

Agronomic Management Strategies for Soybean and Corn

Manni Singh

Cropping Systems Agronomist

agronomy.msu.edu

msingh@msu.edu, 517-353-0226

Feb 10, 2022, Thumb Extension Meeting



Cropping Systems Agronomy
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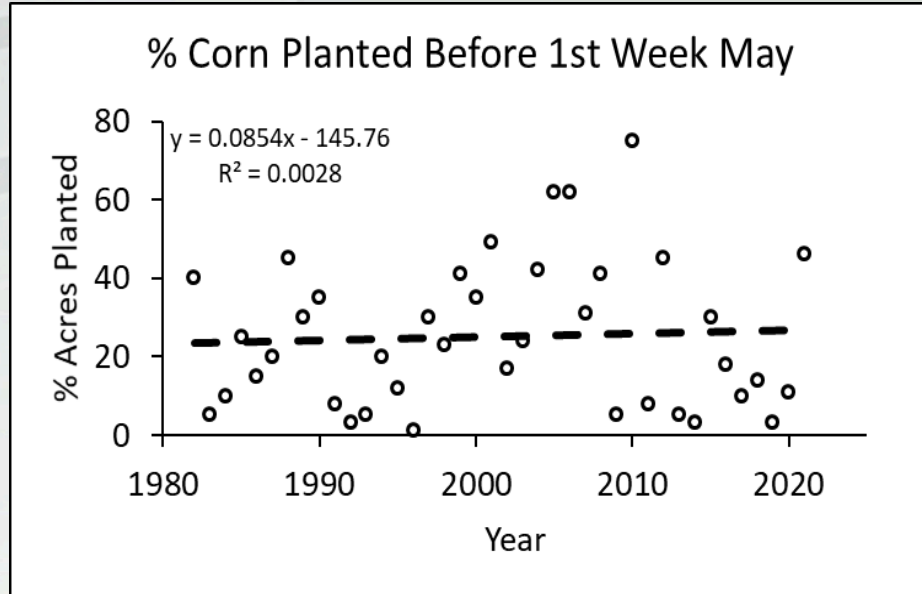
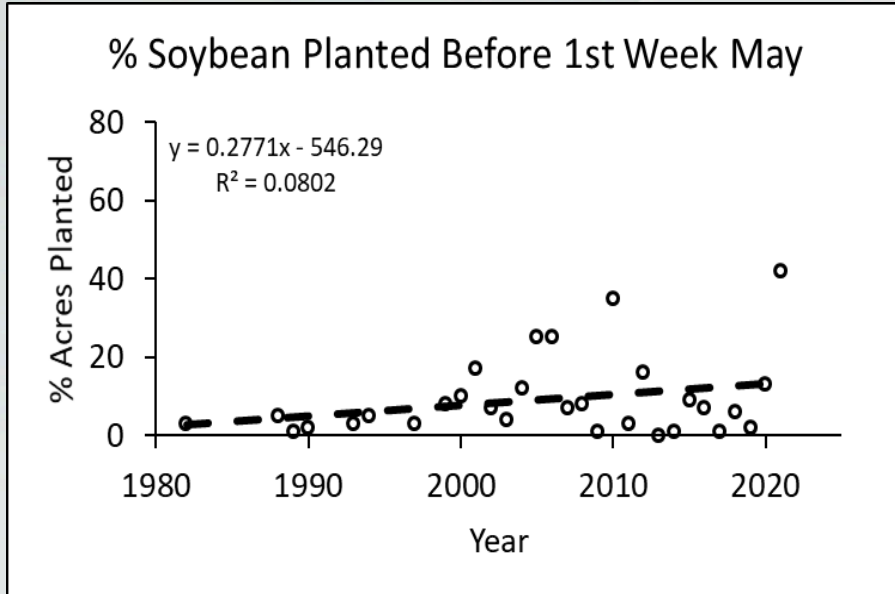
Project
GREEN



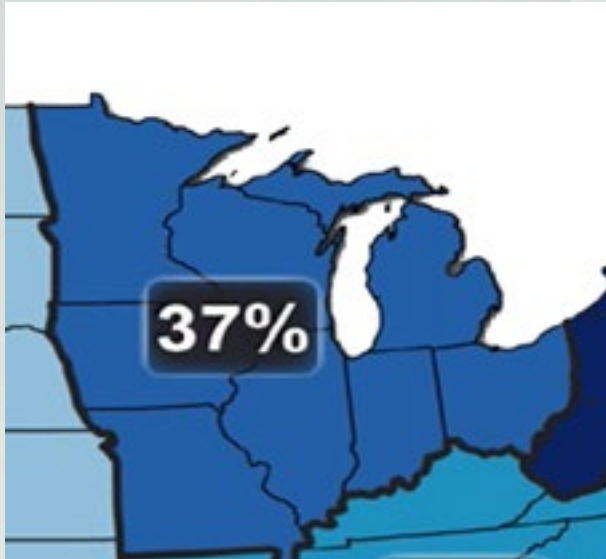
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NCSRP NORTH CENTRAL SOYBEAN
RESEARCH PROGRAM

Planting Progress- Variability over years



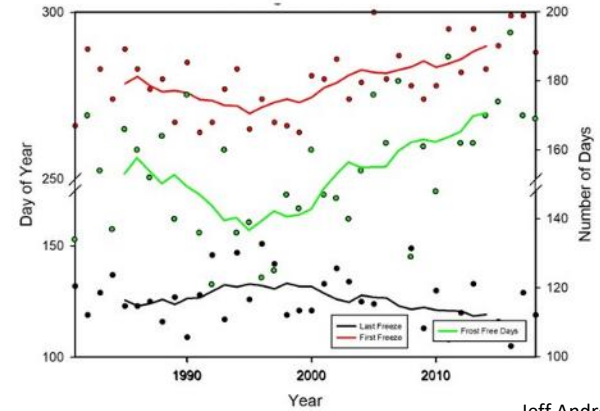
Weather Trends: Wetter and Warmer



Increase in extreme precipitation
(during top 1% of severe storms)

GLISA, 2019

First, Last Freezes and Frost-Free Season Length
Lansing, MI, 1981-2018

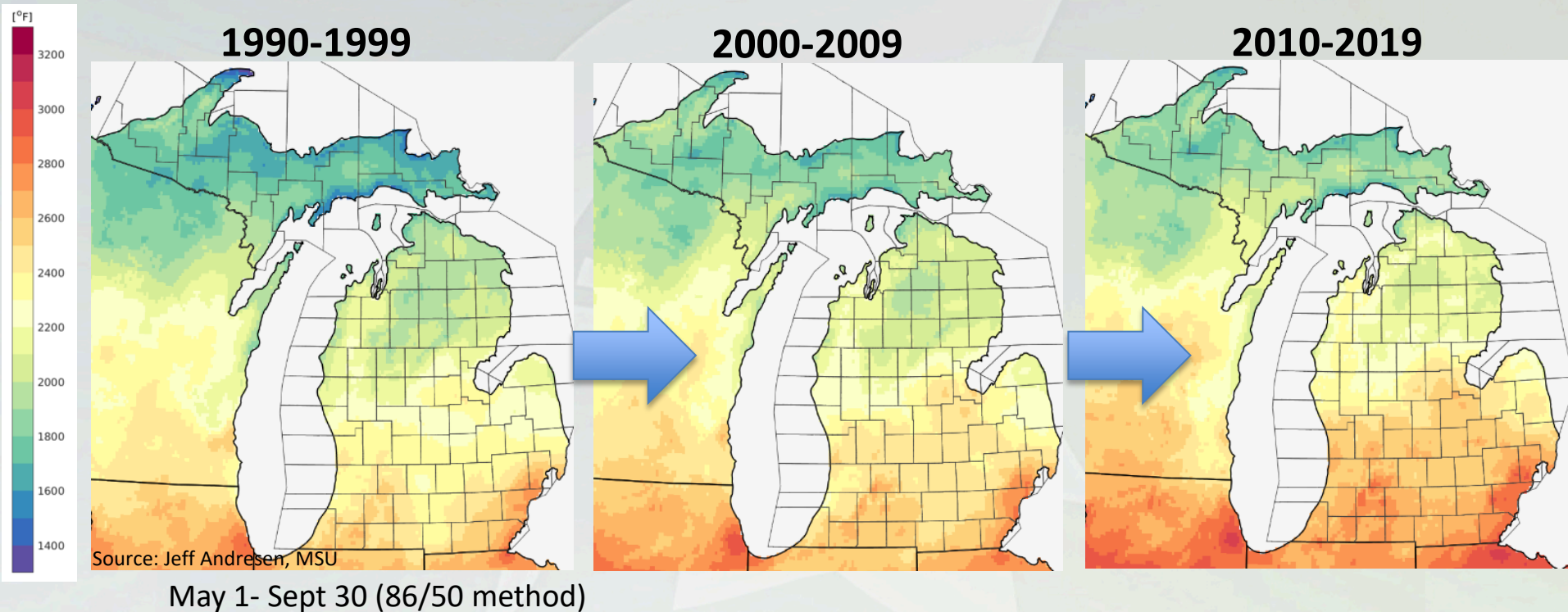


Jeff Andresen, MSU



GLISA, 2019

Seasonal Heat Units (GDD) are Increasing over time



- Seasonal GDD (growing Degree Days) totals are increasing over time in Michigan
- Match “available GDDs” with **hybrid maturity selection**

Planting Time

Conditions

➤ **Early Season**

(end April to early-May)

- Cool, wet soil- can lead to uneven stands
- **Extended Growing Season**

➤ **Mid Season**

- Typically, adequate soil temp. and moisture

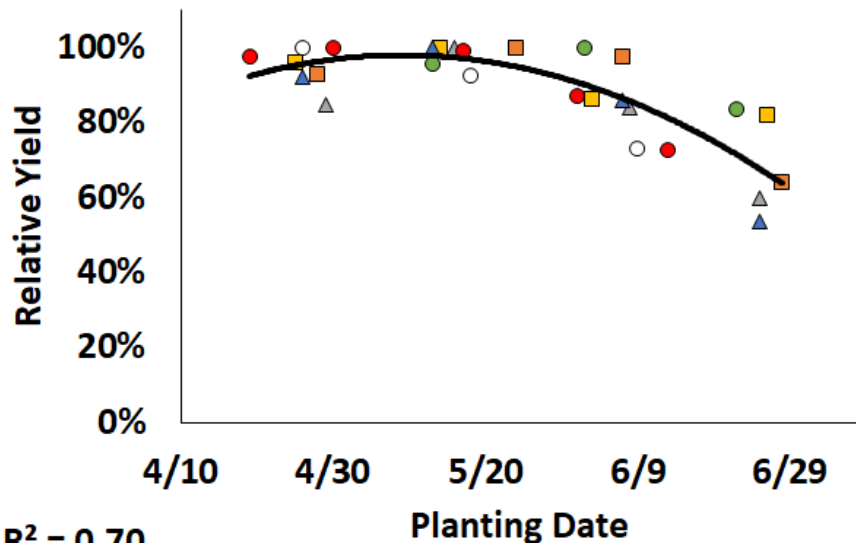
➤ **Late Season**

(June)

- Lack of soil moisture
- **Restricted Growing Season**

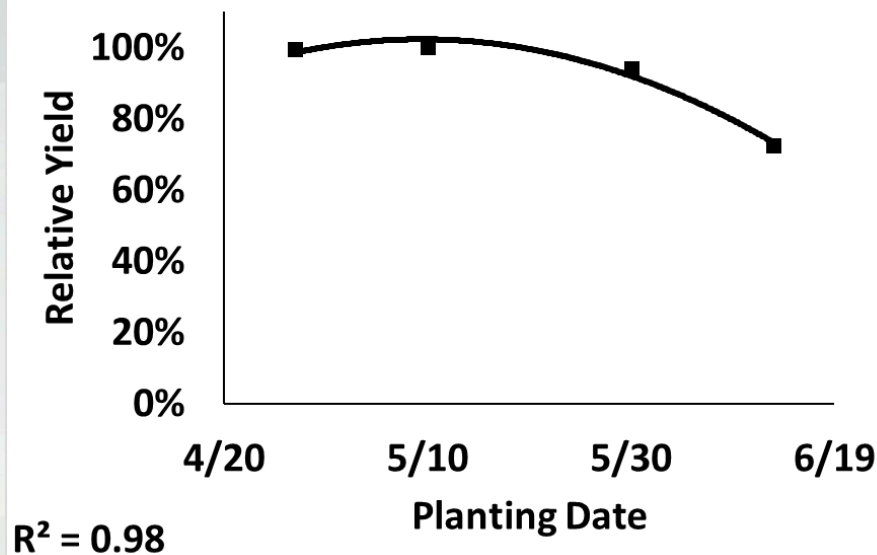
Planting Time Impacts Yield in Michigan

Optimal Soybean Planting Date



Data from 2018-2021 across multiple trials

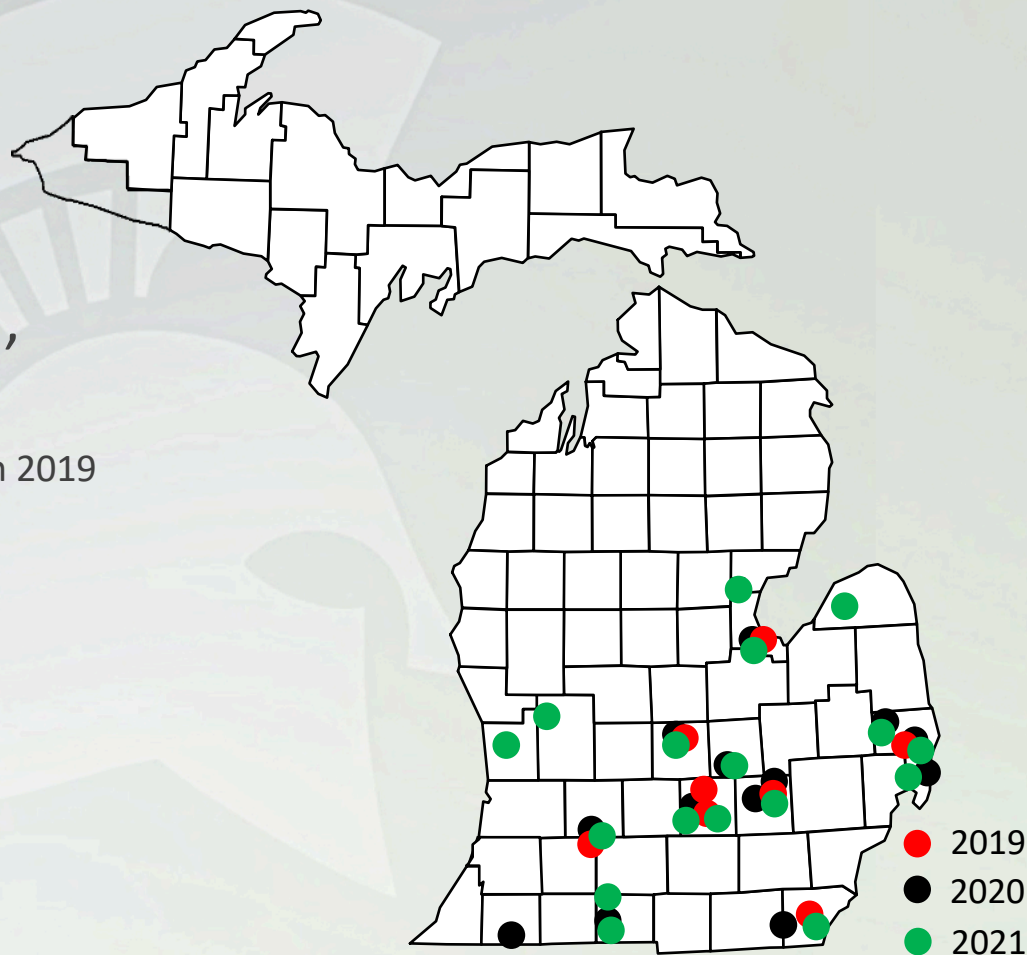
Optimal Corn Planting Date



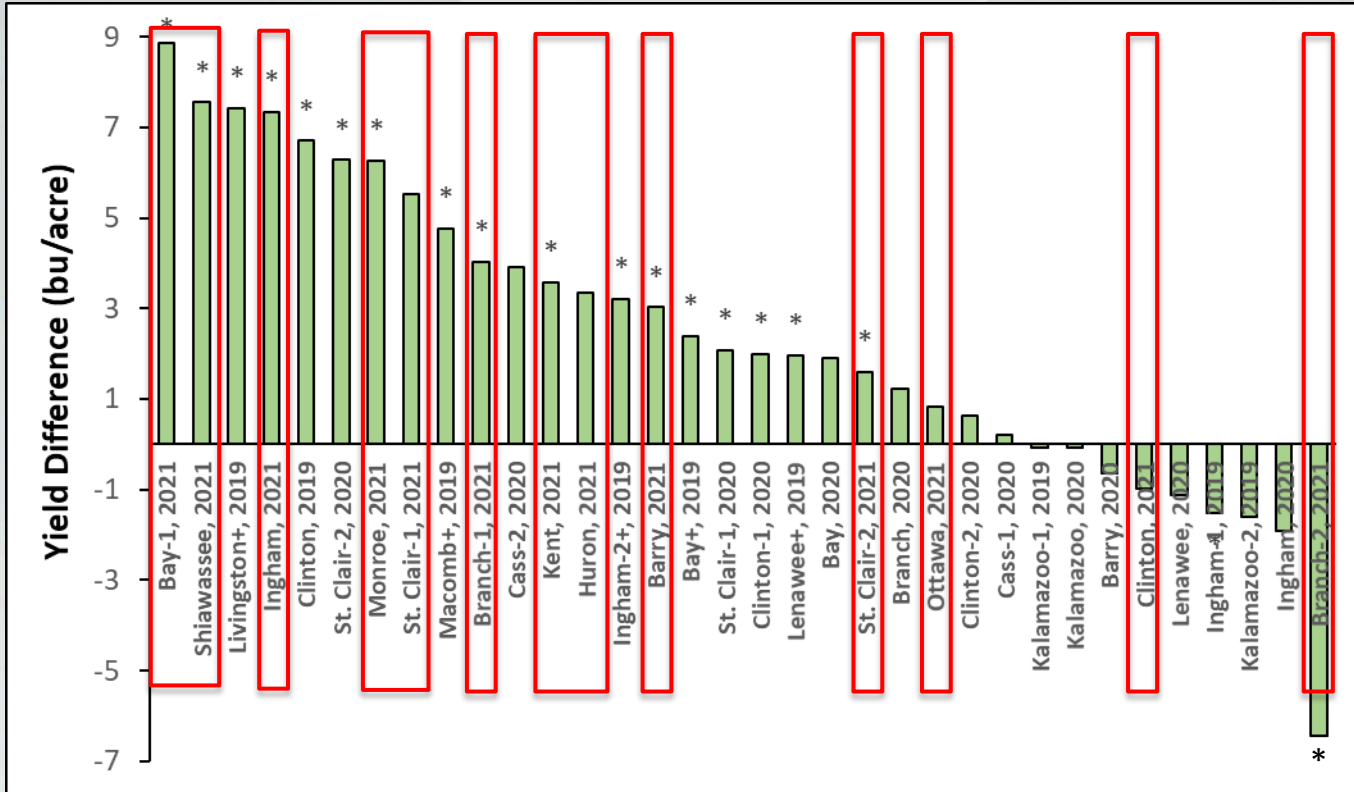
Data from 2021

On-farm Soybean Trials

- Conducted 2019 - 2021
- 2 plant dates (**early, typical**),
~3 weeks apart, in strips
 - Fungicide/insecticide at R3 in few fields in 2019 in early planting
- Yield from each strip
- Seed quality samples



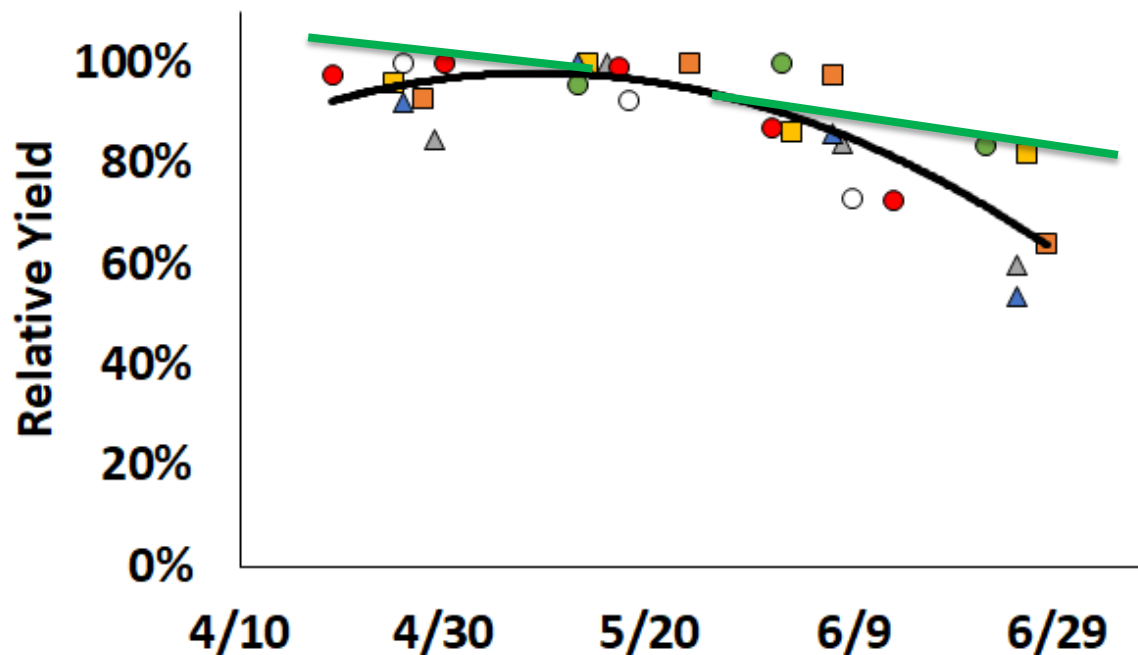
Yield: 2019 - 2021 Michigan Data



Yield diff. = Early planting- Normal planting time

* Denotes significant differences at P < 0.10
 + denotes fung./insect. spray at R3 in early planting in 2019

Planting Time: change other management?



Planting
Season

Early

Mid

Late

How to Improve
Yield Potential

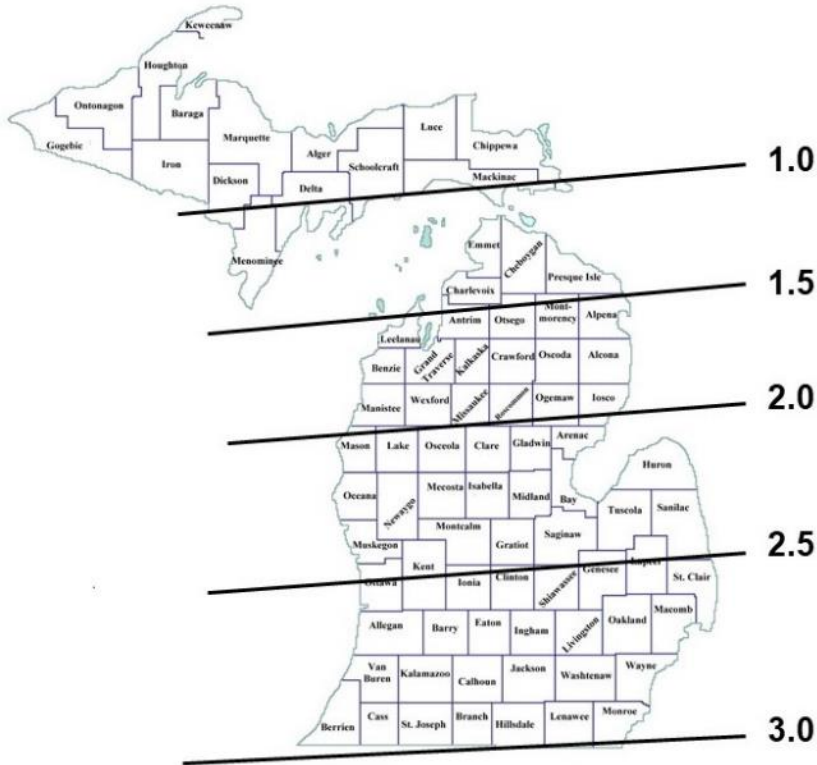
OR Minimize
Input Cost

=Increased Profit

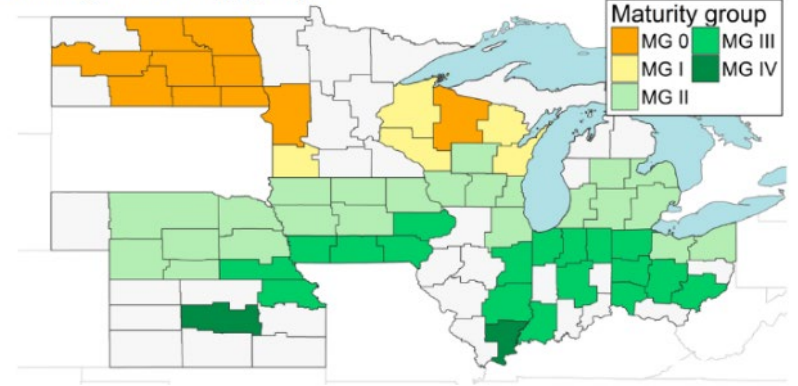
Data from 2018-2021
across multiple trials

Optimal Maturity Selection: Role of planting date?

Soybean Maturity Zones in Michigan

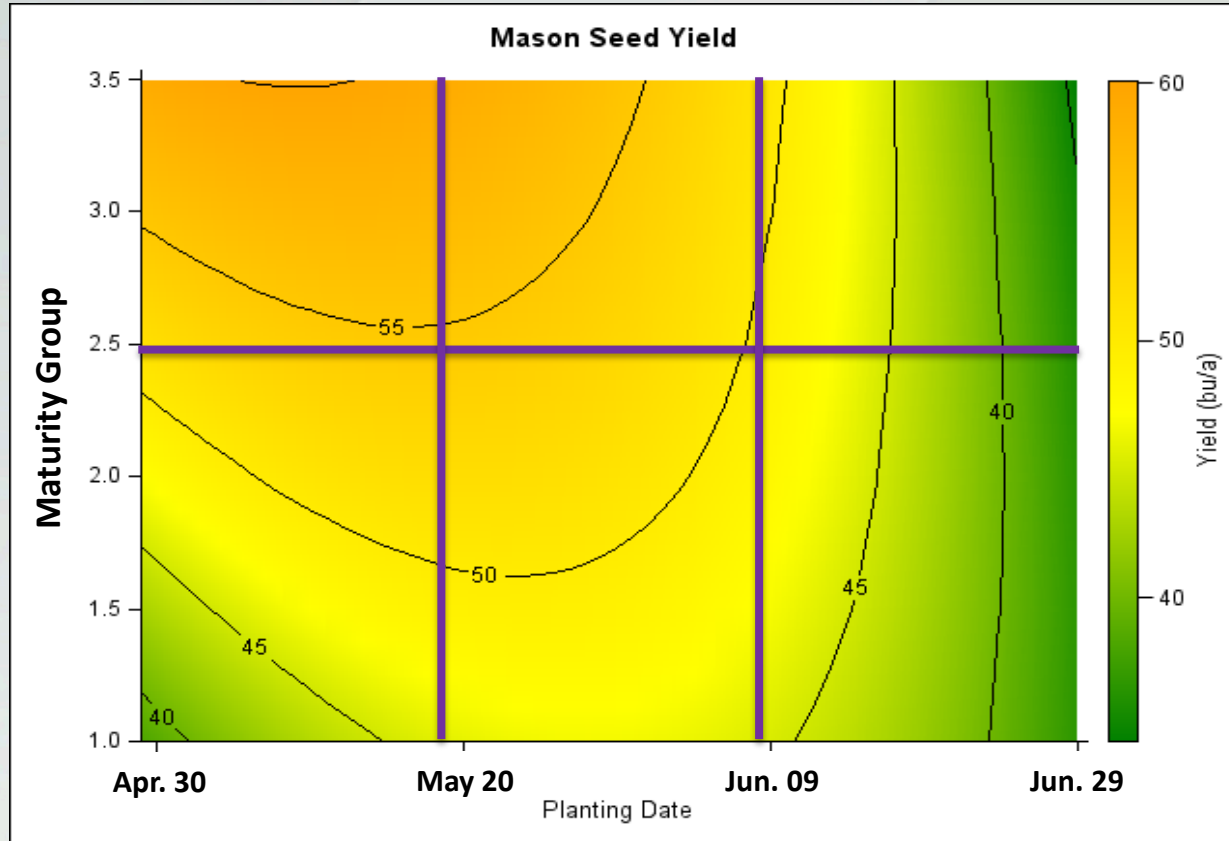


Average maturity group 2014-17 farmer survey data



- Based on one planting date (mid-season)
- Does NOT account for early/late planting

Optimal Maturity Selection: by planting date



Physiology of Yield Increase

- Adjust planting date and soybean maturity in order to:
 - Harvest more light prior to the onset of reproductive development
 - Maximize number of nodes/pods/seed per acre, longer reproductive phase
 - Minimize the impact of periods of extreme heat and/or moisture stress during flowering and pod set



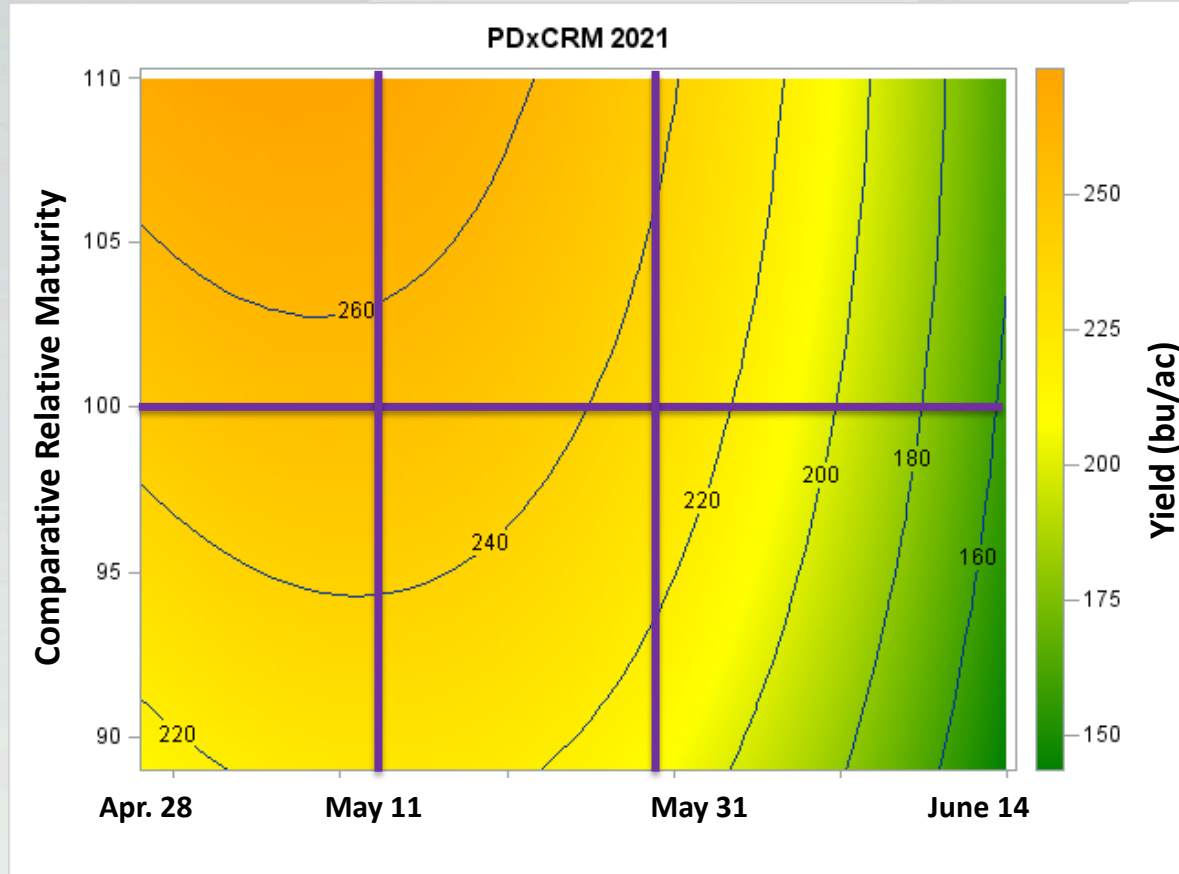
Late-April

mid-May

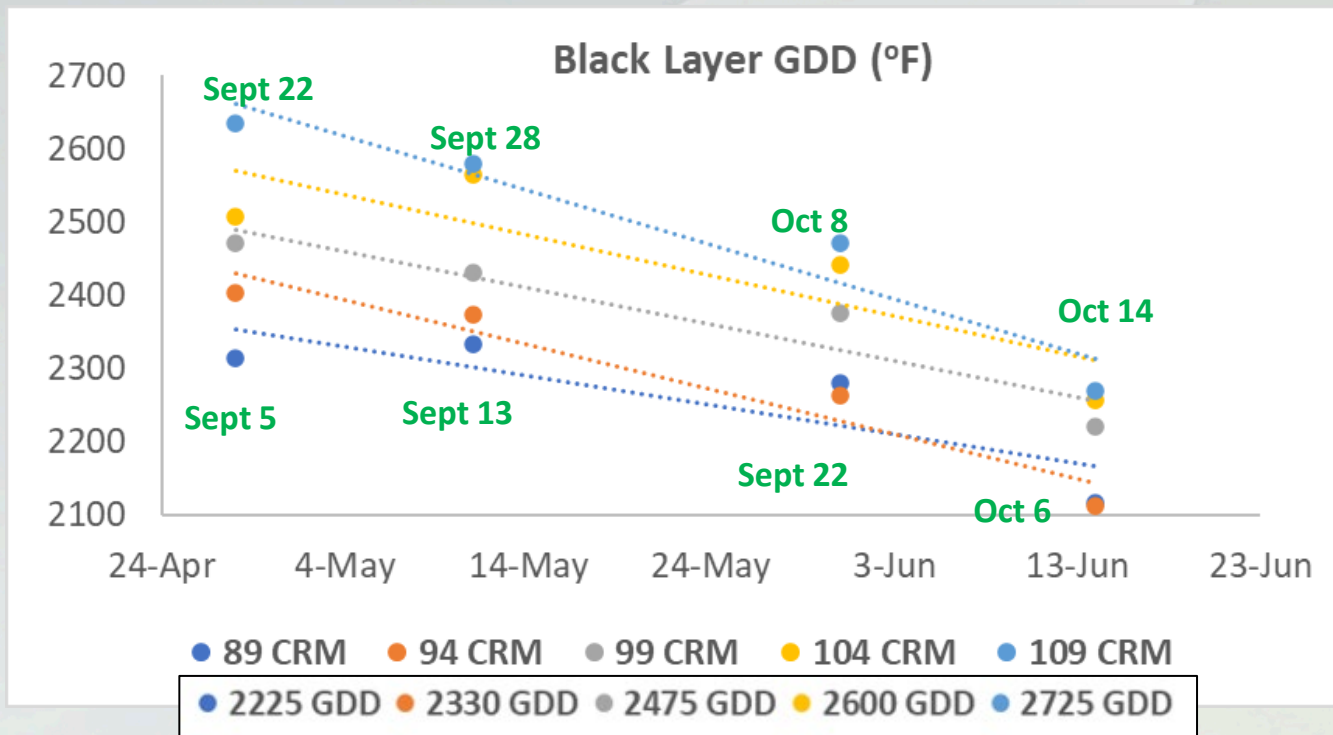
early-June

Late-June

Corn Grain Yield- Lansing

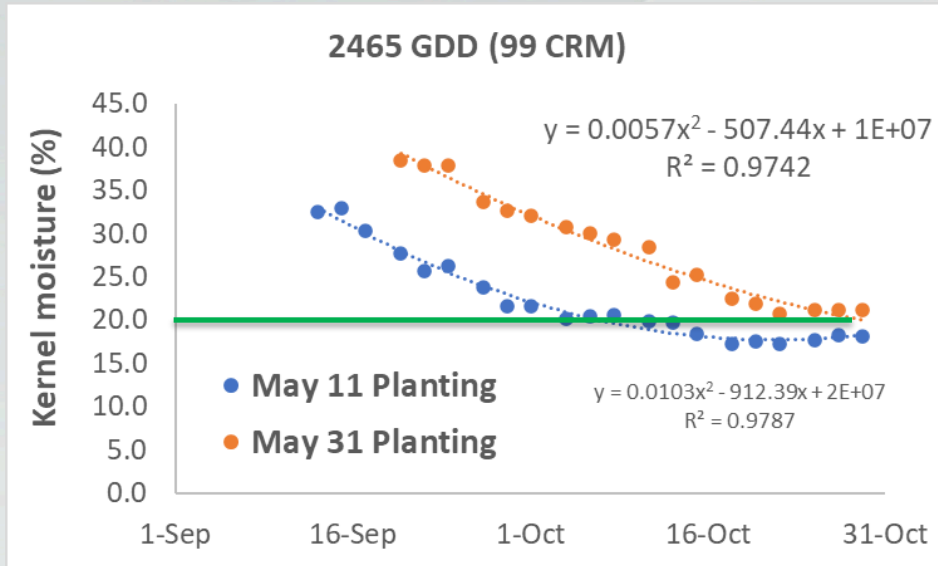


Time to Black Layer and GDD Compression



- **GDD Compression:** Decrease in hybrid GDD requirements with delayed planting
- Compression of **~5.6 GDD (4.0 - 7.4) per day delay in planting** for Black Layer; rate of compression increased with late-maturity hybrids

Kernel Moisture Drydown



- Daily drydown dependent on weather, planting date, hybrid maturity
- Greater Moisture/low TW: late-maturity hybrid in late planting
- In-fields sensors and **new predictive tools** for kernel drydown

Plant date/ Maturity selection Summary

- Combine early planting with other management for higher yields
- 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 (also provide genetic diversity)
 - Plant late-maturity variety first (30-40% acres)
 - Plant mid- and early-maturity varieties in sequence to “stack” soy flowering/pod set OR corn pollination
 - Plant ~20-30% acres to each of mid- and early-maturity variety

Soybean Seeding Rate



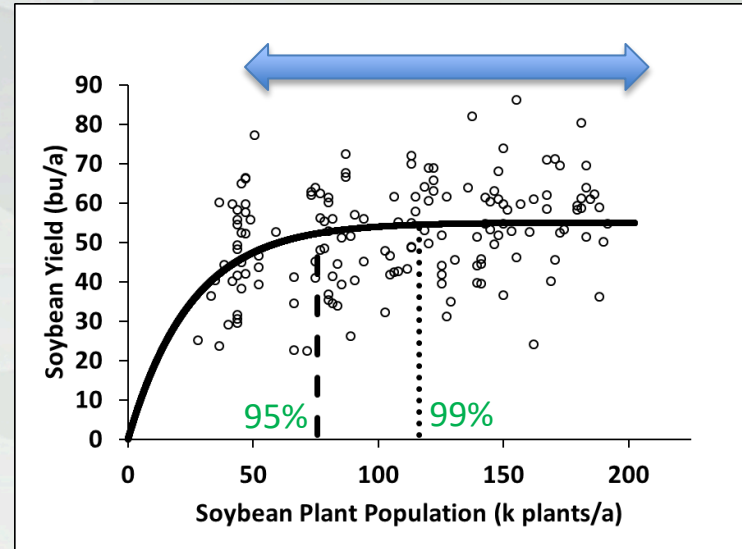
50,000
Seeds/A

90,000
Seeds/A

130,000
Seeds/A

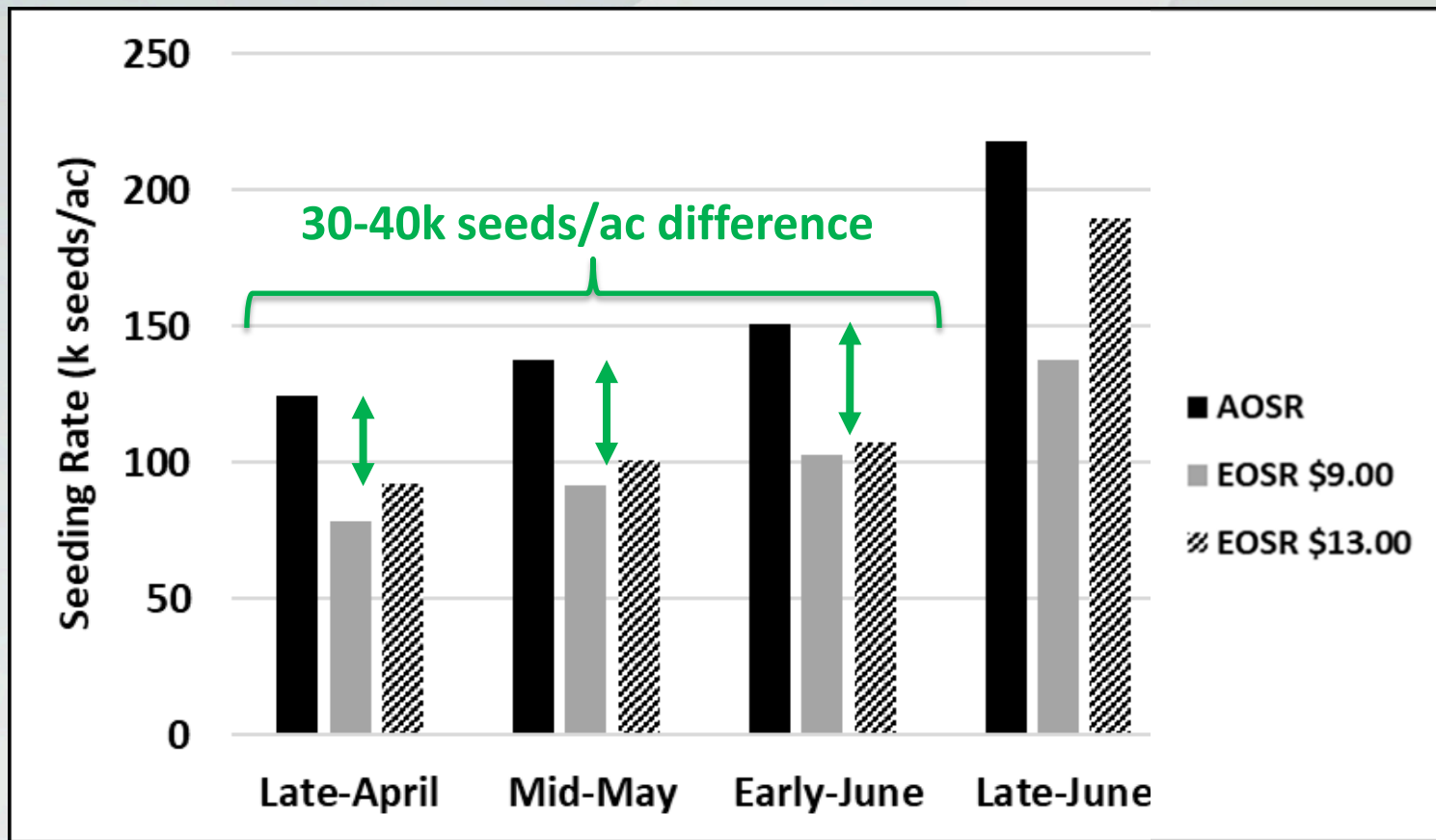
170,000
Seeds/A

210,000
Seeds/A



Seed rate: ~20% higher

Soybean Seeding Rate- Agronomic vs Economic Optimal



Agronomic Optimal Seed Rate

Economic Optimal Seed Rate

15-inch rows
4 site-years data

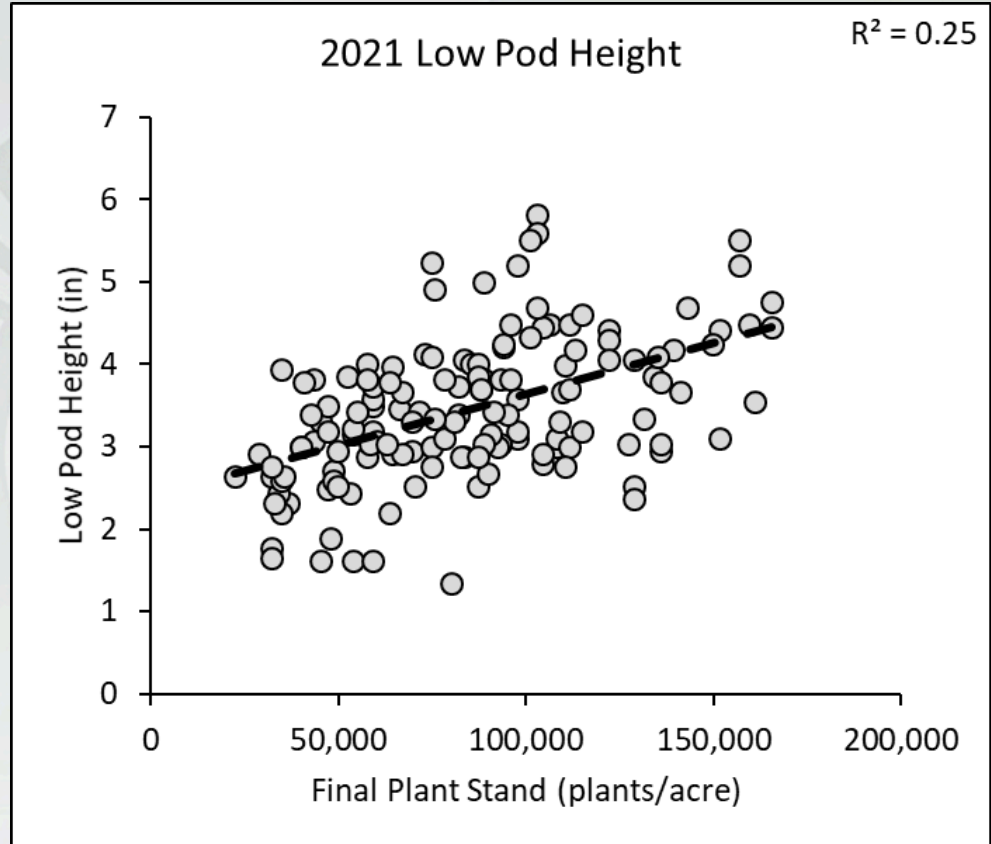
Seeding Rate- Plant architecture



Low Seed Rate



High Seed Rate

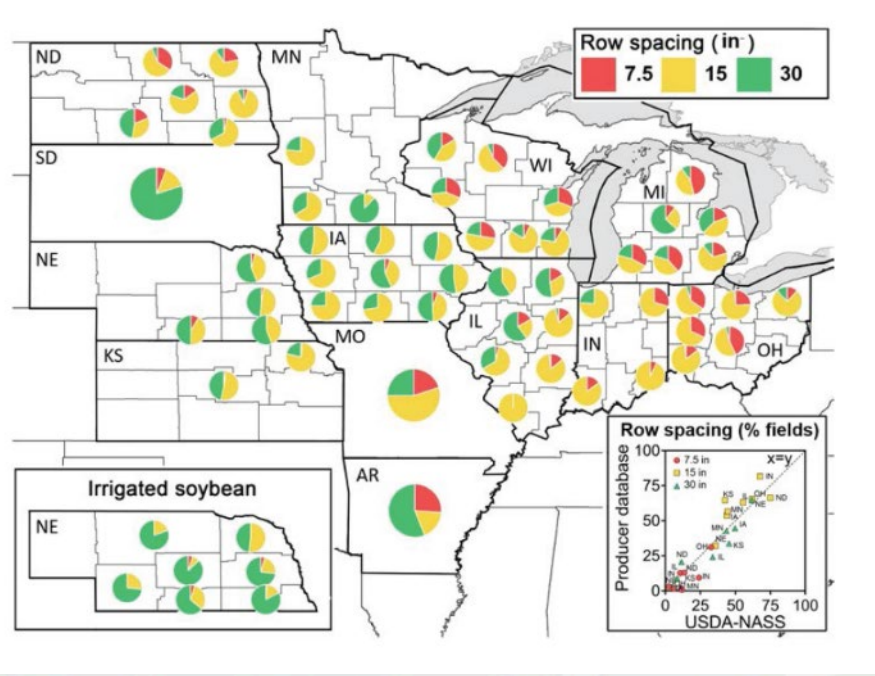


Seeding Rate Summary- Soybean

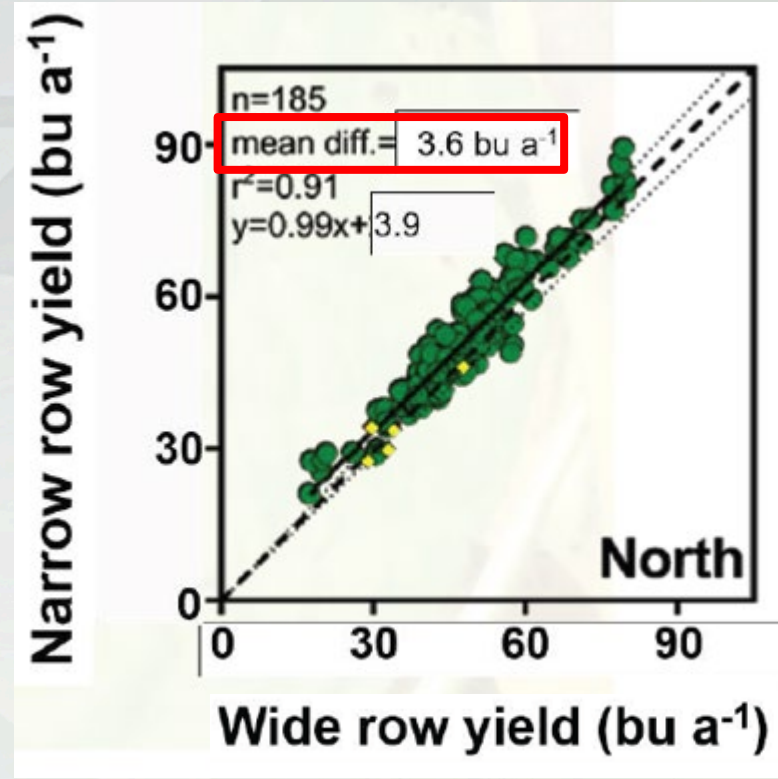
- For max yield: final plant stand of 100-120,000/ac for early/mid planting, 120-150,000 plants/ac for late planting (~20% higher for seeding rate)
- Economic optimum rates are lower (30-40k) than agronomic optimum rates
- Leave a strip in field with lower seeding rate (~10-30%) to evaluate response
- Early planted uniform stand of >50k/ac can produce high yield, plant into existing stand below that stand (inter-planting) rather than re-planting
- Stand count is important for evaluating yield potential

3: Planting Time x Row Spacing

Row Spacing- Soybean



2014-17 farmer survey data



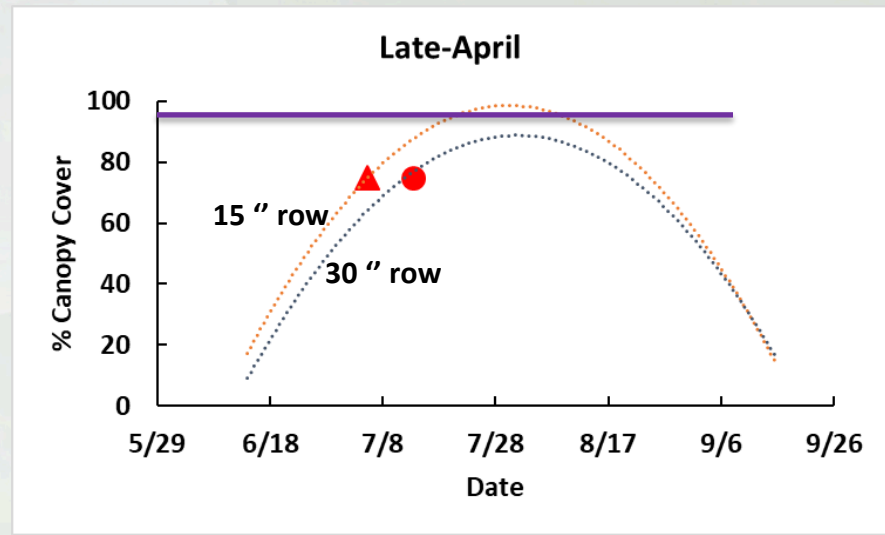
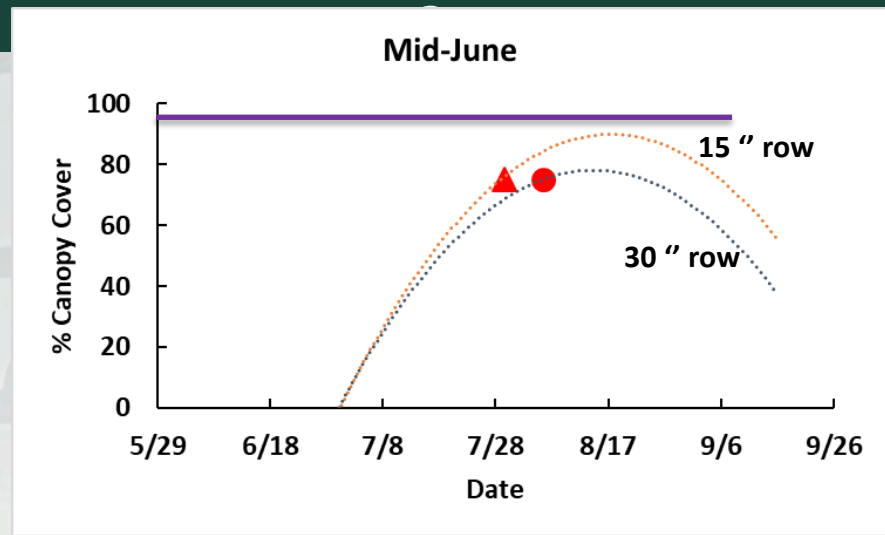
Row Spacing- Soybean



30" spacing

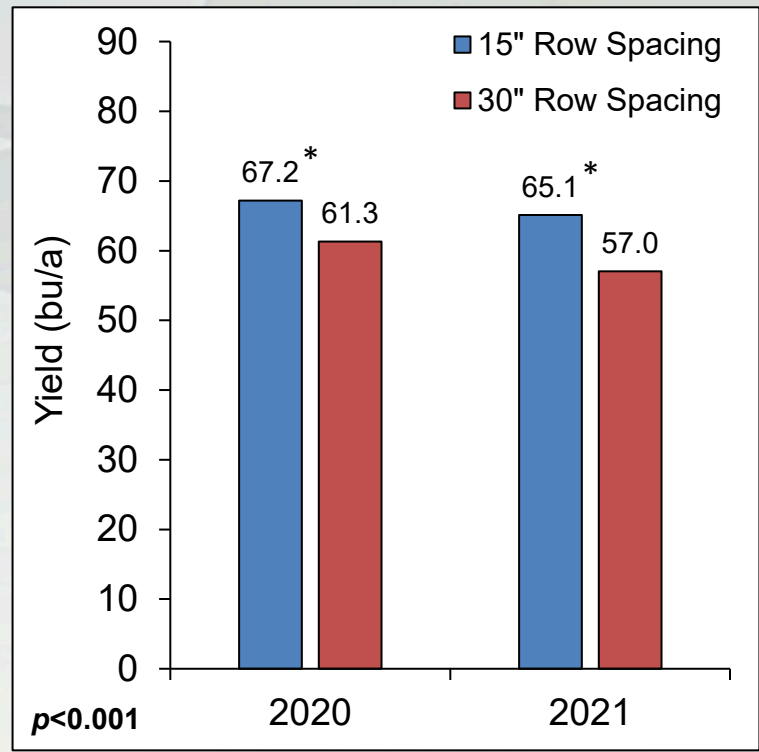
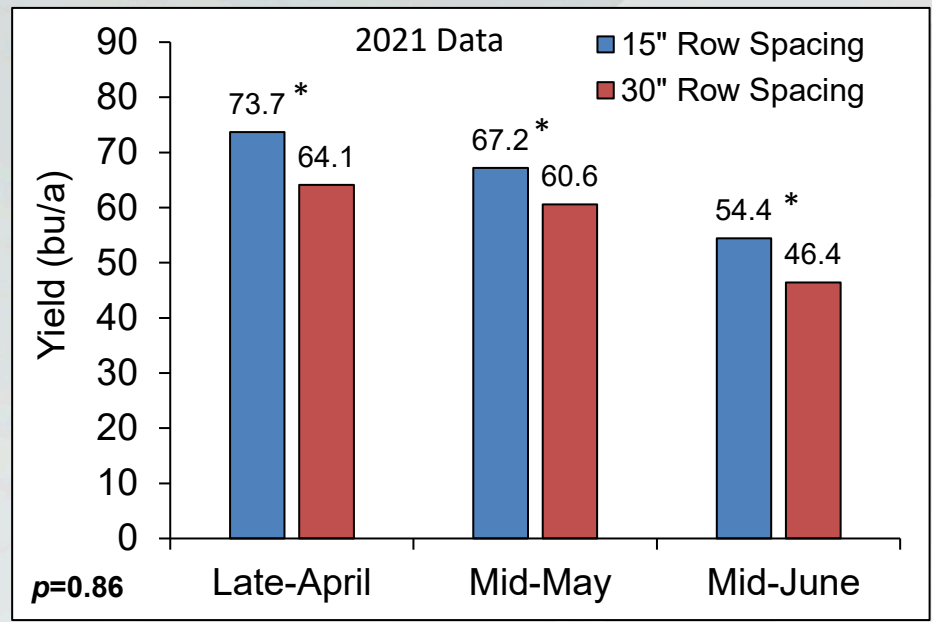


15" spacing



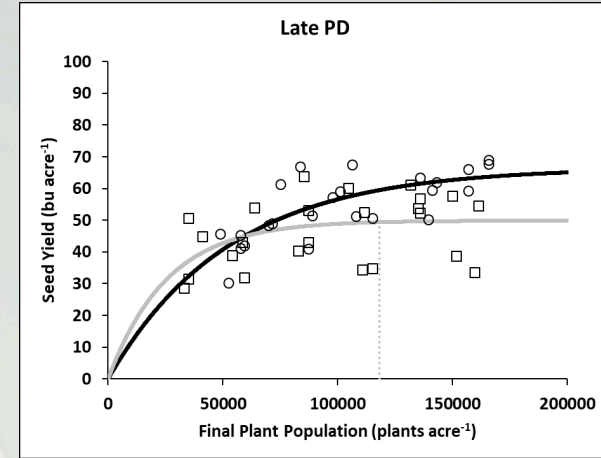
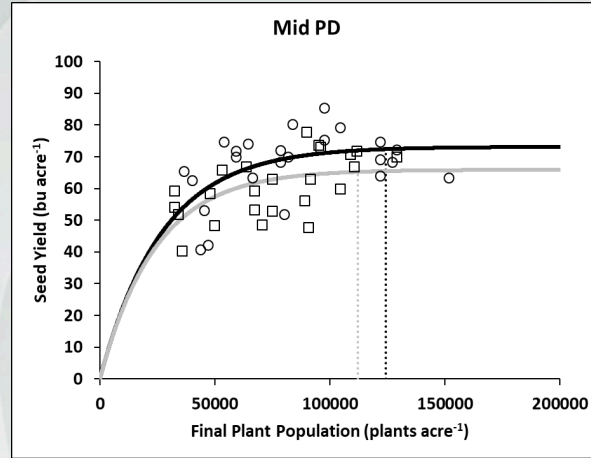
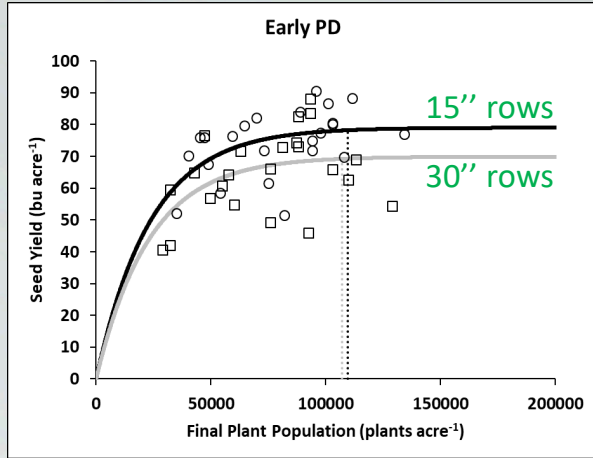
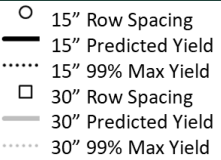
* Denotes significant differences at P < 0.10

Row Spacing- Soybean



➤ Yield increase with narrow rows did not differ between planting dates

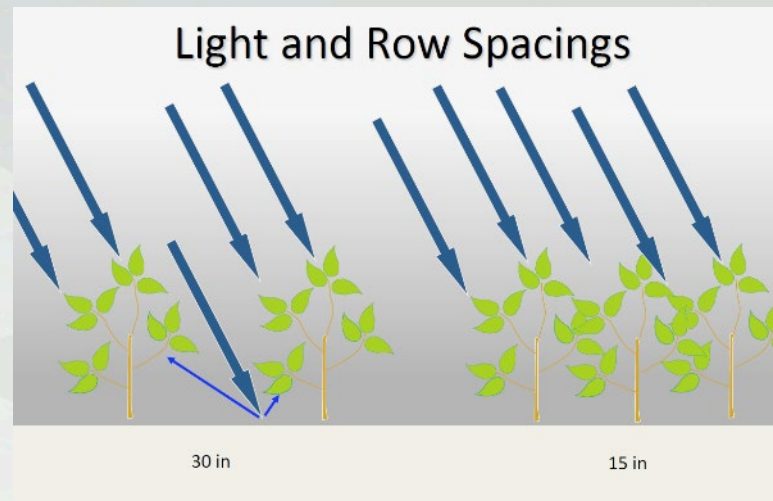
Row Spacing- Soybean: seeding rate responses



- Agronomic optimal seeding rate did not differ between the two row spacings
- Economic optimal seeding rate, across both row spacings
 - Early PD – 86,890 plants/acre
 - Mid PD – 85,281 plants/acre
 - Late PD – 118,081 plants/acre

Row Spacing Summary- Soybean

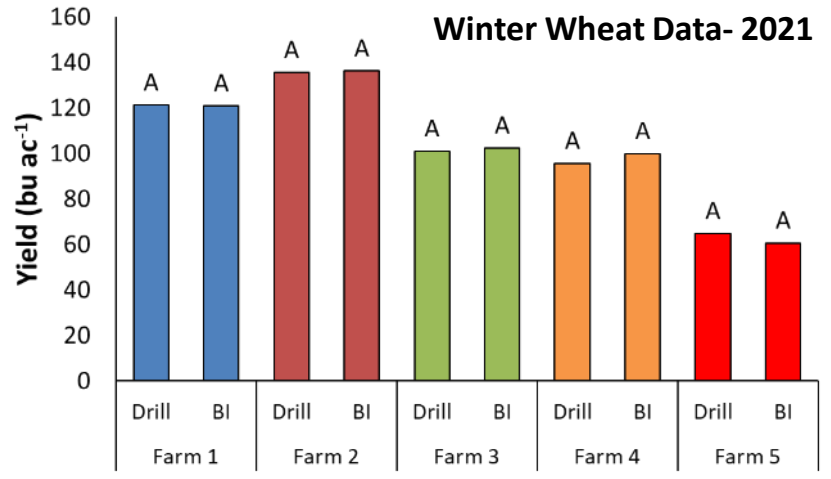
- **Narrow rows:** faster canopy closure, >95% light interception, moisture conservation, weed control
- **Yield benefit** under narrow rows: Limited time for vegetative growth before flowering
 - Northern production regions
 - Delayed planting/ Double crop
 - Early-maturing varieties
- **Yield loss:** Disease pressure- white mold
 - Use relatively lower seeding rates



Planting Systems



Broadcast Incorporation (BI)



Progressive FARMER by DTN MARKETS NEWS WEATHER LIV
News World & Policy Business & Inputs Farm Life

Spread the Wealth

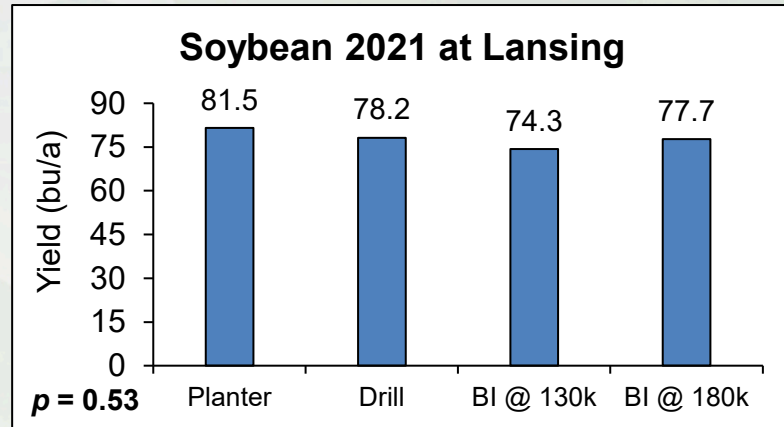
Broadcast-seeding soybeans can help increase yields and exist.

1/30/2020 | 11:00 PM CST

By Matthew Wilde,

An unconventional revenue may be already exist.

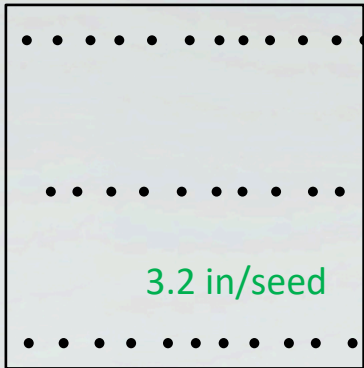
One of the easiest at production nationwide means at the same time explain. But, many factors



Planting Systems

Precision Planter

15" Row Spacing
130,000 seeds/ac



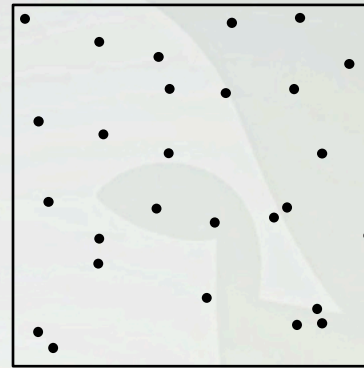
Precision Planter

30" Row Spacing
130,000 seeds/ac



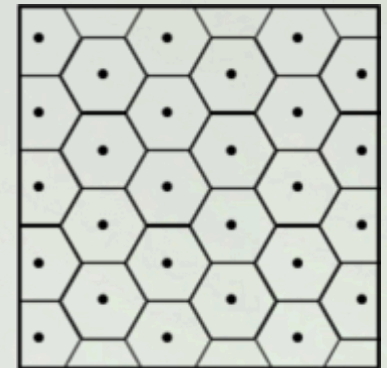
Broadcast Incorporated

130,000 seeds/ac



Ideal

130,000 seeds/ac



Take Home Messages

- Combining improved genetics (variety selection) with 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, soy vs corn
 - **Maturity selection:** later-maturity variety with early planting
 - **Seeding rate:** lower seeding rate in soybean with minimum yield penalty
 - **Row Spacing:** narrow row spacing in soybean
 - Others- crop rotation, planting systems, seed treatment, fertility, pest management
- Not every practice will affect yield in a given field or year
 - Minimize field-specific yield limiting factors (**light, water**, nutrition, pests) to best utilize the growing season

Resources: agronomy.msu.edu




The best soybean management practices by Extension researchers from

The Soybean Growth Cycle: Important Risks, Management and Misconceptions




The best soybean management practices by Extension researchers from across the United States

The Best Soybean Planting Date

Take Home Points

- Timely planting of soybean is critical to achieve high soybean yields. In many regions, the success of

Introduction

Soybean planting dates can vary greatly depending on soybean growing region (Mourzimis et al. 2019). Timely soybean planting is just as critical for attaining high soybean yields as it is for other crops such as corn and wheat. Generally, soybean responds better to early planting but the degree of soybean yield response is dependent on field productivity, variety characteristics (i.e. pest tolerance or resistant traits), maturity group, growing season, pest control (i.e. weeds, insects, and diseases) and weather conditions. Early soybean planting requires additional




The best soybean management practices by

HOW TO PICK THE RIGHT SOYBEAN ROW SPACING

Take Away Points

- Soybean producers across the US use row spacing from 7 to 40 inches; row

National Recommendations

- Mechanism behind narrow row of the yield advantage from more sunlight driving more photosynthesis. Yield advantages are typically greater for earlier maturing varieties, and high tillage from VE (emergence) to R3 (line
- Data: Soybeans in 15-inch or narrower rows, and soybeans in 20-inch rows, and




Soybean planting-time management considerations

Maninder Singh and Thomas Siler, Michigan State University, Department of Plant, Soil and Microbial Sciences - April 22, 2021

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SOYBEAN PLANT POPULATION DENSITY

Take Home Messages

- Current soybean varieties efficiently respond to their

Introduction

Soybean production with high yields in the United States and in later-planted fields across the US. Soybean typically requires fewer plants and lower seeding rates for much of the Midwestern and Southern US when timely planting occurs.

Matching planting time with optimal variety maturity group and seeding rate can increase yield while minimizing input costs.

Cropping Systems Agronomy

Team Research **Extension** Resources Michigan Corn Hybrid Trials Prospective Students Contact

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Soybean

Articles

- Science for Success- Soybean Row Spacing
- Science for Success- Soybean Population
- Science for Success- Soybean Planting Date
- Reducing weather risk in soybean production
- Options for handling treated soybean seed (including as a cover crop)

Presentations

- Soybean Planting Decisions for Maximum Yield and Profit, 2021 Virtual Extension Meeting:

Extension

- Cropping Systems
- Corn Grain
- Corn Silage
- Soybean
- Small Grains

2020 On-farm Trials Report

Boots on the Ground: Validation of benchmarking process through an integrated on-farm partnership

IN A BEAN POD:

- In the 2020 crop season, the improved management treatment netted soybean producers an average of 3.2 bu/ac yield increase and \$31/ac

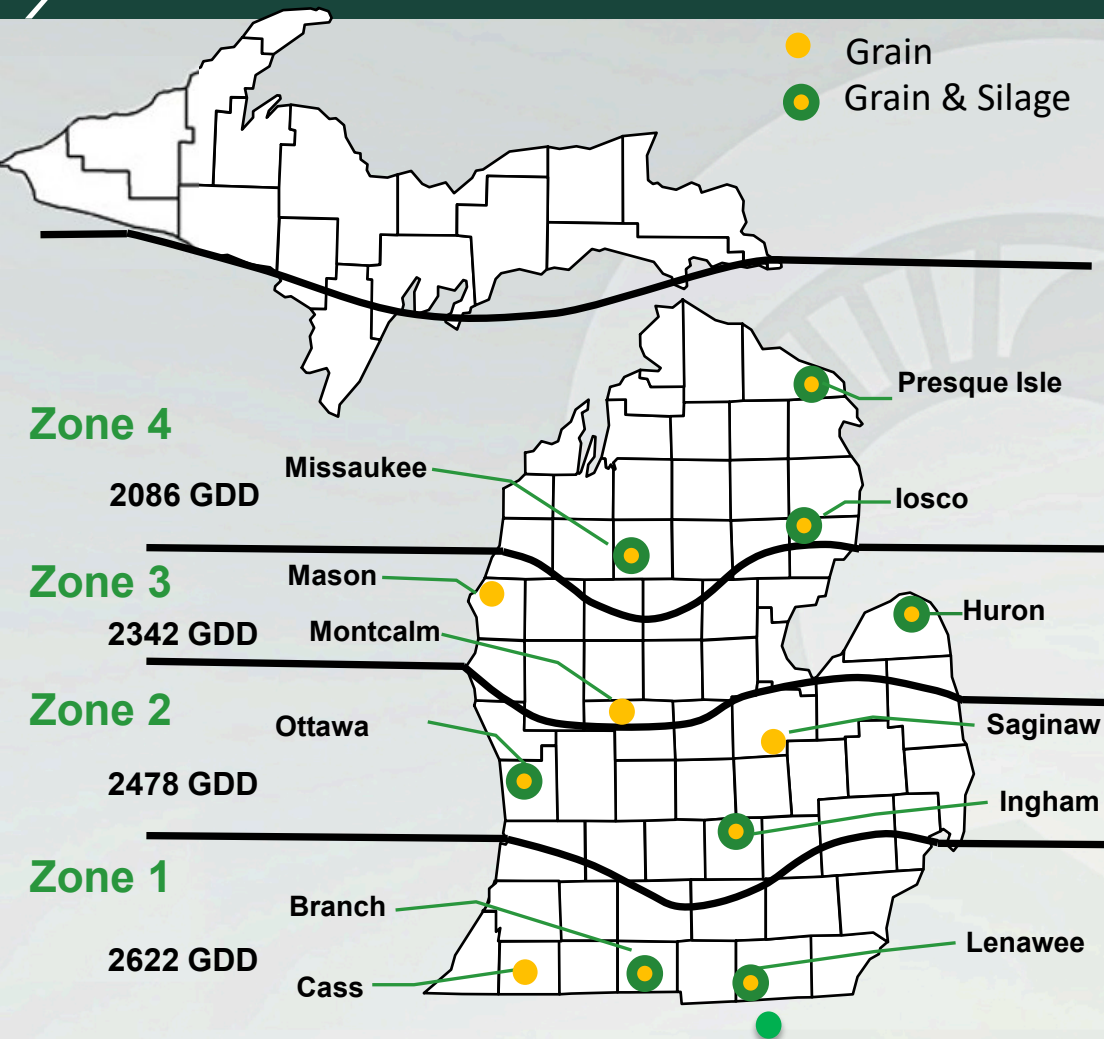
The best soybean management practices by Extension researchers from across the United States

Foliar Fertilizers Rarely Increase Yield in U.S. Soybean

Foliar Fertilizer Overview

2021 Corn Hybrid Testing Locations

<https://varietytrials.msu.edu/corn>



2021 MICHIGAN CORN HYBRIDS COMPARED

EXTENSION BULLETIN E-431

- **Technicians:**
 - **Tom Siler**
 - **Micalah Blohm**
- **Graduate Students**
 - Harkirat Kaur
 - Patrick Copeland
 - Benjamin Agyei
- **Undergrad students**
- **Past students**
- Mike Particka
- Paul Horny
- Charles Scovill (Syngenta)
- **Farmer cooperators**

- Dr. Laura Lindsey (OSU)
- Dennis Pennington
- Dr. Marty Chilvers
- Dr. Chris Difonzo
- Dr. Jeff Andresen
- Dr. Matt Gammans
- Dr. Christy Sprague
- Dr. Erin Burns
- Dr. Dechun Wang
- Dr. Kurt Steinke
- Dr. Karen Renner
- Dr. I. Ciampitti (KSU)
- Dr. Shawn Conley (UW)
- Mike Staton

Manni Singh

msingh@msu.edu

517-353-0226

agronomy.msu.edu

Thanks!

Seed companies



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