Historical view of corn and soybean production – What about the future?

2024 ACAW

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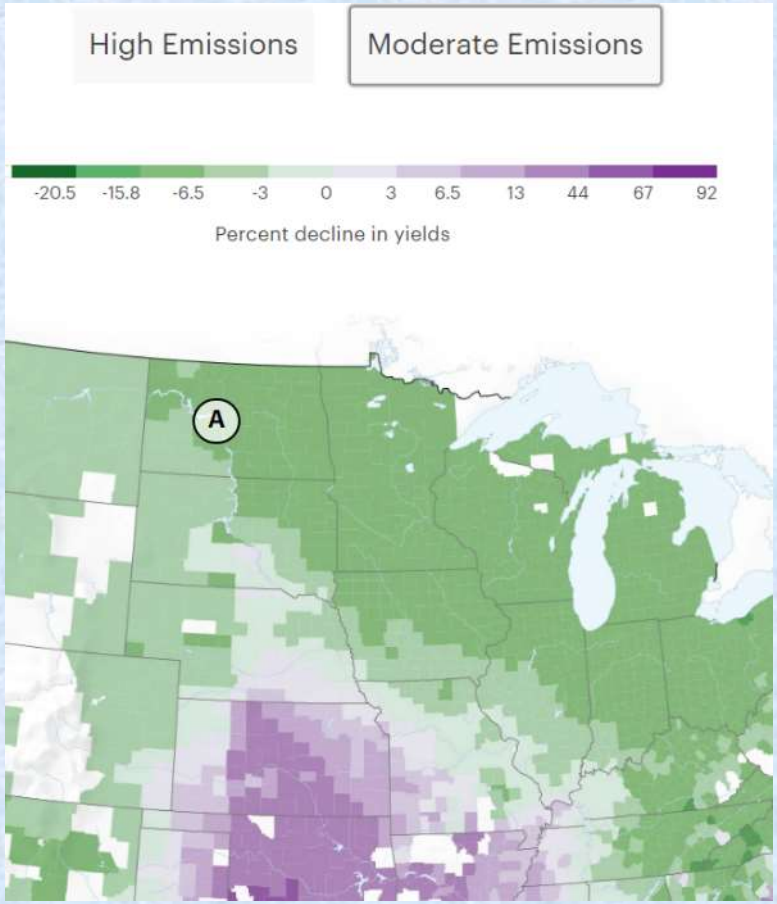
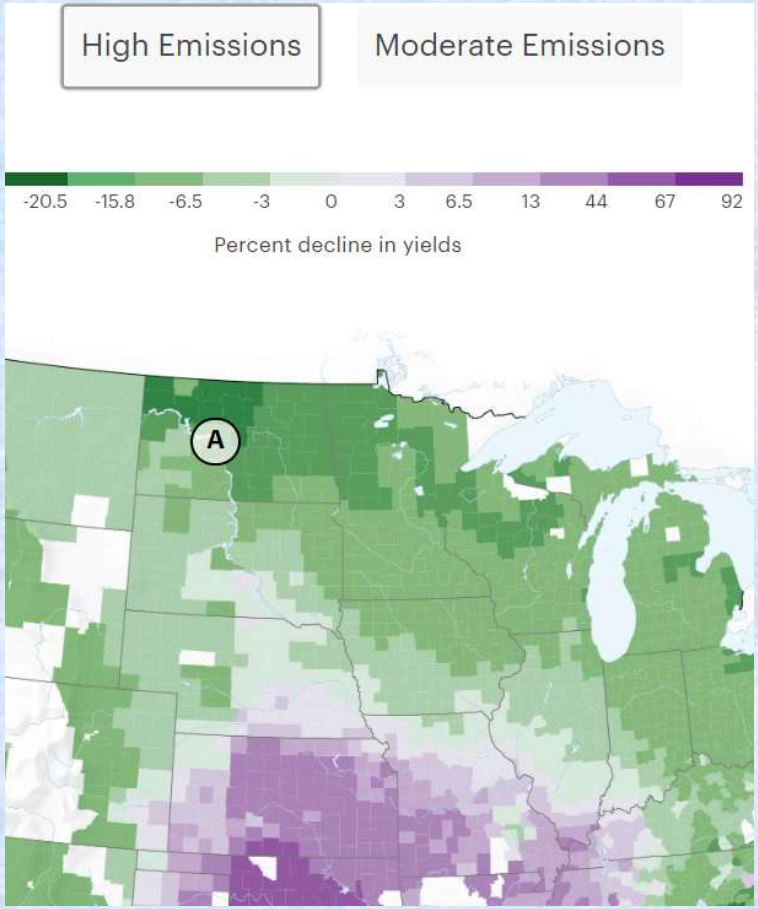
2040-2060

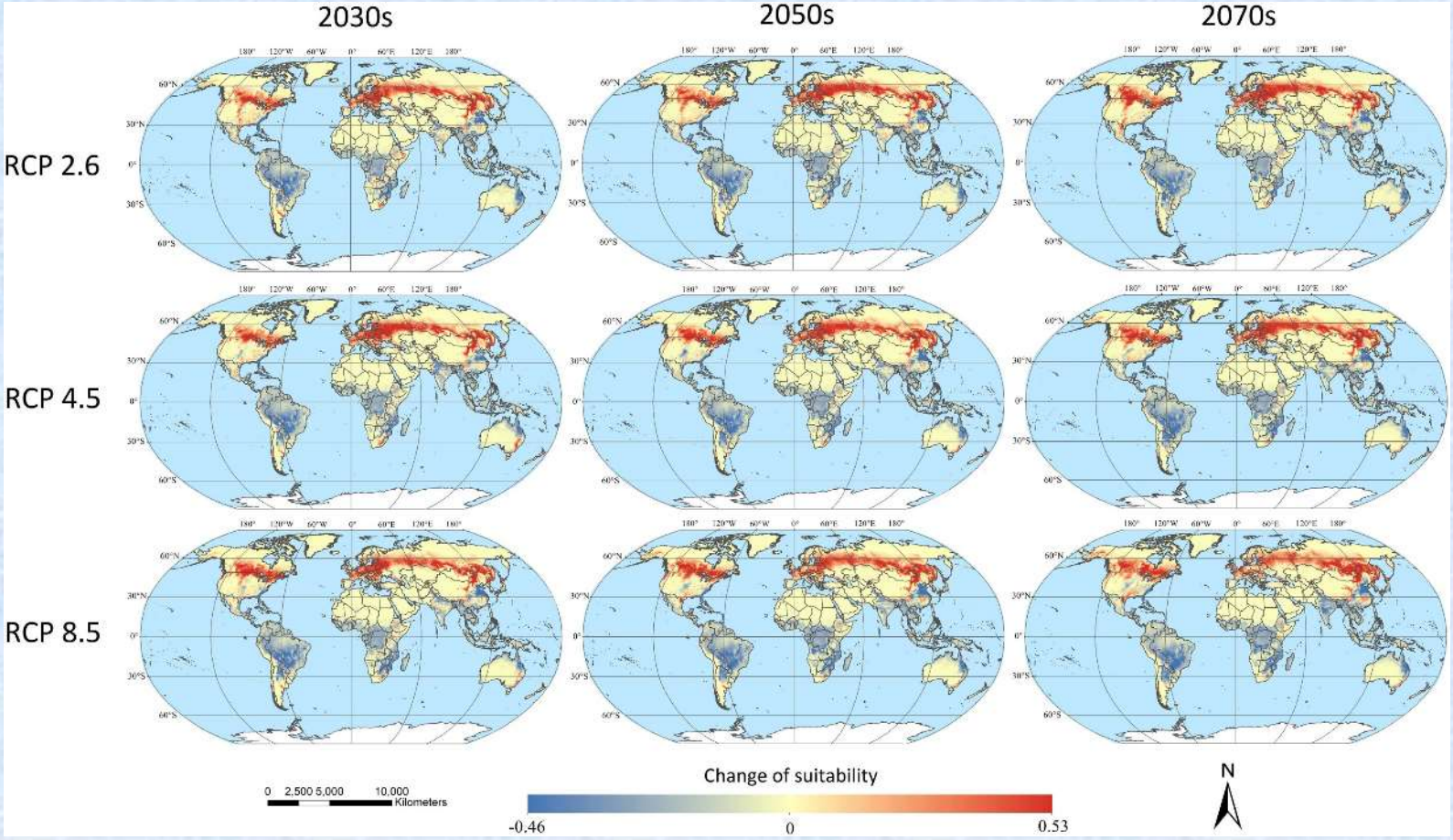
https://projects.propublica.org/climate-migration/





The projection: best areas for growing soybean will move north
But there will be net loss of suitable area

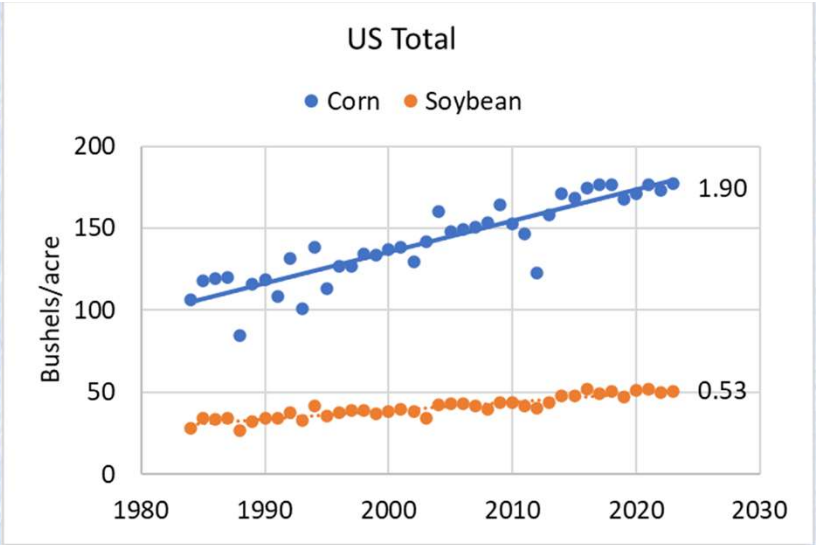
Fig. 5. The distribution of the change in soybean cultivation land suitability under climate change scenarios.

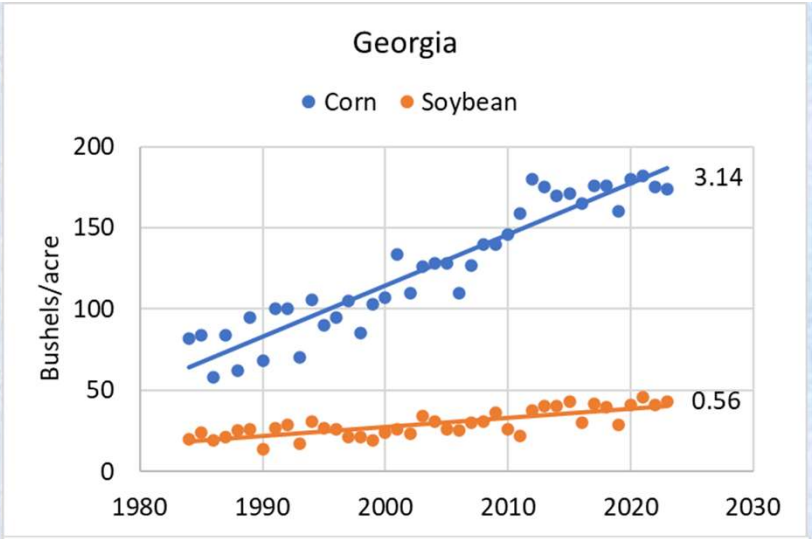


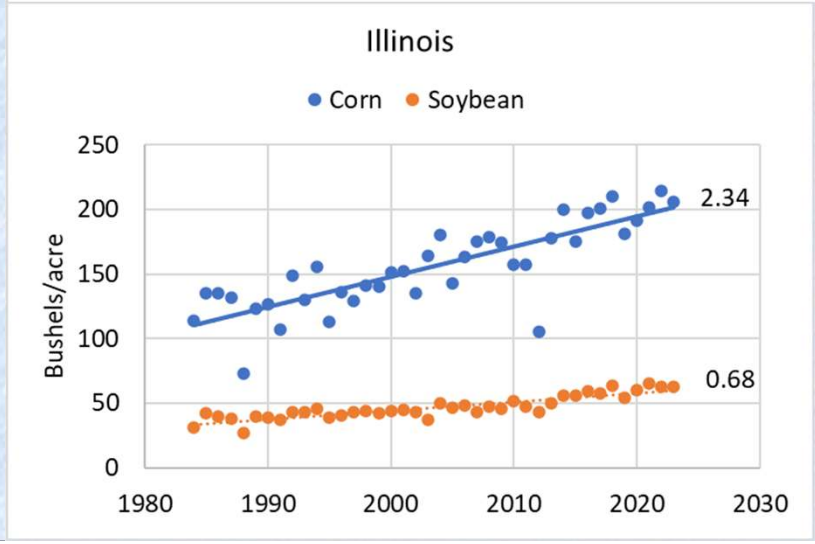
A comment on climate change and crops

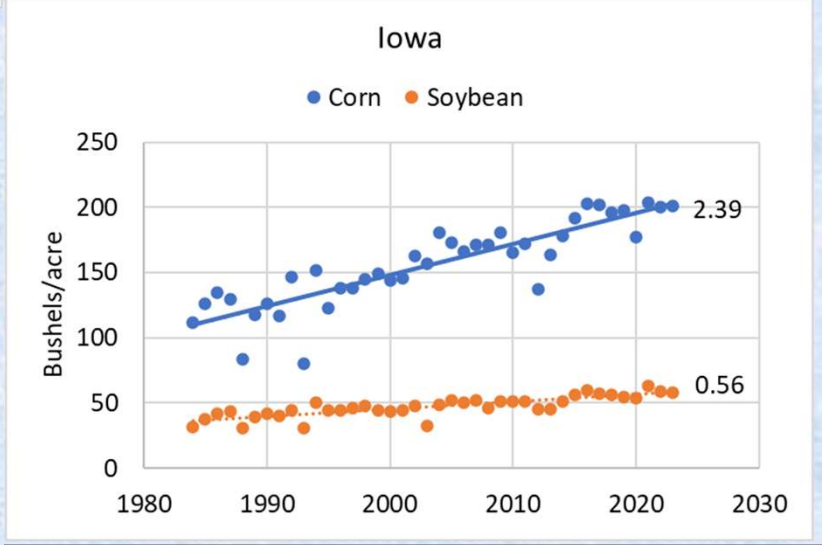
- A lot of money has gone into trying to estimate effects of increasing [CO_2] on crop yields – e.g. SoyFACE at the University of Illinois
- But ongoing breeding efforts in crops will be done under increasing [CO_2], and current varieties can't anticipate what those changes will be
- Because CO_2 is the raw material for all plants, increasing its concentration will be positive, especially once plants are bred under increasing CO_2
- It is not certain that the benefit of high CO_2 will outweigh the negative of higher temperature, but it is more likely to at higher latitudes

Corn & Soybean Yield Trends, 1984-2023









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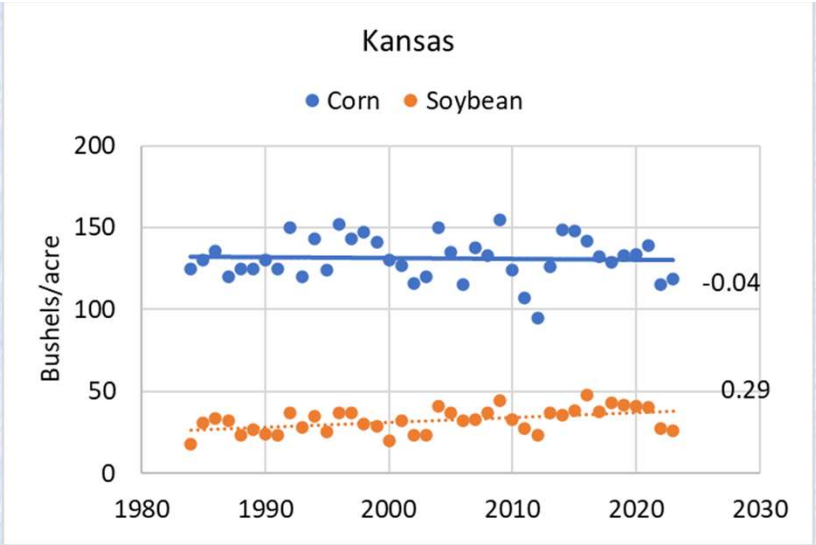

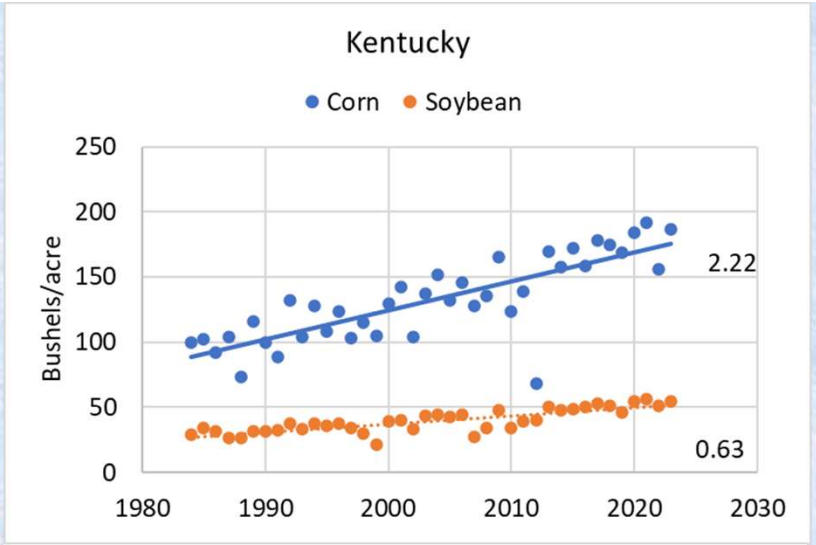

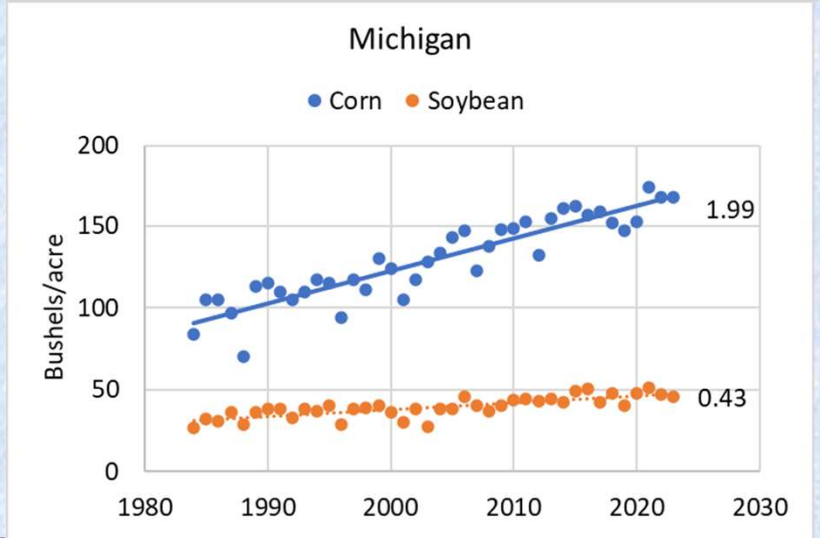

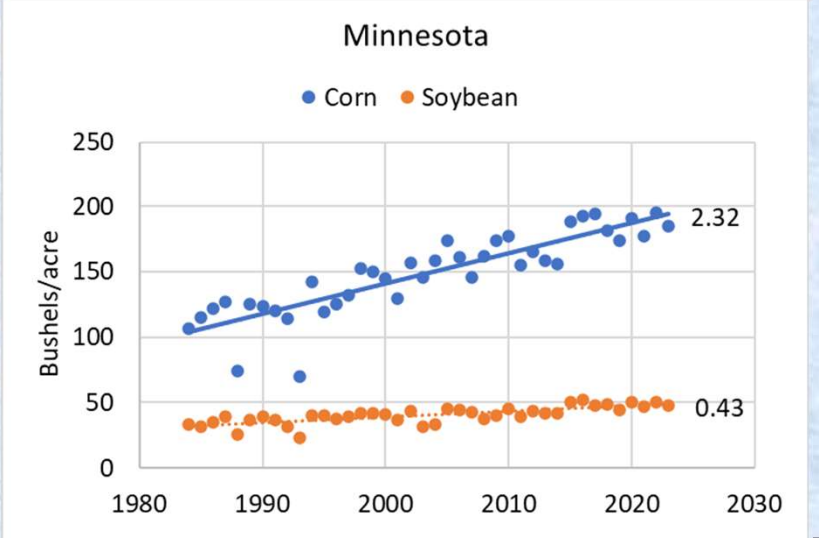

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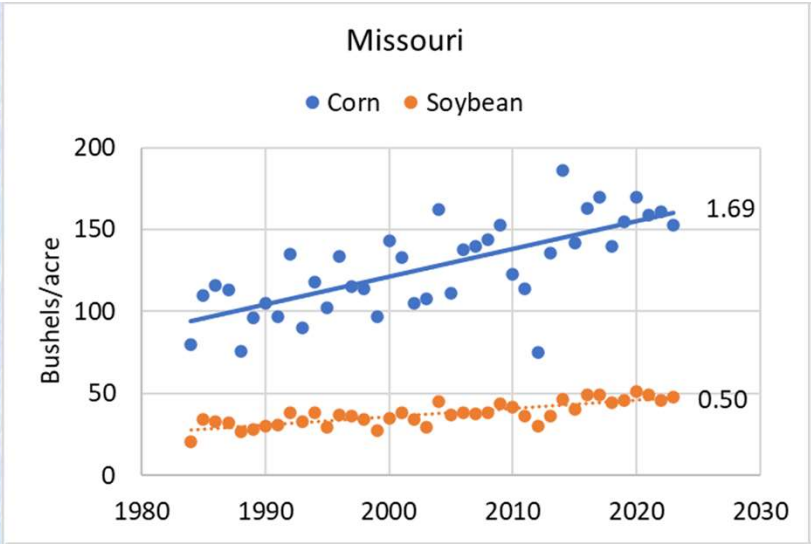

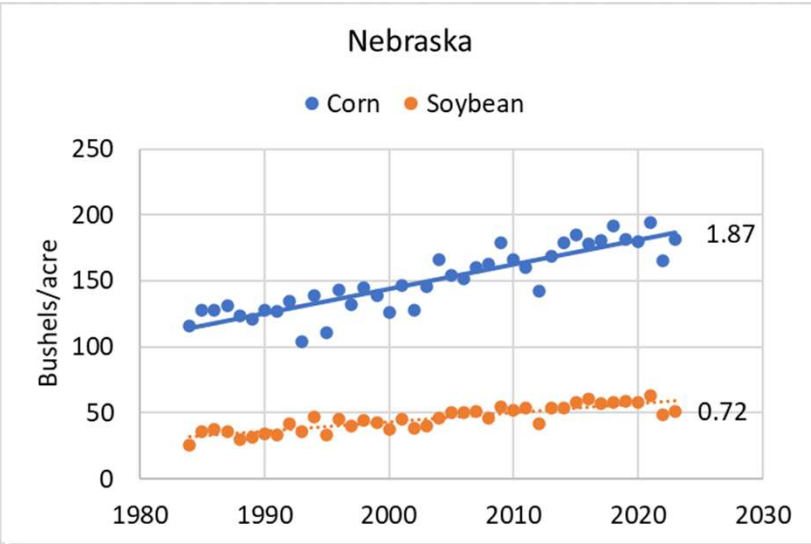

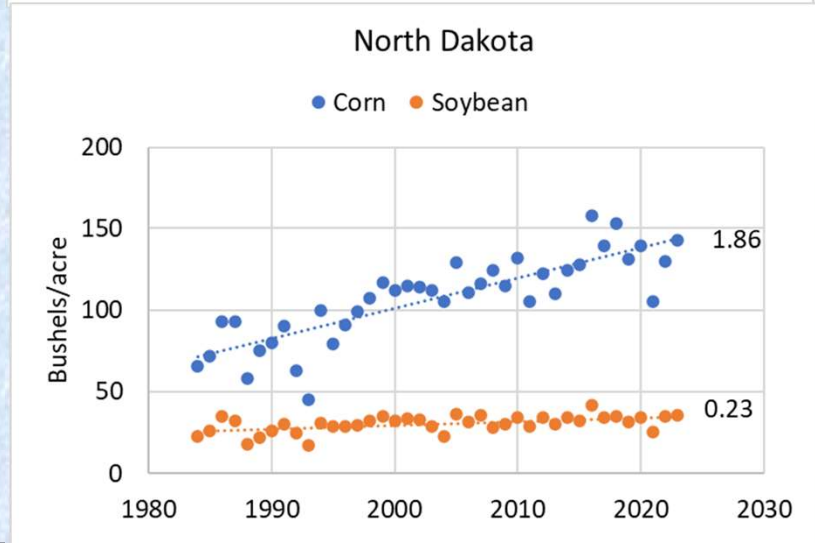

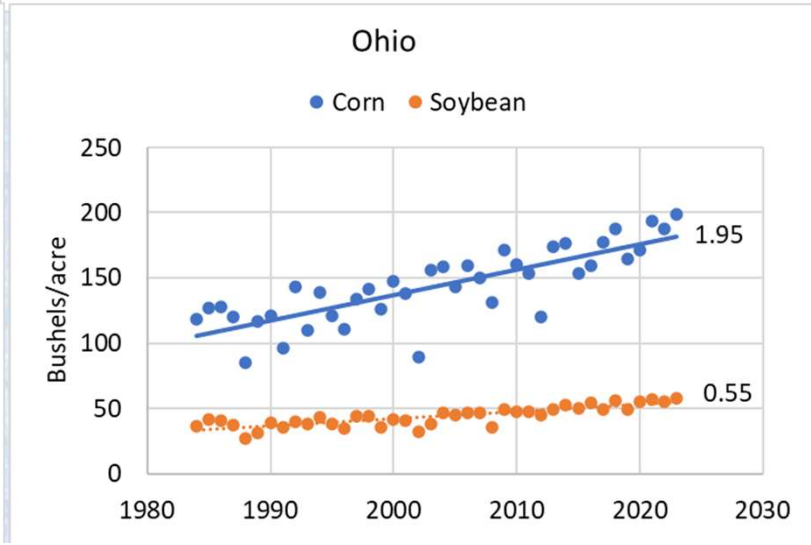

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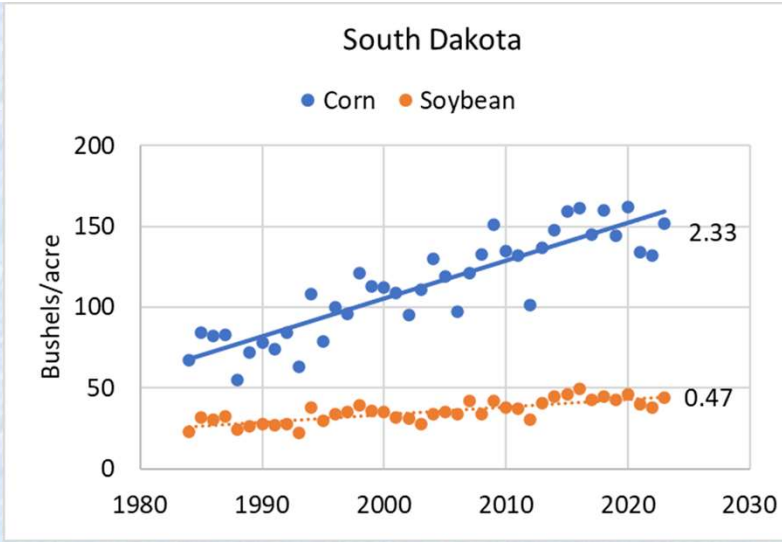
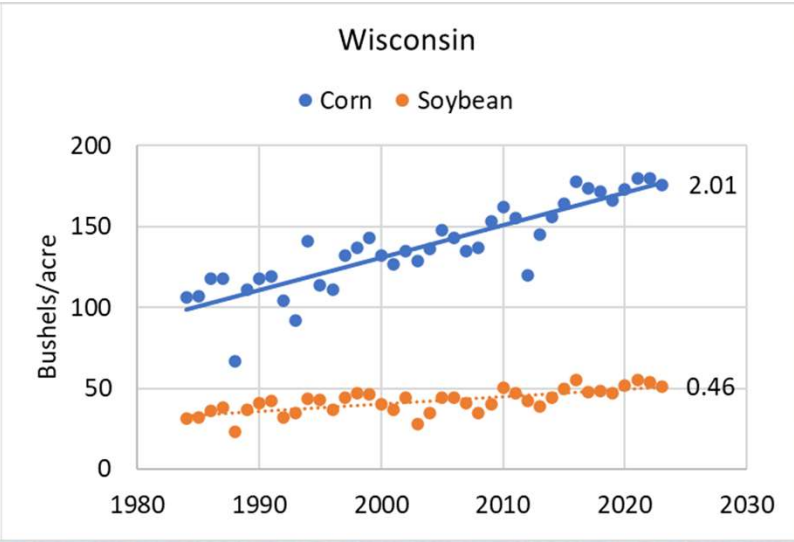
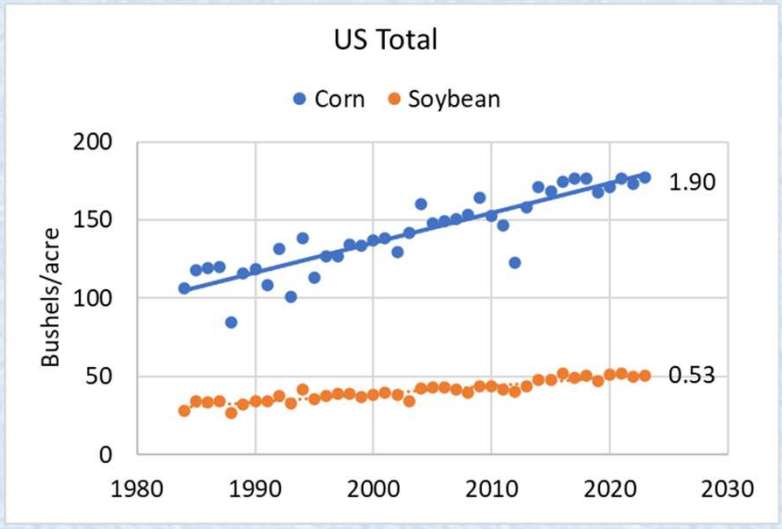
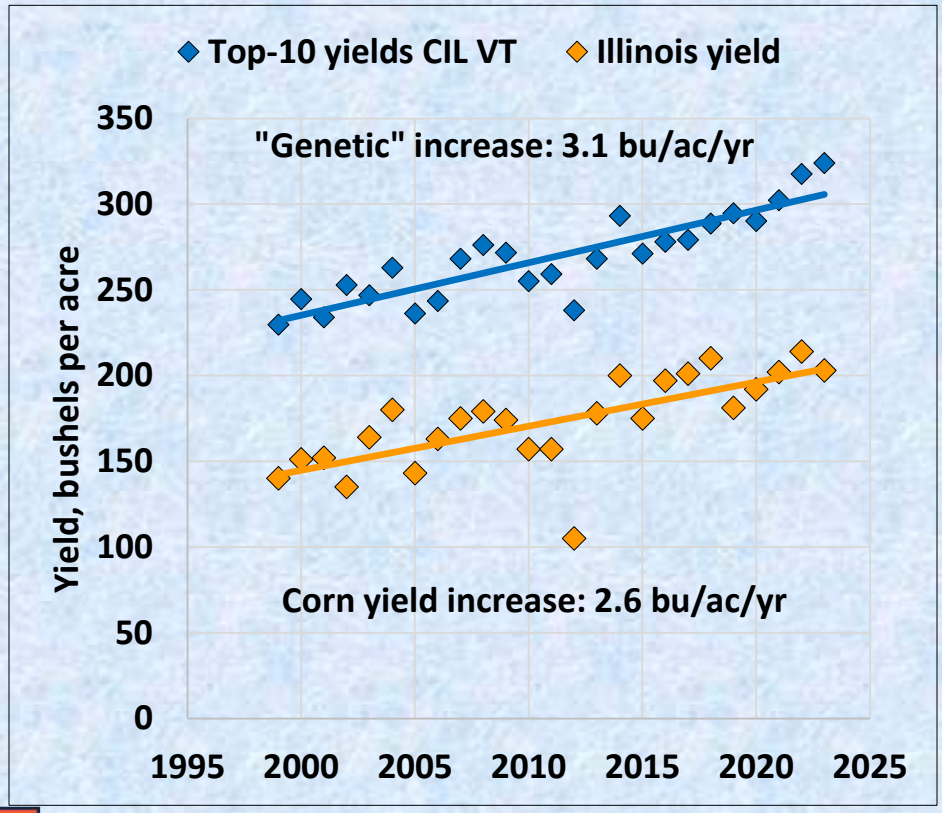
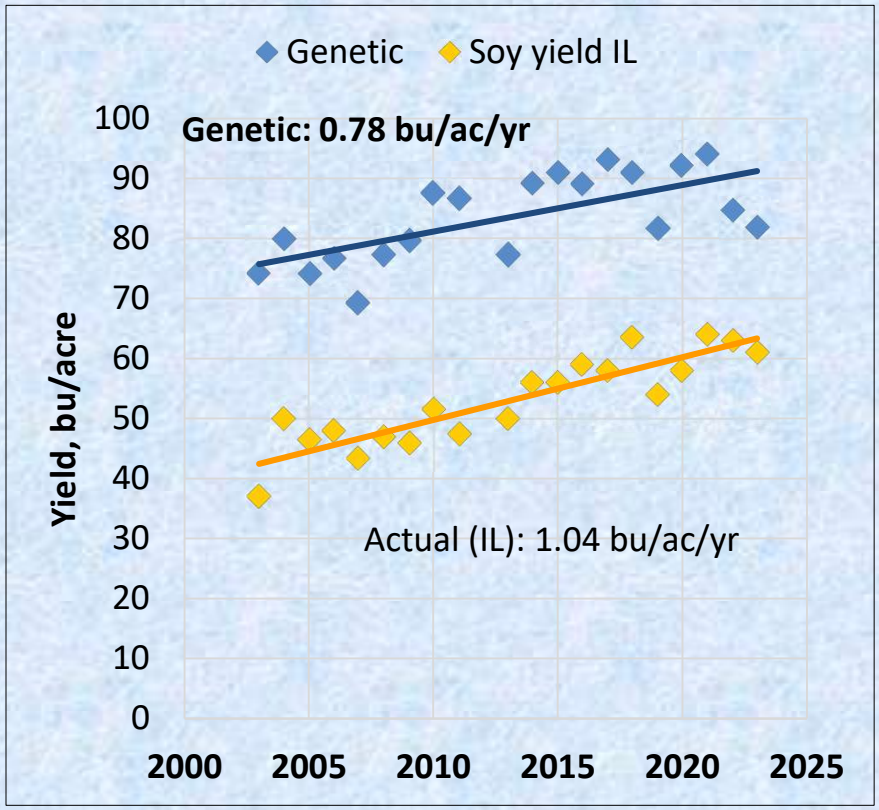






Source of high yields and resilience? – Genetics





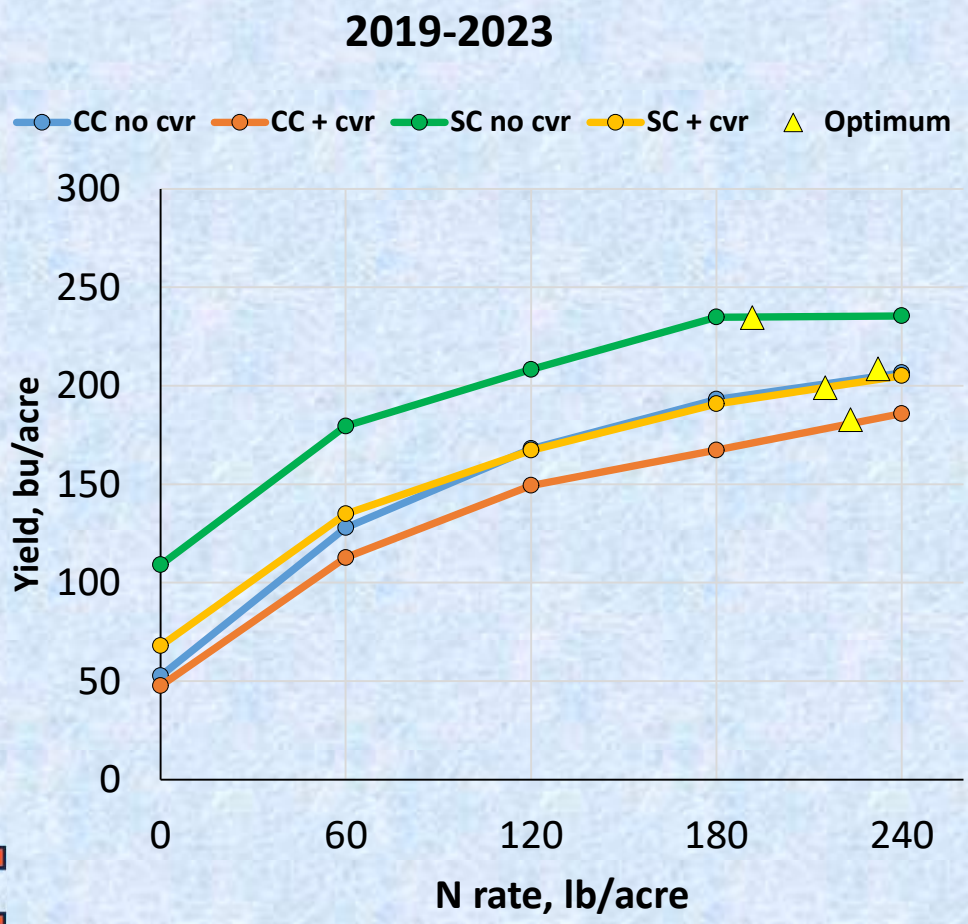
Will genetics keep improving for the next 100 years?

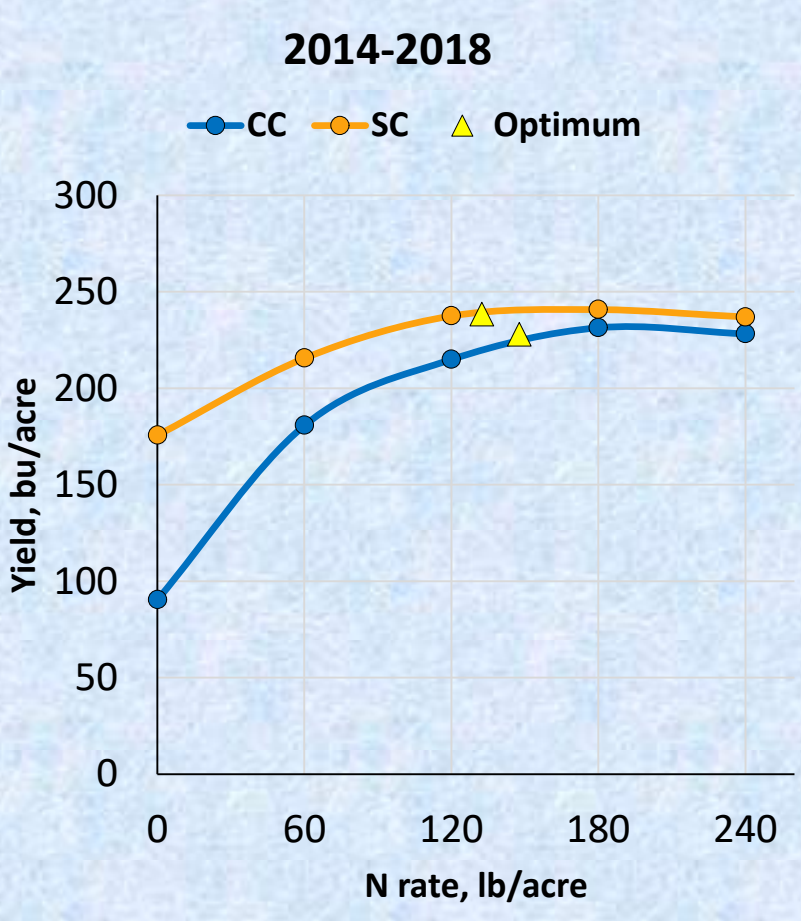
- Most breeders think so, or if they don't, they aren't talking
- Corn may have more genetic potential to exploit, but there's no sign that soybeans are running out
  - Some breeders have noted, though, that it takes very large numbers of crosses to keep soybean yields moving up
  - New genetic/breeding techniques have speeded progress, and *if* there are limits, they might be reached sooner
- GM traits no longer get center stage in releases, but they are adding stability to yields, and maybe some direct effects as well
- A question: if genetic increases slow, can management pick up the slack?

What do improved genetics need from management?

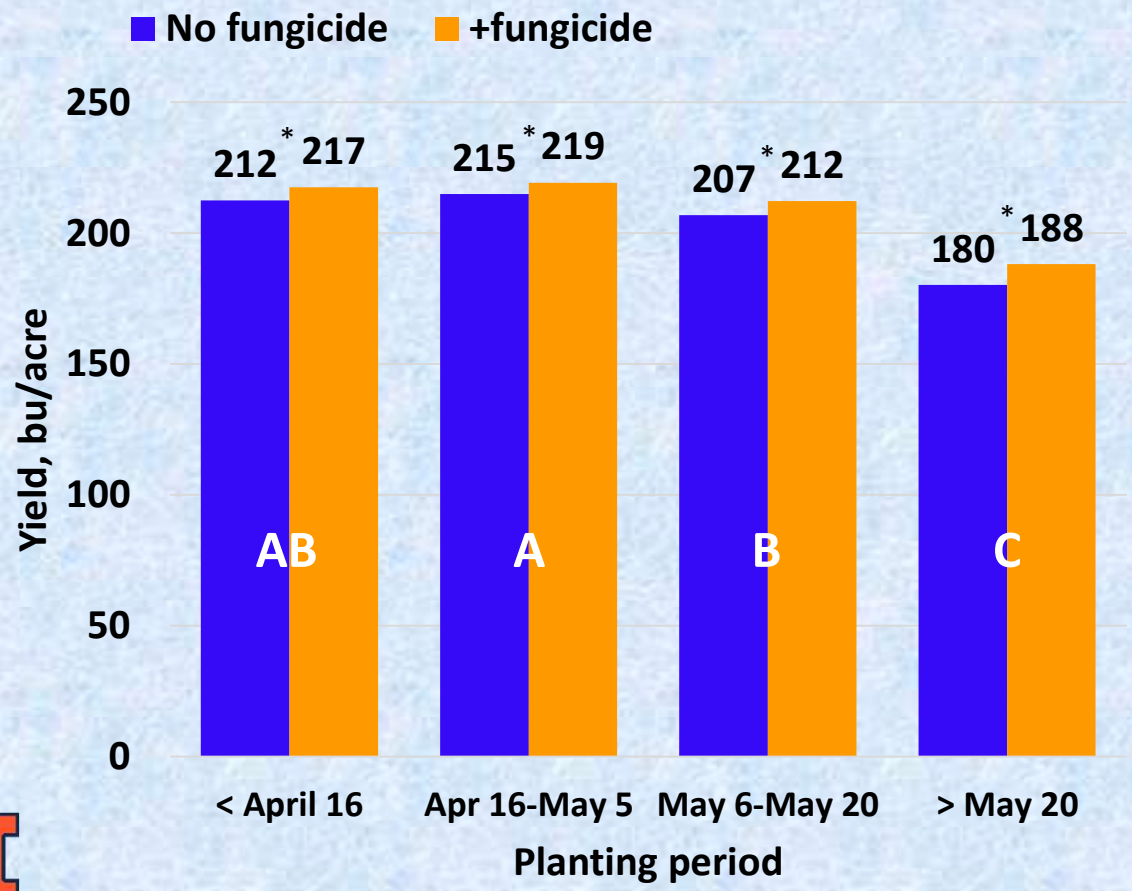
- We need to focus on economic and environmental efficiencies instead of ever-increasing yield
- Many inputs being developed and marketed today may act as advertised, but most are being marketed as “new technology” that few if any farmers have said they needed
- The recurring question should be “Is this product or technology adding profit in a way I can see and measure?”
- A related question: “How much money do I spend to produce “the last bushel” of added yield?

Long-term N x rotation, Monmouth (cover crop since 2019)



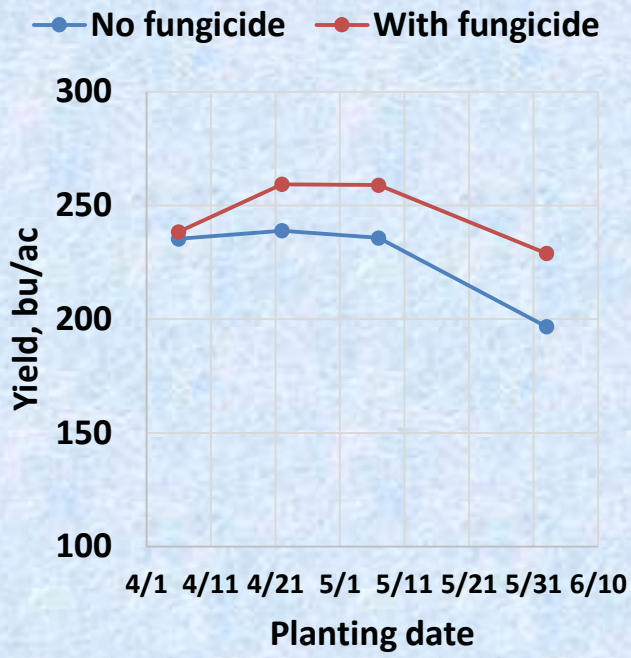


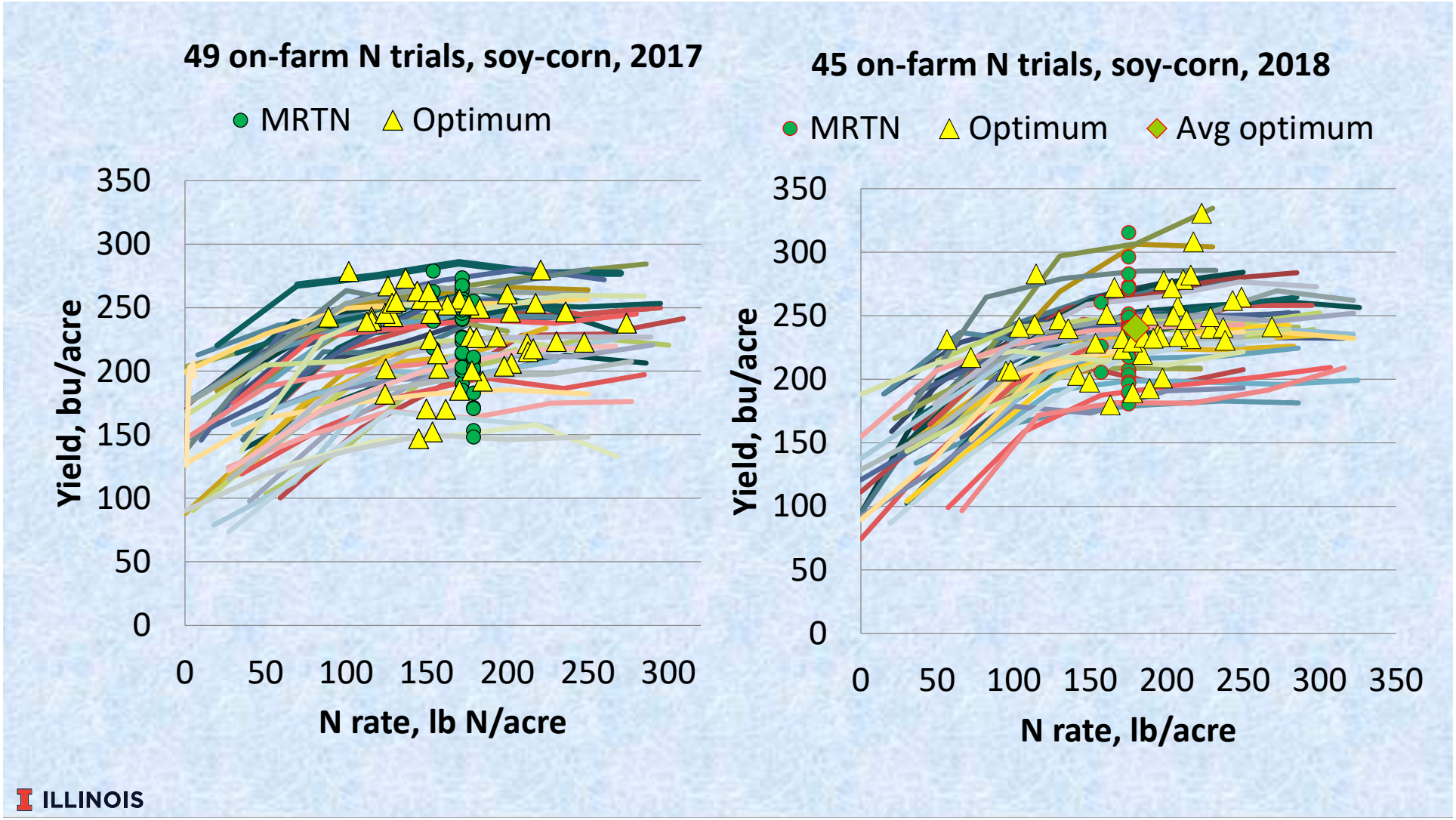
Planting date x fungicide across 29 sites



9 of 29 sites with a significant yield increase from fungicide

Only 1 site (below) with a PD x fung. Interaction – late tar spot




49 on-farm N trials, soy-corn, 2017
MRTN
Optimum
Yield, bu/acre
0
50
100
150
200
250
300
350
N rate, lb N/acre
45 on-farm N trials, soy-corn, 2018
MRTN
Optimum
Avg optimum
Yield, bu/acre
0
50
100
150
200
250
300
350
N rate, lb/acre

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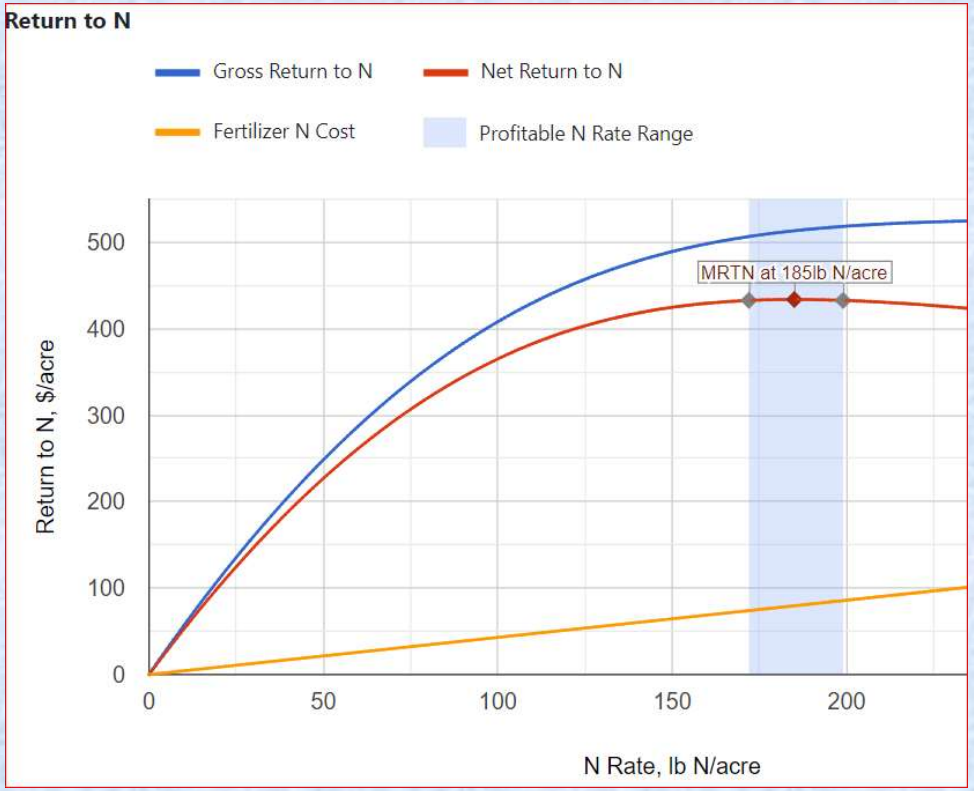
https://cornnratecalc.org/

State : **Illinois**
Region : **Central**
Number of sites : **290**
Rotation : **Corn following soybean**

Nitrogen Price ($/lb):	**0.43**
Corn Price ($/bu):	**4.75**
Price Ratio:	**0.090526315789474**
MRTN Rate (lb N/acre):	**185**
Profitable N Rate Range (lb N/acre):	**172 - 199**
Net Return to N at MRTN Rate ($/acre):	**$433.82**
Percent of Maximum Yield at MRTN Rate:	**99%**



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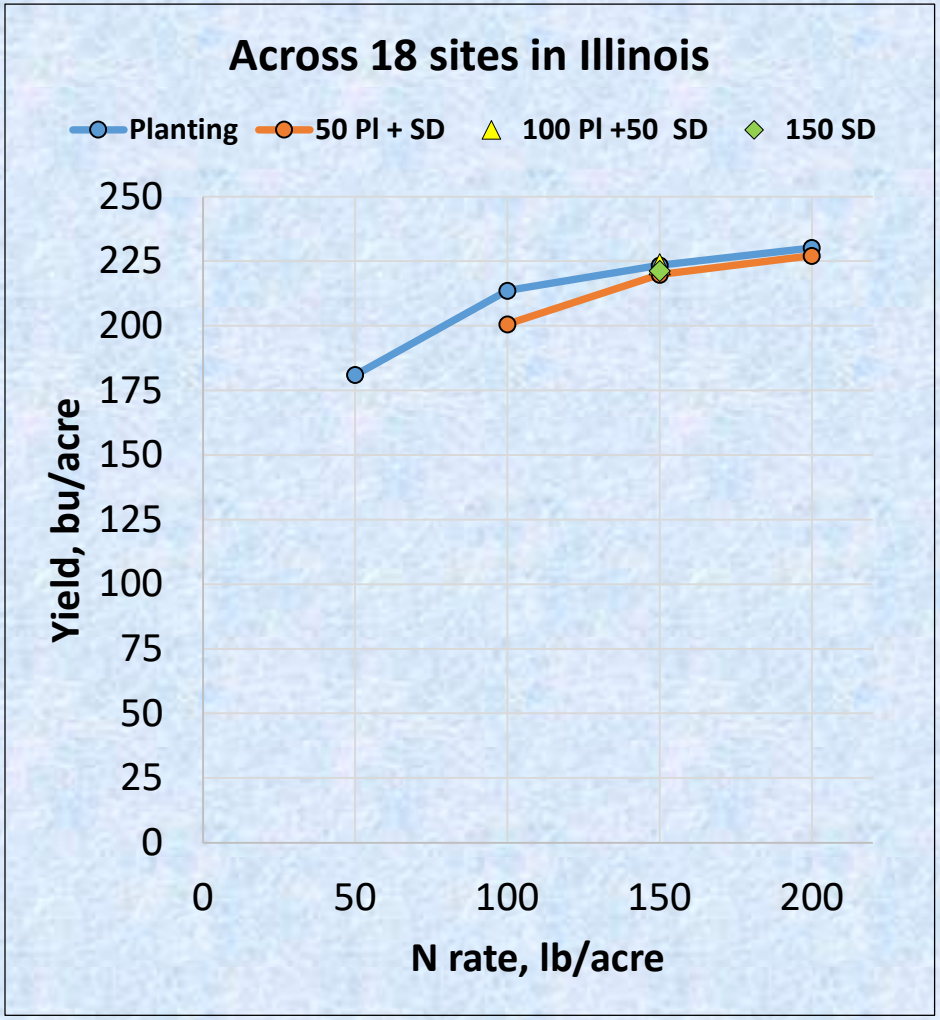
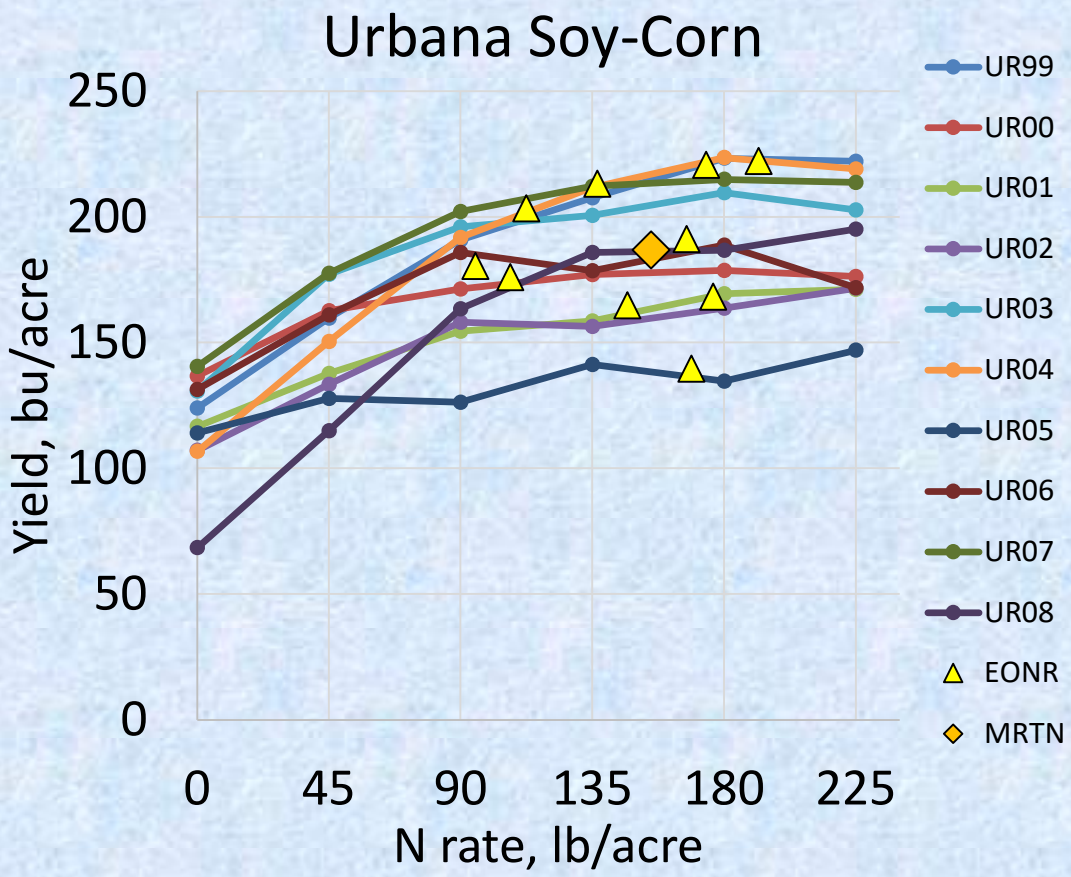
What about splitting N?

- It's a very reasonable way to apply some N for many
- It has seldom produced higher yield with the same N rate
- Might occasionally be needed to supply additional N
- Brings some risk of delay in the N getting into the plant



Variable-rate N?



These trials were run in the same field every year for 10 years. Corn following corn was much more variable than corn following soybean.

With no ability to predict N responses in advance, it is not clear how variable-rate N could be profitably done

The MRTN is a way to put the data together to give a best prediction of N rate each year

Can we learn to sense corn N status and fertilizer accordingly?

We can match canopy color (sometimes, and at some stage) to yield when N availability varies due to N rate or N loss

The timing aspect – is it already too late to get N into the plant when we see deficiency? – is a barrier

It seems unlikely that we will learn to do this in rainfed production without increasing yield and profitability risks

But stay tuned…

New technology: on-seed pulsing of liquid

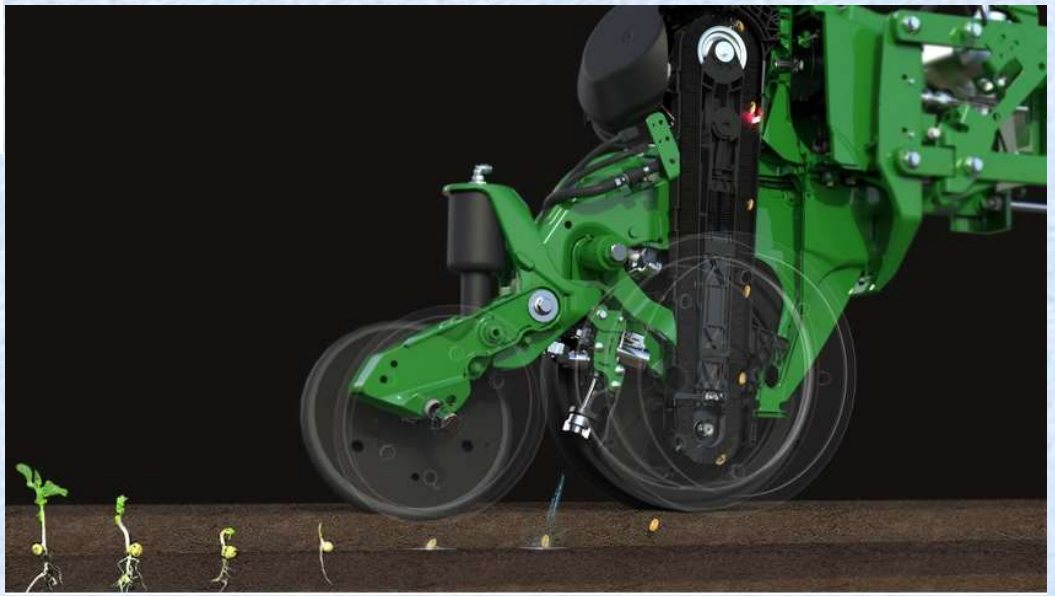
Add precision to starter fertilizer use

John Deere's new ExactShot tech directs starter fertilizer to hit only the seed, cutting costs.

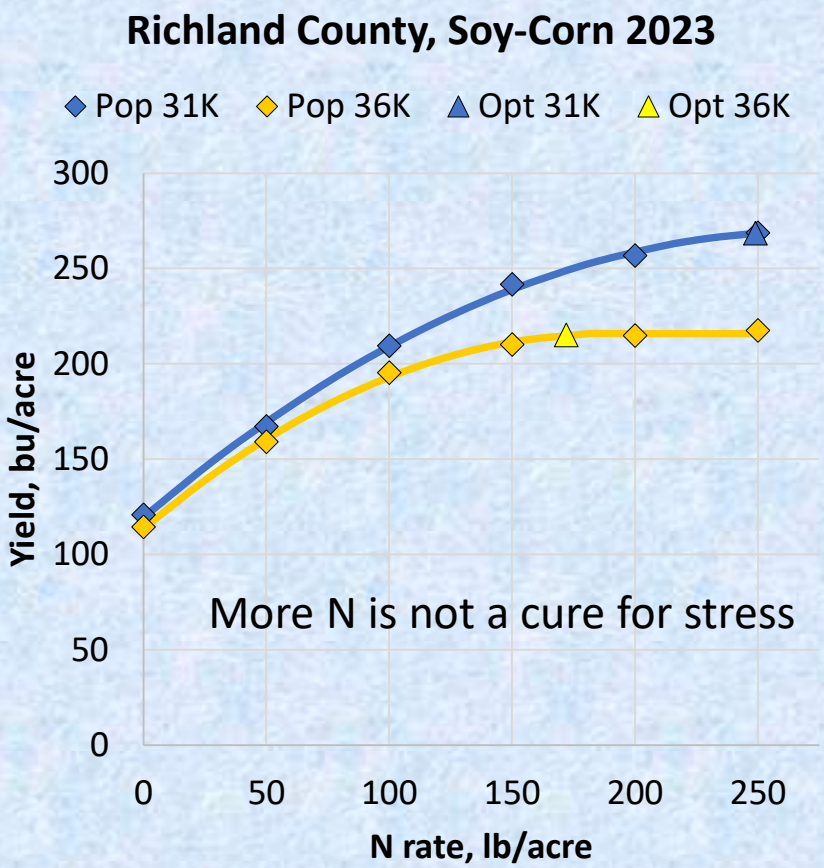
At a Glance

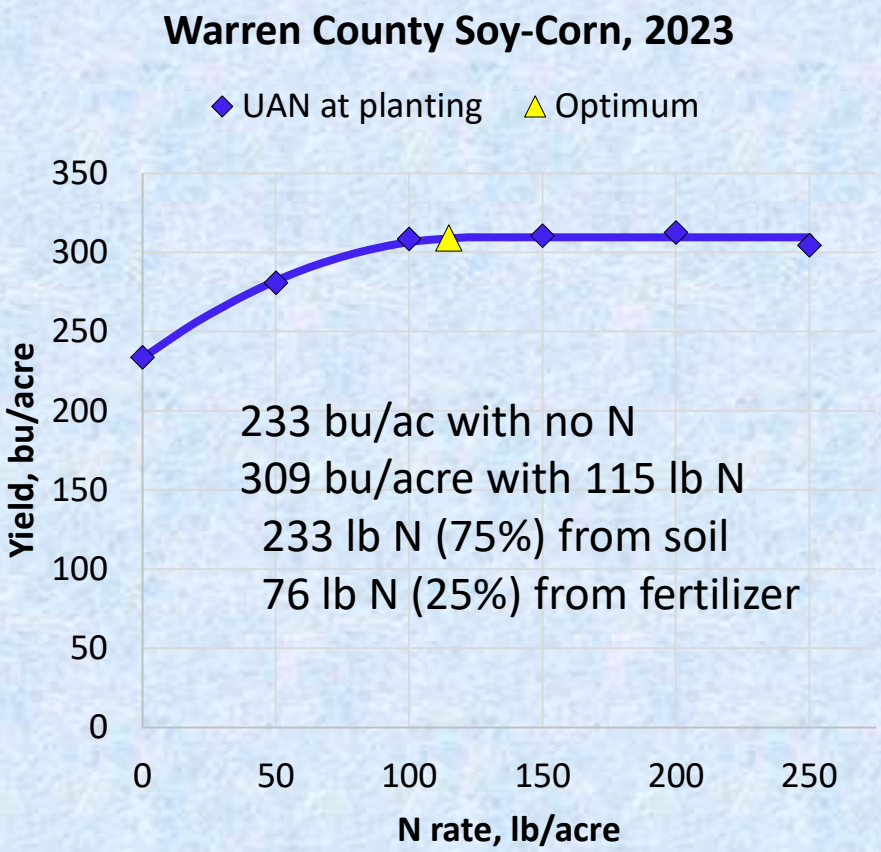
- ExactShot offers per-seed pulse spraying of starter at planting.
- System uses spray tech also found in ExactApply nozzles.
- System can be purchased to put on existing planters.

Story (Farm Progress daily, Jan. 18, 2023) talks about fertilizer savings – says fertilizer applied between plants is "wasted"



Nitrogen examples from 2023



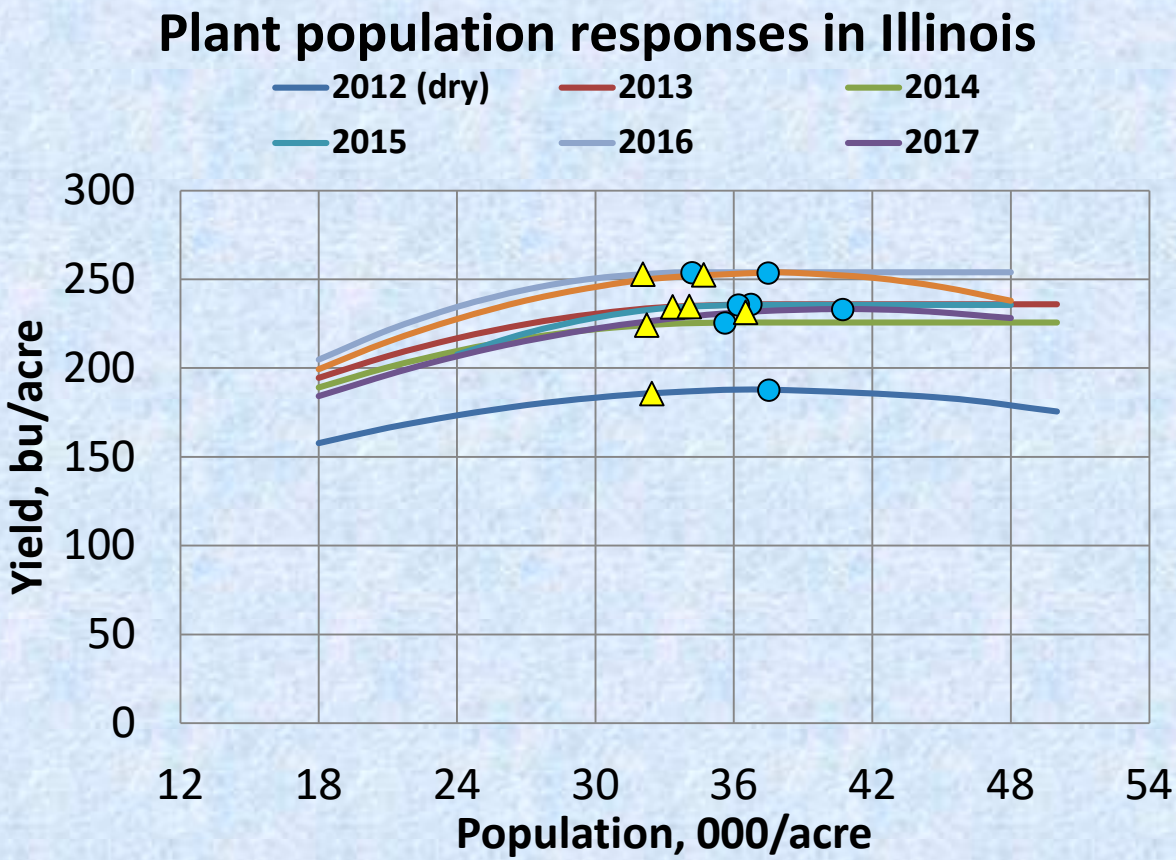


Corn plant population: easy to do in strips but not much reported

Small-plot trials done at 5-6 sites annually in Illinois for 7 years

Max = point where yield was maximized

Optimum = point where last seed added just paid for itself

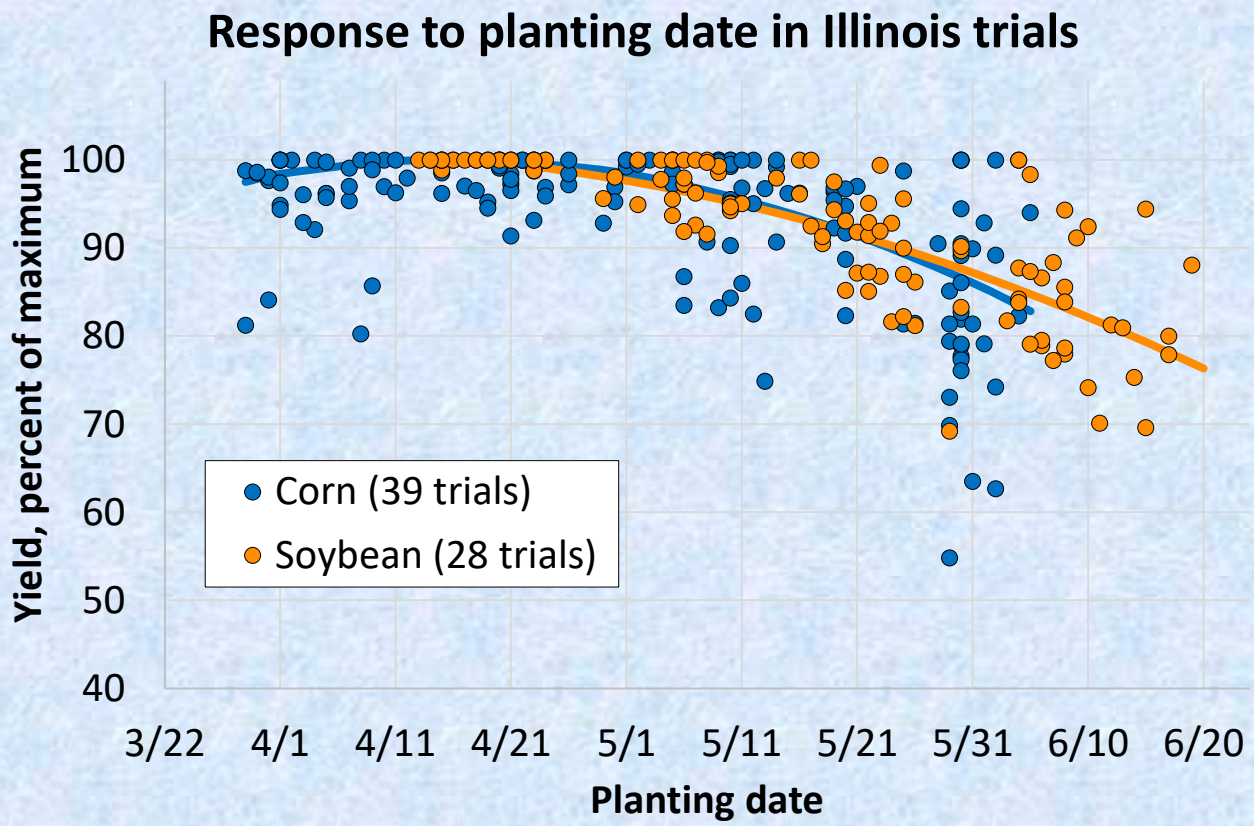


Start planting corn or soybean first?

Answer:

Whichever makes sense

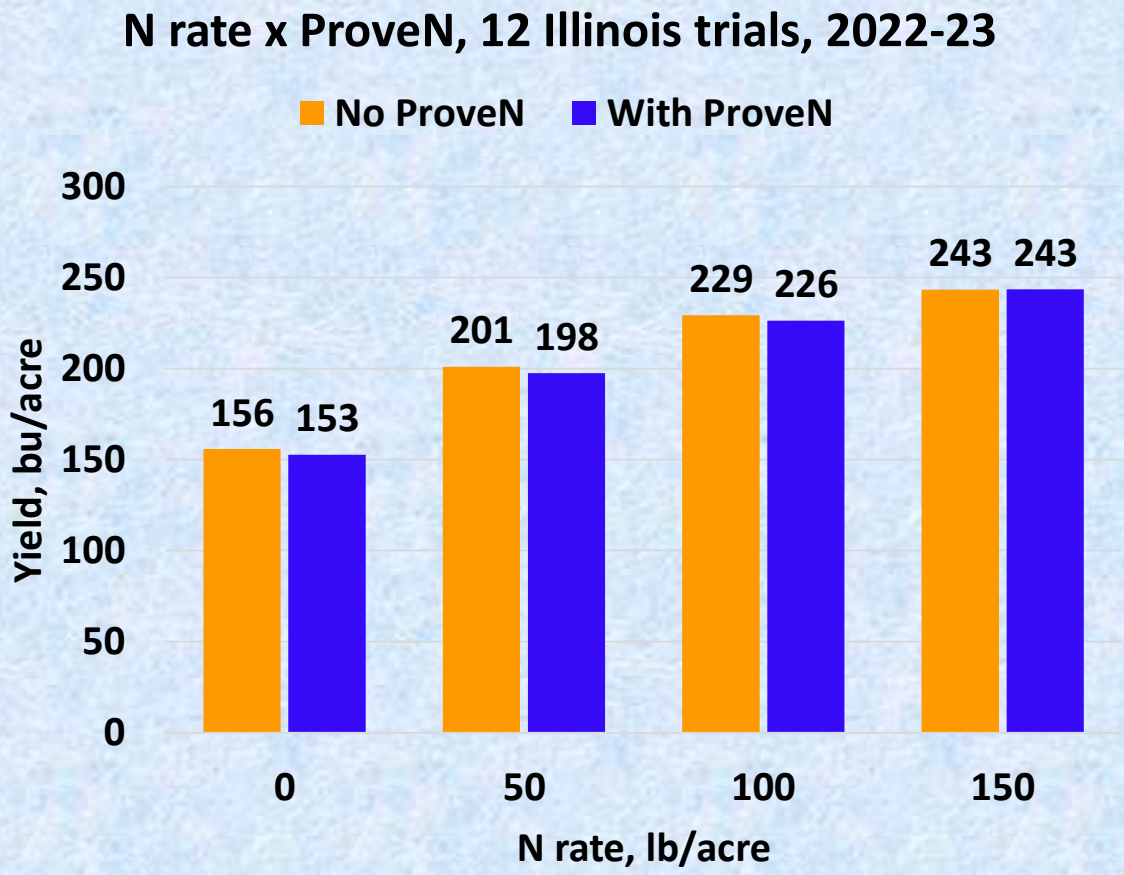
In February and usually in March, don't plant either one



Pivot Bio ProveN 40

Said to fix “up to” 40 lb of N per acre for the crop, allowing fertilizer N rate to be cut back

Most who apply too much N could cut back without paying for the privilege…



Short corn?

Data support for using new "technology"?

- Companies and the government have funded huge efforts to gather more data using sensors: the race to collect more data on plants in field continues
- This has led to a proliferation of new equipment and sensors to monitor field operations and plant
- Modern equipment (planters, tractors, harvesters) is much-improved, but there has not been very much indication that applying sensing technology and algorithms (such as variable-rate inputs and remote scouting) has produced higher profits

  An example: can "planting to moisture" and by-planter-unit down pressure monitoring and adjustment increase yields in a productive soil? Would more data help make this work?

An example of new technology

PrairieFarmer

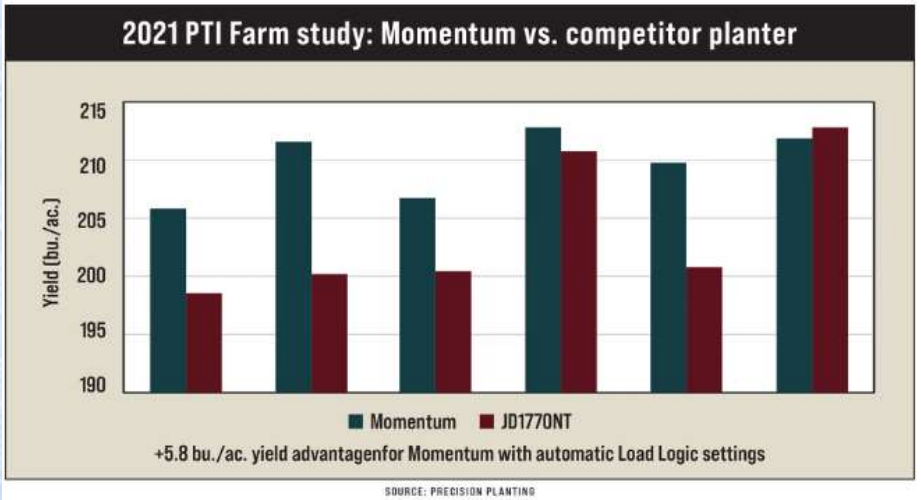
Can a different planter really get you an extra 6 bushels an acre?

The answer is yes, but at a cost. Jason Webster put the Fendt Momentum planter up against a John Deere planter. Here's what he learned.

Holly Spangler
November 10, 2023

4 Min Read

DATA: Jason Webster's trials on the PTI Farm at Pontiac, Ill., showed that the Momentum planter with Load Logic weight transfer outperformed a John Deere 1770NT planter in 5 of 6 replications, adding an average of 5.8 bushels per acre. PHOTOS BY HOLLY SPANGLER



He conducted similar trials in 2022 with similar results. Fendt rolled out the Momentum

Rep	Momentum	JD1770NT	Diff
1	205.6	198.7	6.9
2	211.2	200.1	11.1
3	206.6	200.4	6.2
4	212.8	210.8	2.0
5	209.7	201.0	8.7
6	211.6	212.7	-1.1
Avg	209.6	204.0	5.6
Sign?		Yes (97%)	

Thank you for your attention

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