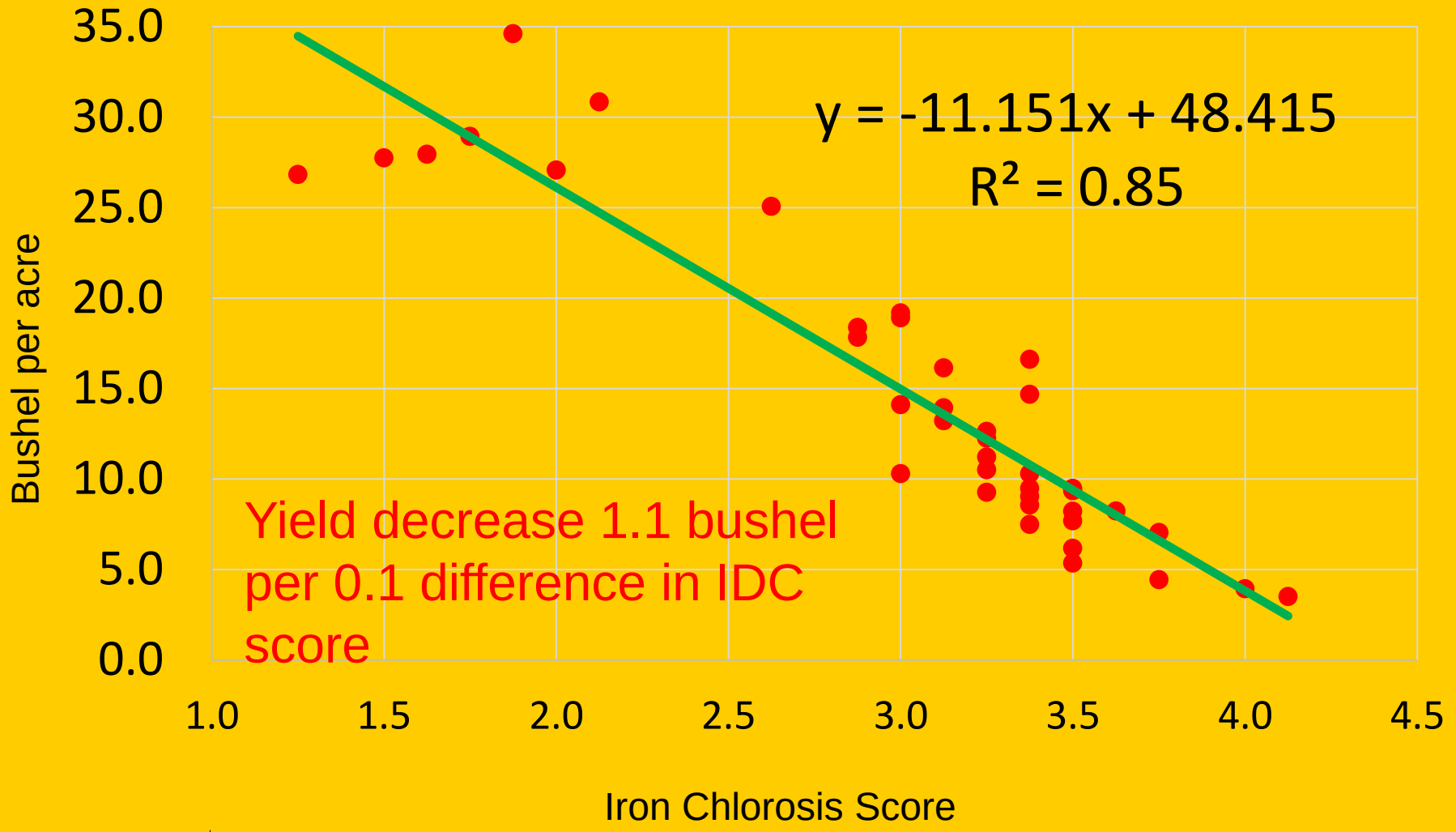

1
1.5
2
2.5
3
3.5
4
4.5
5

Table 3. 2019 NDSU Enlist, Roundup Ready and Xtend Soybean Iron-deficiency Chlorosis Trial - Author, T. Helms (Page 1 of 3).

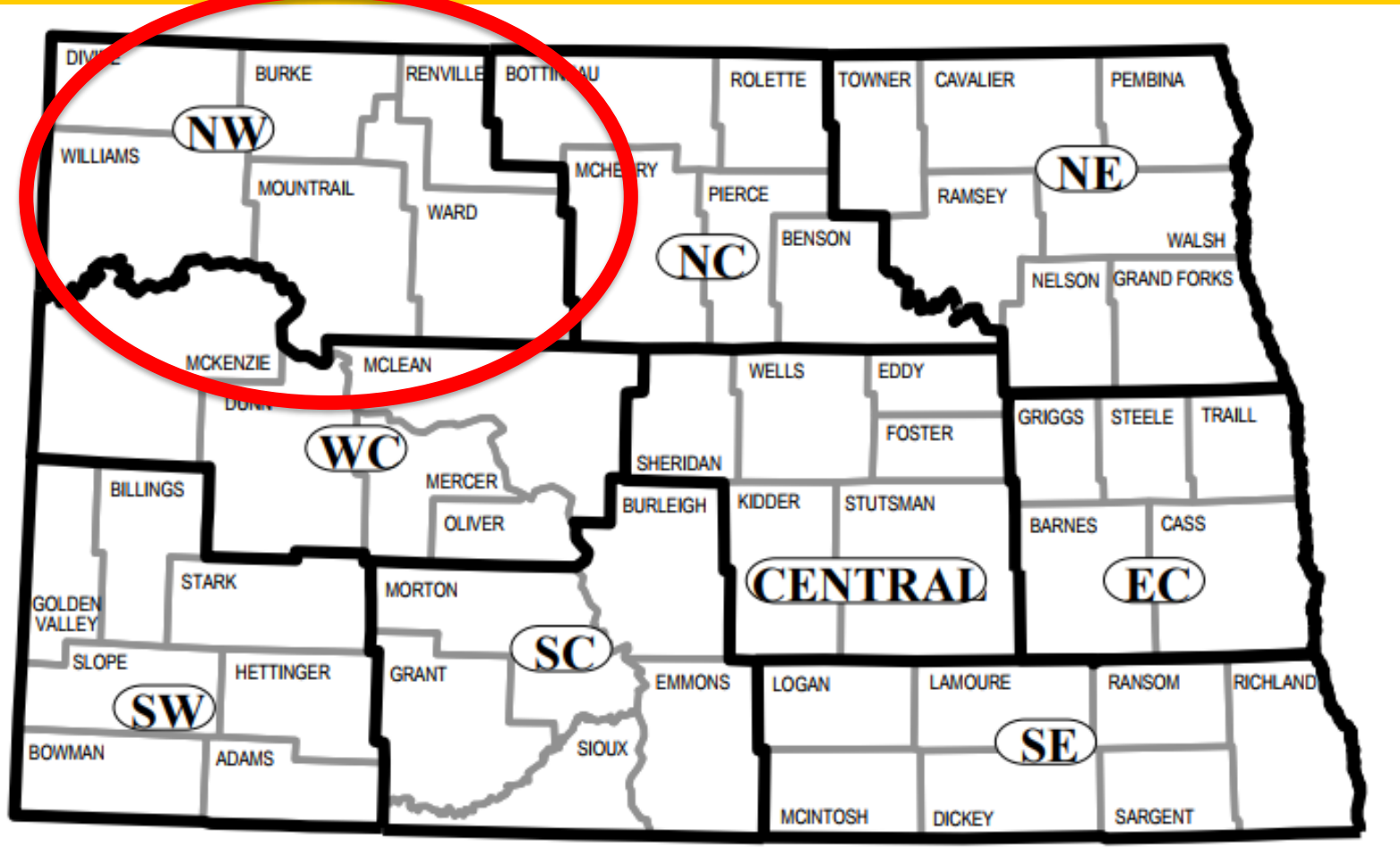
Company	Variety	2-site Mean IDC[1]	Company	Variety	2-site Mean IDC[1]
Channel	0218R2X	1.3	Hefty	H03X8	2.0
Pioneer	01A84X	1.3	P3 Genetics	2003E	2.0
Mustang	03X329	1.3	Peterson	20X05	2.0
Integra	40129E3	1.4	Dahlman	1004E3N	2.0
Pioneer	03A17X	1.4	Dahlman	6903XN	2.0
Dairyland	DSR-0577E	1.4	Mustang	05E449	2.0
NorthStar	90094E3	1.4	NorthStar	60092XR2	2.0
Asgrow	AG 0937	1.5	Allegiant	009X08	2.1
Integra	50309NR2X	1.5	Dairyland	DSR-0988/R2Y	2.1
Hefty	H04X8	1.6	NorthStar	60555NXR2	2.1
Proseed	XT80-20N	1.6	P3 Genetics	1906E	2.1

Trial Mean	2.4
LSD 0.05	0.4
LSD 0.10	0.3

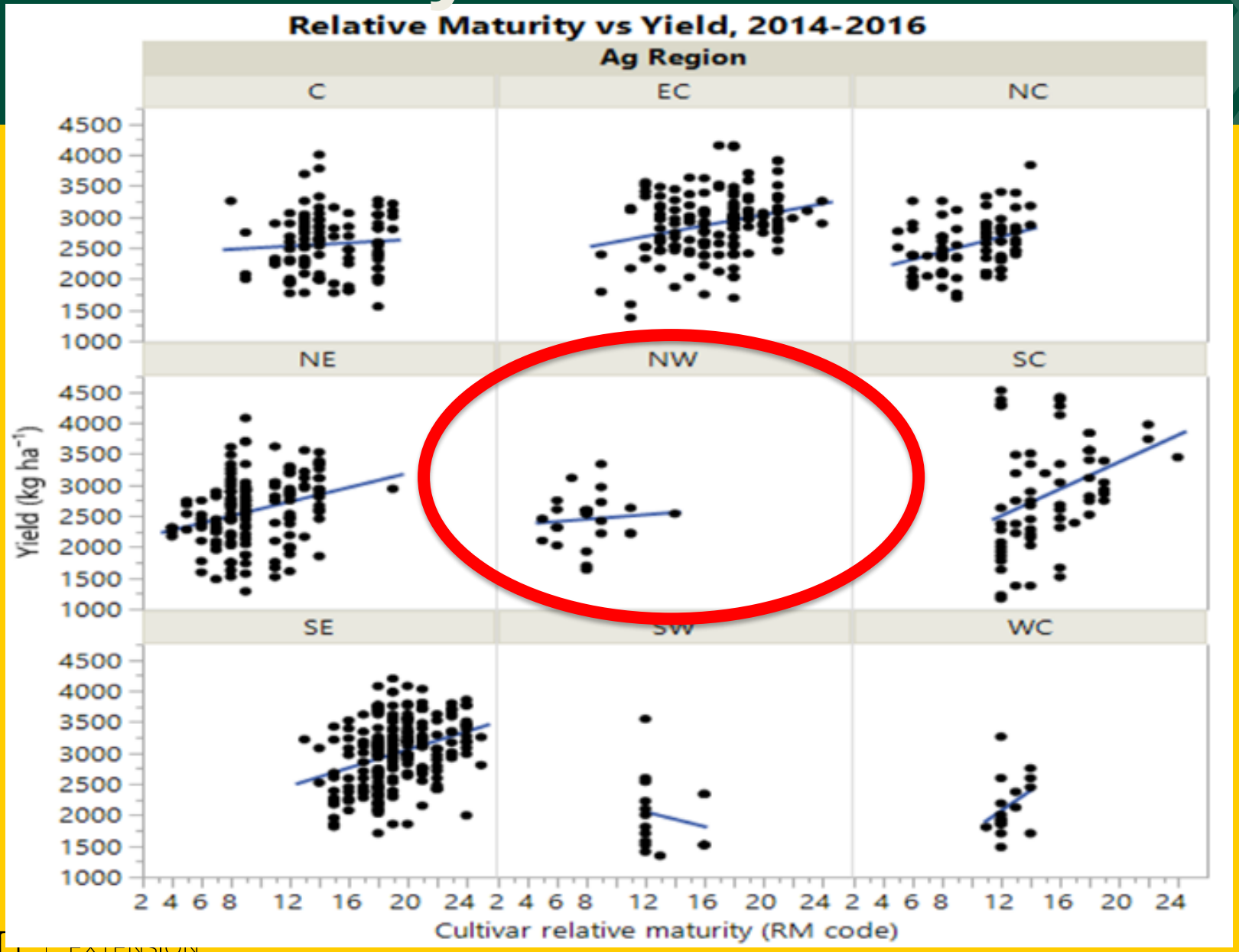
2019 NDSU Soybean Iron-deficiency Chlorosis Trial - Erie, N.D.



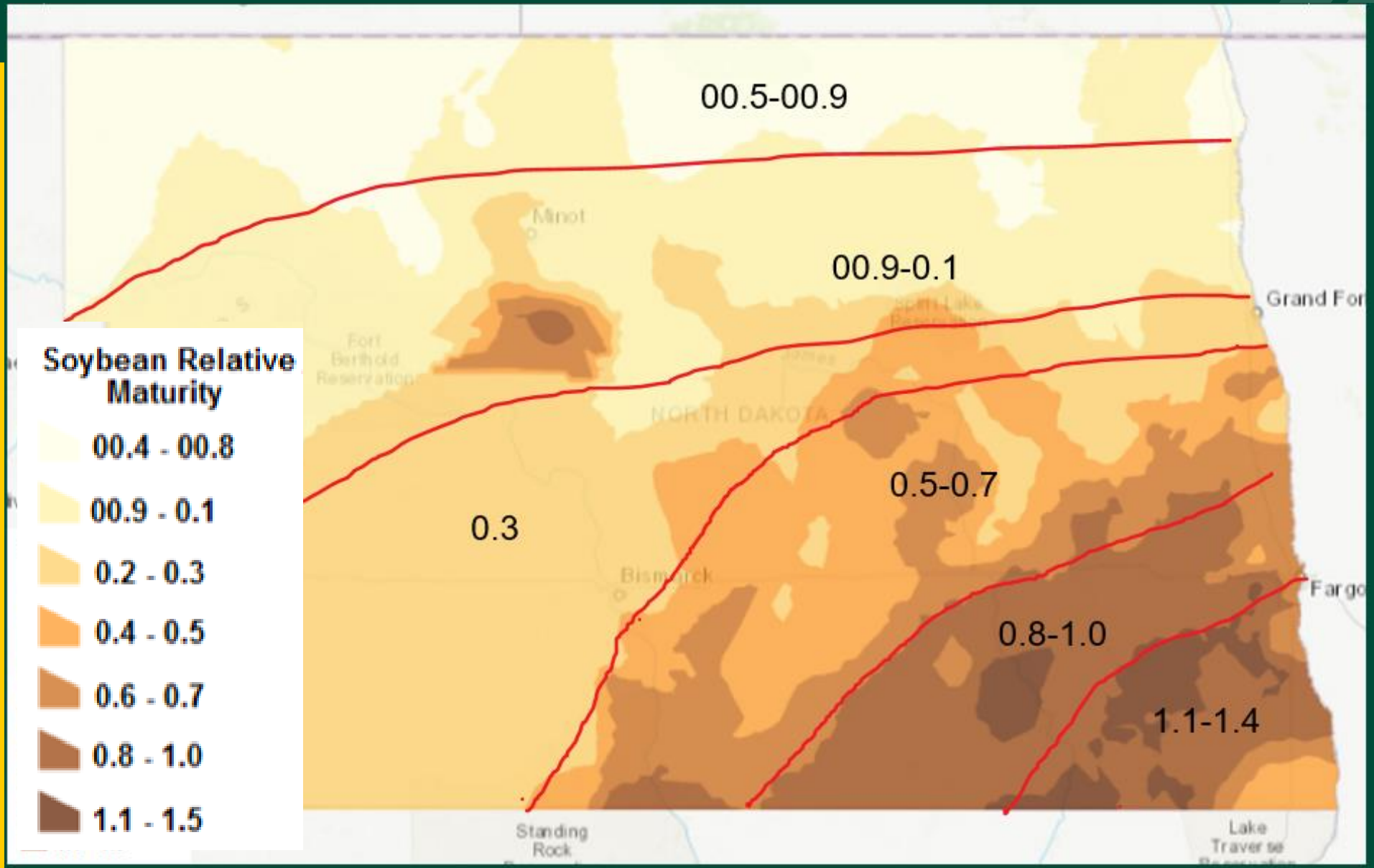
Agricultural Statistics Districts ND



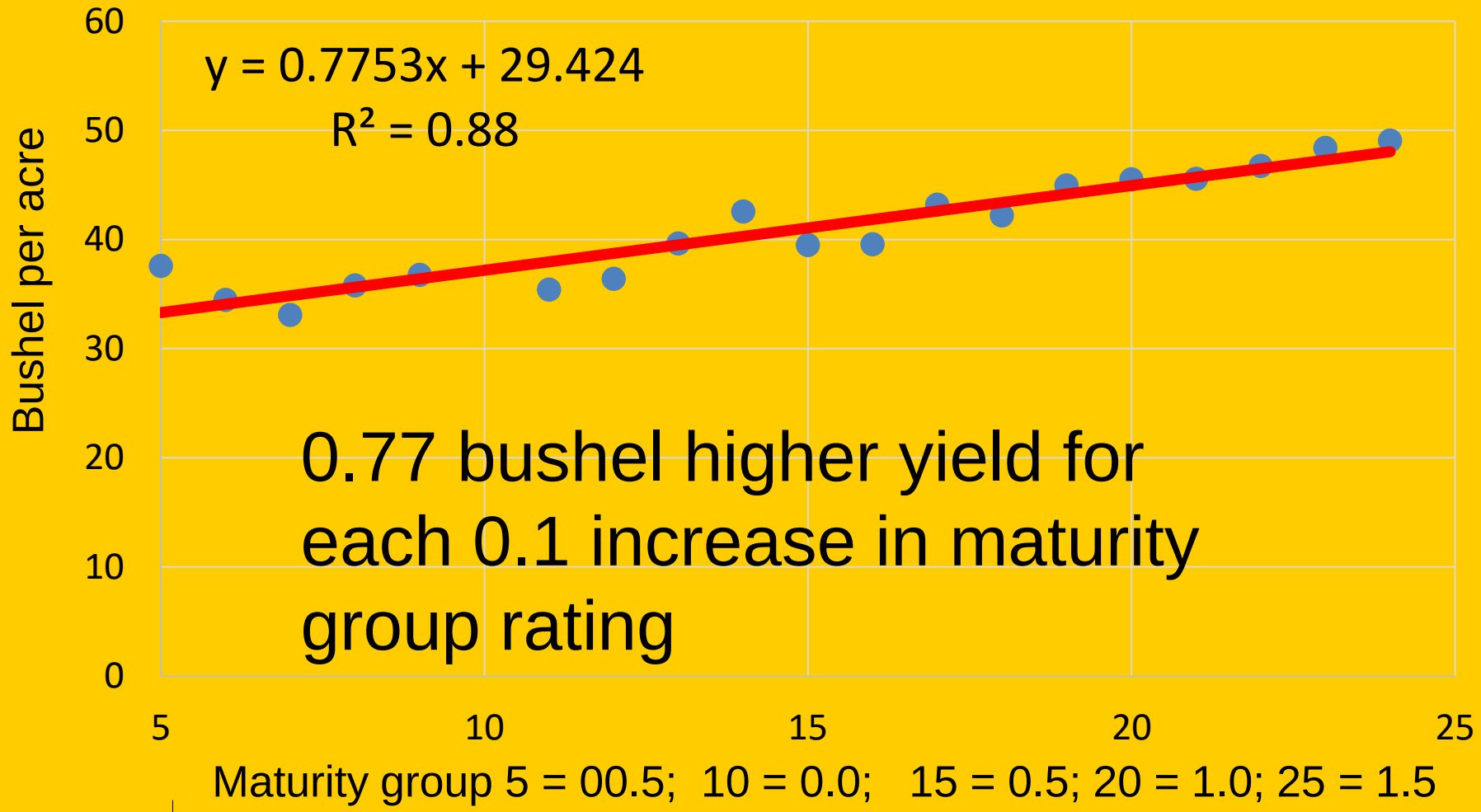
RM Variability Statewide



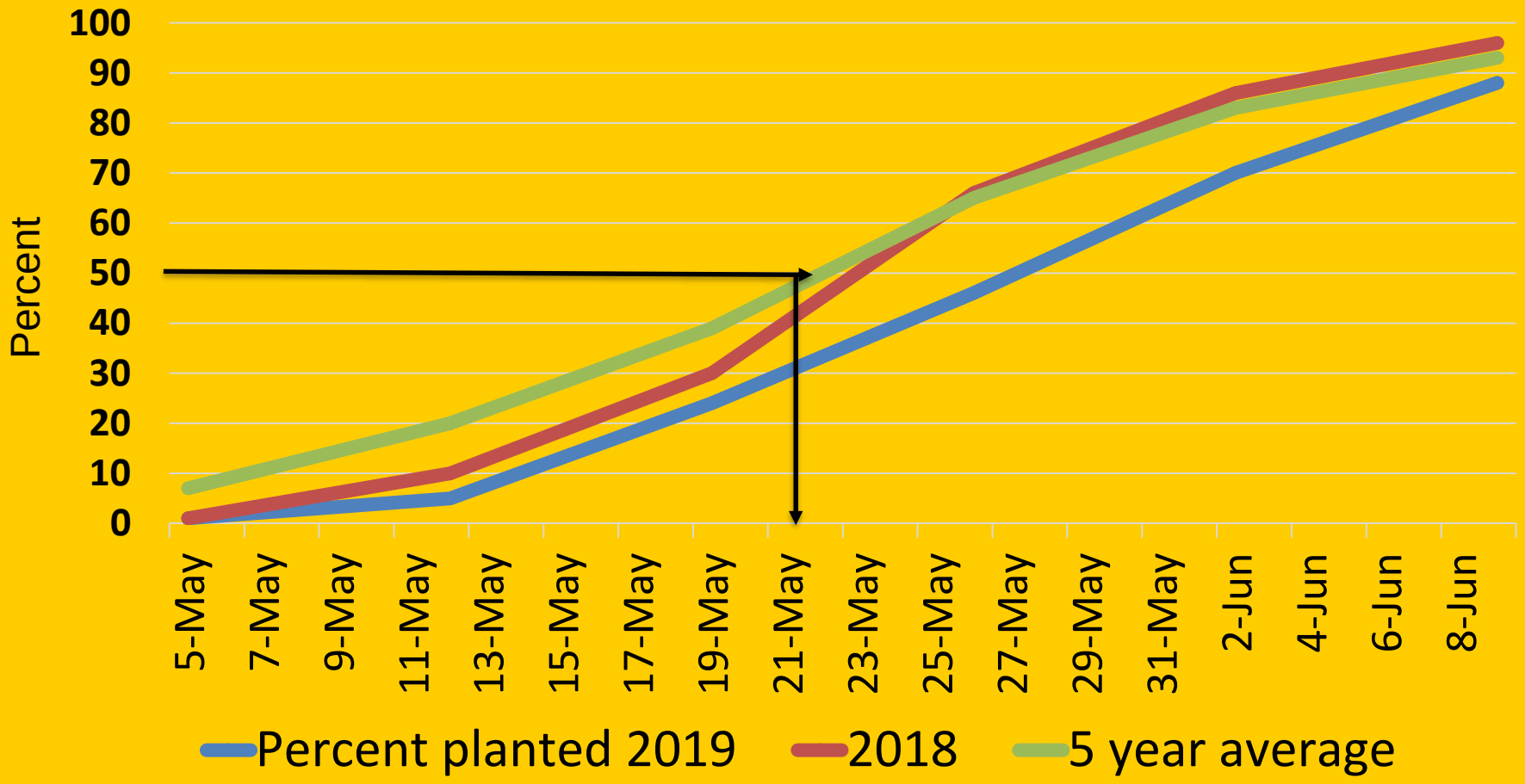
Maturity group map 2014-2017



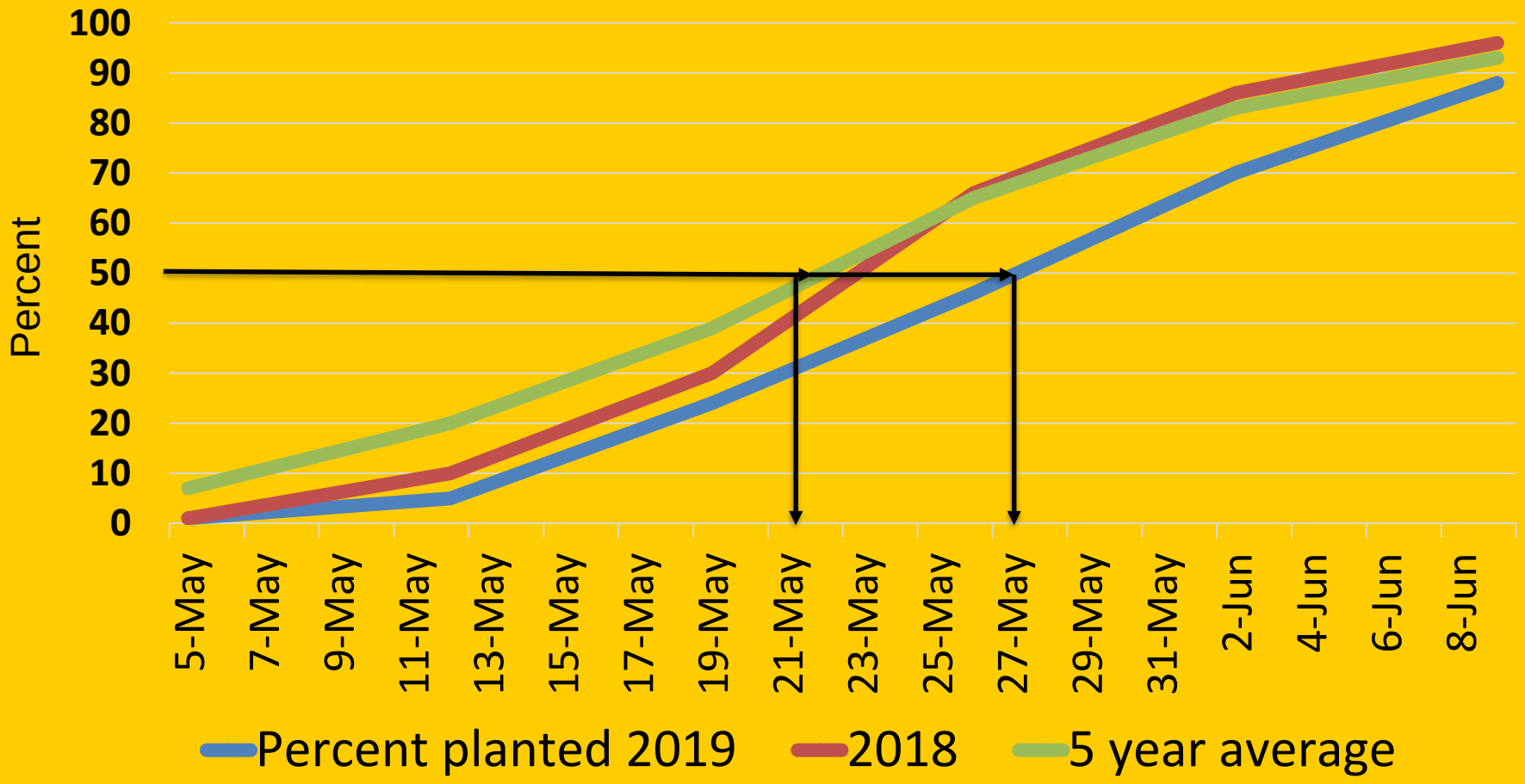
ND Survey yield in bushel per acre by maturity group, 2014-17 (1098 fields)



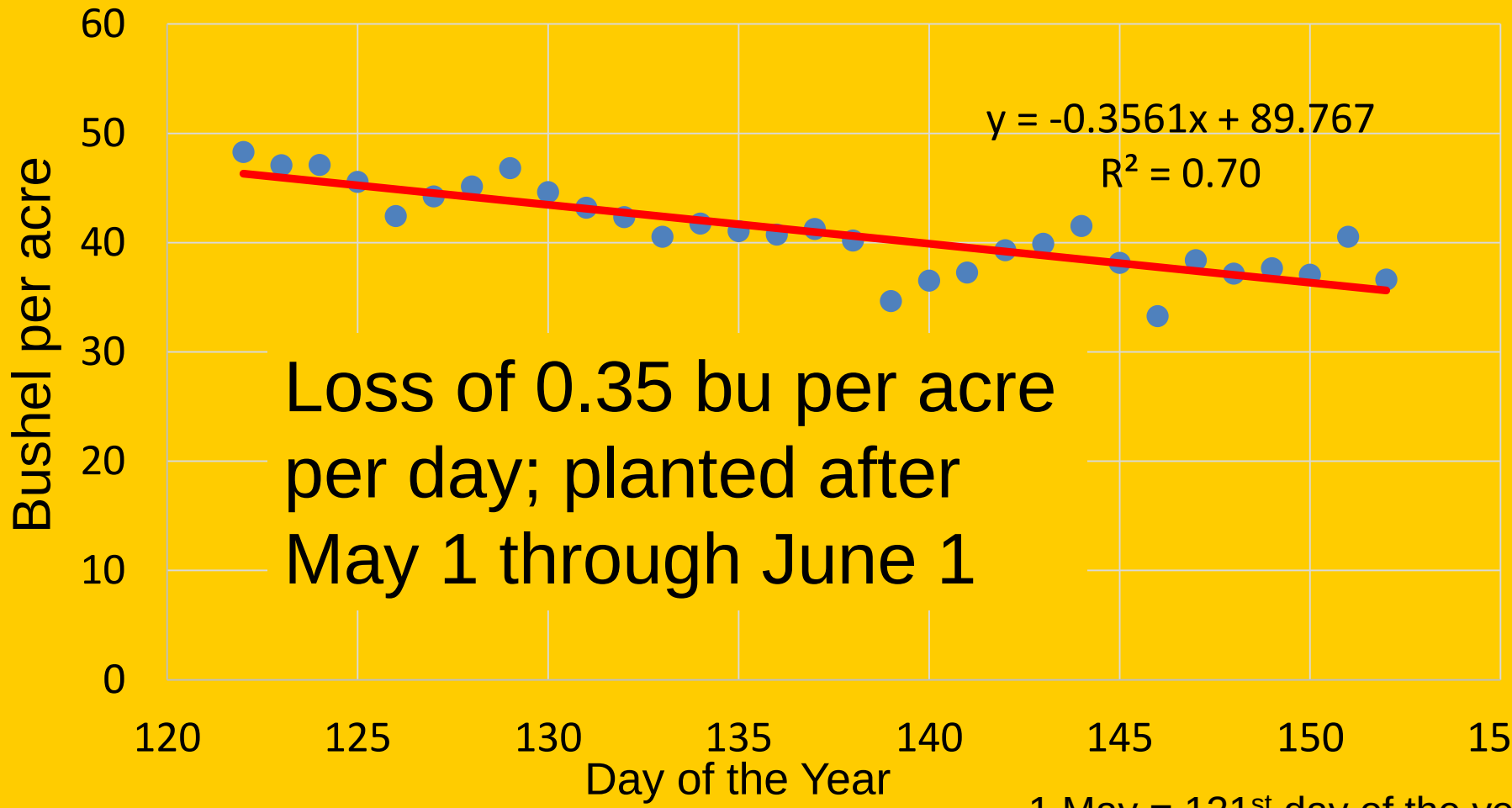
Percent Soybean Acres Planted by Date, North Dakota 2019



Percent Soybean Acres Planted by Date, North Dakota 2019



Planting day of the year vs yield in bushel per acre 2014-2017 (1023 fields)



1 May = 121st day of the year.
4 June = 155th day of the year.

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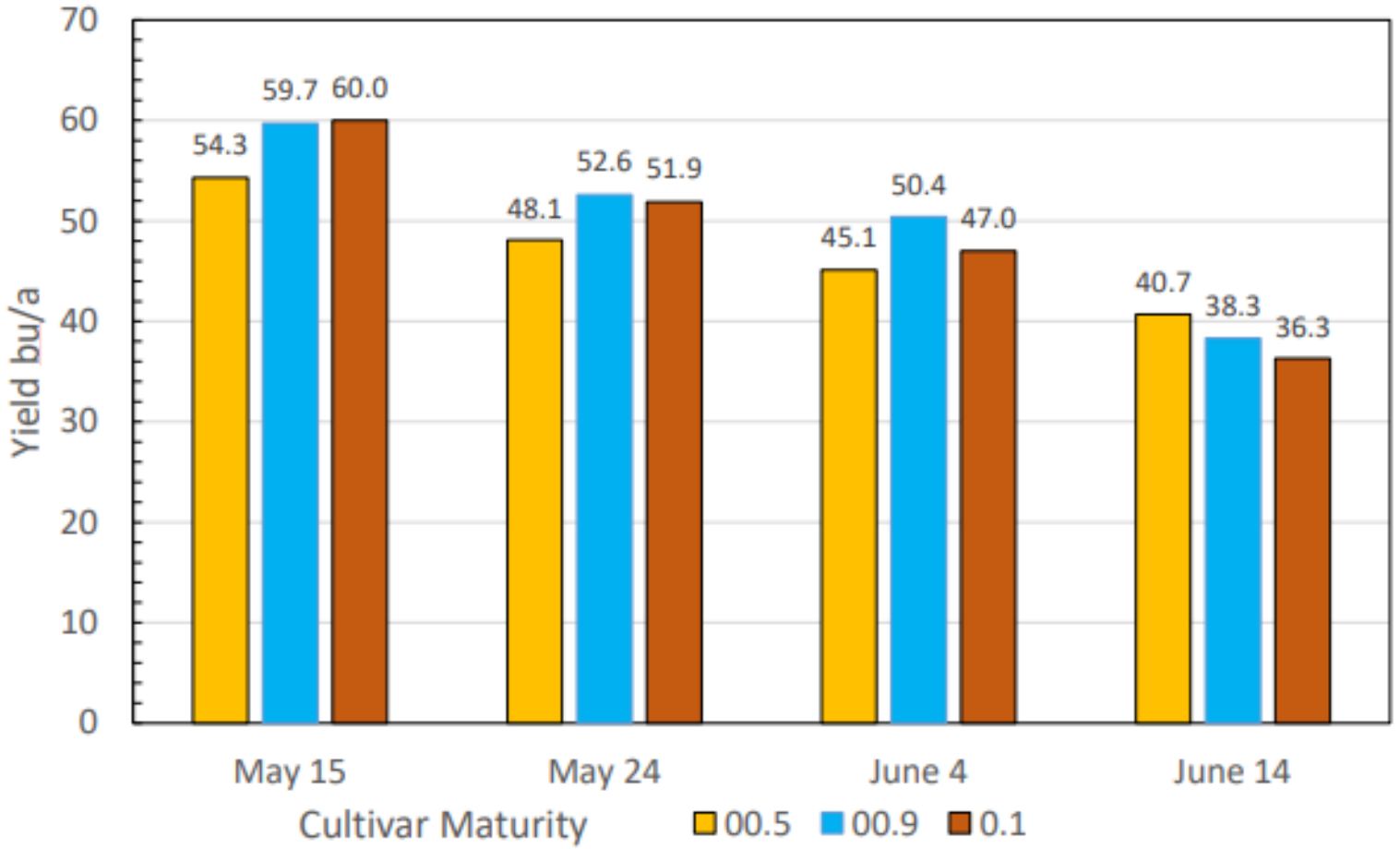
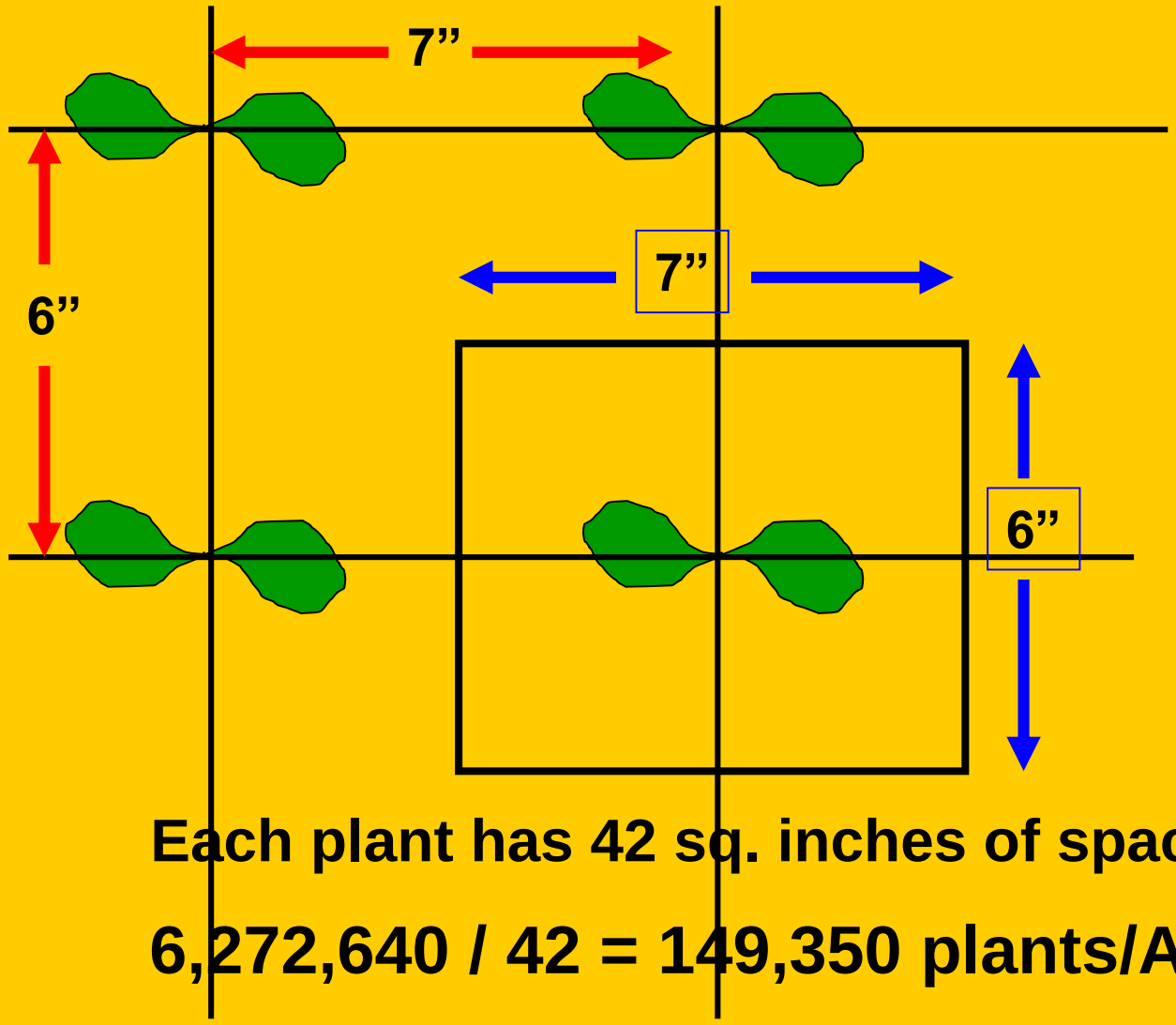
Langdon 2018 soybean trial

Figure 1. Seeding date and cultivar effect on soybean yield.



LSD 5%. Compare cultivars at same seeding date - 4.0 bu/a
Compare a cultivar at different seeding dates - 3.5 bu/a



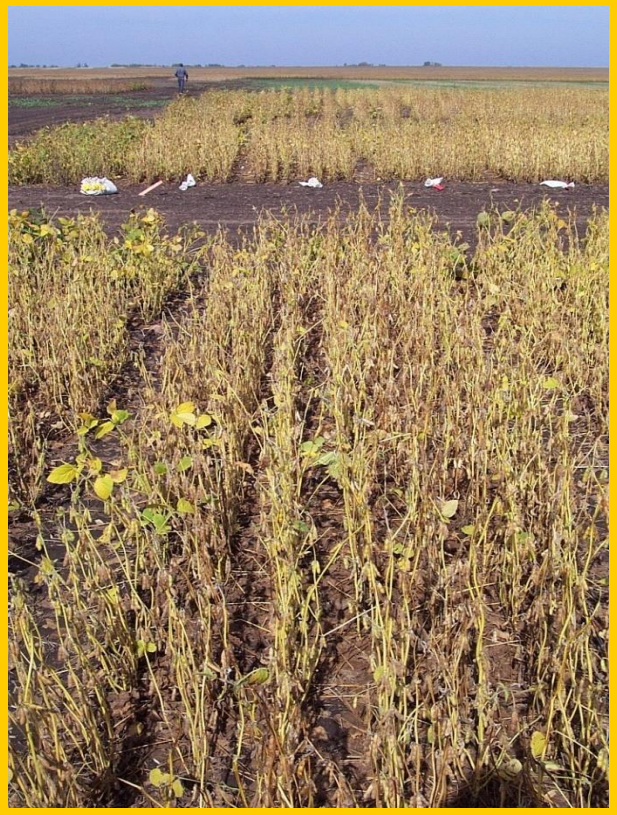
Each plant has 42 sq. inches of space:

6,272,640 / 42 = 149,350 plants/A



Row spacing x population study 7, 14 and 28 row spacing

7 inch



14 inch

28 inch

24 inch

80,000 live seeds acre^{-1}

200,000 live seeds acre^{-1}

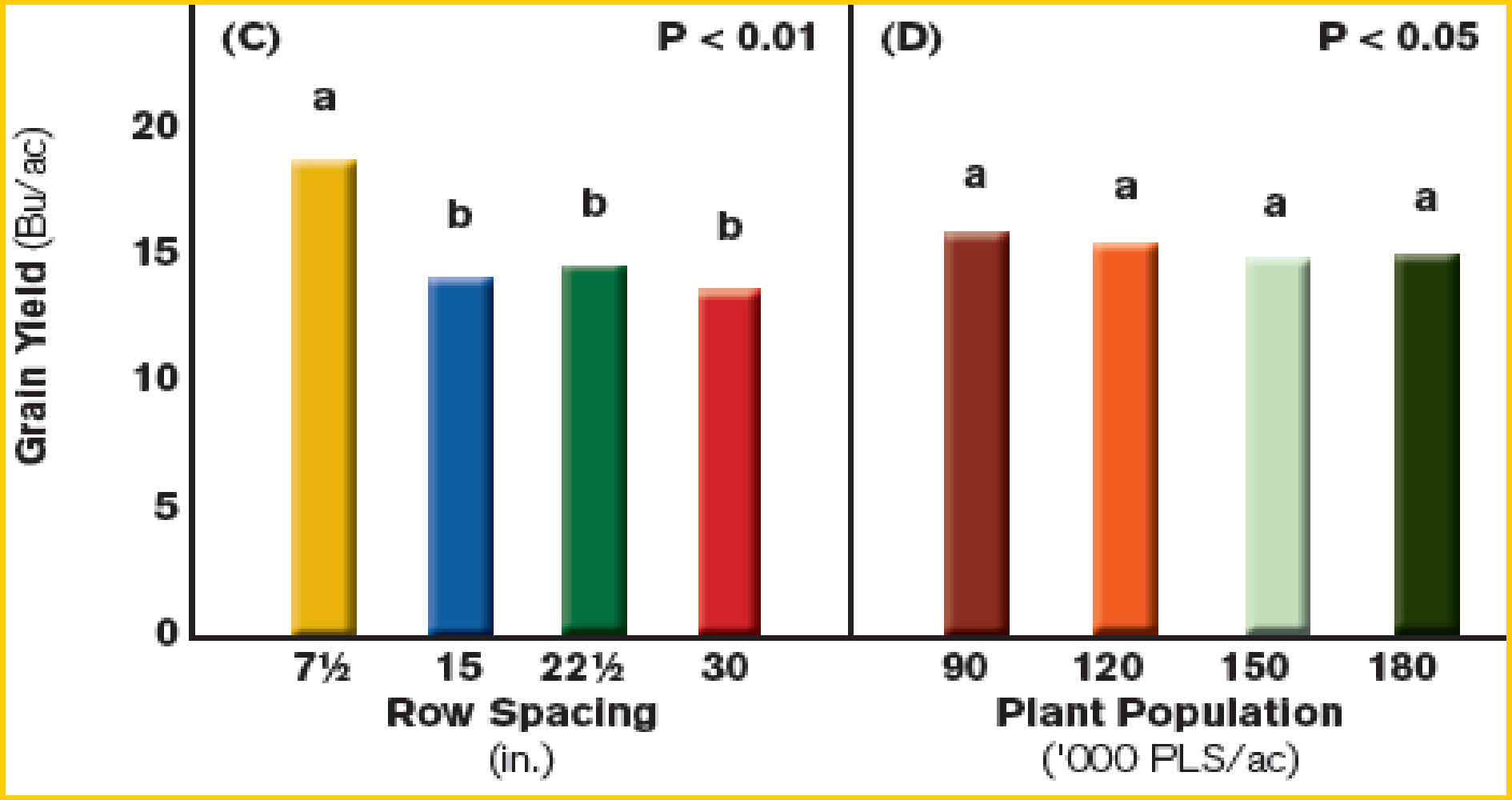
12 inch

80,000 live seeds acre^{-1}

200,000 live seeds acre^{-1}

Canopeo

Williston 0.3 RR2Y May 30, 2018



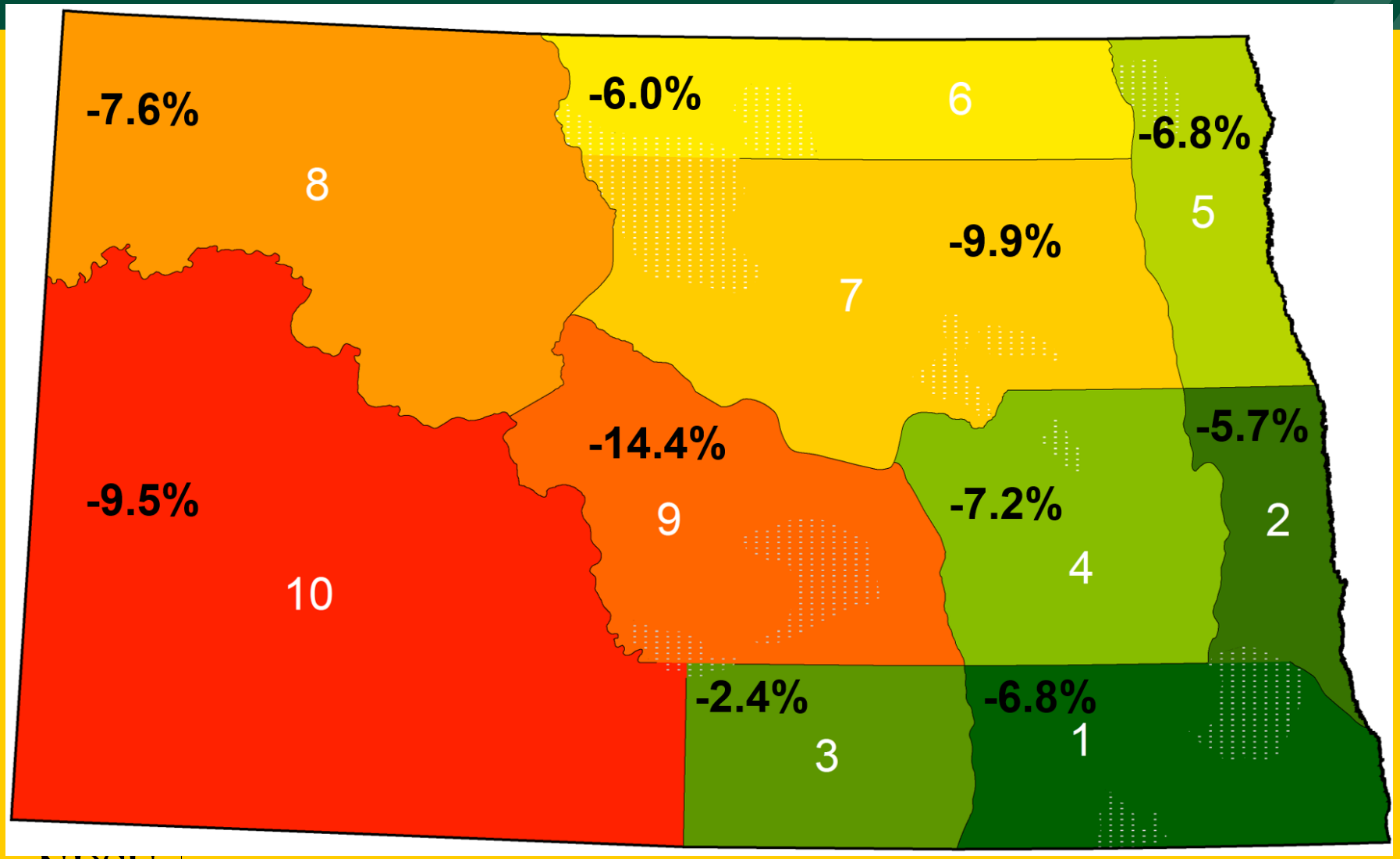
Drs. G. Pradhan, J, Bergman and J. Staricka

Plant Loss / not contributing to yield

> 200 Field Visits 2017-2018

- Survey 3 locations within field
- Try and represent field

Plant loss between V and R stages by growing region



Row Spacing and Seeding Rate 2017-2018

- Row spacing (inch)
  - 12
  - 24
- Seeding Rates (live seed acre)
  - 80 000
  - 100 000
  - 120 000
  - 140 000
  - 160 000
  - 180 600
  - 200 000

Mean agronomic trait observations for two row spacings averaged across seven seeding rates and 15 environments.

Row Spacing	Emerged	Final	Co-ver	Height	Yield	Loss
inch	plants ac^{-1}	x1000	%	inch	bu ac^{-1}	%
12	134.4b	126.4a	68a	30a	46.8a	5.6b
24	138.2a	126.6a	62a	31a	44.1b	7.6a

Mean agronomic trait observations for two row spacings averaged across seven seeding rates and 15 environments.

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24	138.2a	126.6a	62a	31a	44.1b	7.6a

Estimated soybean net revenue per acre based on row spacing and seeding rate yields averaged across 15 environments

	Market Price (USD bu^{-1})		
Row spacing	8	9	10
inch	USD $acre^{-1}$		
12	324a	371a	418a
24	294b	338b	382b

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inch	USD $acre^{-1}$		
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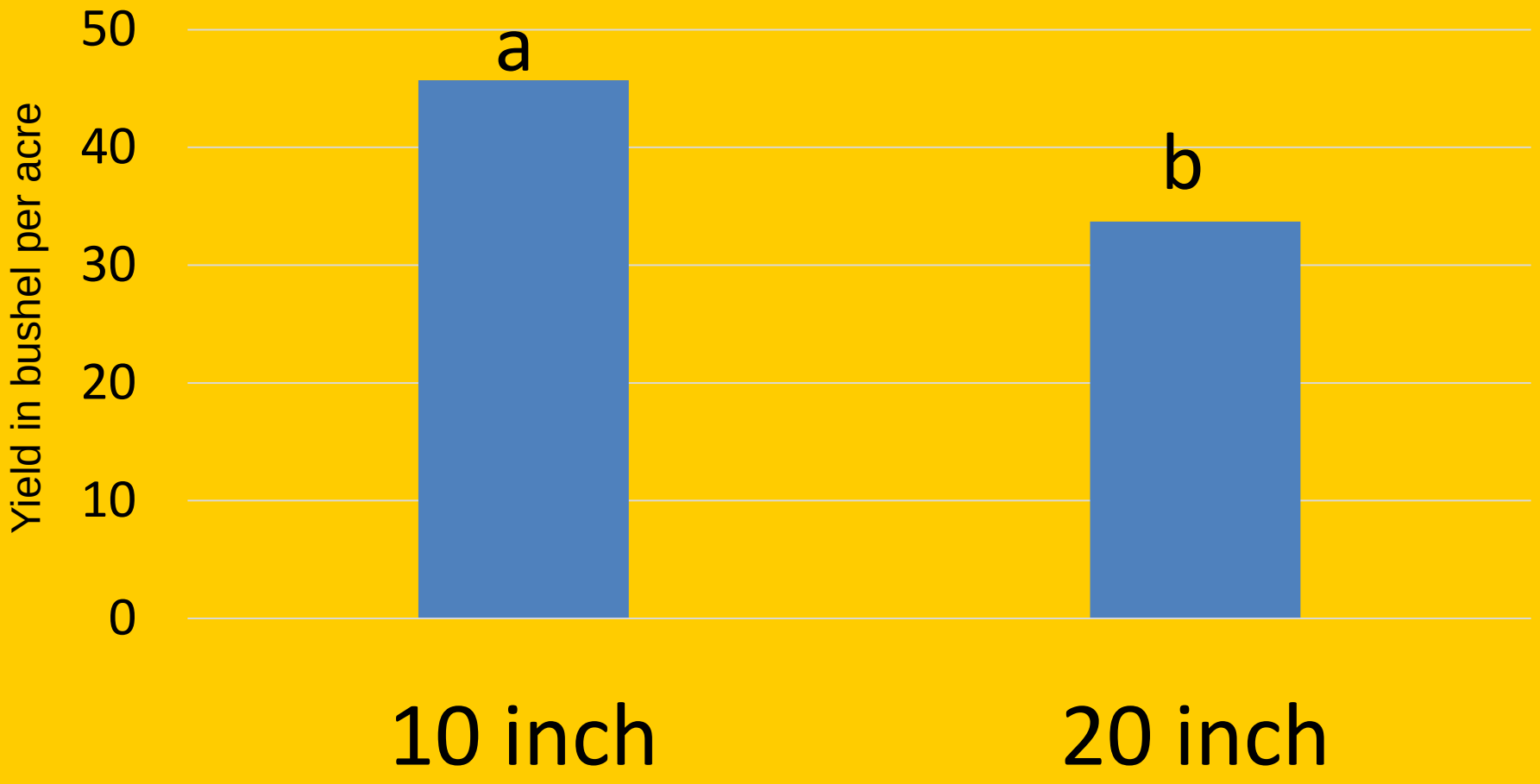
24	294b	338b	382b

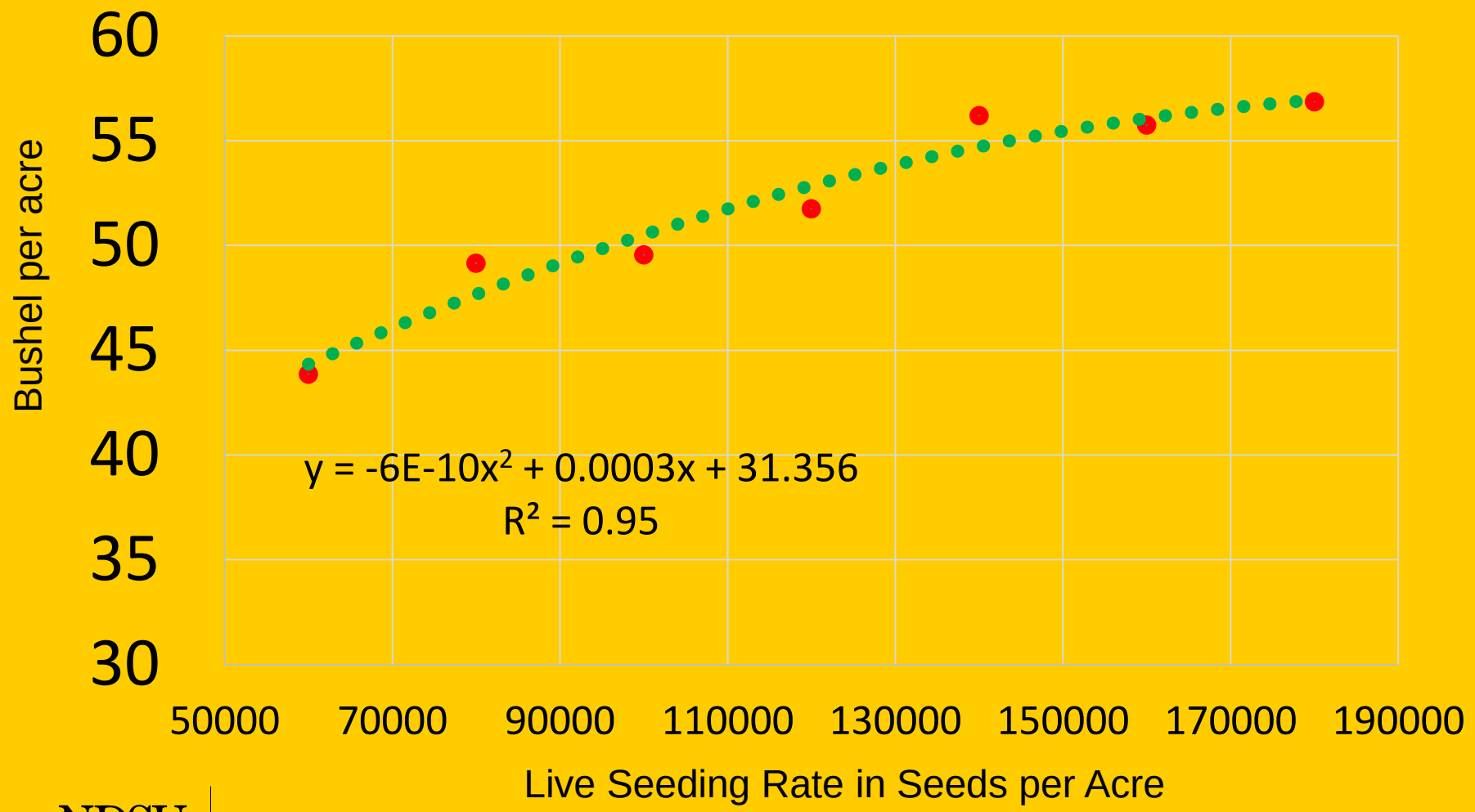
Soybean Yield and row spacing, Minot 2016



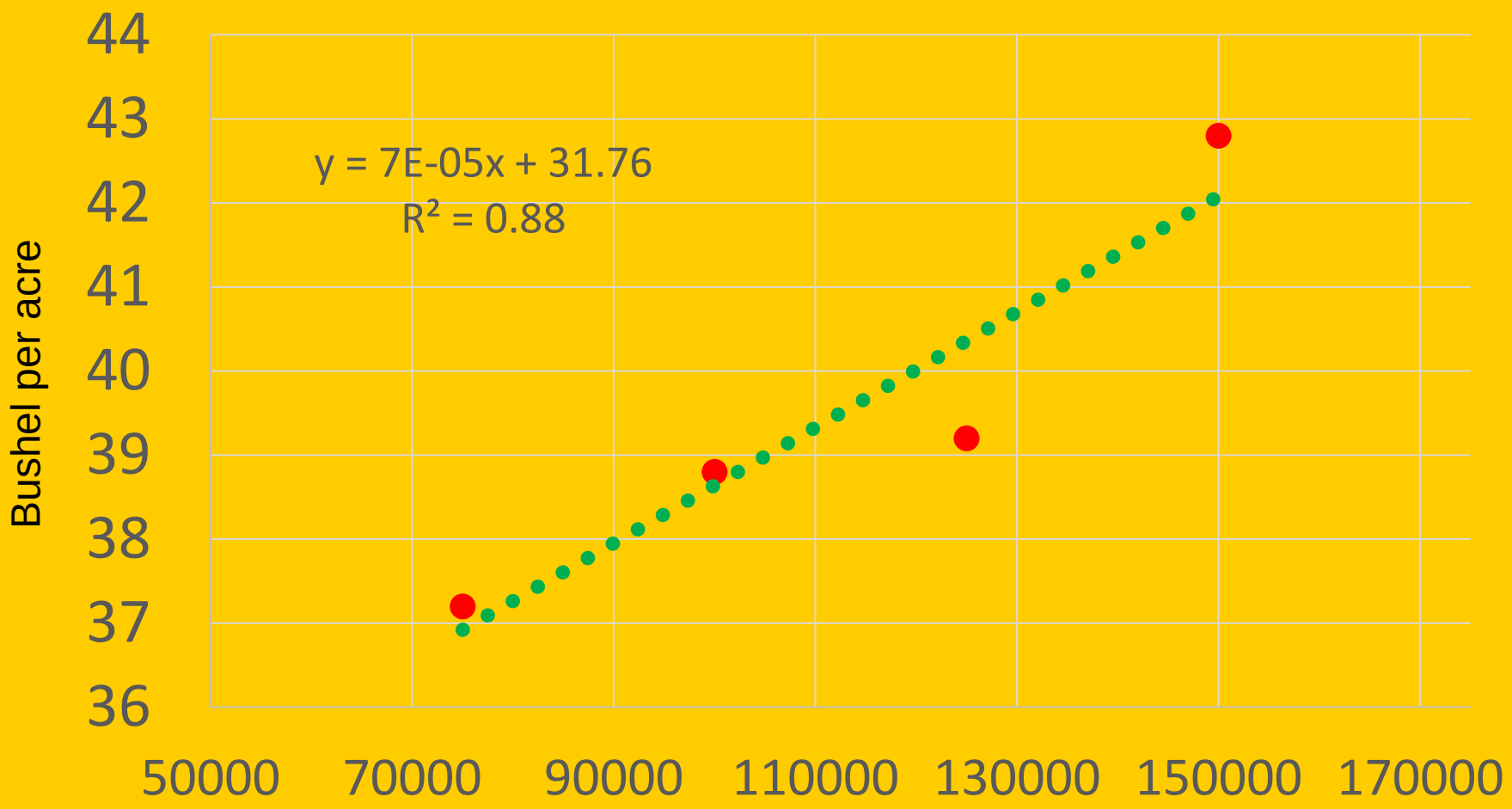
Agronomic observations averaged across seeding rate across all 15 environments

Seeding Rate	CC	Yield
live seed ac^{-1}	%	bu ac^{-1}
80 000	56	43.2c
100 000	60	44.1bc
120 000	63	44.9bc
140 000	66	45.8ab
160 000	68	45.9ab
180 000	69	47.0a
200 000	72	47.2a
Tukey's HSD (0.05)	ns	2.1

Yield for seeding rates and 12 and 30 inch Row Spacing, Casselton combined, 2019



Minot soybean yield and seeding rate, 2016



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Seeding rate

- Established stand 140,000
- Germination rate 96%
- Loss from live seed to established plant 10% (90 % will make it into a plant)

(140,000/96) * 100 is live seed = 145,900

(145,900/90) * 100 is seeding rate = 162,000

A1174 (Revised)

Soybean

Growth and Management

QUICK GUIDE

Reviewed by
Greg Endres, Area Agronomist
Hans Kandel, Agronomist
NDSU Extension Service

Growth, development and yield of soybeans are a result of a variety's genetic potential interacting with environmental and farming practices. Correct production decisions using plant growth staging and timing are important for successful soybean production. Minimizing environmental stress will optimize seed yield.

Farmers who understand how a soybean plant grows and develops can establish their field practices to maximize the genetic potential of the varieties grown. Management practices that may influence crop growth include seedbed preparation, variety selection, planting rate, planting depth, row width, pest management (diseases, insects and weeds), fertilization and harvesting.

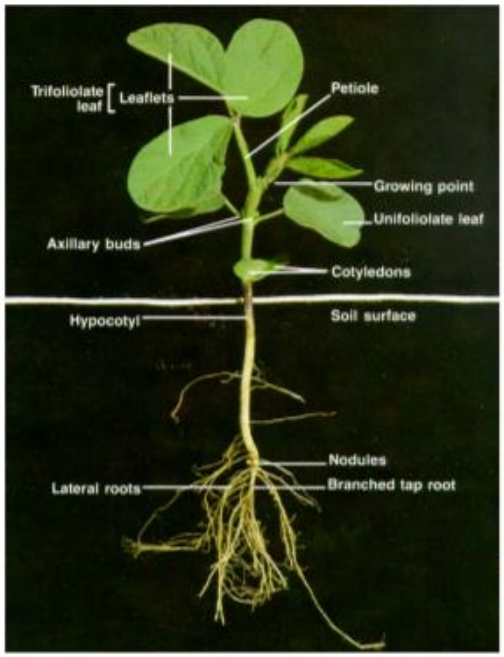


Figure 1. Soybean plant.

NDSU EXTENSION SERVICE
North Dakota State University
Fargo, North Dakota
MAY 2015

Internet search:
'NDSU A1174'

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

A Visual Guide to Soybean Growth Stages

Understanding and being able to correctly identify the growth stages of soybean is important for making sound agronomic management decisions. This guide describes the growth stages starting with germination, progressing through the vegetative stages (V) and concluding with the reproductive stages (R). Coolbeans!

Germination

Germination begins with the seed absorbing 50% of its weight in water, this is called imbibition

- Imbibition is dependent on soil temperature (optimum 60-70°F) and soil moisture (optimum 50%)
- Imbibition requires good seed-to-soil contact
- The radicle (or primary root) grows from the swollen seed and elongates downward
- The hypocotyl begins elongation upward toward the soil surface, pulling the cotyledons along

VE

Vegetative Stage Emergence

Cotyledons above the soil surface

VE stage occurs approximately 5-14 days after planting depending upon the soil

http://www.coolbean.info/library/documents/2017_Soybean_GrowthDev_Guide_FINAL.pdf

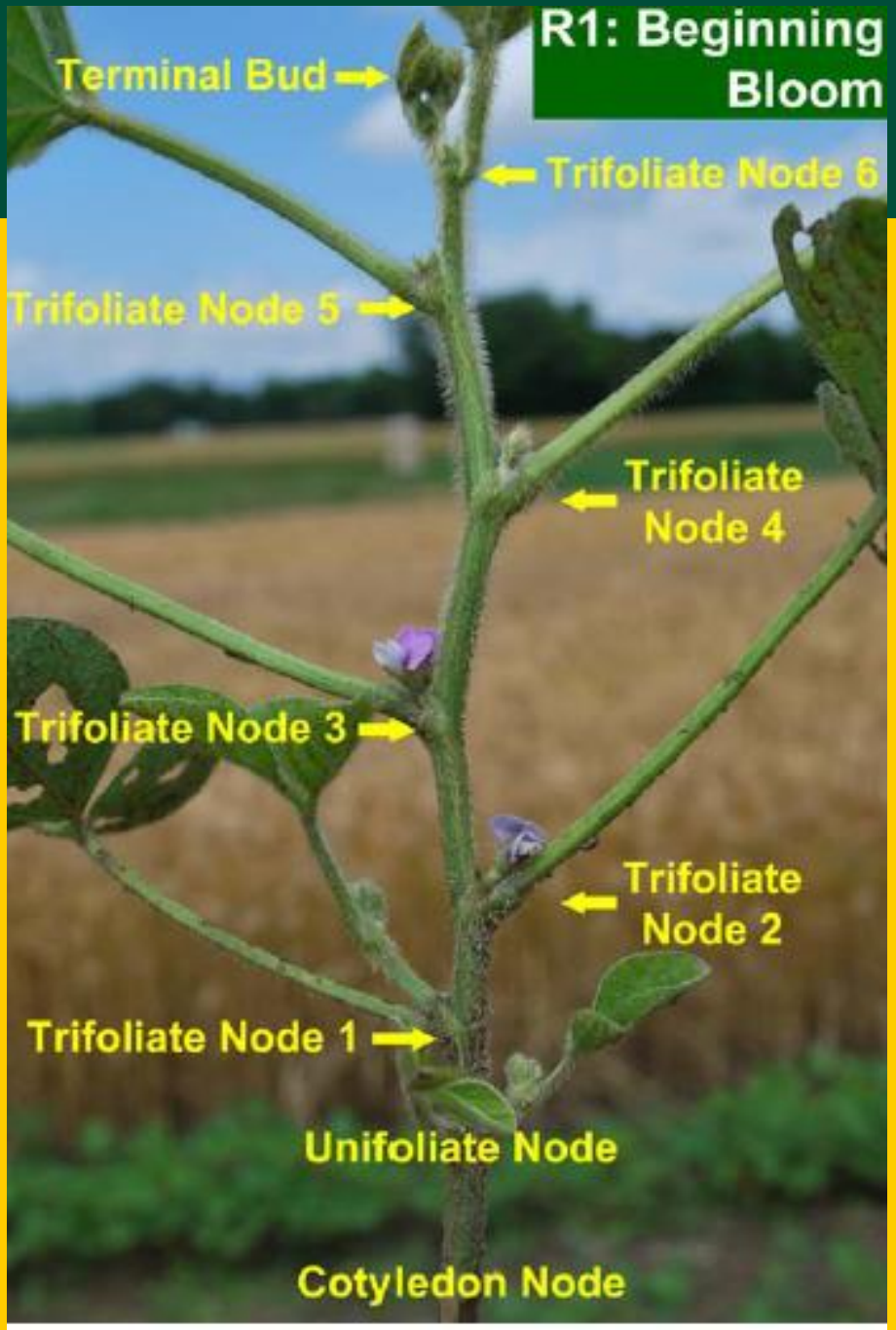
Soybean Growth Stages

Vegetative

- VE (plant emergence)
- VC (cotyledon stage)
- V1 (first trifoliate)
- V2 (second trifoliate)
- V3 (third trifoliate)
- V(n) (nth trifoliate)

Reproductive

- R1 (beginning bloom)
- R2 (full bloom)
- R3 (beginning pod)
- R4 (full pod)
- R5 (seed filling)
- R6 (full size seed)
- R7 (beginning maturity)
- R8 (full maturity)



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R2


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R3

Days for soybean plant development, Carrington

RM*	VE (emergence)	V1 (1st trif leaf)	R1 (first flower)	R3 (first pod)	R5 (first seed)	R7 (initial PM)	R8 (full PM)
	Days from planting**						
0.0	18	31	52	68	78	112	118
0.4 to 0.5	18	30	54	70	81	119	124
Average	18	31	54	70	81	117	123

*0.0 = Walsh in 2004 and RG200RR in 2005-07; 0.4 = RG604RR, O.5 = RG405RR.

**planting dates: 2004=May 10; 2005=May 17; 2006=May 16; 2007=May 17.

Yield of soybean with and without fungicide seed treatment, ND 2014-2016 survey

Seed treatment	2014	2015	2016
	----------Bushel per acre--------		
No seed treatment	39.6	40.4	39.7

Yield of soybean with and without fungicide seed treatment, ND 2014-2016 survey

Seed treatment	2014	2015	2016
	----------Bushel per acre--------		
No seed treatment	39.6	40.4	39.7
Seed treatment	41.1	40.6	40.9

Yield of soybean with and without fungicide seed treatment, ND 2014-2016 survey

Seed treatment	2014	2015	2016
	----------Bushel per acre--------		
No Seed Trt	39.6	40.4	39.7
Seed treatment	41.1	40.6	40.9
Increase with seed treatment	**3.7%**	**0.5%**	**3.0%**

Growing Degree Model for Soybean

RM†	RM code		RM	RM code
00.4	4		0.5	15
00.5	5		0.6	16
00.6	6		0.7	17
00.7	7		0.8	18
00.8	8		0.9	19
00.9	9		1.0	20
0.0	10		1.1	21
0.1	11		1.2	22
0.2	12		1.3	23
0.3	13		1.4	24
0.4	14		1.5	25

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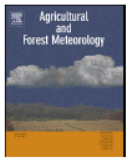

Developing a growing degree day model for North Dakota and Northern Minnesota soybean

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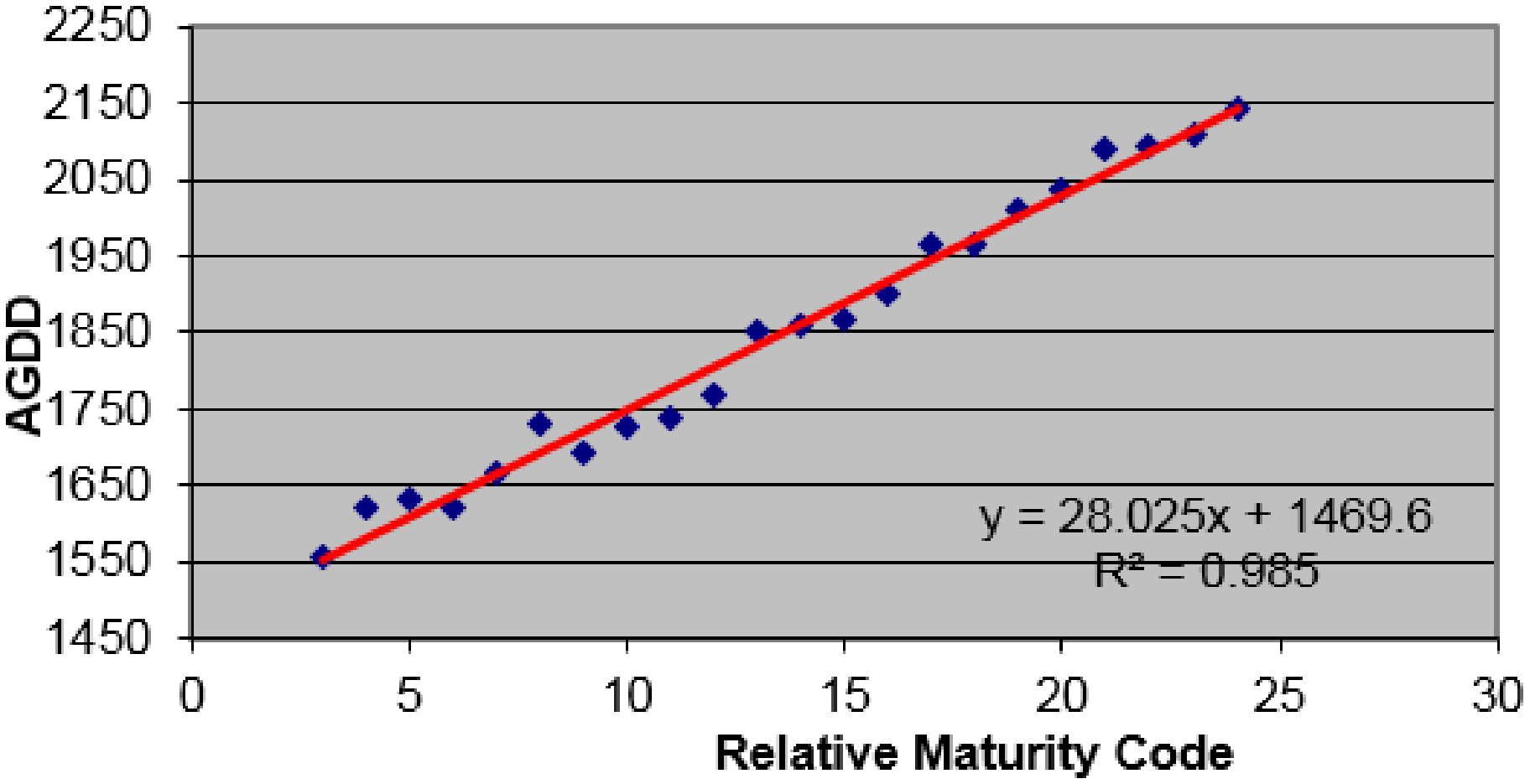
ABSTRACT

Farmers in North Dakota and Northern Minnesota did not have a model to predict when their soybean (*Glycine max* L. Merr.) crop will be mature. Soybean plants need to be mature before the first fall freeze. The objectives of this study were to estimate needed accumulated growing degree days (AGDD) for adapted soybean maturity groups (MG) to reach maturity (R8). Research was conducted during 2007–2012 at

Average Accumulated Growing Degree Days for Langdon, Carrington, Central, and Southern sites, averaged across years (2007-2012)



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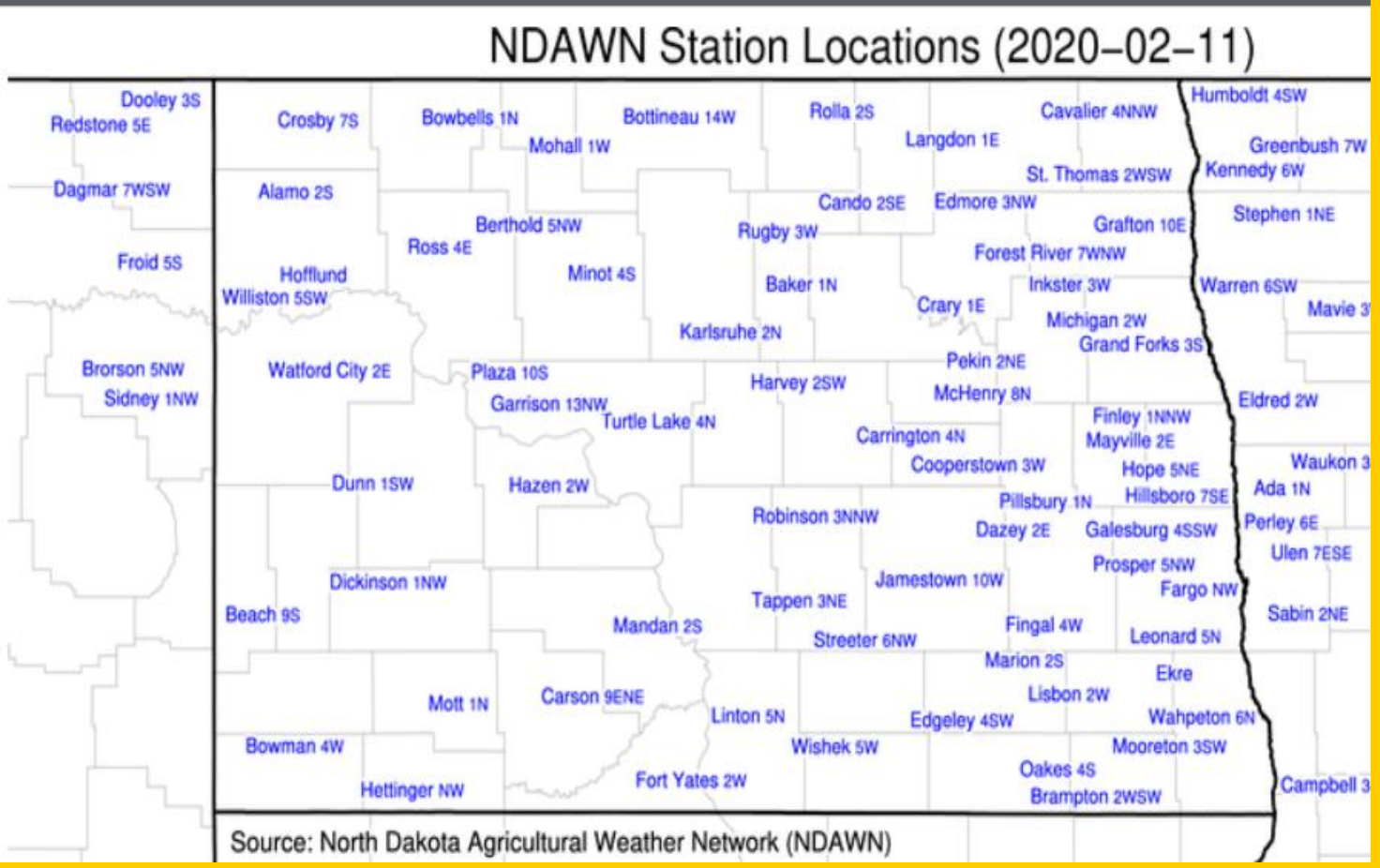

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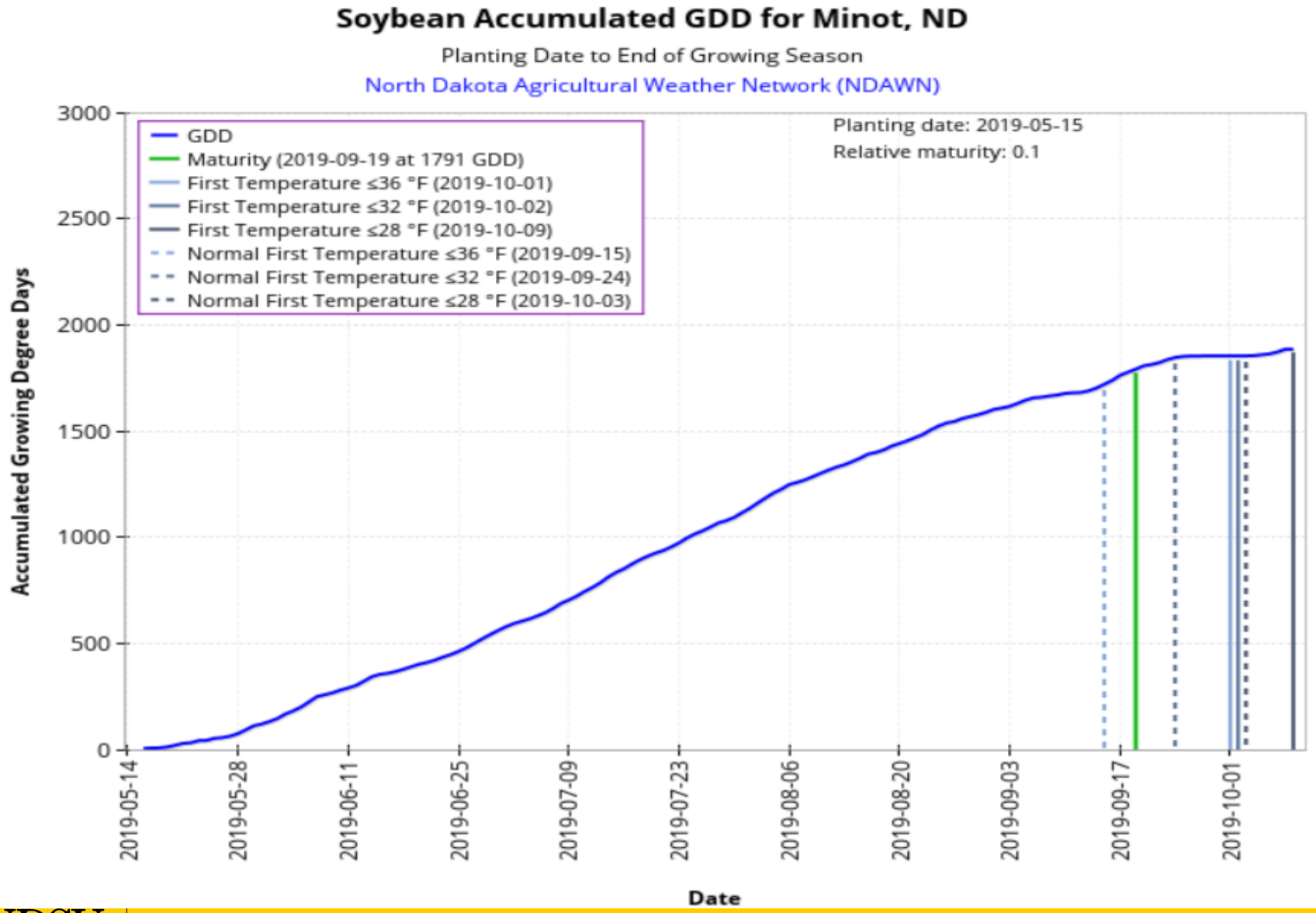
Soybean Growing Degree Days

Get information about soybean growing degree days



Interseeded Cereal Rye

September 29th 2017

October 31St 2017

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USDA NIFA

United States Department of Agriculture
National Institute of Food and Agriculture

Interseeded Camelina vs Cereal Rye

Camelina

October 31st 2017

Rye

October 31St 2017

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United States Department of Agriculture
National Institute of Food and Agriculture

Camelina spring 2017

Rye fall 2016 and spring 2017

NDSU | EXTENSION

2016

2017

USDA NIFA
United States Department of Agriculture
National Institute of Food and Agriculture

Spring 2017, Fargo ND

Cover crop	Spring soil cover		Biomass
	In percent		Pounds per acre
Camelina (Joelle)	6	b	130
Rye (Rymin)	27	a	478
Check	0	c	0

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