

Optimizing Soybean Planting Decisions for Max Yield/Profit

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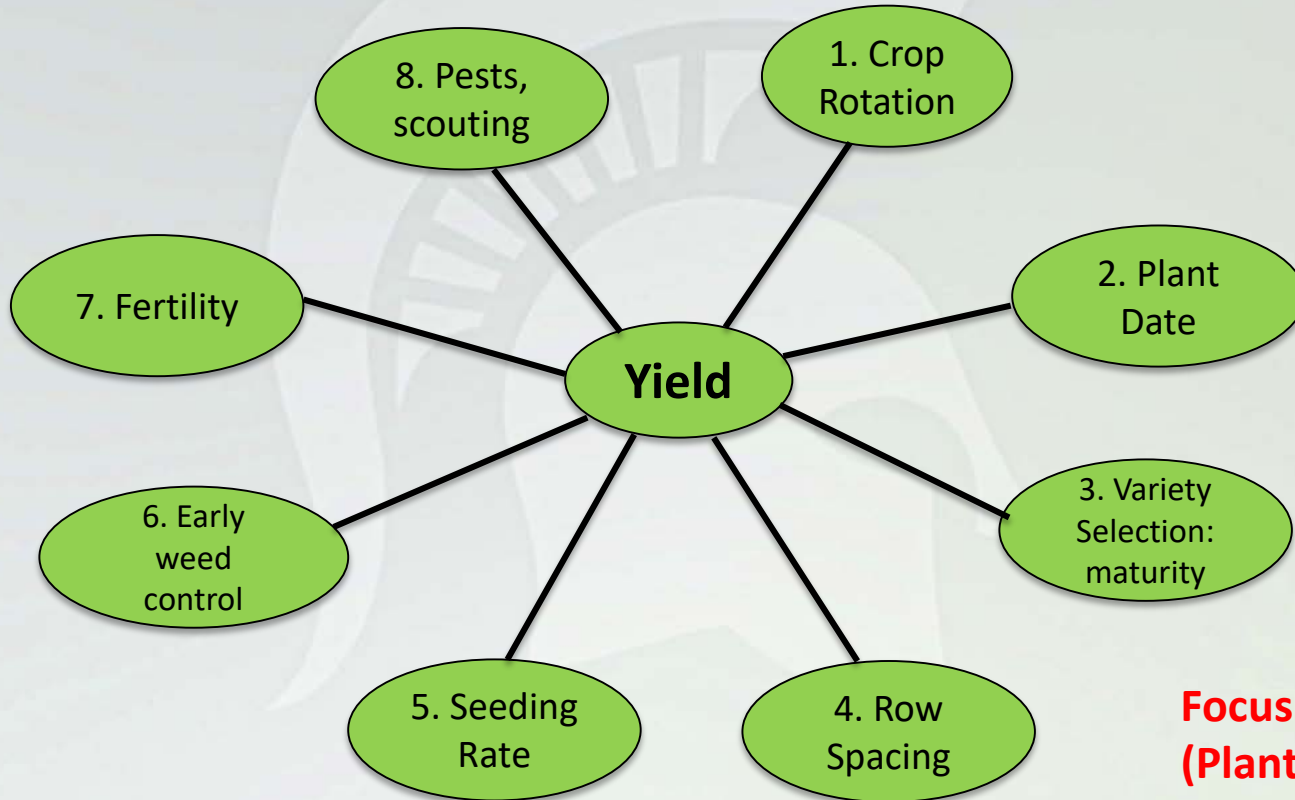
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Feb 2, 2021, Virtual Extension Meeting



Managing Soybean for higher Yield/Profit

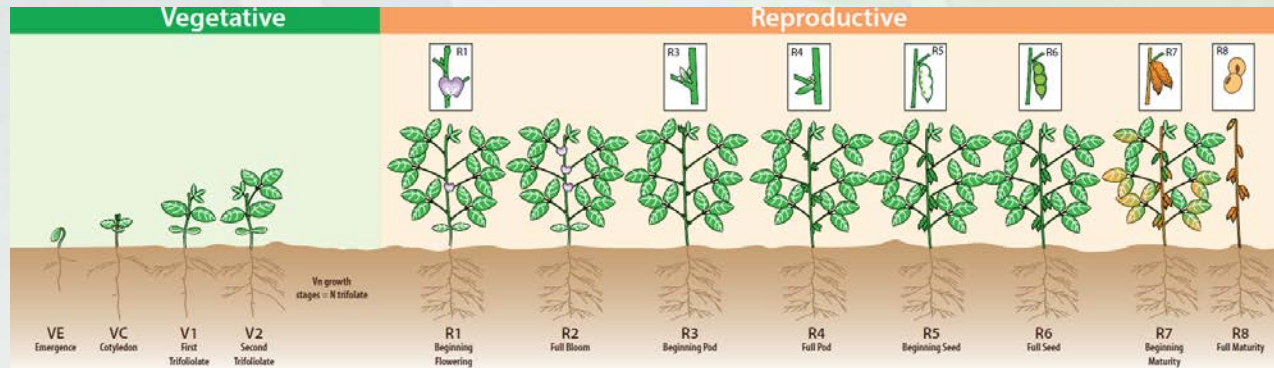


**Focus today on #2-5
(Planting decisions)**

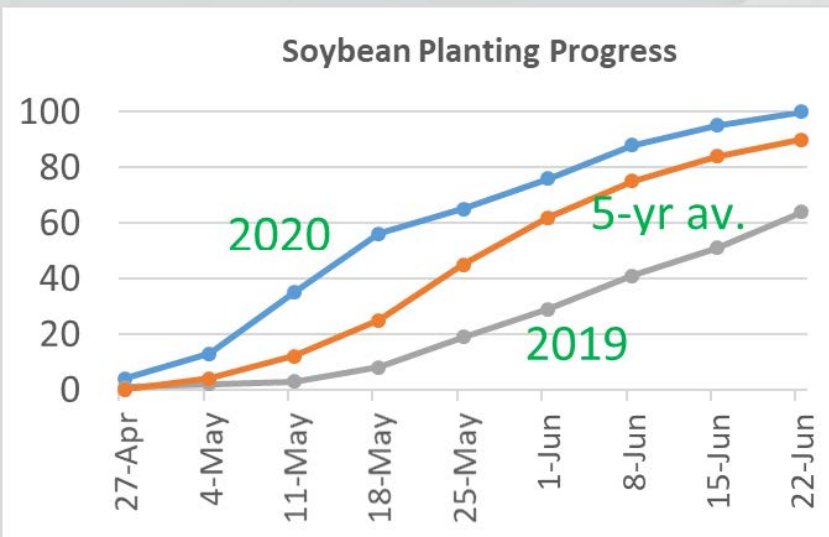
Soybean Yield Components

- Establish uniform plant stand (plants/acre)
 - Set and retain more pods (pods/plant)
 - Increase number of seeds/pod
 - Maximize seed weight (seeds/lb)
- } **Seeds/acre**
- Seed weight**

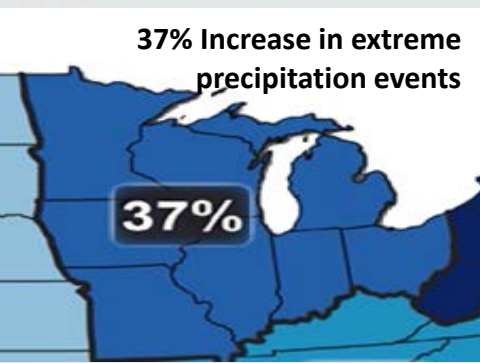
What can be done to **POSITIVELY** influence these yield components and **minimize Yield Limiting Factors**



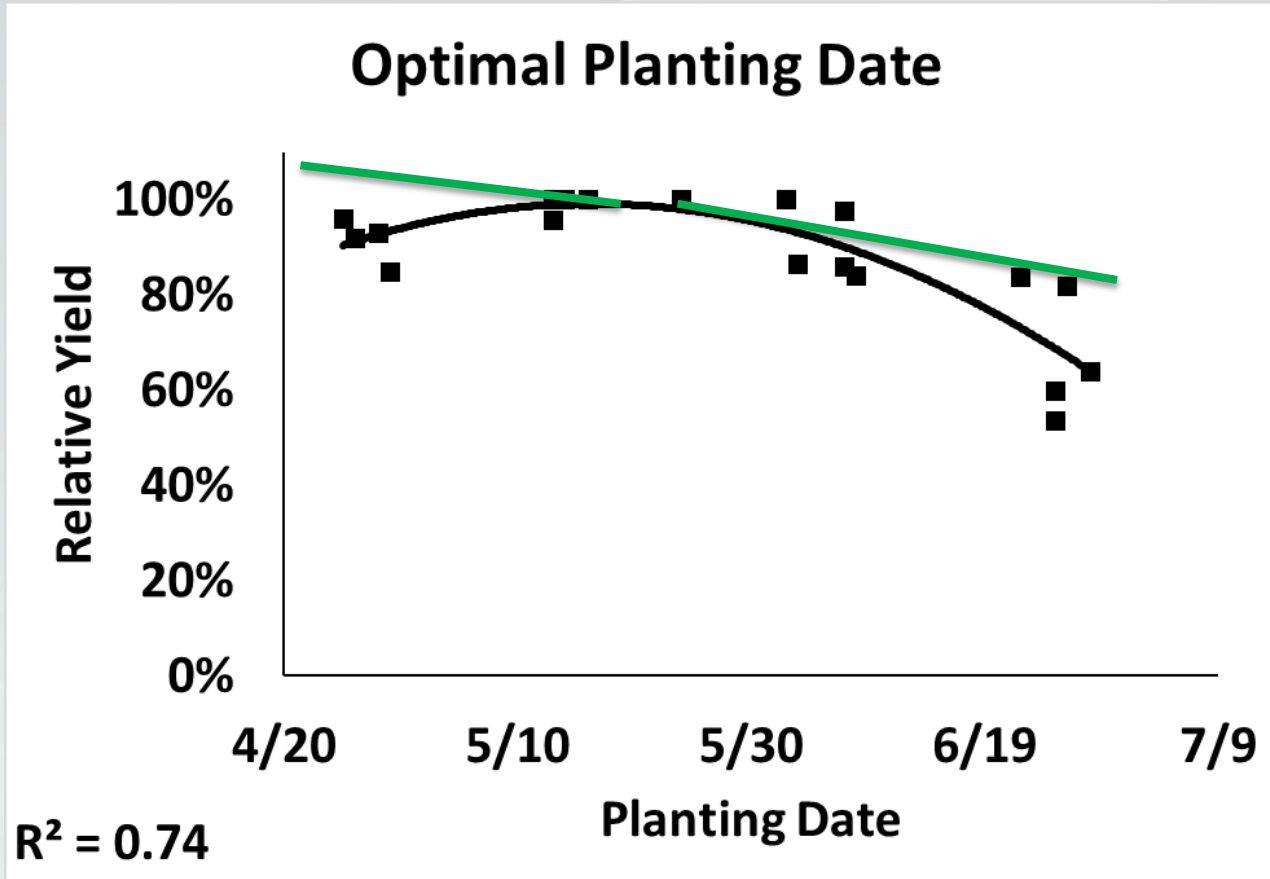
Recent planting seasons...



- Variability in planting window
- Extreme weather events- lead to poor field planting conditions
- Need to adjust agronomic practices based on planting time?
- **Optimal management strategies** to best utilize the relatively-short growing season for max yield/profit



Soybean Planting Date (2018-20 data)



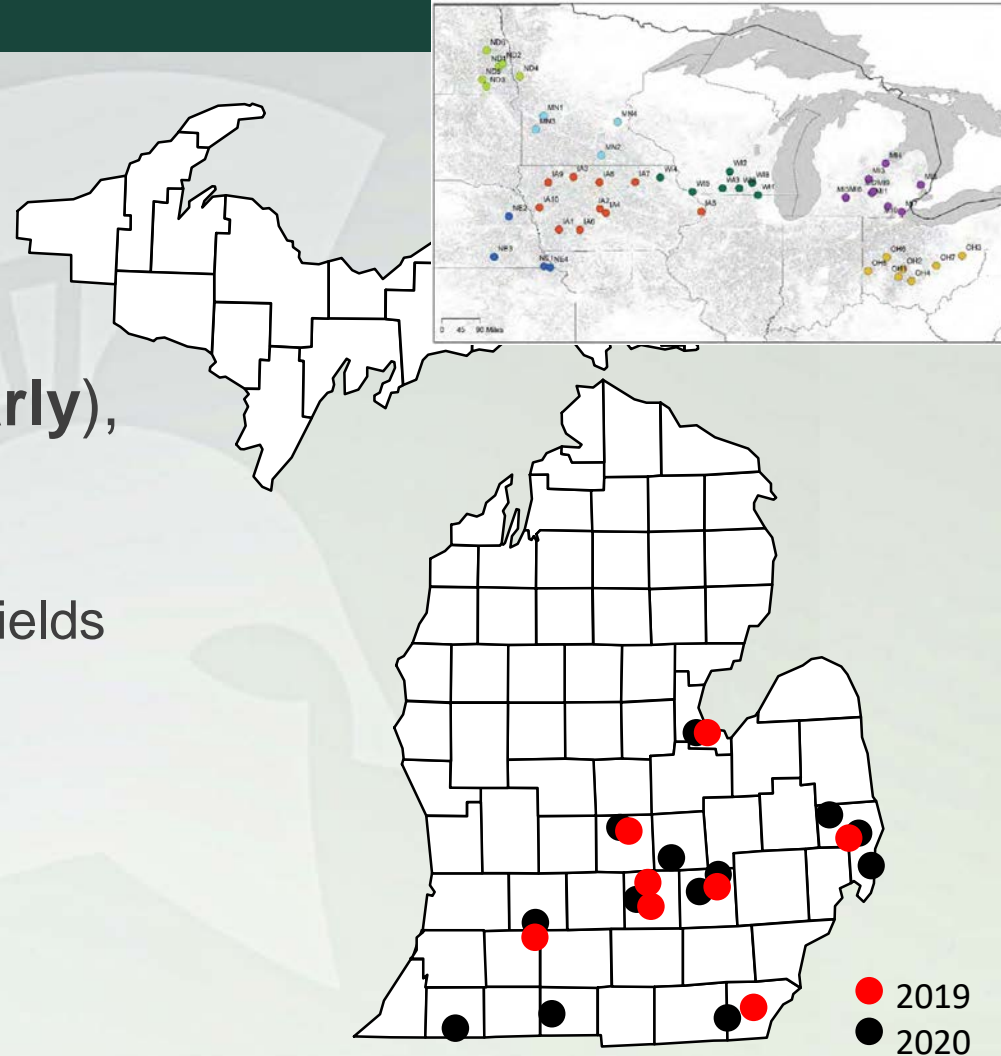
How to
Improve Yield
Potential

OR Minimize
Input Cost

Increased Profit

On-farm Soybean Trials

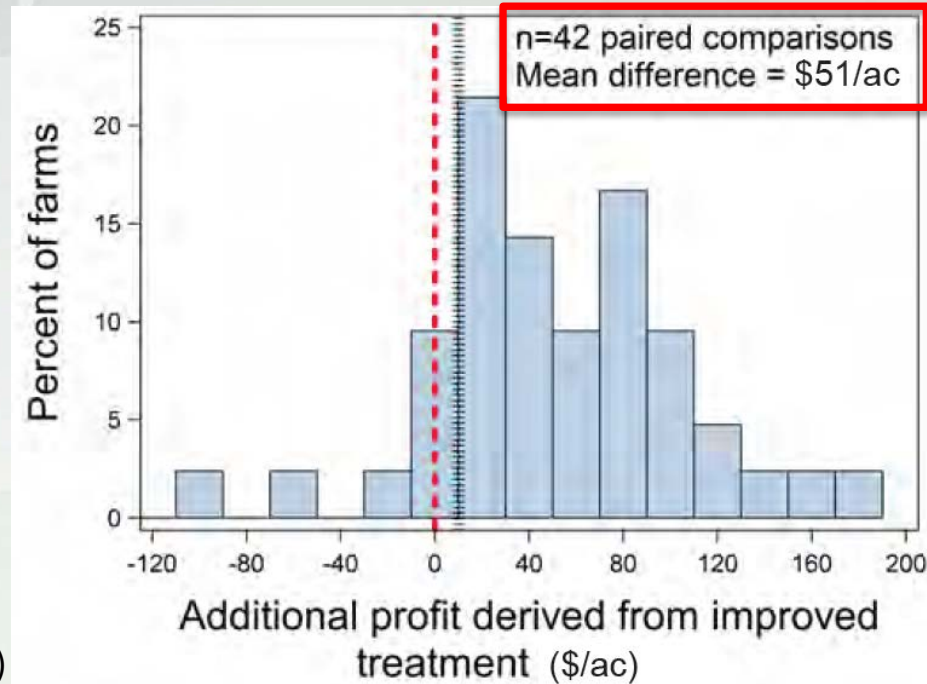
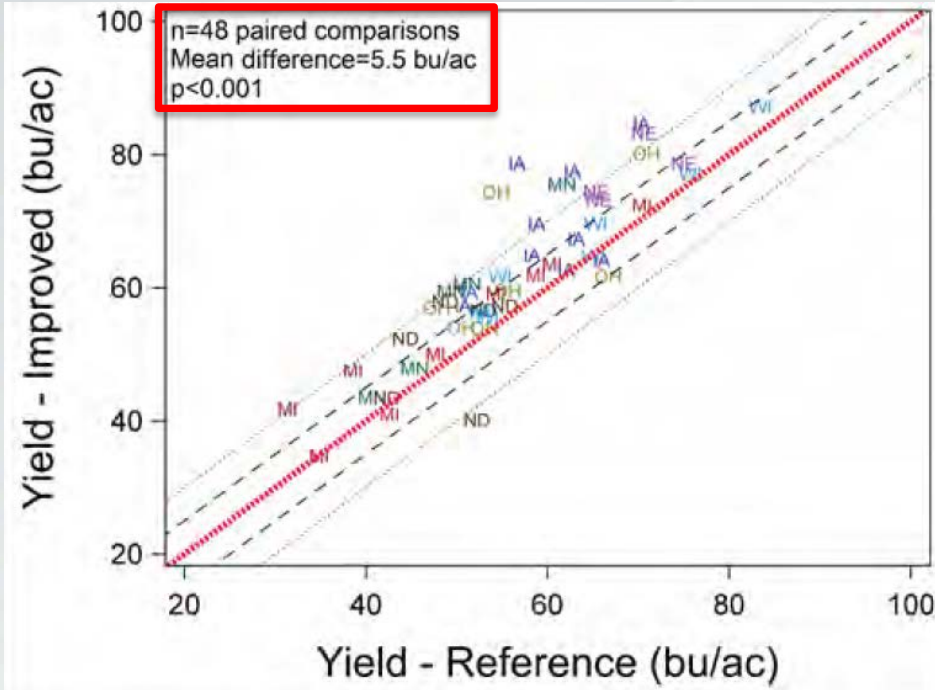
- Conducted in 2019, 2020
- 2 plant dates (**Optimal vs Early**), ~3 weeks apart, in strips
- Fungicide/insecticide at R3 in few fields in 2019 in early planting
- Yield from each strip
- Seed quality samples





Yield and Profit- 2019

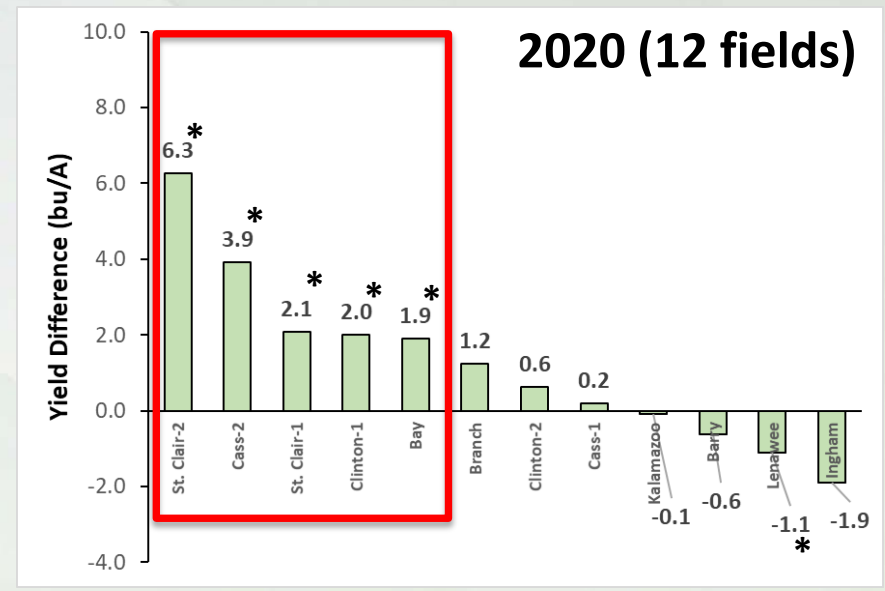
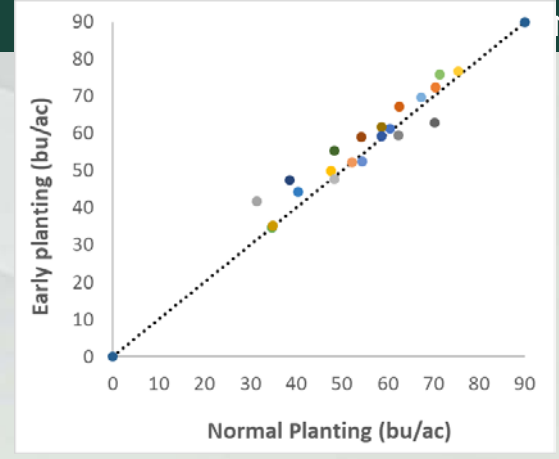
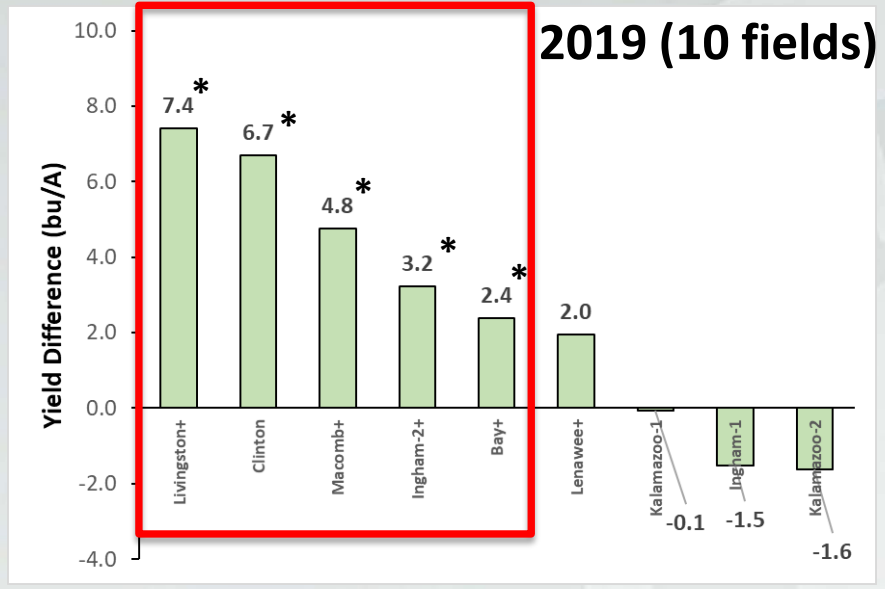
- ▶ Soybean price: \$9/bu
- ▶ Treated seed cost: \$60/140k seeds
- ▶ Non-treated seed cost: \$54/140k seeds
- ▶ Foliar insecticide (product only) = \$3/ac
- ▶ Foliar fungicide (product only) = \$10/ac
- ▶ Foliar fungicide and/or insecticide application (excluding product cost)=\$6.50/ac



Reference is Normal planting

Improved is Early Planting (+ fung./insect. spray in few fields)

Michigan Data



Yield diff. = Early planting- Normal planting
 * Denotes significant differences at P < 0.10

+ denotes fung./insect. spray at R3 in early planting in 2019

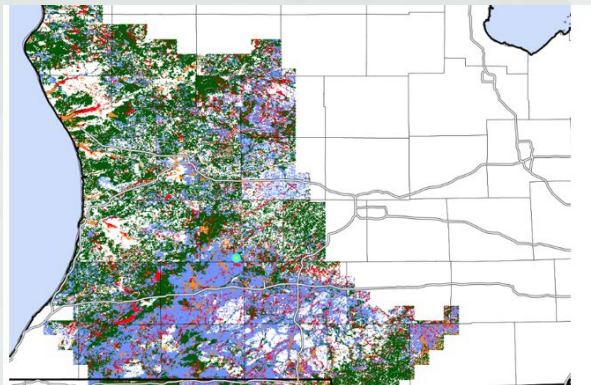
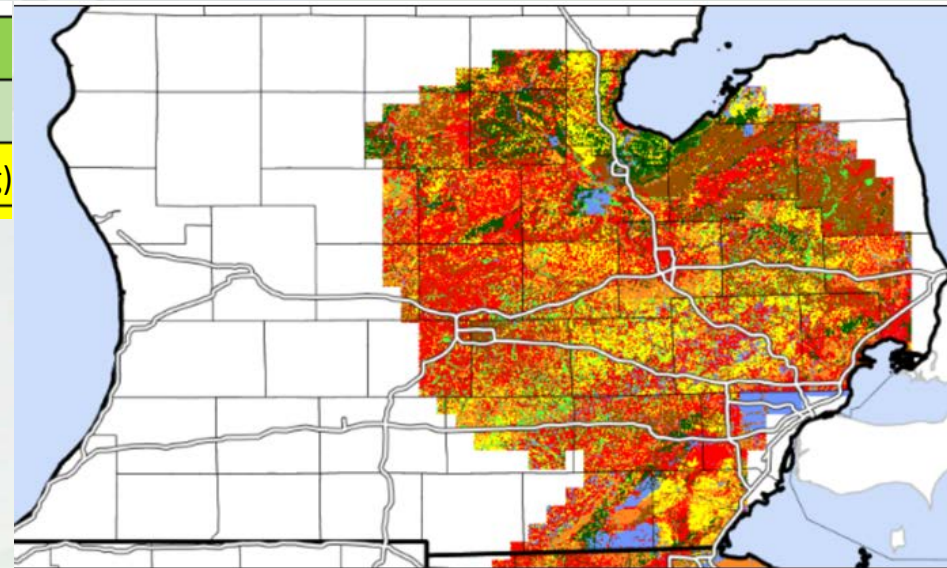
On-farm Plant date study (2021 trials- 3rd year)

Let us know if interested in hosting this trial on your farm in 2021

T3- Early Planting + Foliar

T2- Early planting

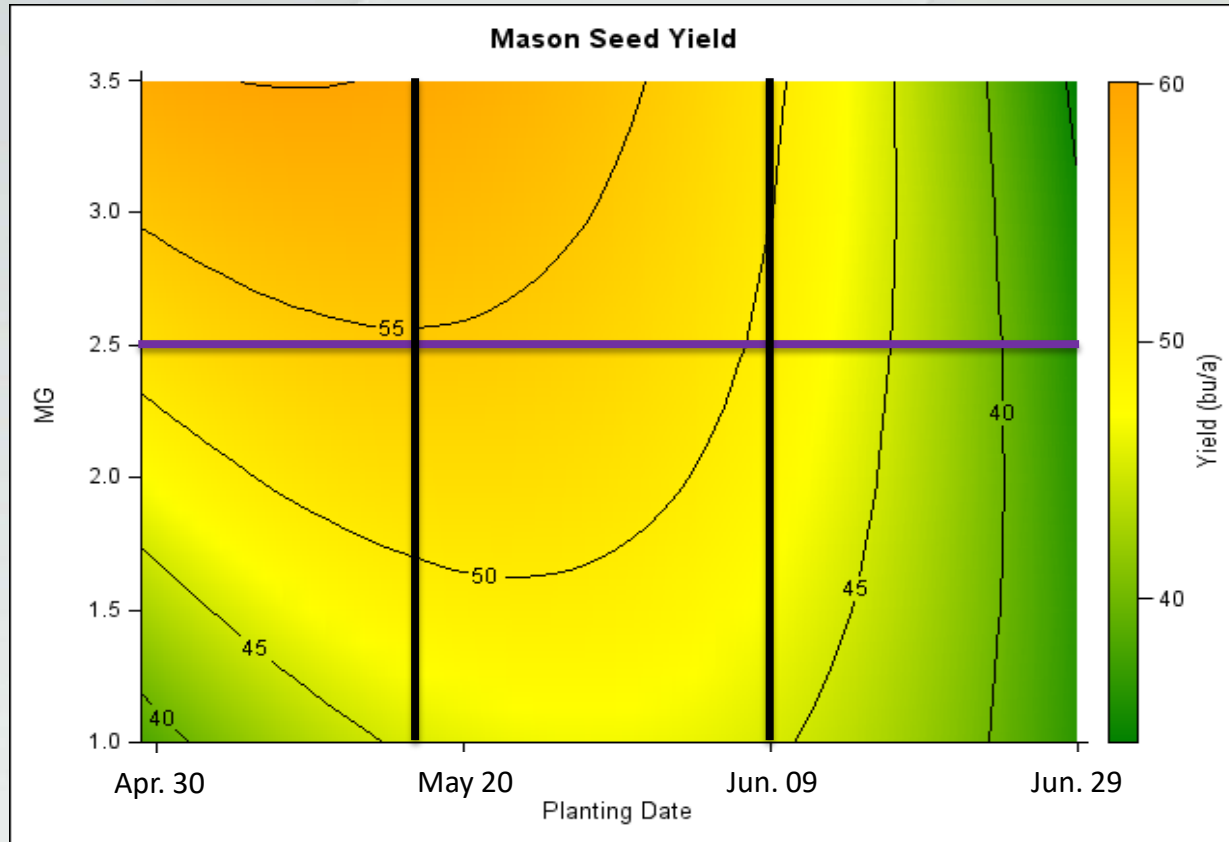
T1- Control (mid-May planting)



T2- Early planting

T1- Control:mid-May

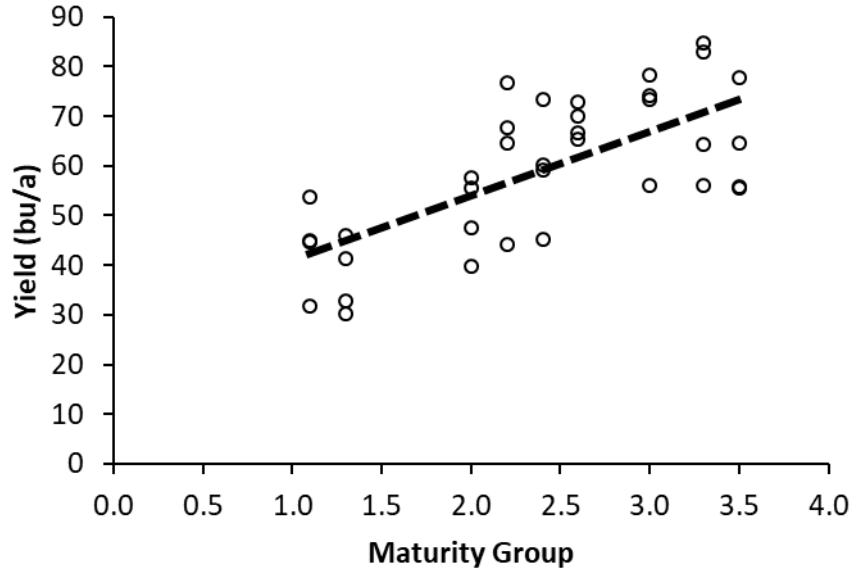
Soybean Variety Maturity Selection



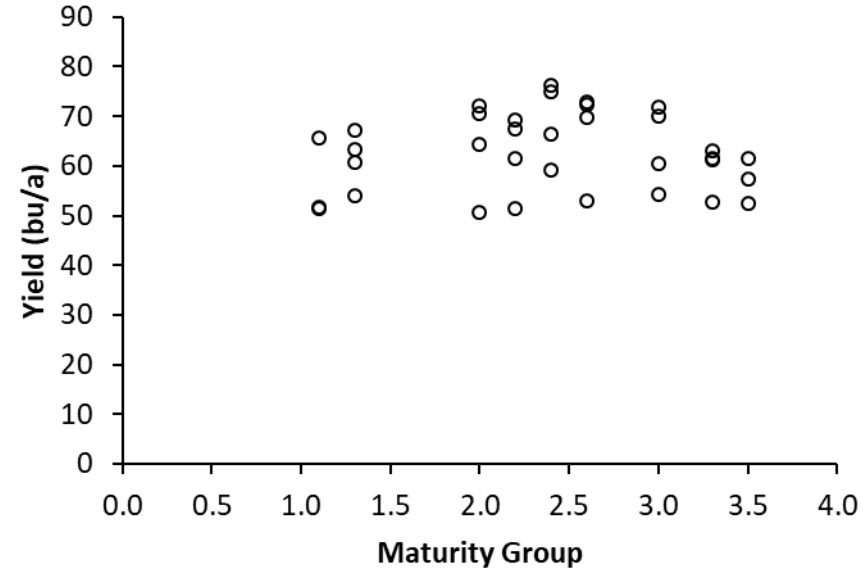
2020 Results

Mid-May PD

$R^2 = 0.48$

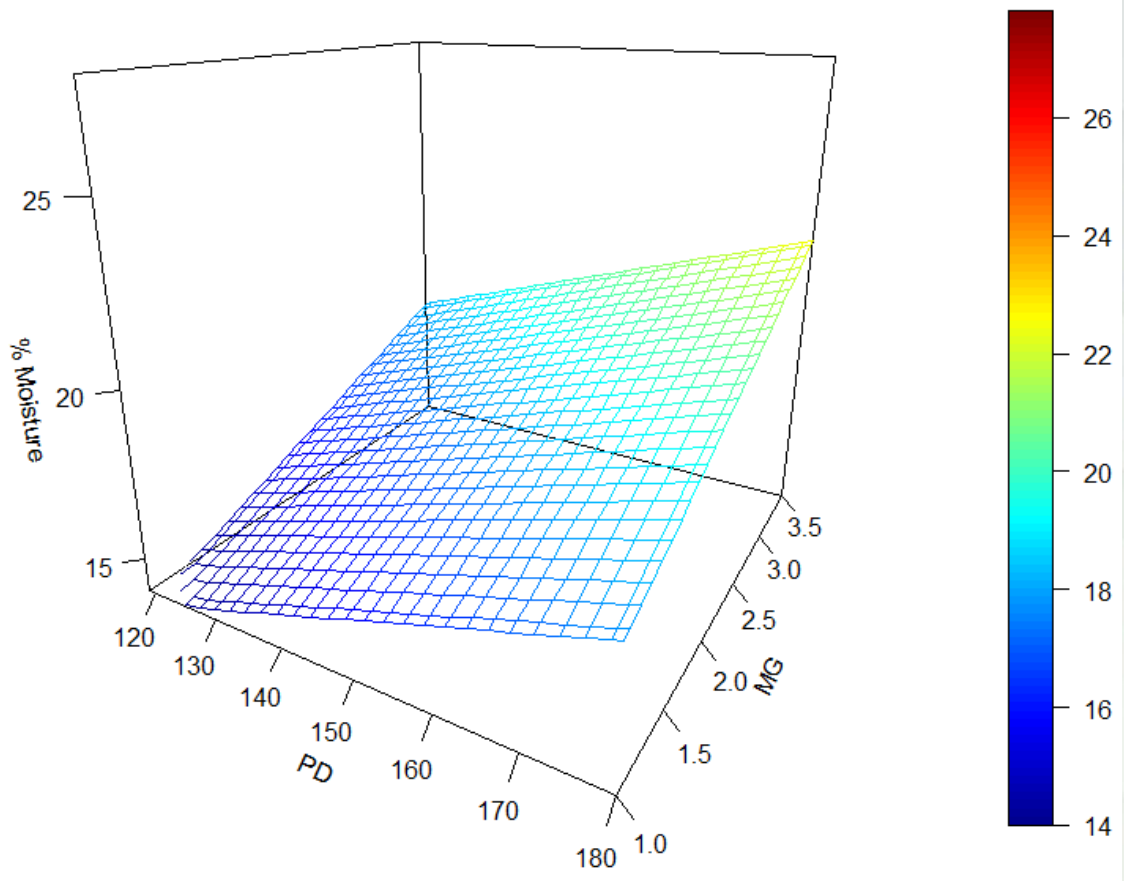


Mid-June PD



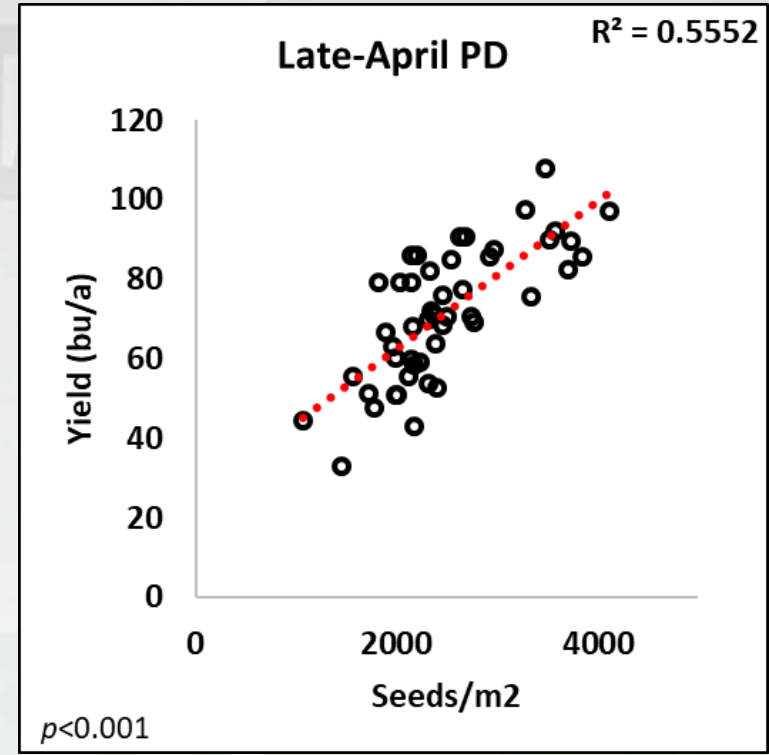
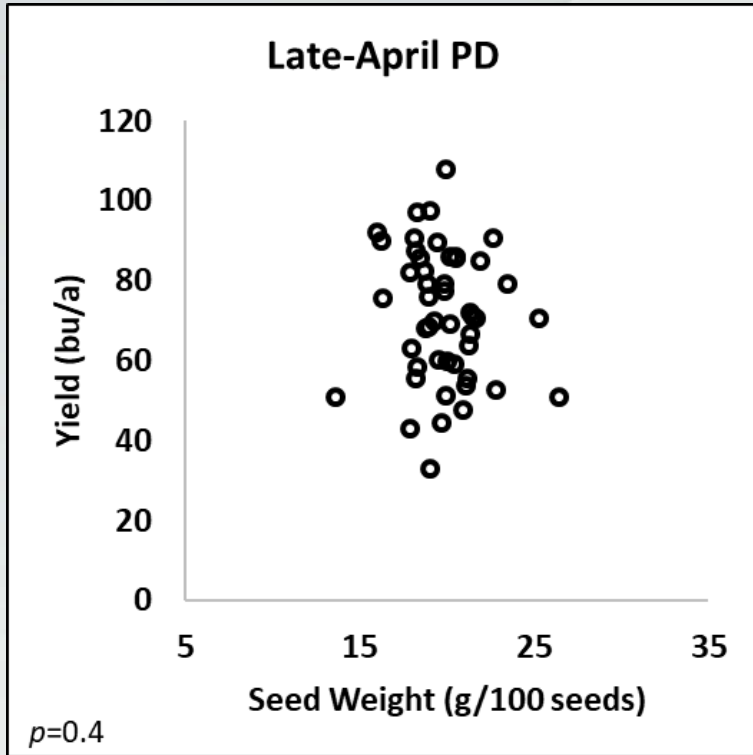
➤ Increase in Yield by using late-maturity variety ONLY in Early Planting

Late Season Planting: Harvest Moisture

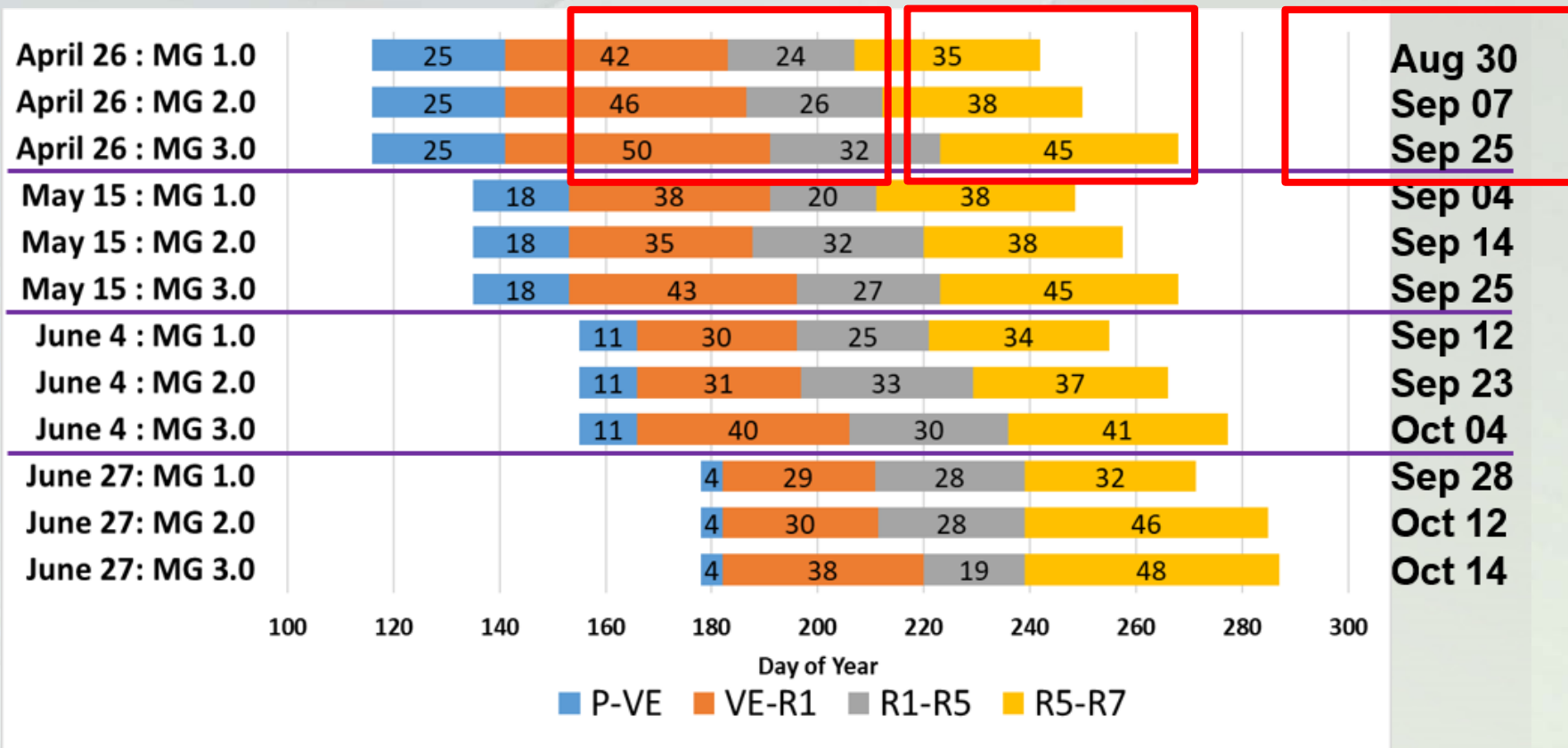


Frost on Oct 16 on MG >3.0

Yield Components



Phenology



Plant date/ Maturity selection Summary

- Combine early planting with other management for higher yields
- Optimal maturity varies with time of planting
- For mid-season planting, mid- and early- maturity varieties have competitive yield, and low moisture
- Benefits of early-season planting can be expanded upon with the use of late-maturity variety
- Select early-maturity variety to minimize yield loss/ moisture issues in delayed/replant situations
- **Portfolio approach** in maturity selection
 - Plant late-maturity variety first (30-40% acres)
 - Plant mid- and early-maturity varieties in sequence to “stack” flowering/pod set/fill
 - Plant ~20-30% acres to each of mid- and early-maturity variety

Seeding Rate

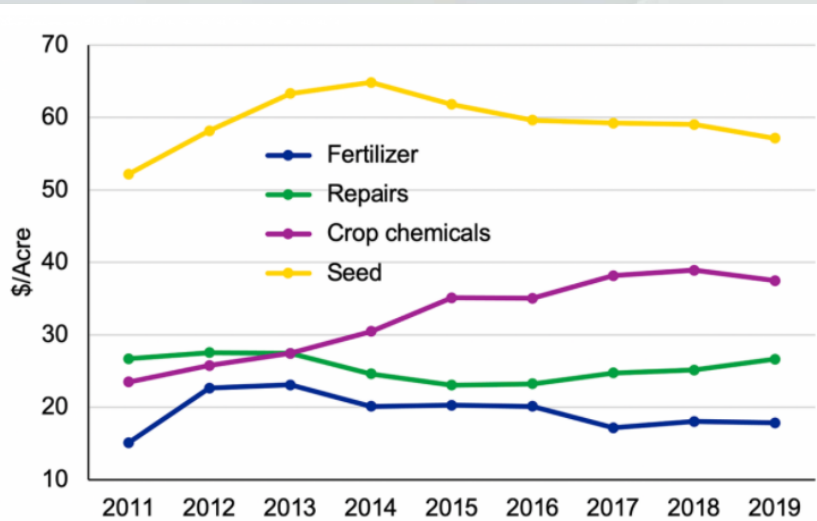
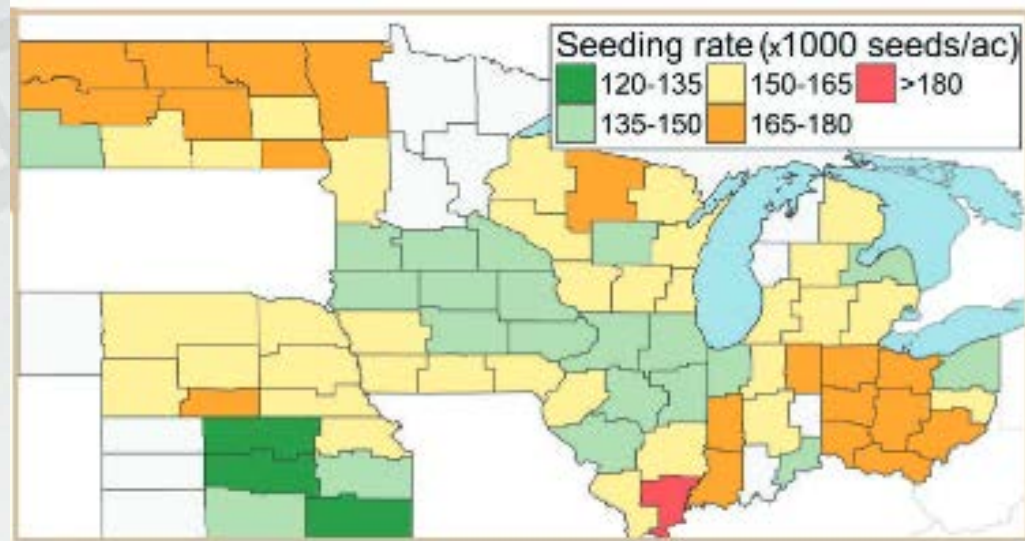
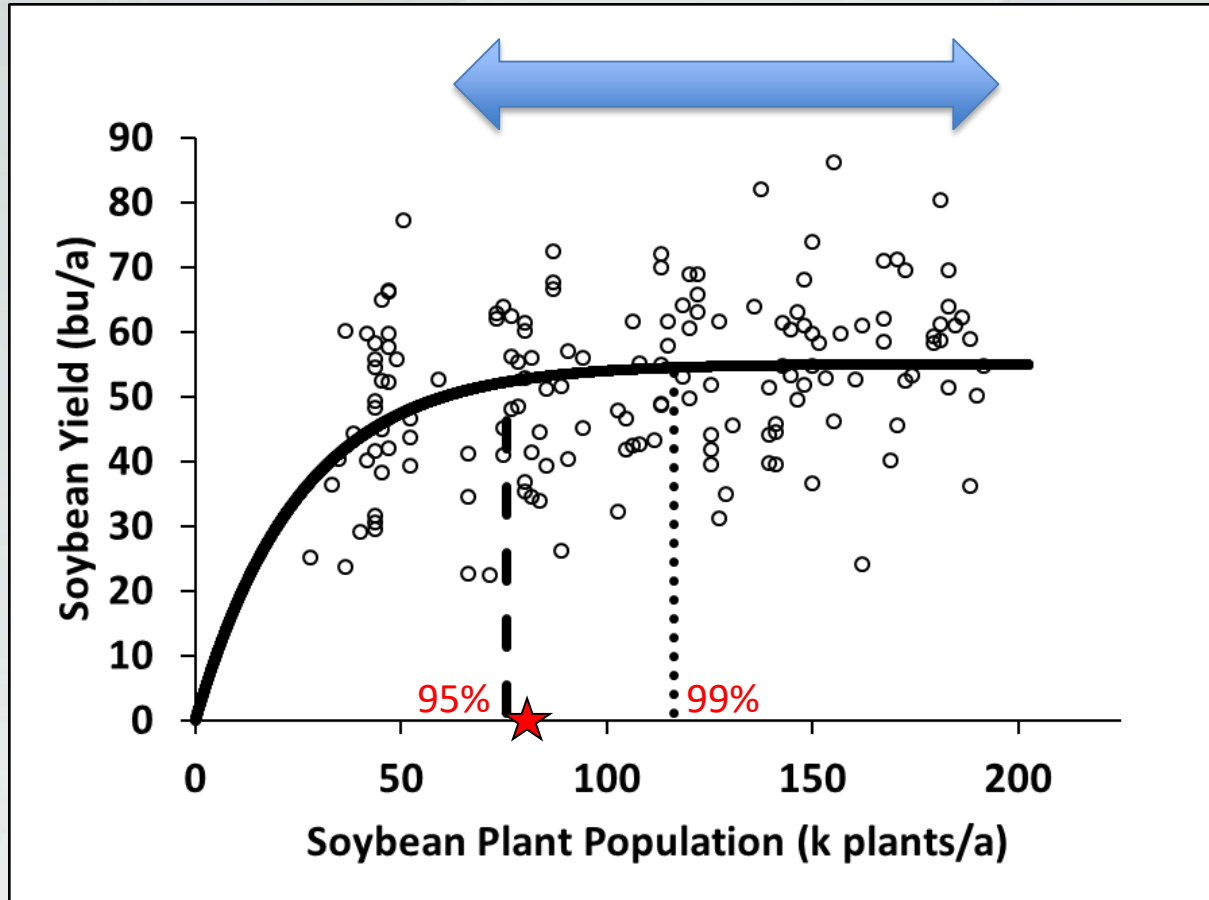


Figure 2. Four most expensive production cost categories after land rent for soybean production in Minnesota, North and South Dakota, 2011-2019, measured in \$/acre. Source: finbin.umn.edu



Grassini, P., & Conley, S. (2019), based on 2015-17 farmer survey

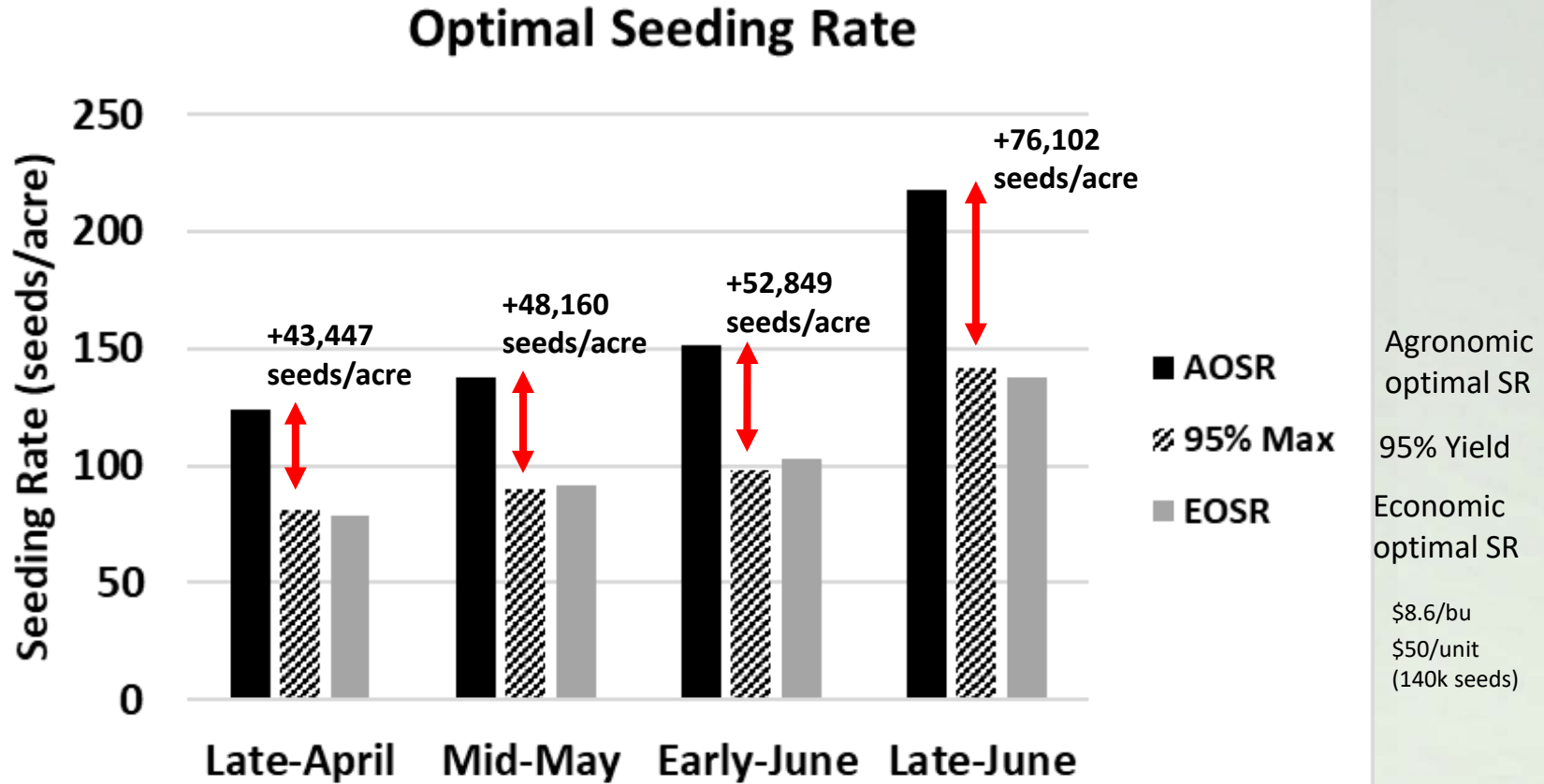
Seeding Rate



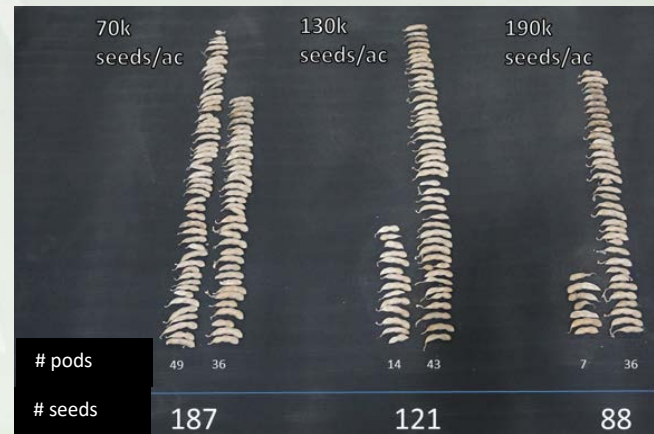
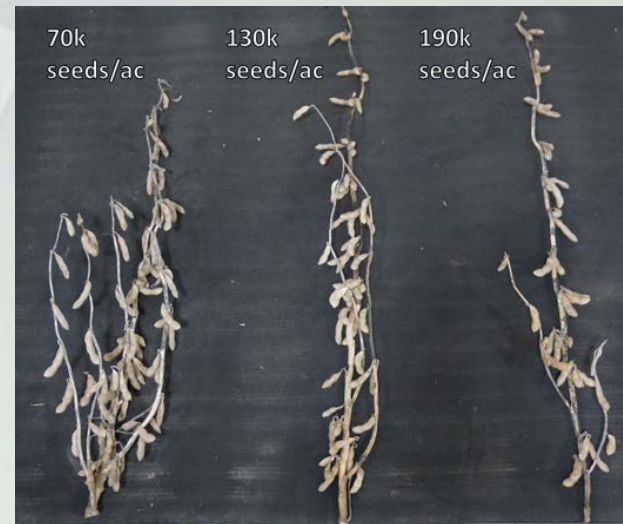
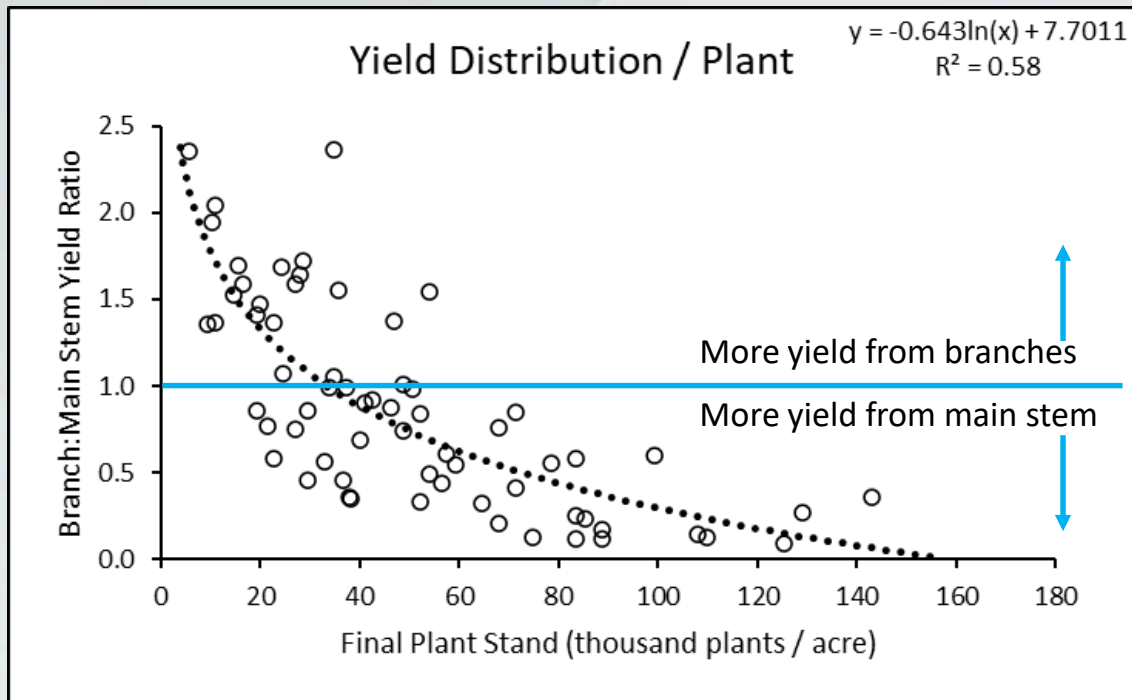
~20% extra
for seed rate

★ 99% returns

Seeding Rate- Agronomic vs Economic Optimal



Seeding Rate- Plant architecture

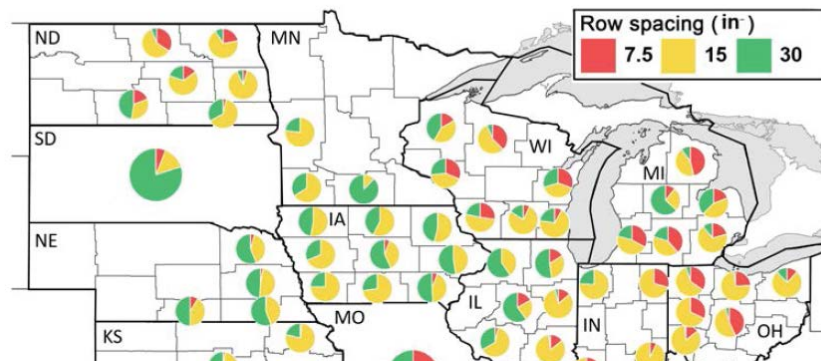


Seeding Rate Summary

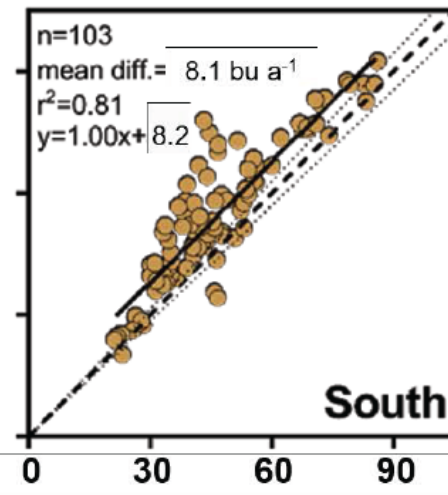
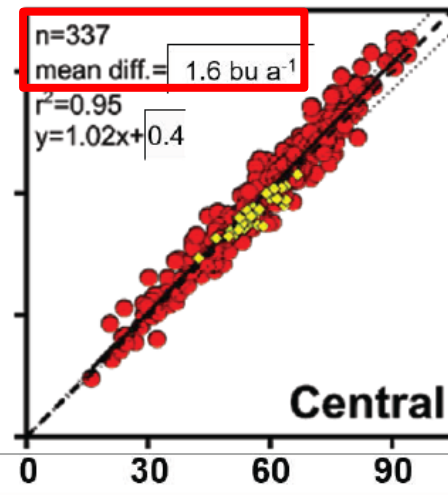
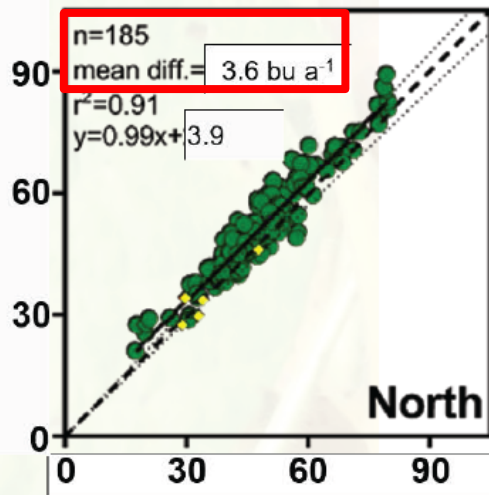
- For max yield: final plant stand of 100-120,000/ac for May planting, 120-150,000 plants/ac for June planting (~20% higher for seeding rate)
- Economic optimum rates are lower (~40k) than agronomic optimum rates, small yield loss
- Lower seeding rate in high yielding areas/fields, higher rate in low yielding areas
- Higher seeding rate for early-maturity varieties, northern locations
- Early planted uniform stand of >50k/ac can produce high yield, plant into existing stand below that stand rather than replanting
- Stand count is important, early vs late season?

Row Spacing

Based on 2015-17 farmer survey data



Narrow row yield (bu a⁻¹)



Wide row yield (bu a⁻¹)

Row Spacing- 2020 data

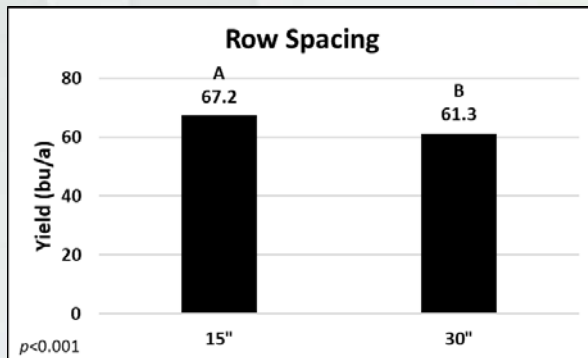
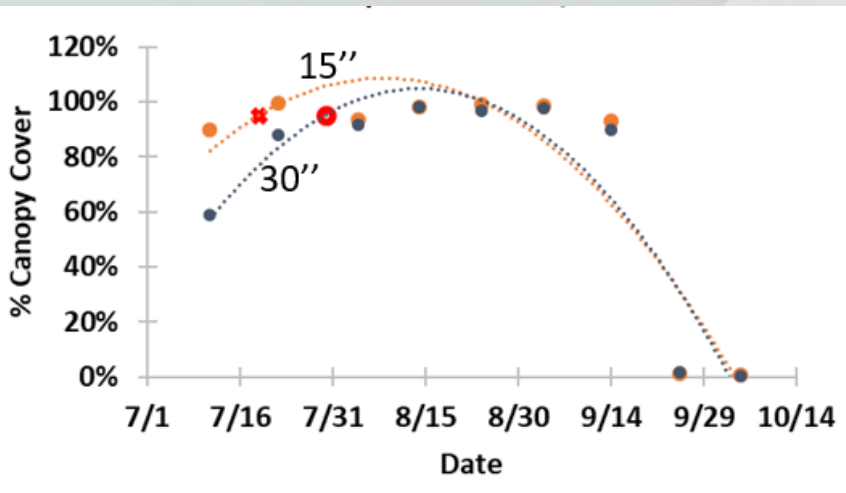
July 20, 2020



30" spacing



15" spacing



Yield increase in 15" over 30" across early, mid, and late planting date

Take Home Messages

- Improved genetics (variety selection) and management can increase yield (reduce on-farm yield gap), quality, and profits
- Specific practices dependent on field specific conditions:
 - **Plant date:** early planting in optimal moisture, change other management
 - **Maturity selection:** later-maturity variety with early planting
 - **Seeding rate:** lower seeding rate with minimum yield penalty
 - **Row Spacing:** narrow row spacing
 - Others- crop rotation, weed control, fertility, inoculation
- Not every practice will effect yield in a given field or year
 - Minimize field-specific yield limiting factors (**light, water**, nutrition, pests) to best utilize the growing season

Other Management Decisions

- Seed Inoculation: Fields under stress or new fields
- Fertility: do not apply N; consider eliminating foliar applications; P & K based on soil test levels
- Seed Treatment: if seedling pests are present
- Foliar fungicide: if field and weather conditions favorable for white mold
- Control weeds early to minimize hidden yield loss

- **Tom Siler**
- Bill Widdicombe
- Katlin Fusilier
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- Harkirat Kaur
- Maddi Yaek
- Garrett Zuver
- Mike Particka
- Paul Horny
- Charles Scovill (Syngenta)
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- Dr. Dechun Wang
- Dr. Marty Chilvers
- Dr. Christy Sprague
- Dr. I. Ciampitti (KSU)
- Dr. Shawn Conley (UW)
- Mike Staton

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Thanks!

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Project
GREEN



**Michigan Soybean
Promotion Committee**
www.michigansoybean.org



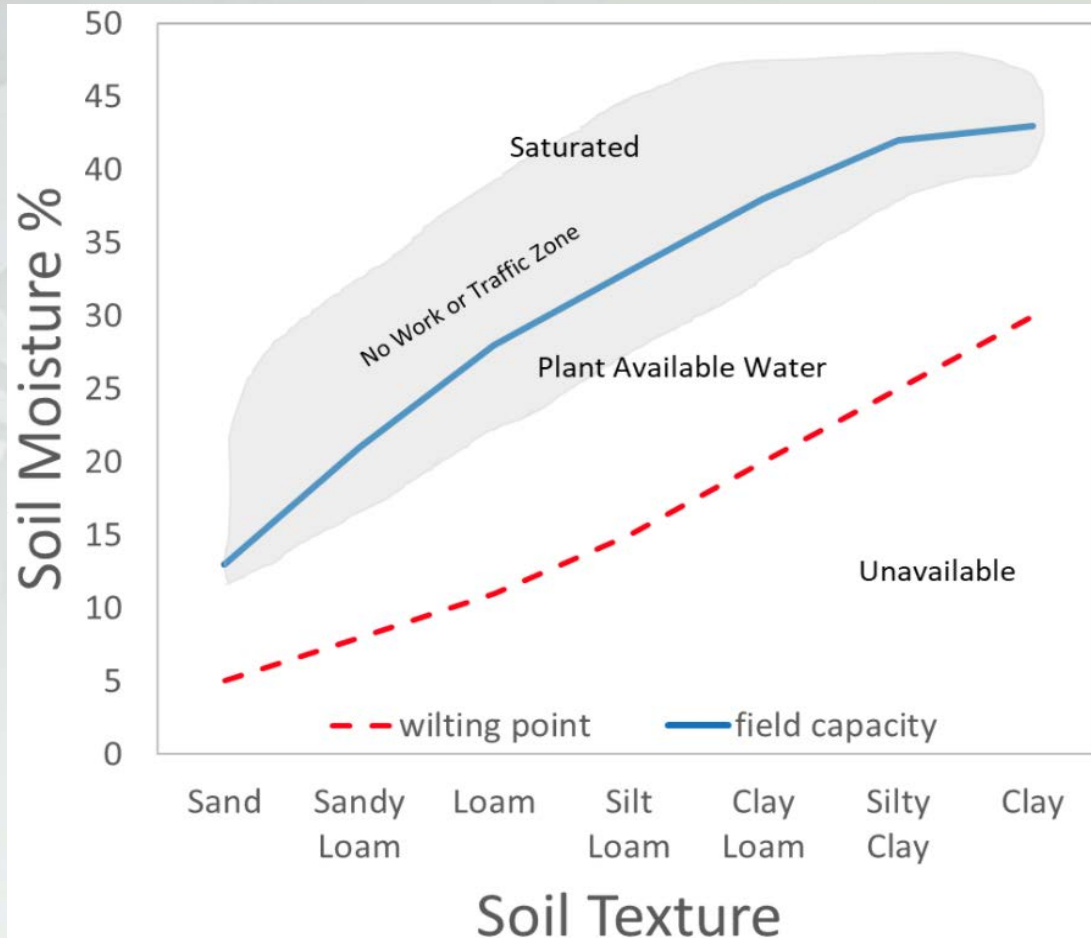
NCSRP NORTH CENTRAL SOYBEAN
RESEARCH PROGRAM



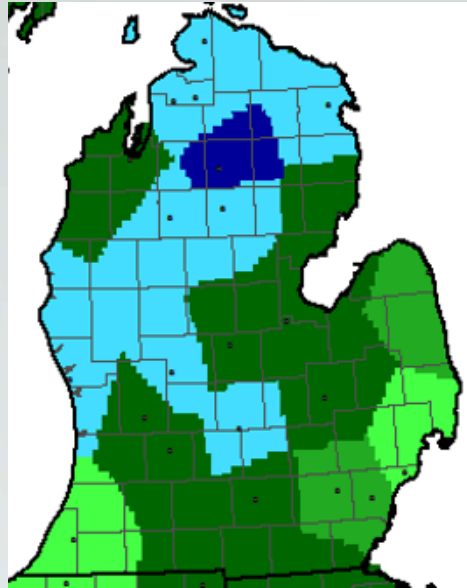
Seed companies

Soil too wet to Till/Plant?

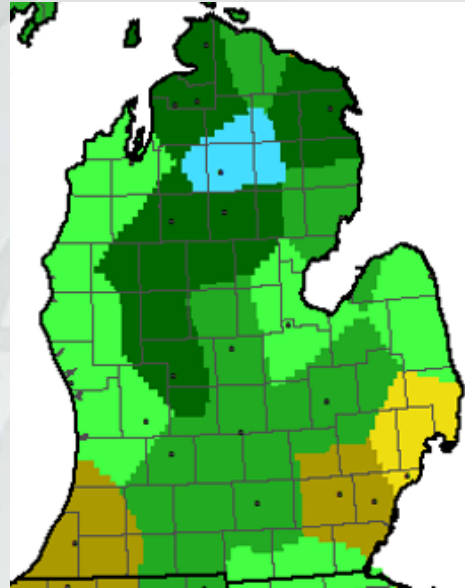
- When soil at desired plant depth crumbles, too wet if just deforms
- Working wet soil can lead to:
 - Cloddy seedbed, reducing seed-to-soil contact
 - Compacted layer below the depth of tillage
 - Sidewall compaction from planter disc opener



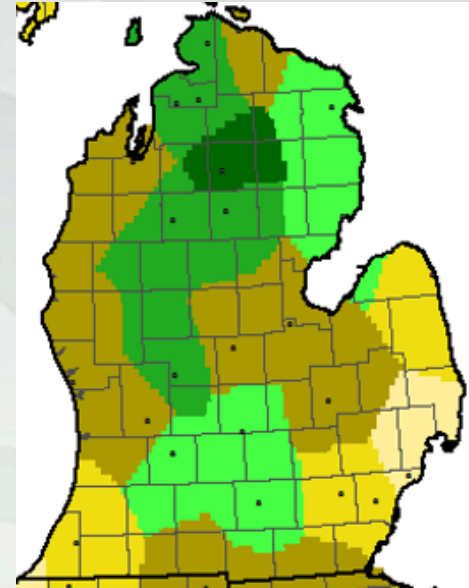
Frost (28 °F) Dates



Early First Frost



Median First Frost



Late First Frost



Seeding Rate- Risk management

