# Managing Soybeans to Make Cover Crops Work

# The TAKE HOME Message

- Cover Crop Success requires a “Systems Approach”

- **Many (most) failures/challenges come from managing the cover crop merely as additional INPUTS**
  - This is like switching from Conventional Tillage to No-Till without adjusting your planter…

# Program contributions

- Emerson Nafziger
- Jake Vossenkemper
- Lowell Gentry
- Mike Plumer
- NREC
- Steve Ebelhar

# The Shift to Early Planted Beans Presents Opportunities

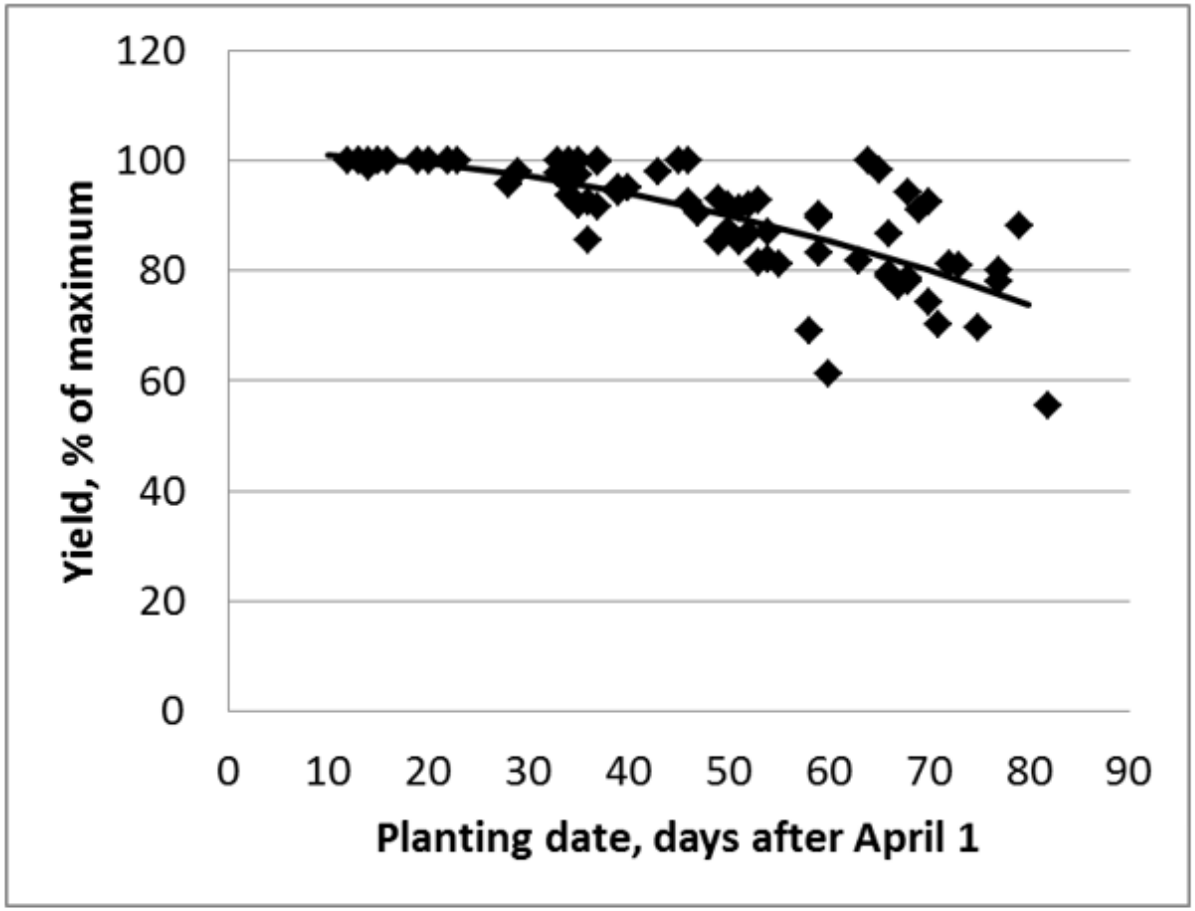
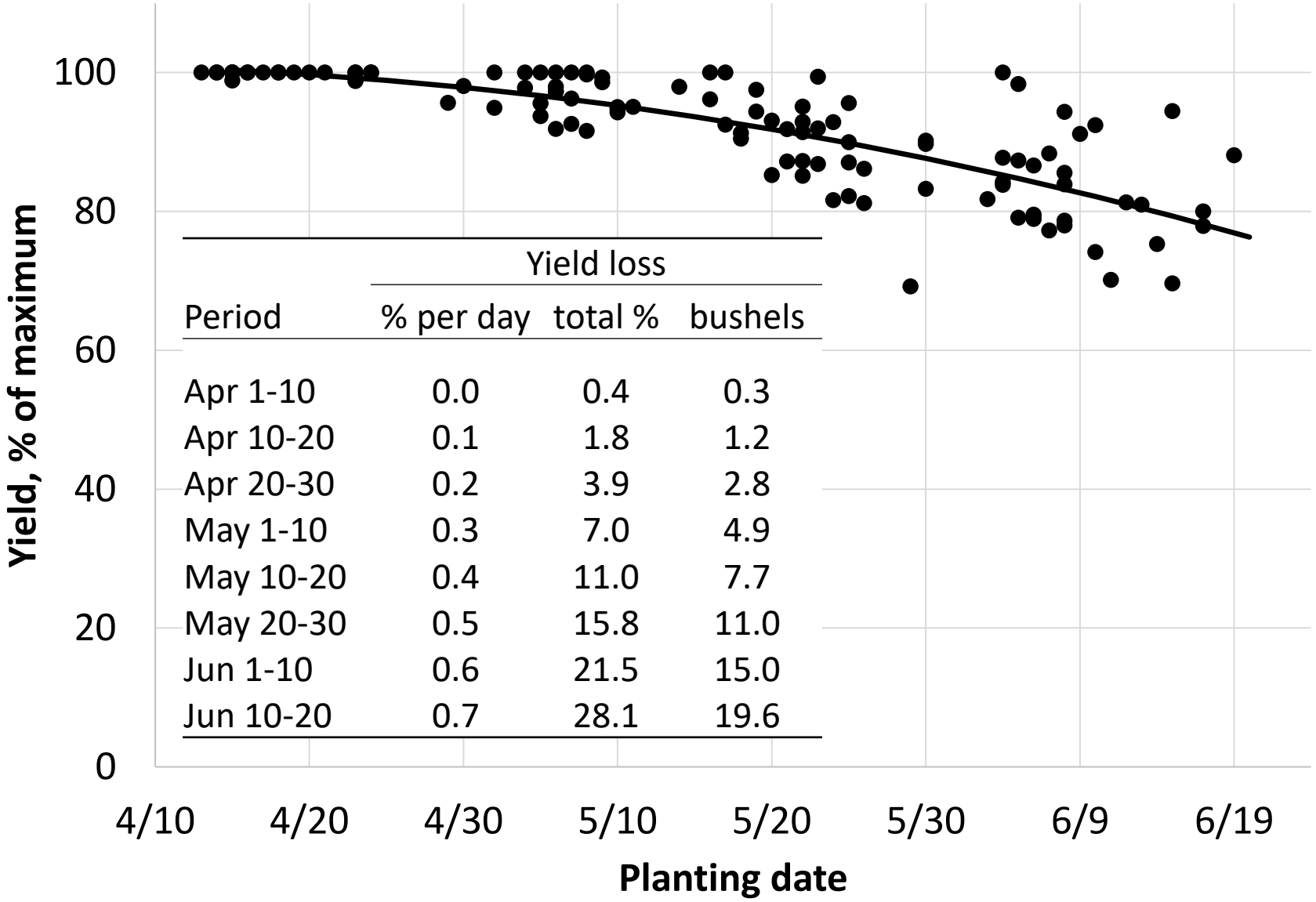



Figure 1. Soybean planting date response over 19 central and northern Illinois site-years, 2010-2014.

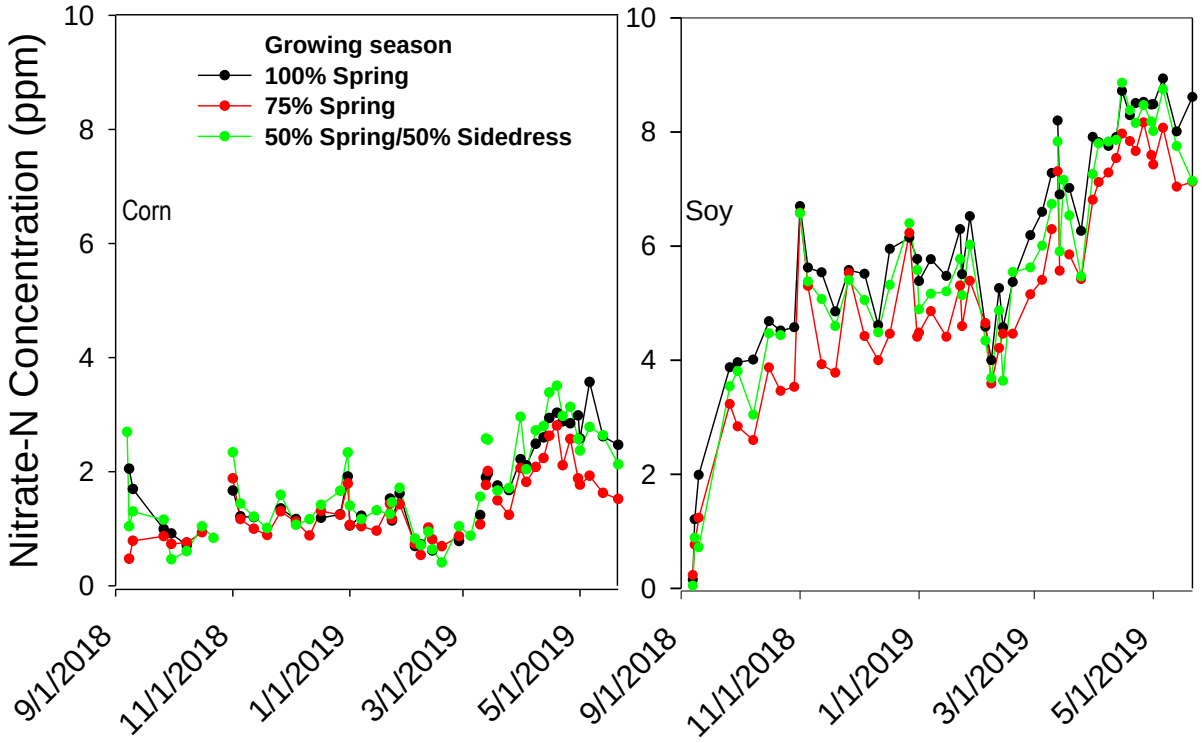
# Soybean planting date response, 29 Illinois trials




| Period | Yield loss | | |
|---|---|---|---|
| | % per day | total % | bushels |
| Apr 1-10 | 0.0 | 0.4 | 0.3 |
| Apr 10-20 | 0.1 | 1.8 | 1.2 |
| Apr 20-30 | 0.2 | 3.9 | 2.8 |
| May 1-10 | 0.3 | 7.0 | 4.9 |
| May 10-20 | 0.4 | 11.0 | 7.7 |
| May 20-30 | 0.5 | 15.8 | 11.0 |
| Jun 1-10 | 0.6 | 21.5 | 15.0 |
| Jun 10-20 | 0.7 | 28.1 | 19.6 |

# Tile Nitrate Concentration

## (Effect of previous crop)

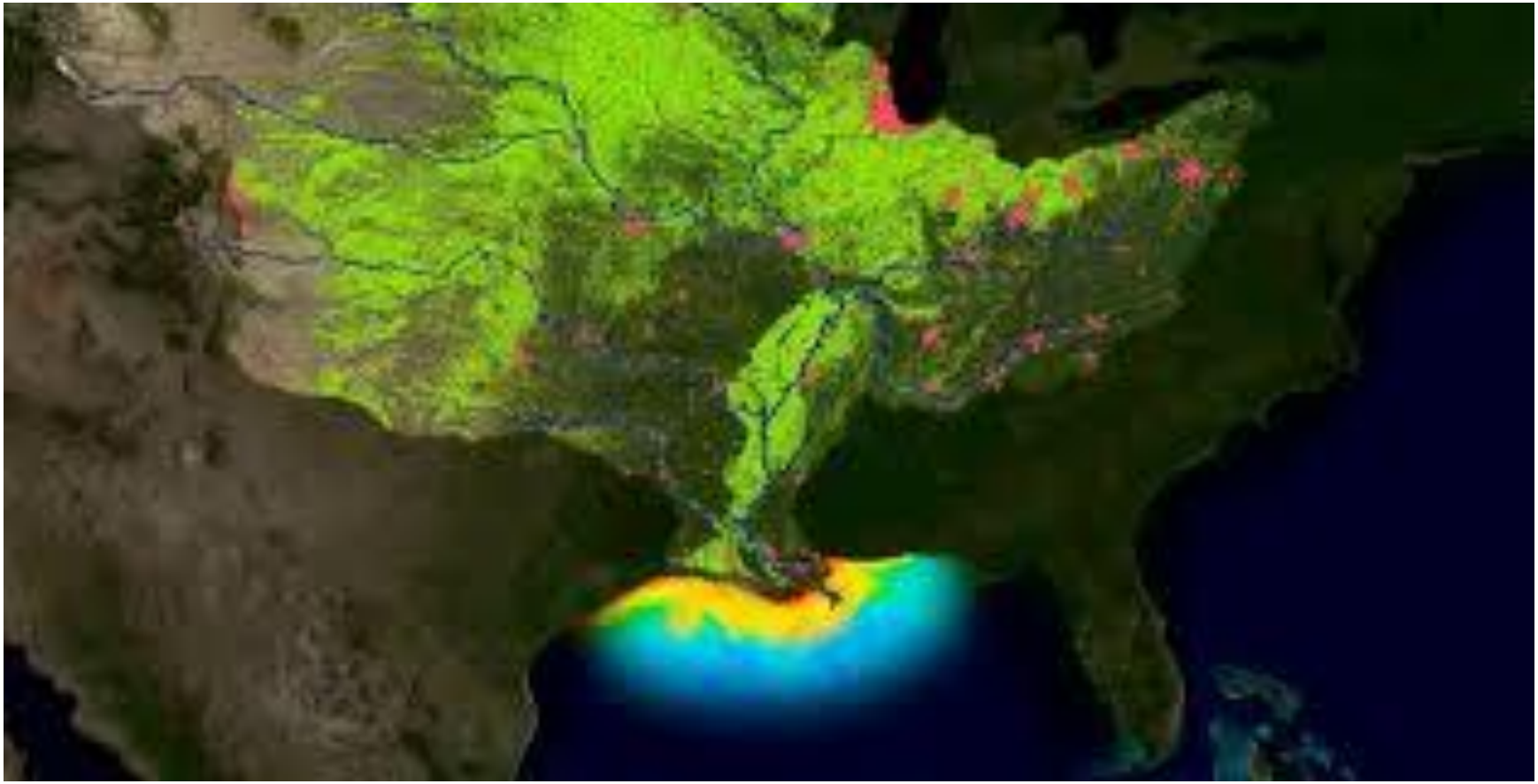



ILLINOIS NREC

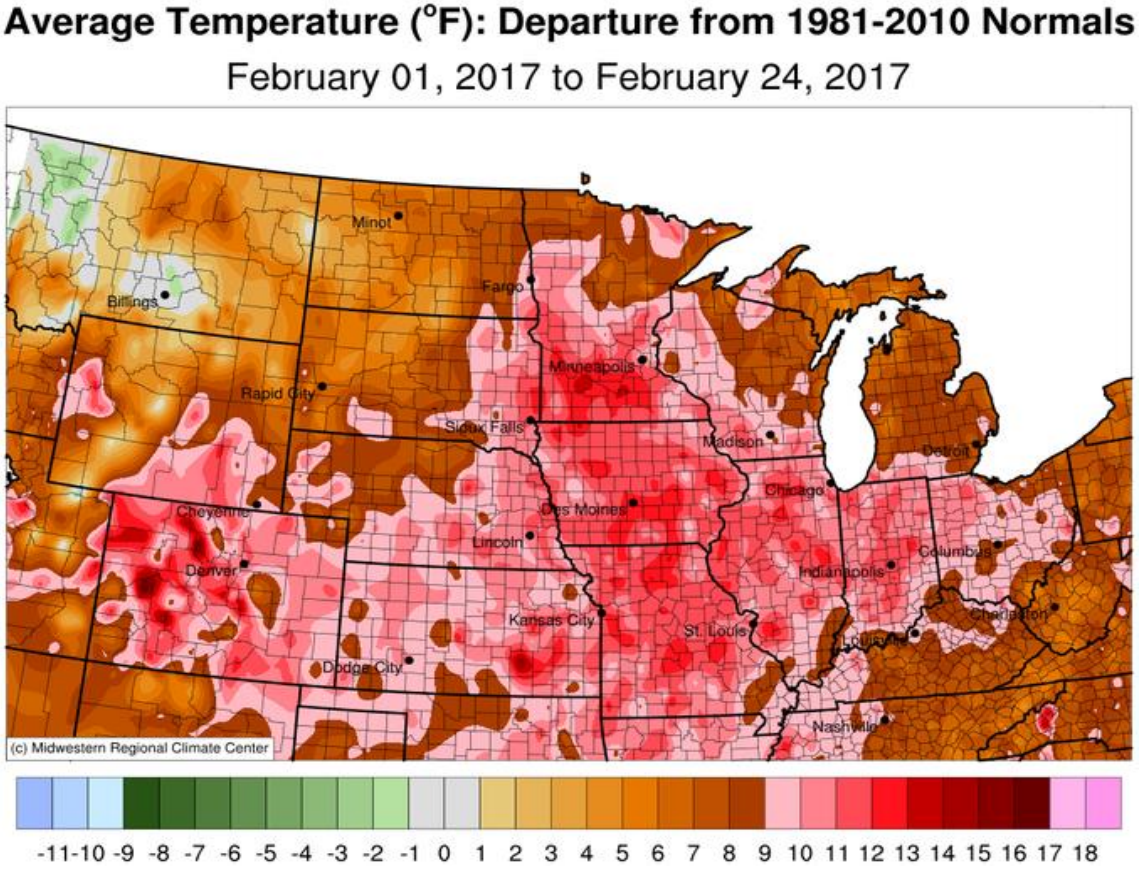
Can a potential problem be converted into a potential opportunity?

# ILLINOIS NUTRIENT LOSS REDUCTION STRATEGY

# Gulf Hypoxia Zone



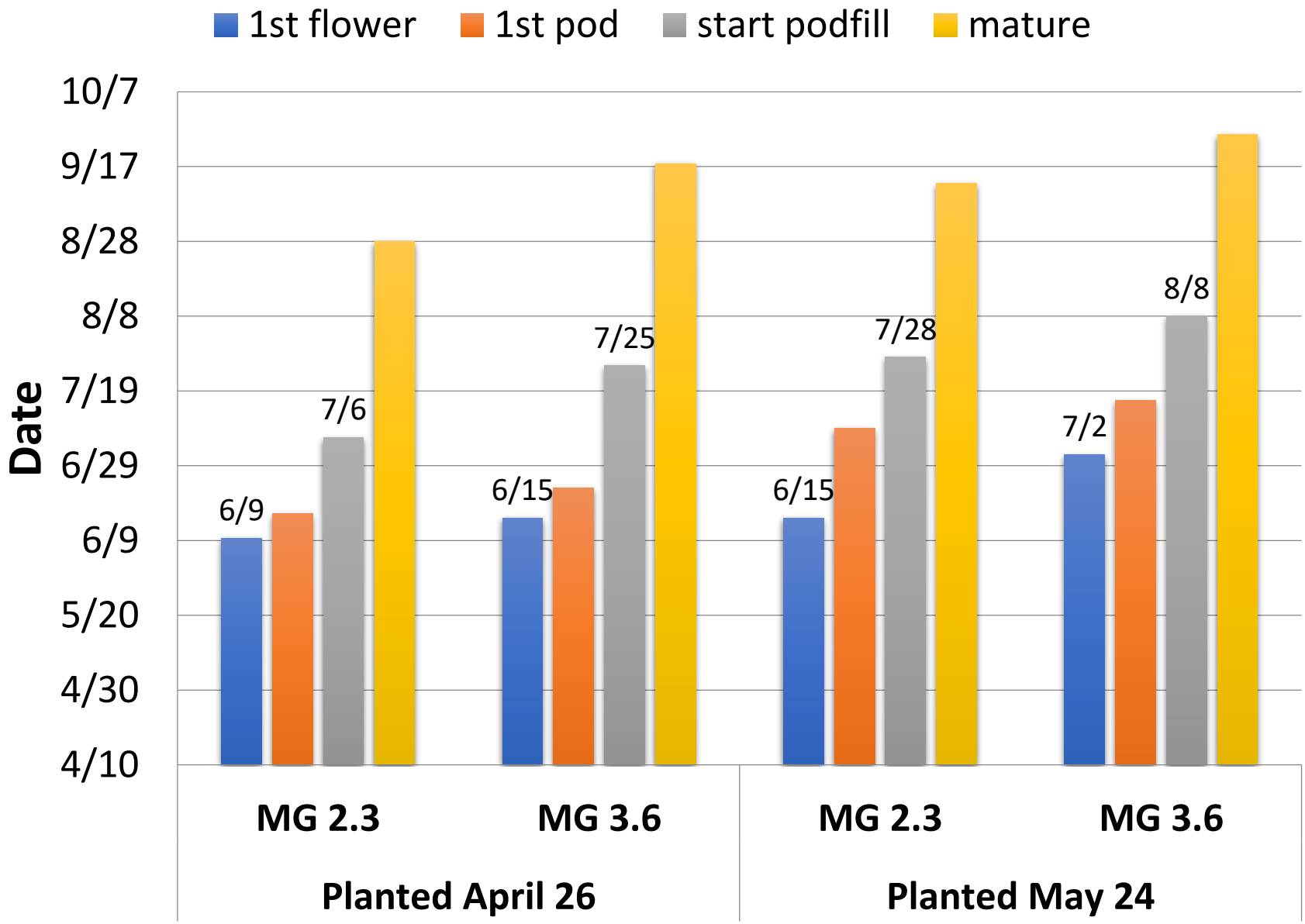
# Warm winters are slowly mining our soil organic matter.

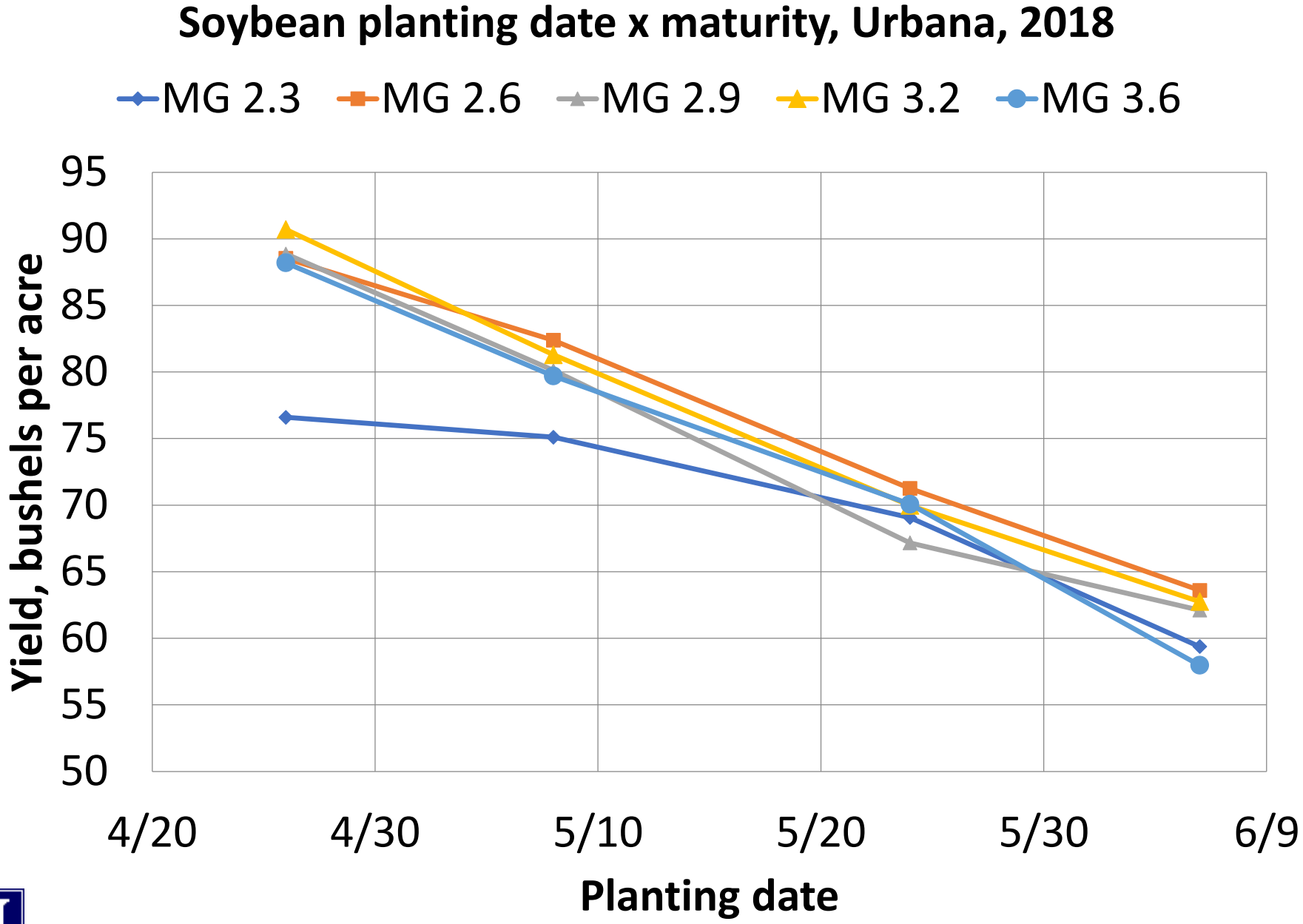


# Advantages of Early Soybean Planting

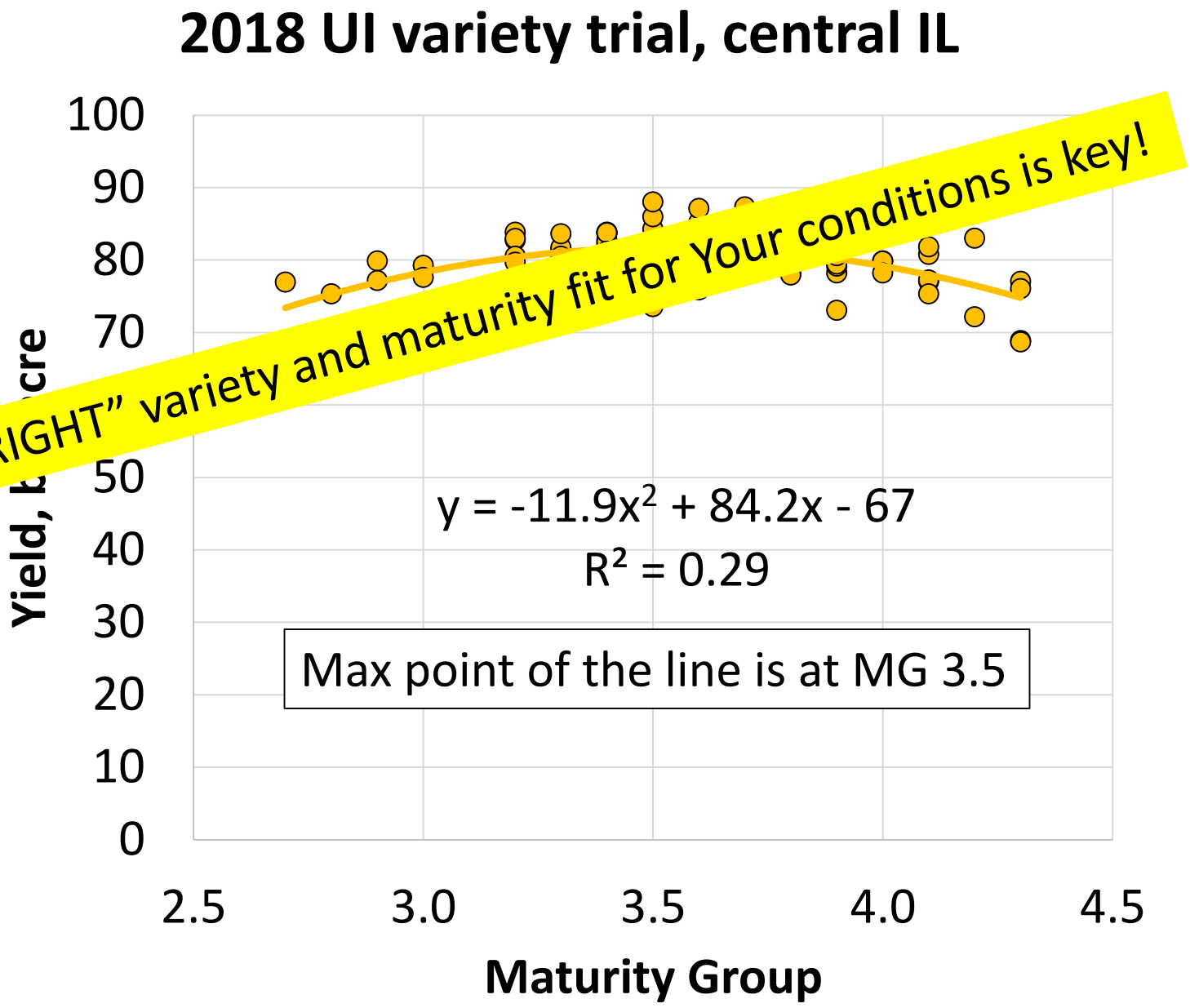
- Potential for Higher yields
- Capitalize on adaptability of Soybean plant
- More efficient harvest season
- Early soybean harvest widens window for Cover Crop establishment
  - Improved winter survival
  - Potential for more diverse cover crop mix
  - More options for better cover crop system ahead of corn
- Reduce nutrient losses and keep them in play for following corn crop
- More…

# Soybean maturity x planting date, Urbana, 2018




Soybean planting date x maturity, Urbana, 2018
MG 2.3
MG 2.6
MG 2.9
MG 3.2
MG 3.6
Yield, bushels per acre
95
90
85
80
75
70
65
60
55
50
4/20
4/30
5/10
5/20
5/30
6/9
Planting date

Maturity usually "explains" little of the yield difference am… varieties, especially in the central MG range - (avg ± 0.5)



# A Better Cover Crop Fit

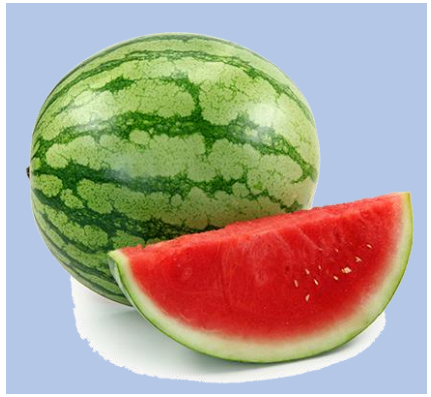
Don’t steer while looking backwards, but a better understanding of why things are the way they are, can help us better evaluate plans to achieve further goals.

# Causes of Cover Crop Failure

- Establishment Failure
  - Herbicide
  - Moisture
- Seed variety not well suited to the region
  - Don’t plant VNS
  - Buy from a sources that “knows” their seed
- Nitrogen Management in Corn
- Not managing for the System

# The Root of Modern Day Conservation Adoption Challenges?

# Perception



| Material | C:N Ratio |
|---|---|
| rye straw | 82:1 |
| wheat straw | 80:1 |
| oat straw | 70:1 |
| corn stover | 57:1 |
| rye cover crop (anthesis) | 37:1 |
| pea straw | 29:1 |
| rye cover crop (vegetative) | 26:1 |
| mature alfalfa hay | 25:1 |
| **Ideal Microbial Diet** | **24:1** |
| rotted barnyard manure | 20:1 |
| legume hay | 17:1 |
| beef manure | 17:1 |
| young alfalfa hay | 13:1 |
| hairy vetch cover crop | 11:1 |
| soil microbes (average) | 8:1 |

# Potential Benefits of Cover Crops

- **Erosion Control**
- **Improve Water Quality**
- Nitrogen Scavenger
- Soil Builder
- Weed control or suppression
- Grazing/forage
- Increase Soil Organic Matter
- Conserve Soil Moisture
- Wildlife habitat
- A Positive for overall SOIL HEALTH

# Several Small Improvements Can Yield Substantial Benefits


## Whether Chopping Or Distributing Residue, Do It Evenly

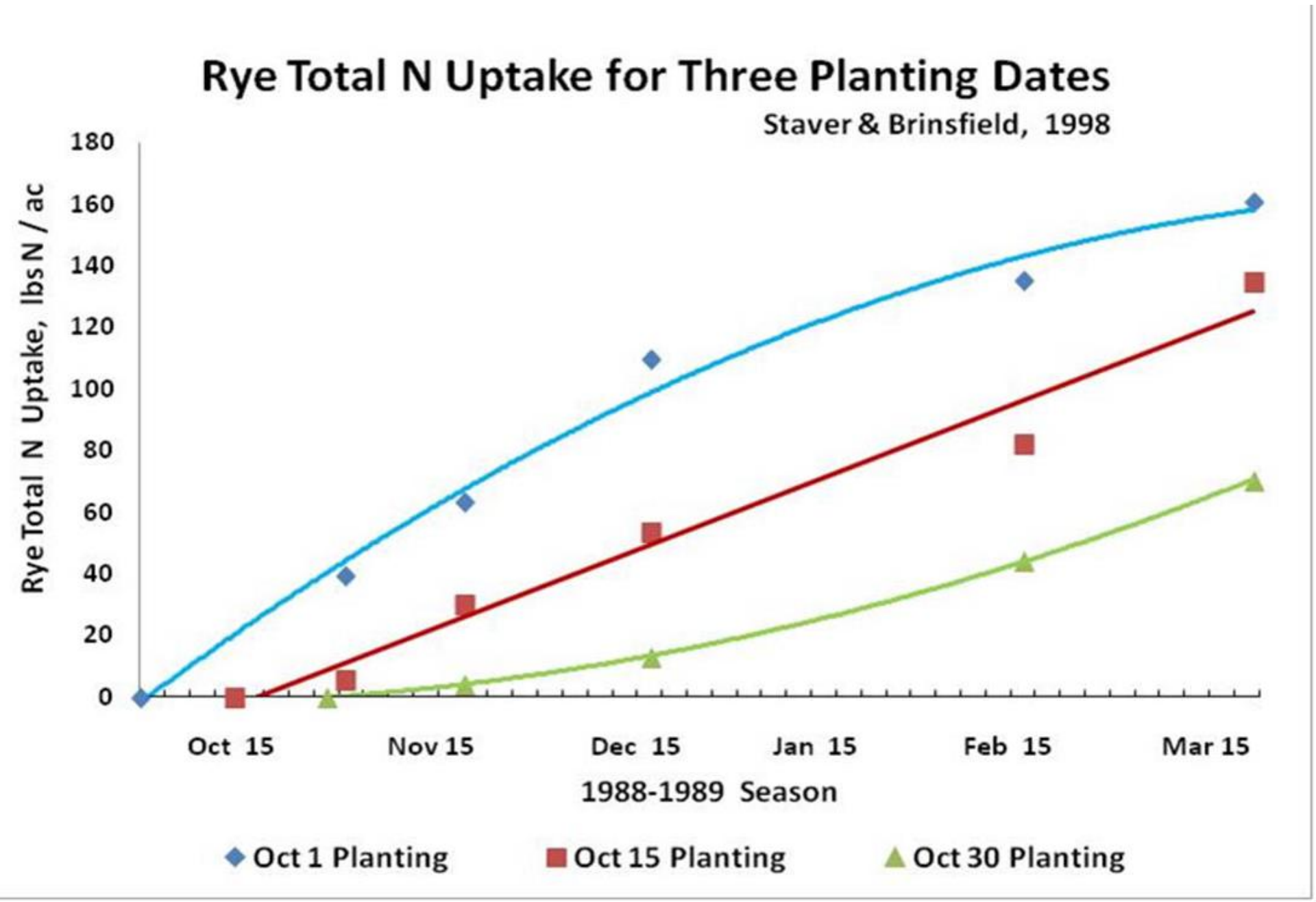
By Frank Lessiter posted on August 1, 2008 | Posted in Residue Management, Precision Ag

# Cover Crop Managment

- Adjust your Cover Crop Plan
  - Just like you adjust the planter/combine/sprayer

- Seeding Date
  - Do everything you can to get the cover crop planted/established as early as possible

  - The more development going into winter increases survivability And Potential Benefits


Rye Total N Uptake for Three Planting Dates
Staver & Brinsfield, 1998
Rye Total N Uptake, lbs N / ac
180
160
140
120
100
80
60
40
20
0
Oct 15
Nov 15
Dec 15
Jan 15
Feb 15
Mar 15
1988-1989 Season
Oct 1 Planting
Oct 15 Planting
Oct 30 Planting

# Cover Crop Management

- Consider maturity of corn/soybean crops to maximize cover crop benefits
  - The move to earlier soybean planting date can play a huge role in potential cover crop successes in the following corn crop.
  - Yield bump for early SB planting?
  - SB have greater ability to adjust for stand loss
- Corn does better in warmer soils
  - Quicker emergence
  - More uniform stand
  - WATER is a bigger concern at pollination than HEAT
    - Cover crop systems can improve mid season water availability

# Cover Crop Management

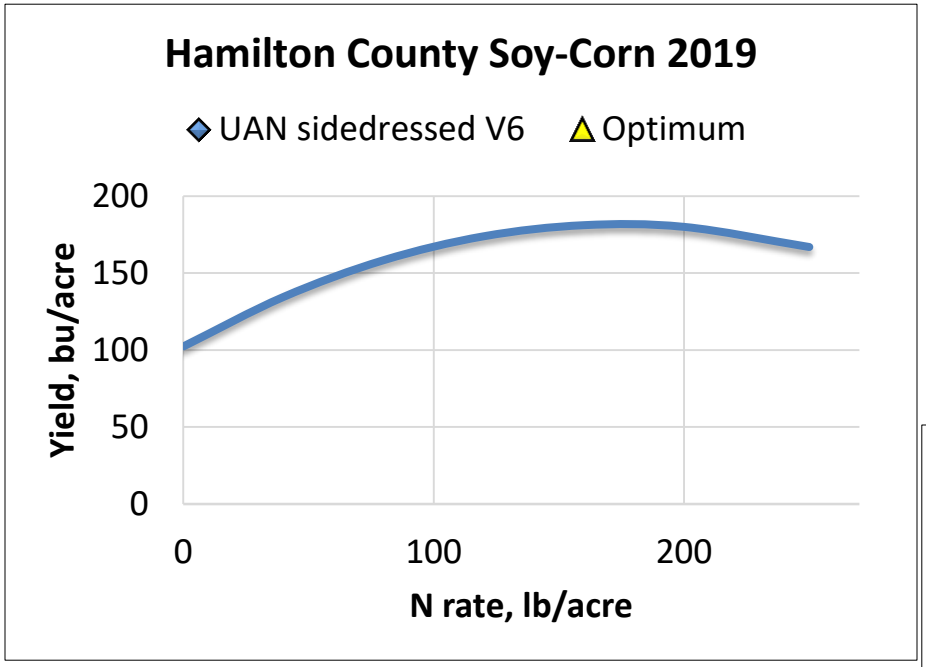
- What's in the Cover Crop Mix?
  - Each species has it's purpose
  - Always more synergism than antagonism in mixes

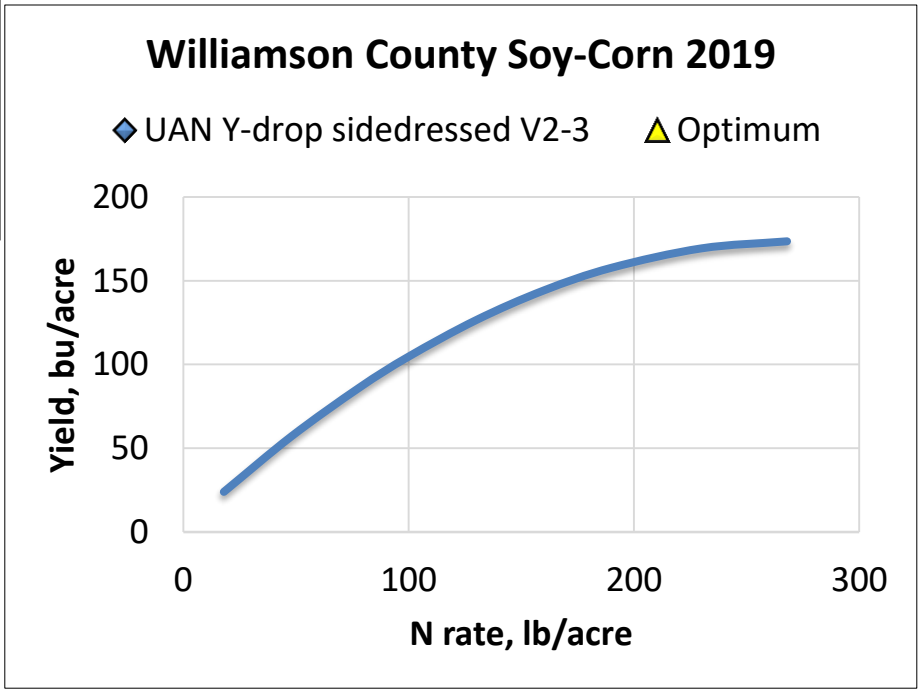
- Termination
  - Have a plan AND Flexibility
  - Early spring temps, moisture, likely planting date, FORECAST
    - Consider these factors more than calendar date!

# Cover Crop Management

- Nitrogen Supply in Corn
  - Cover Crops will sequester early N
    - But it can be available later in season
    - How much N can cover crop supply?
  - Starter N very important
    - Planter applied probably best in most cases
    - In-furrow good but additional N needed soon after
    - 2x2 or Tube dropped UAN is a good bet
    - Advantage to N dropped at plant base in some years
      - This is true for conventional systems too when root growth is slow and N sidedressed in middle of row
- Take advantage of advances in Corn genetics

# Nitrogen Supply from Cover Crop

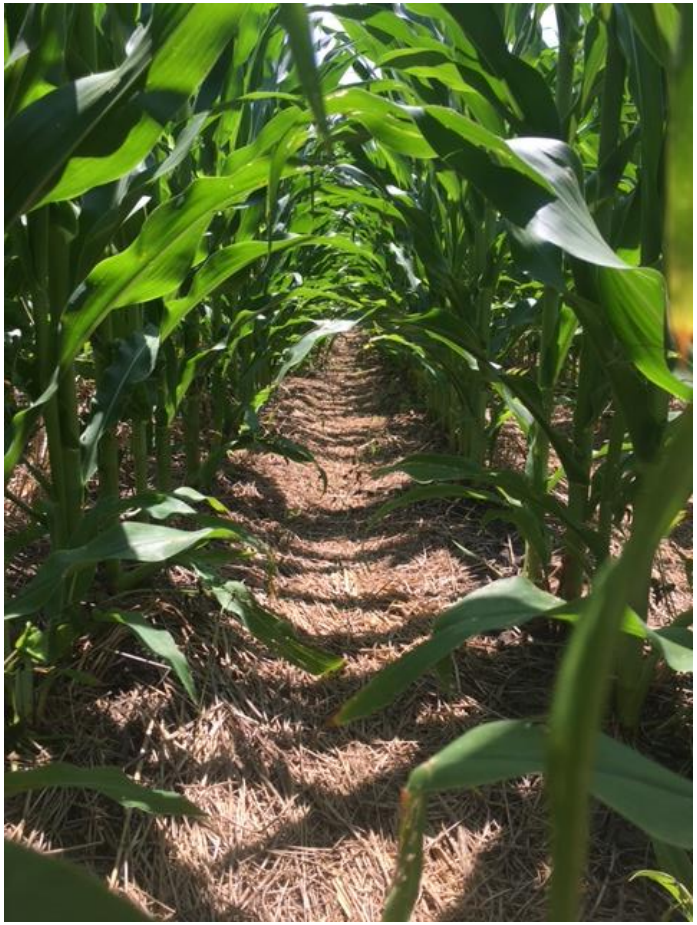


# Several Options for Skip/Strip Systems

# Manage the System, not the Input

# Precision Planted Cover Crops 2018-19 Yield Summary



Junior Upton

John Pike

# 2018 Yields and Rank

| Treatments (2018) | Row Cover/ | By Row/ | Row Middle/ | Yield | Rank |
|---|---|---|---|---|---|
| 1 | **CHECK** | **No cover Crop** | | **147.57** | **12** |
| 2 | Radish | NO | Cereal Rye | **197.85** | **1** |
| 3 | Radish | Vetch | AR + CR + Vetch | **192.80** | **3** |
| 4 | Radish | NO | AR + CR + Vetch | **185.16** | **5** |
| 5 | E. Cabb (east)/Persian (west) | AR + CR + Vetch | AR + CR + Vetch | **169.13** | **9** |
| 6 | Oat | Crimson | AR + CR + Crimson | **171.47** | **8** |
| 7 | Crimson | Crimson | AR + CR + Crimson | **185.81** | **4** |
| 8 | NO | Balansa (L165-16-521) | AR + CR + Crimson | **193.64** | **2** |
| 9 | Crimson + Radish | Crimson + Radish | AR + CR + Crimson | **173.70** | **7** |
| 10 | Cereal Rye | Cereal Rye | Cereal Rye | **163.85** | **10** |
| 11 | NO | Annual Ryegrass | Annual Ryegrass | **179.17** | **6** |
| 12 | E. Cabb + Rape | Crimson | AR + CR + Crimson | **163.42** | **11** |

# 2019 Solid Drilled Grass Cover Crop with N Management

| 2019 Soild Grass Cover Crops | | | **Yields** |
|---|---|---|---|
| Cereal Rye Drilled | Cereal Rye | Cereal Rye | **272.26** |
| Bounty ARG | Bounty ARG | Bounty ARG | **236.79** |
| Lowboy ARG | Lowboy ARG | Lowboy ARG | **245.56** |

- Early burndown
- In-furrow pop-up fertilizer
- Early sidedress
  - Injected UAN 180#
  - Applied V1-2 (7 days after planting)
  - 8” off row, not in middle of row

# 2 Year Averages

- Check (No Cover Crop soybean stubble)
  - **166.21** bu./ac.
  - Early standard burndown
  - Other treatments planted into green cover crop
- **Crimson Clover Treatments**
  - **190.76** bu./ac.
- **Hairy Vetch Treatments**
  - **213.98** bu./ac.

- Check
  - **166.21** bu./ac.
- **Winter Term. Cover on row**
  - **191.94** bu./ac.
  - Some advantage seen with winter terminated row cover in Vetch treatments
- **No cover on row**
  - **211.02** bu./ac.
- **Crimson Clover on row**
  - **179.31** bu./ac.

# Crimson Clover Plots

# Hairy Vetch Plots

# Green covers near row help to dry soil in planting “zones”

# 2019 Planting Corn
# June 3

# Planting 2020 Plot

- Replicated field length strip plots replace small plots
- Planted with commercial drill, instead of small plot drill.


Have a Safe and Profitable 2020!