Nitrogen Considerations for the 2024 Season

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Dry weather and crops 2023

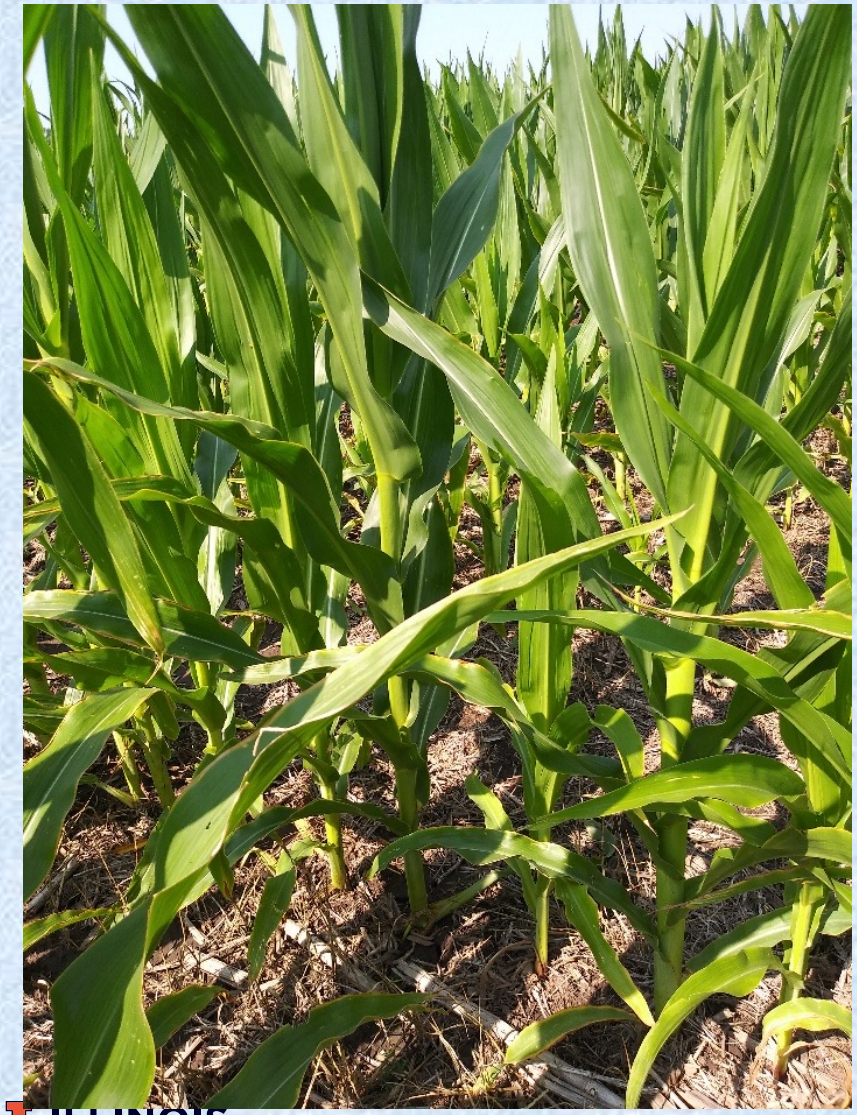
Planted Apr 27; May 17 photo

June 6

June 26

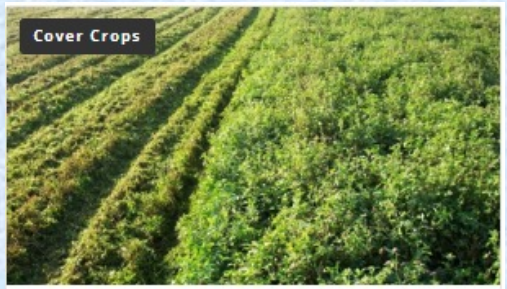
Dry weather and crops 2023

July 3



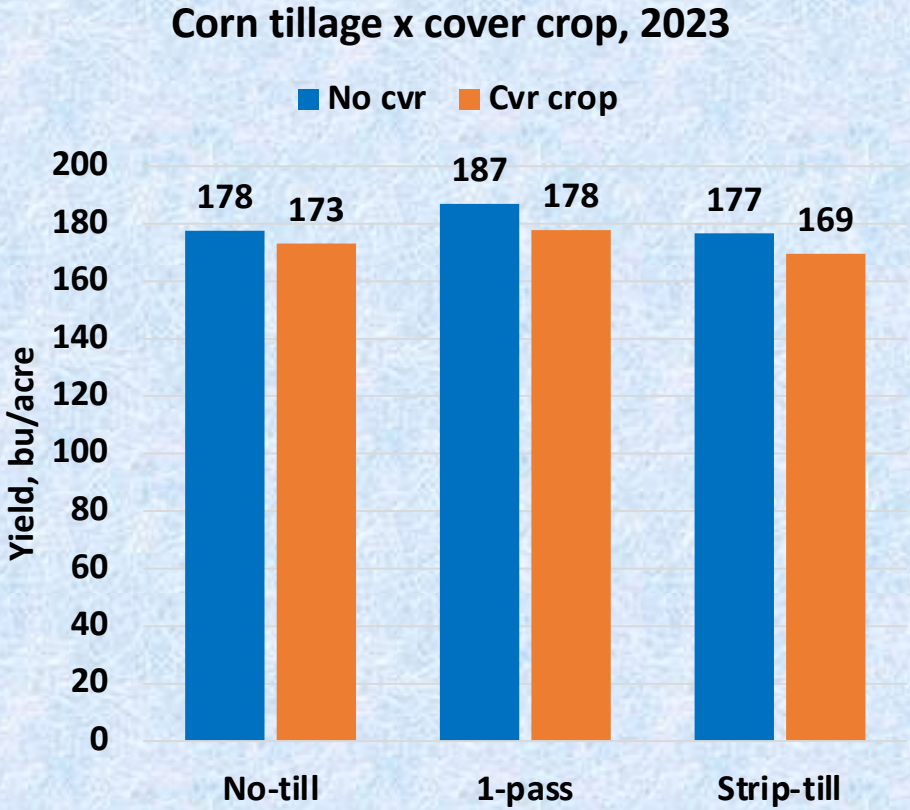
August 17

Cover crops were a problem for corn (and for soybeans) in some fields in 2023



Don't abandon cover crops after one tough year

August 22, 2023



Don't "plant green," especially corn, especially into a grass cover crop, especially no-till

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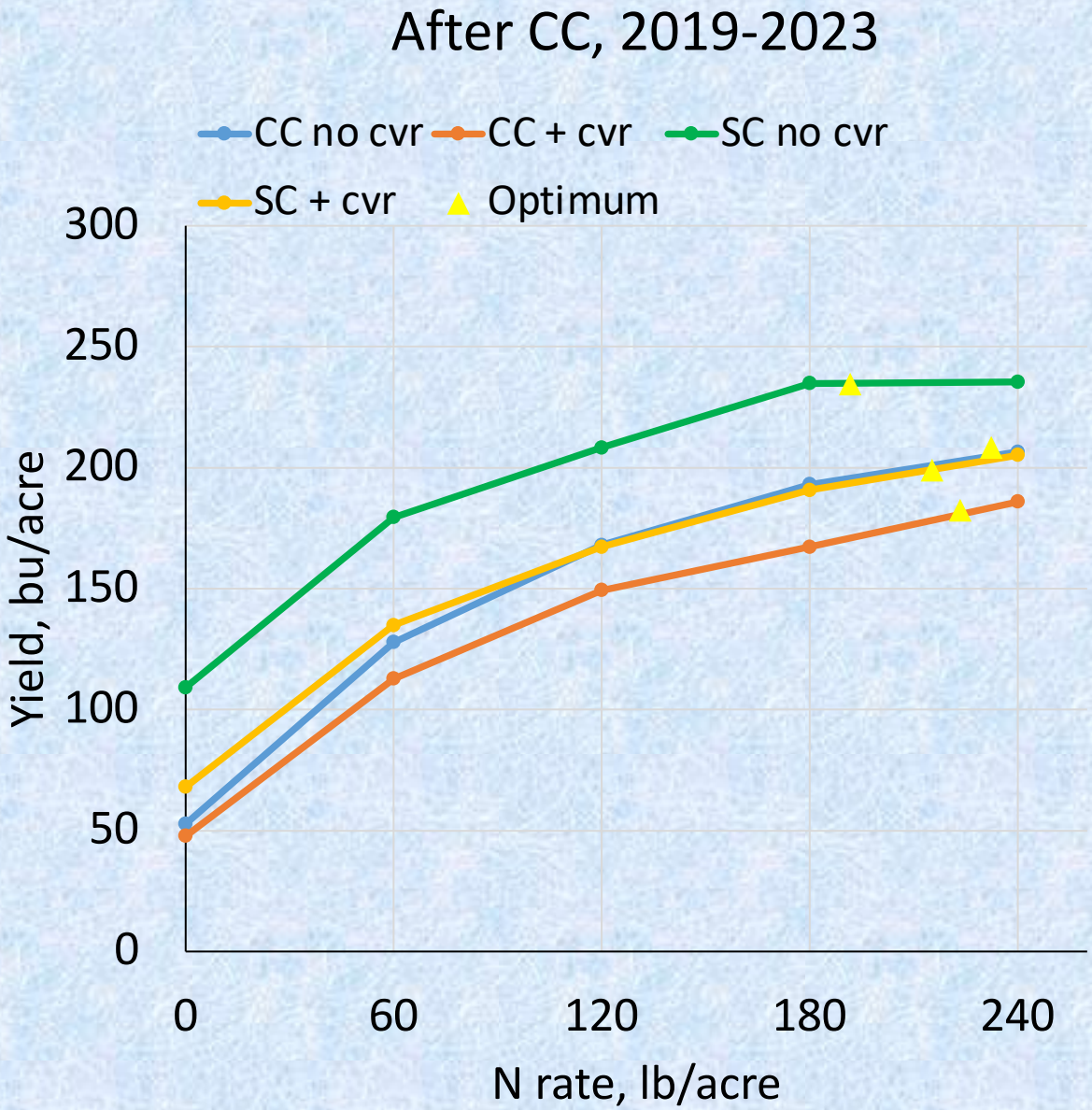
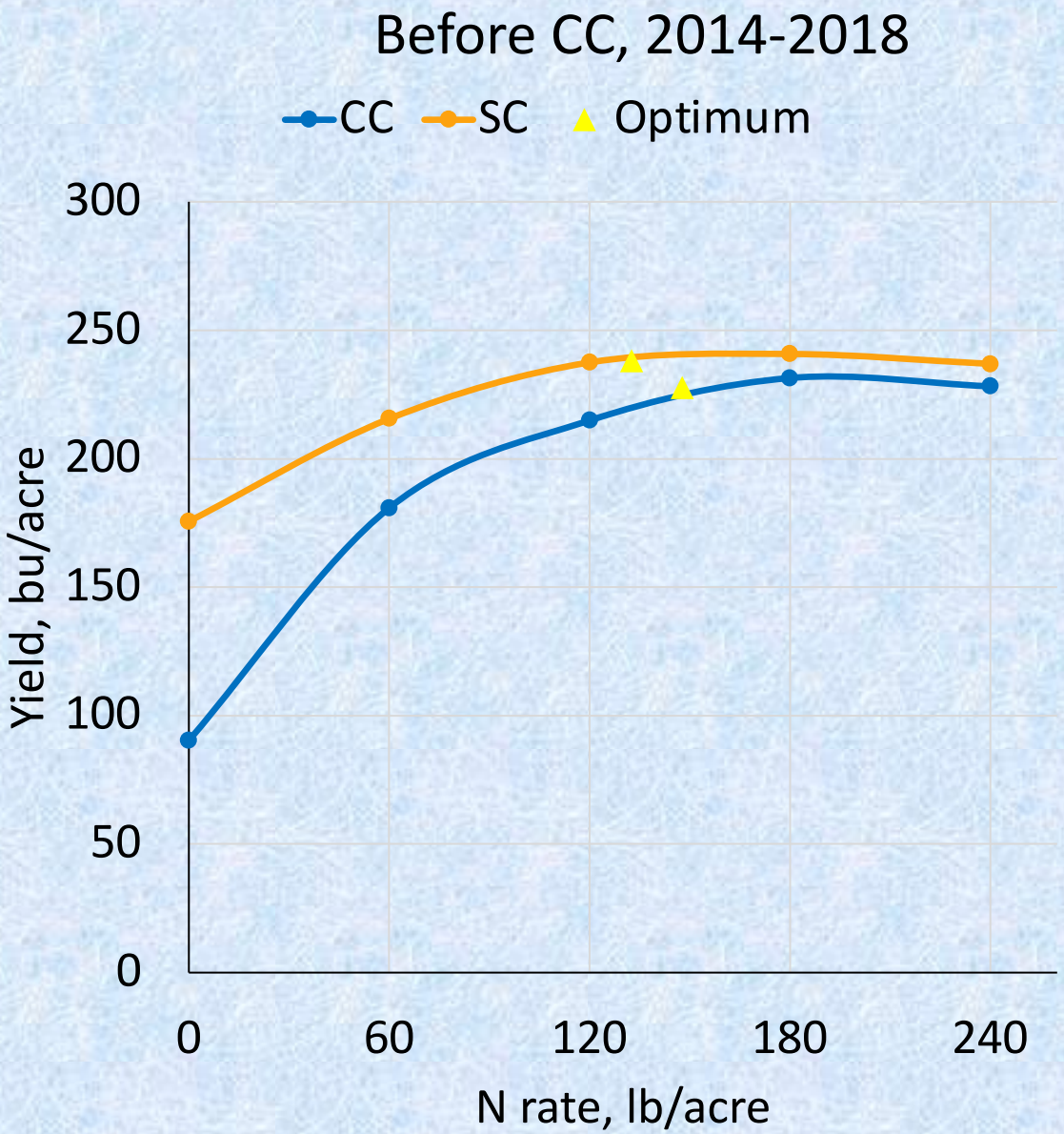
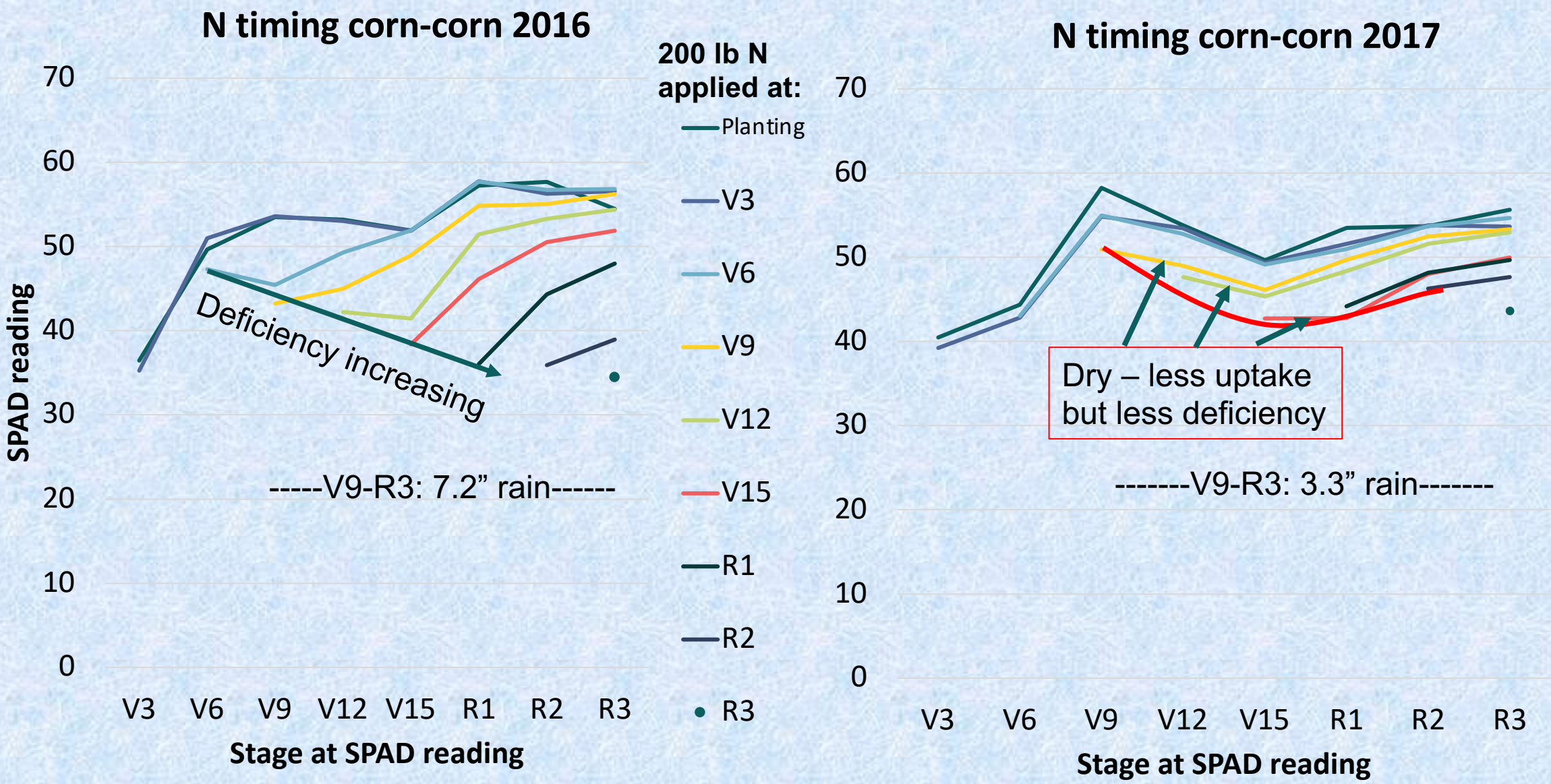
Long-term N x rotation, Monmouth (with cover crop since 2019)

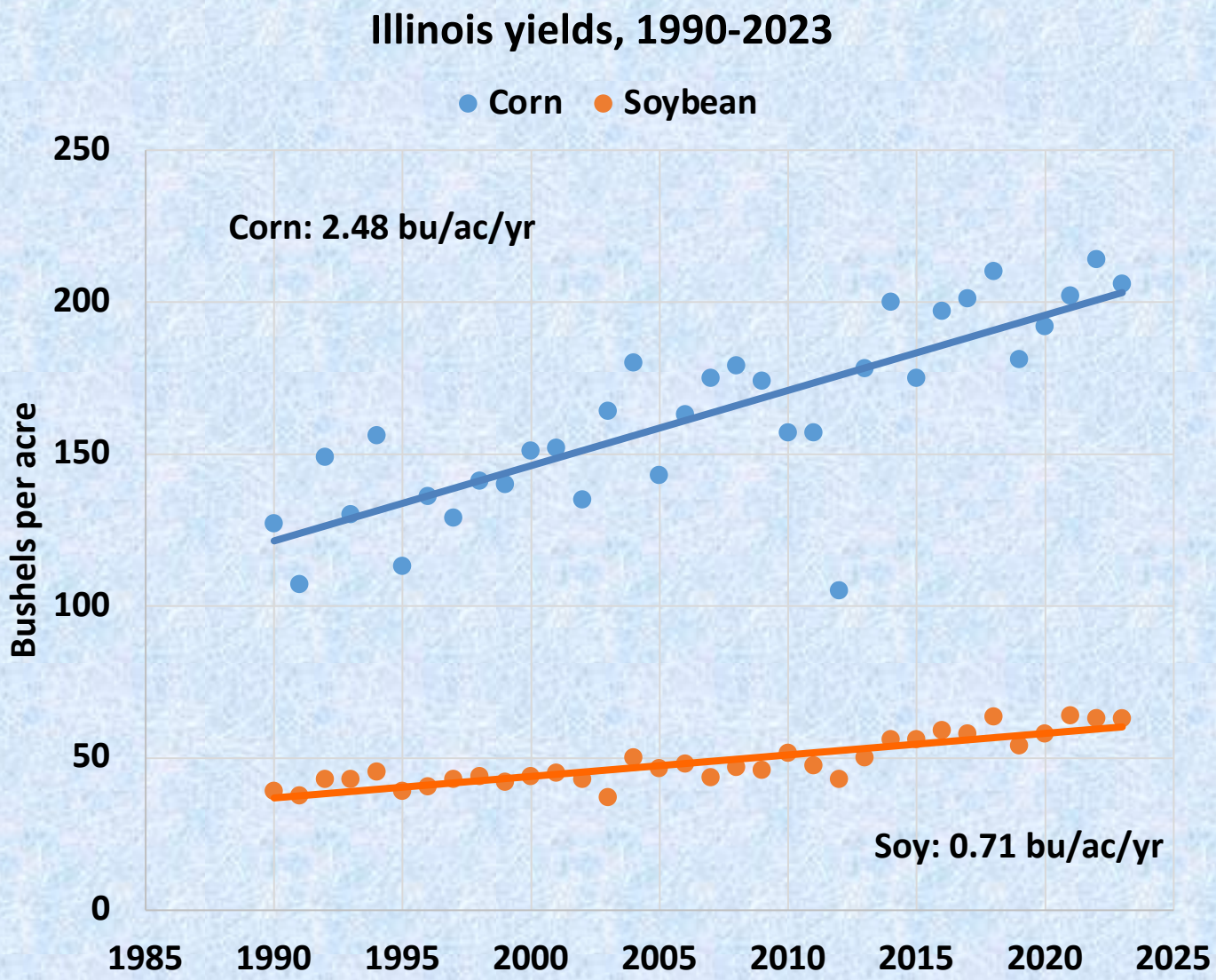


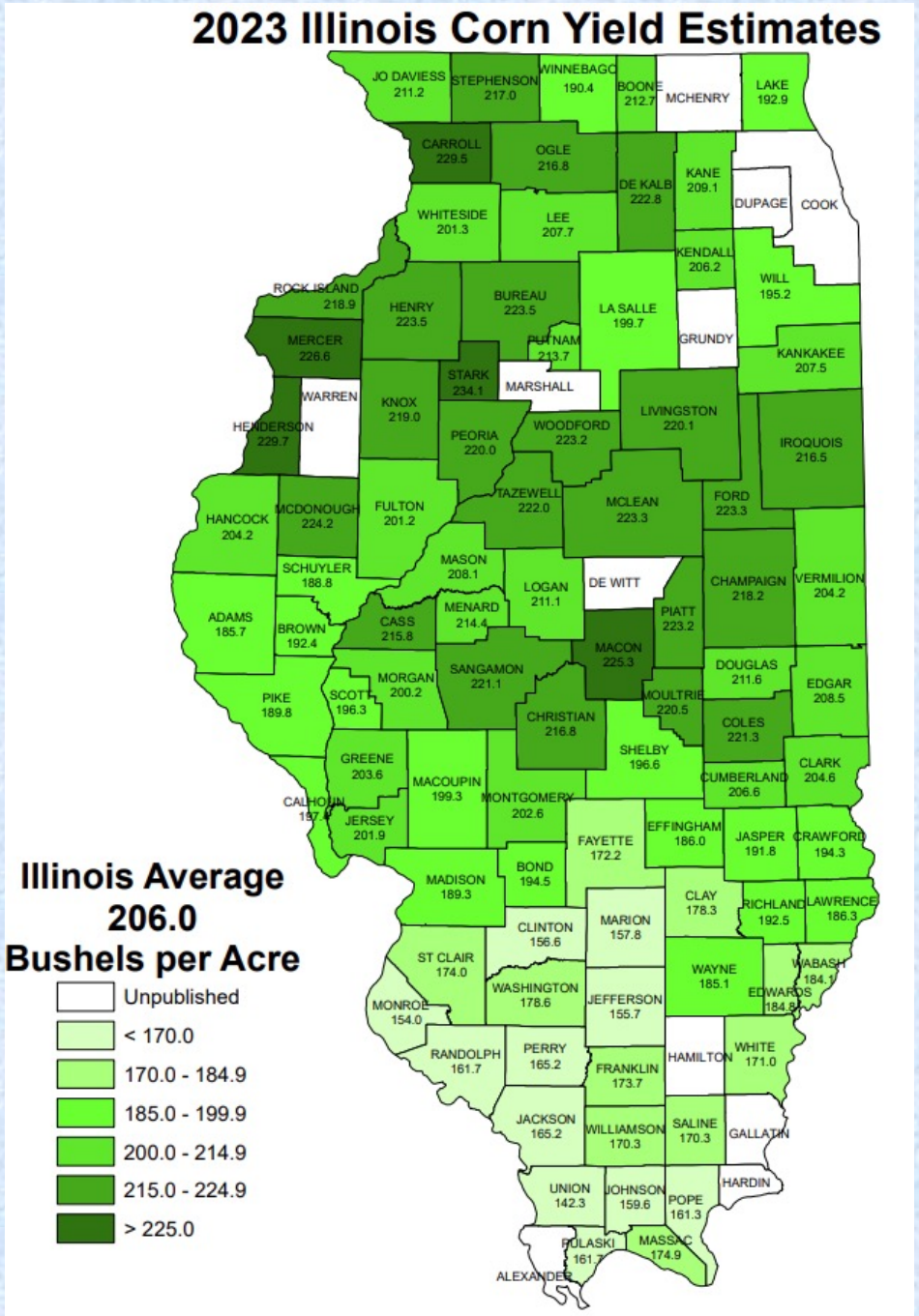


Dry weather and N timing: it's "complicated"

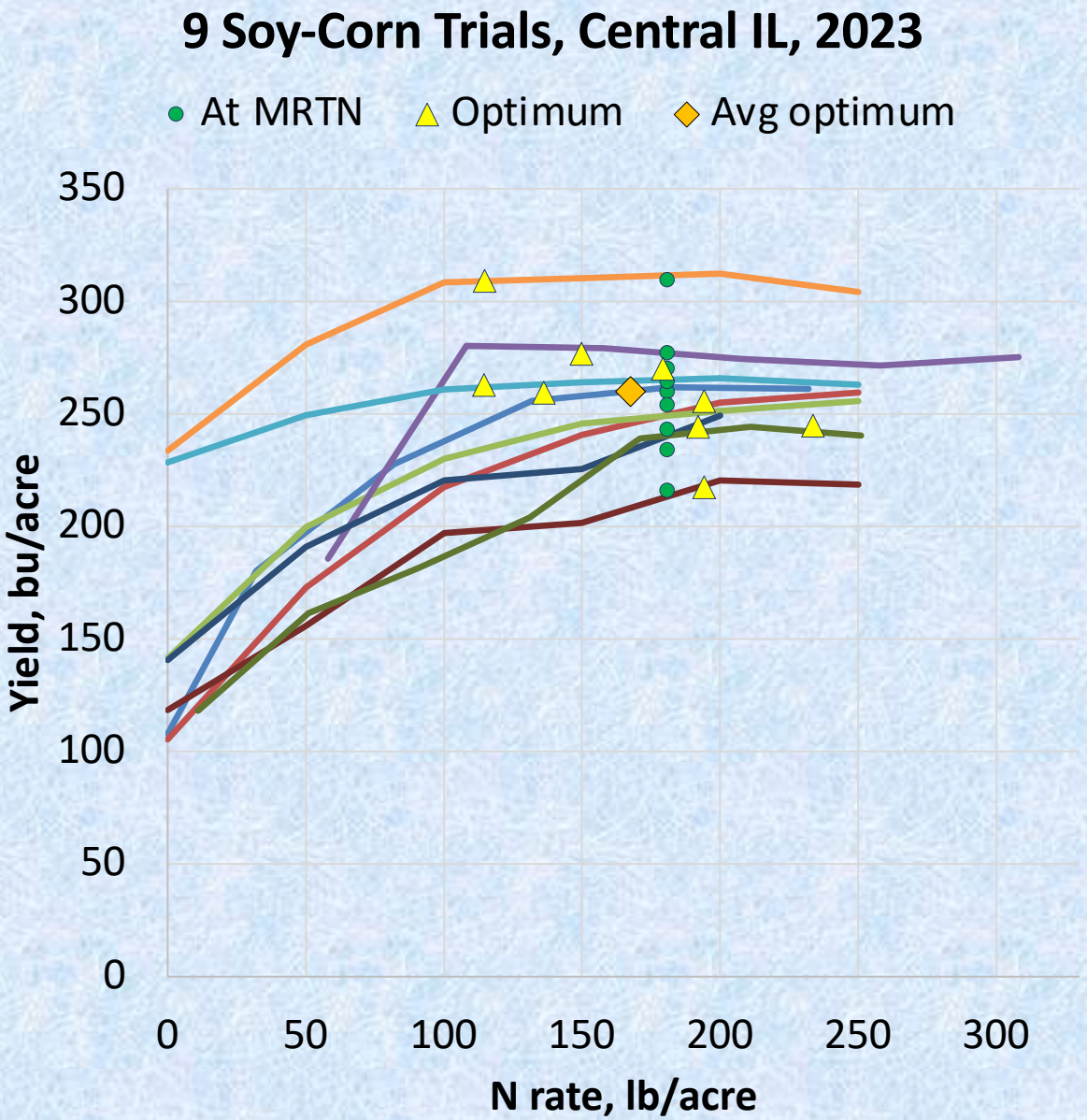


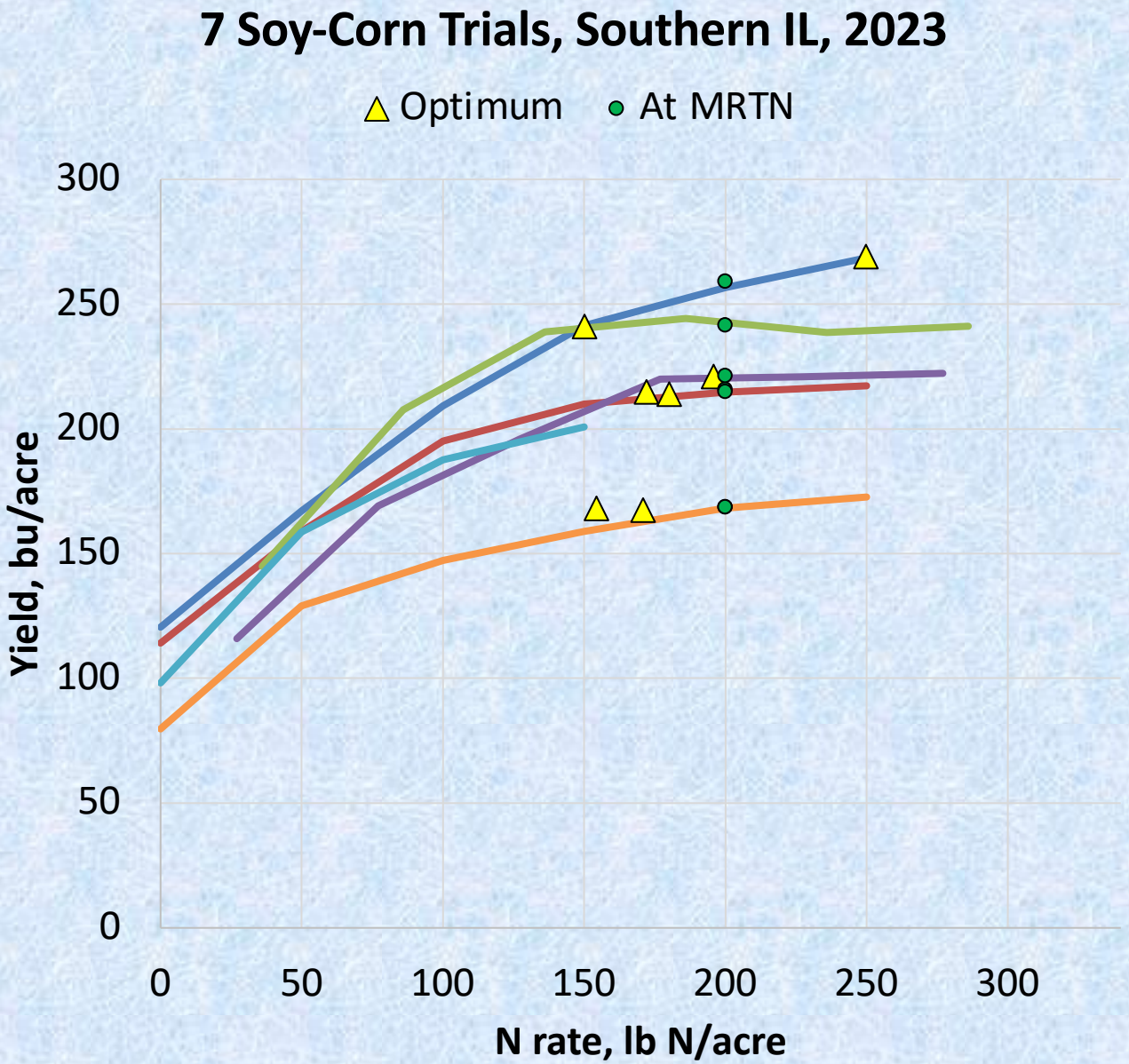
Dry periods (well, rain between dry periods) helped more than hurt yields in 2023



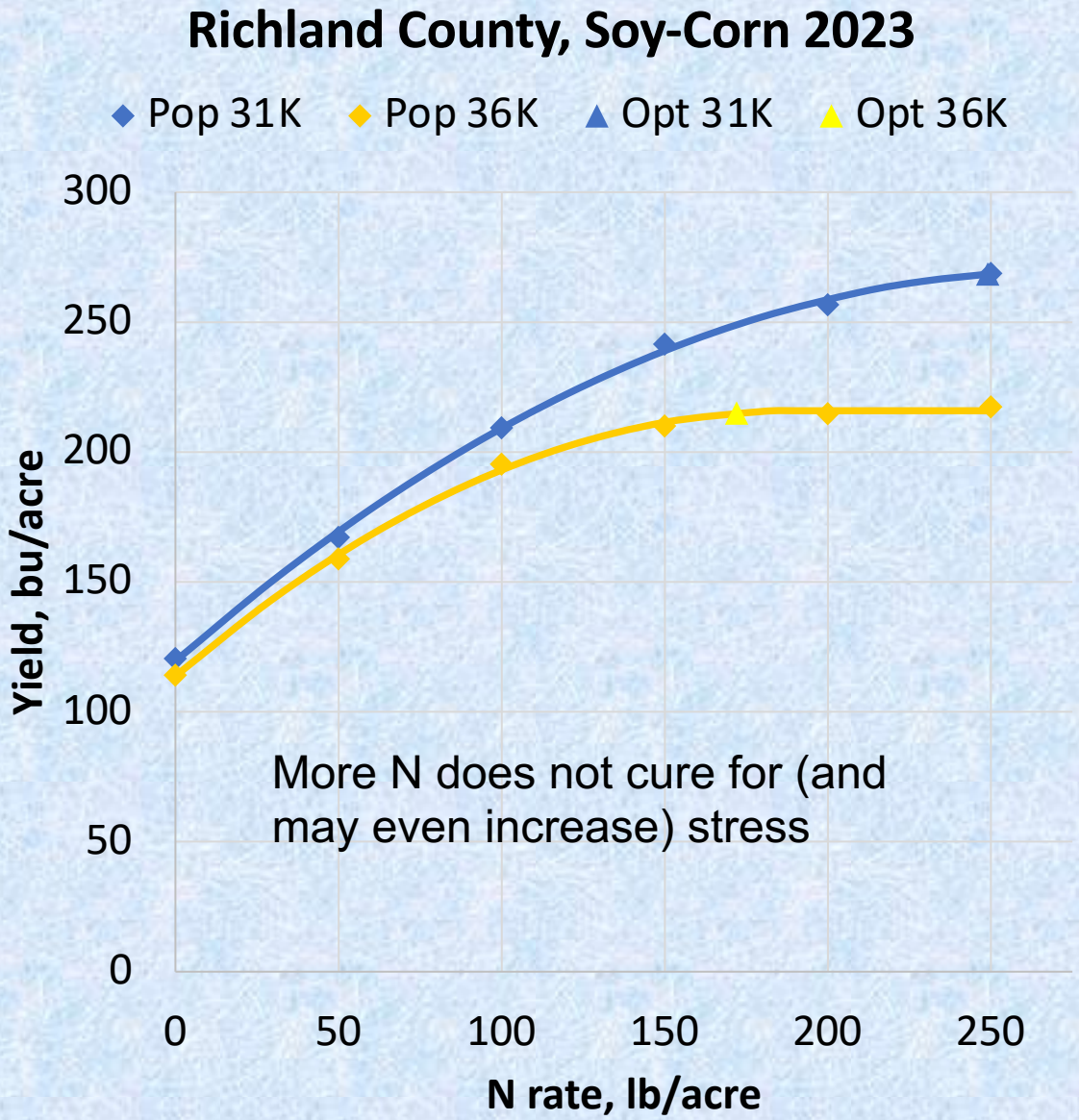


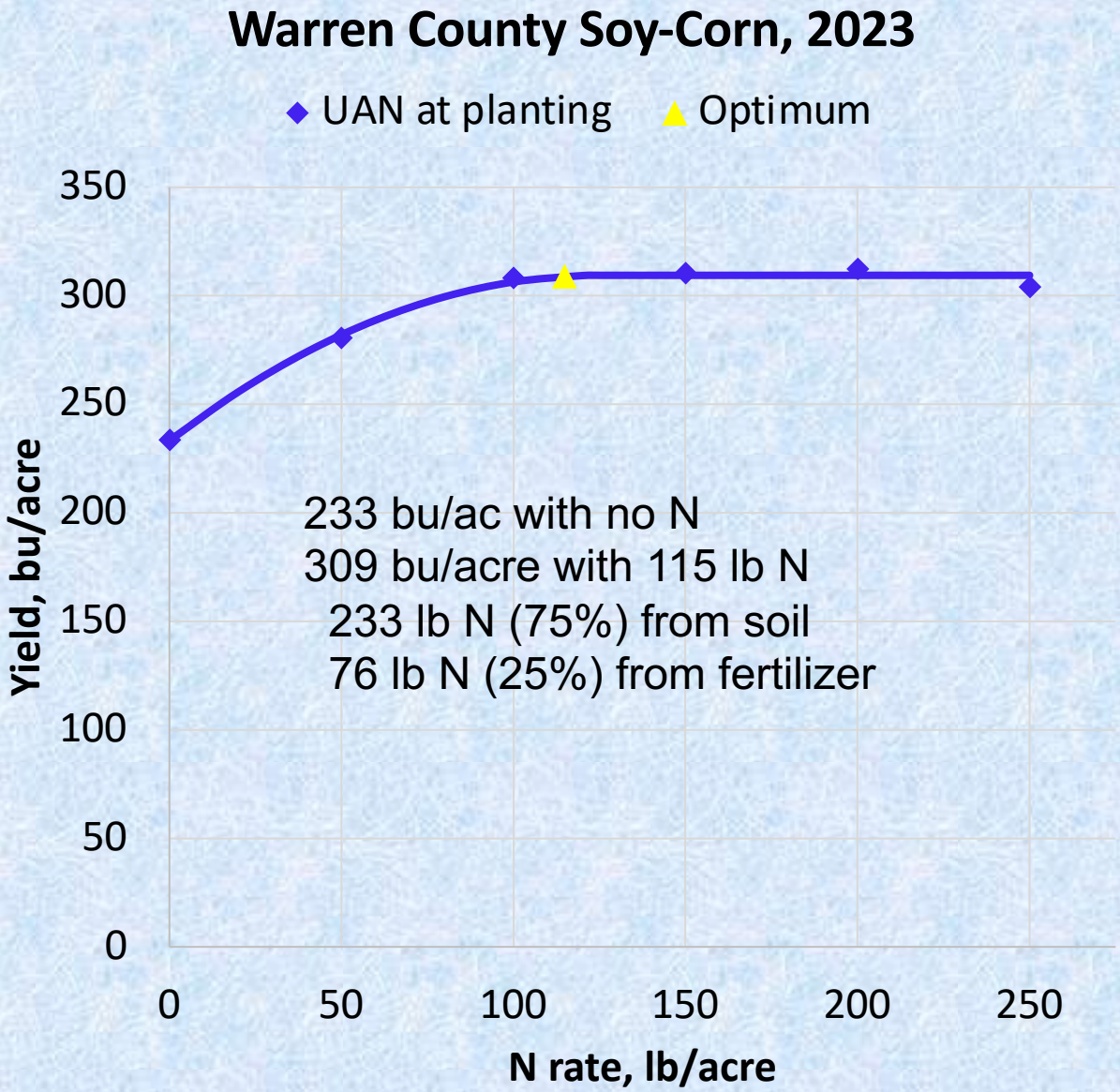
Nitrogen in 2023





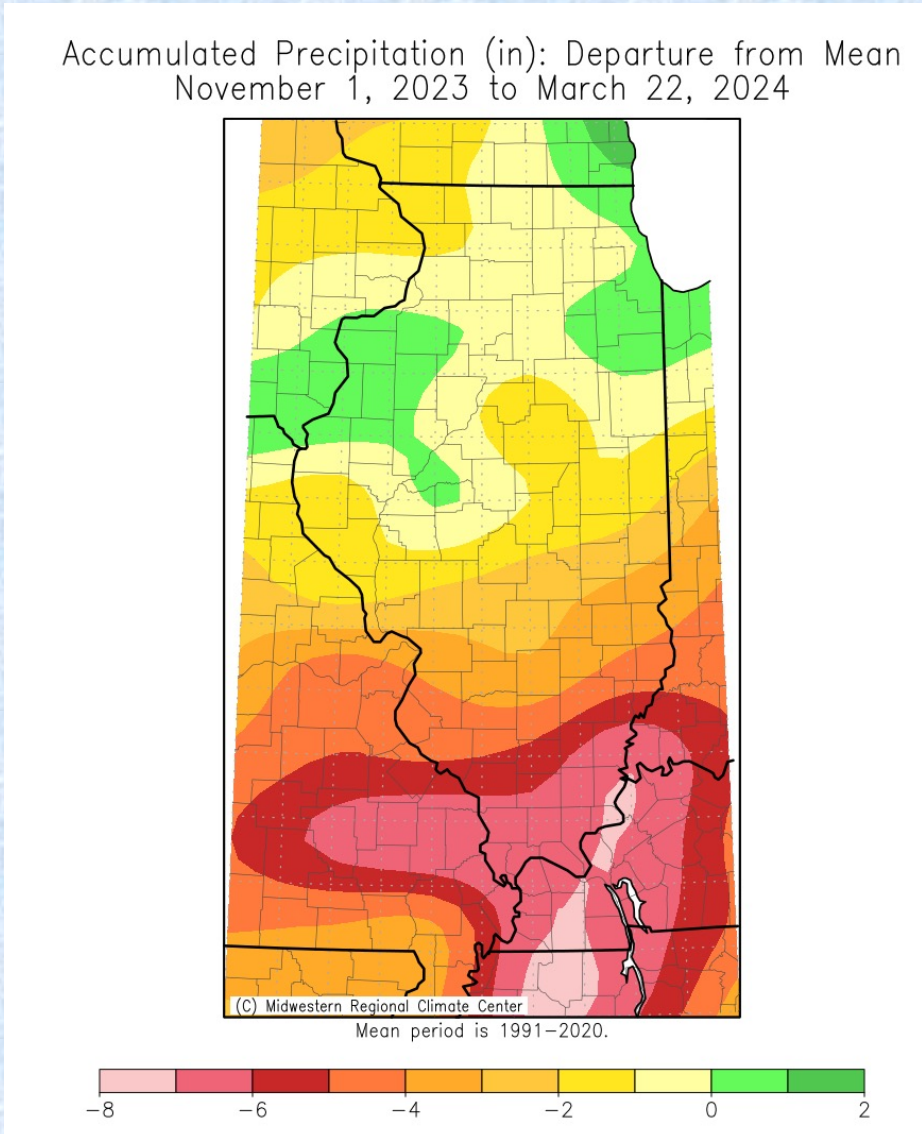
Nitrogen in 2023 – too much to too little to plenty

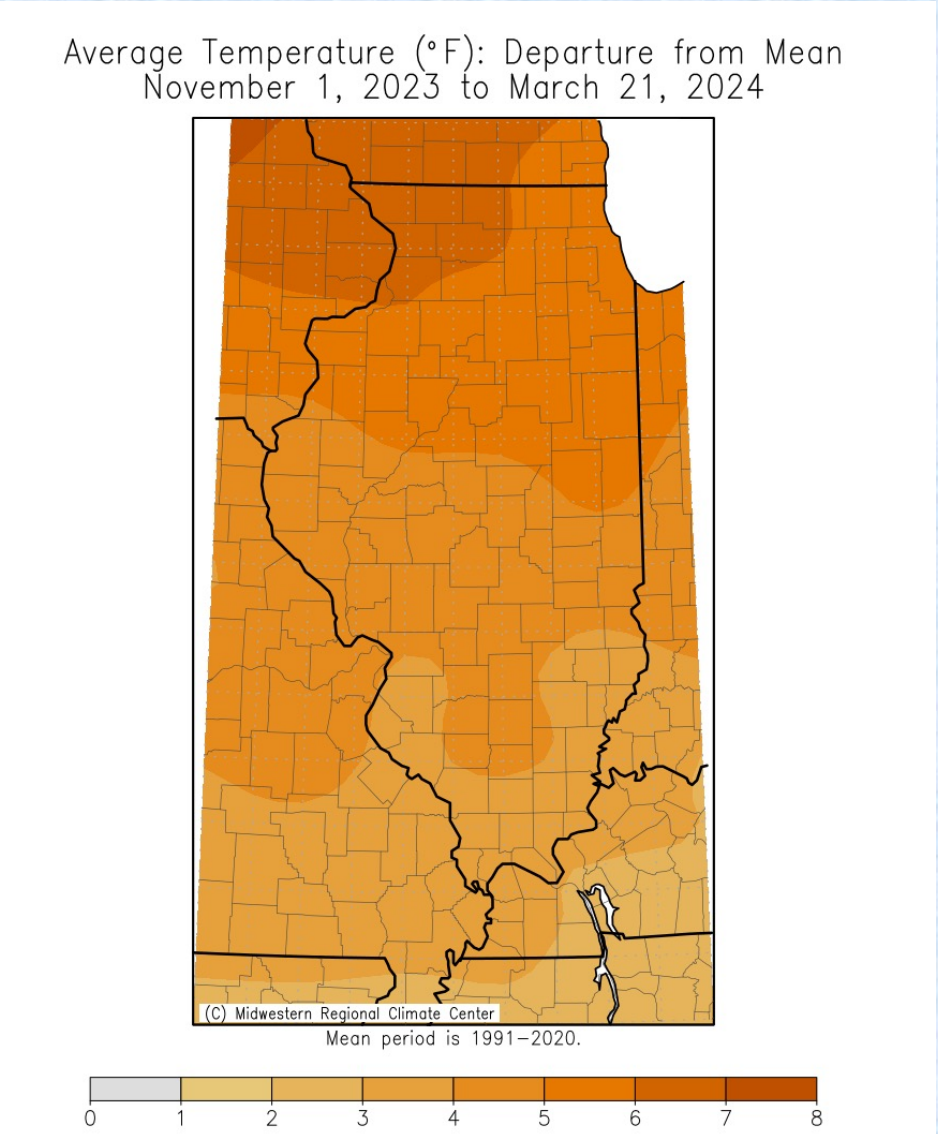




One issue: is N applied in Fall 2023 still present, and is it safe until N uptake begins (in late May)?

- It has been a relatively warm and dry since last fall in Illinois:





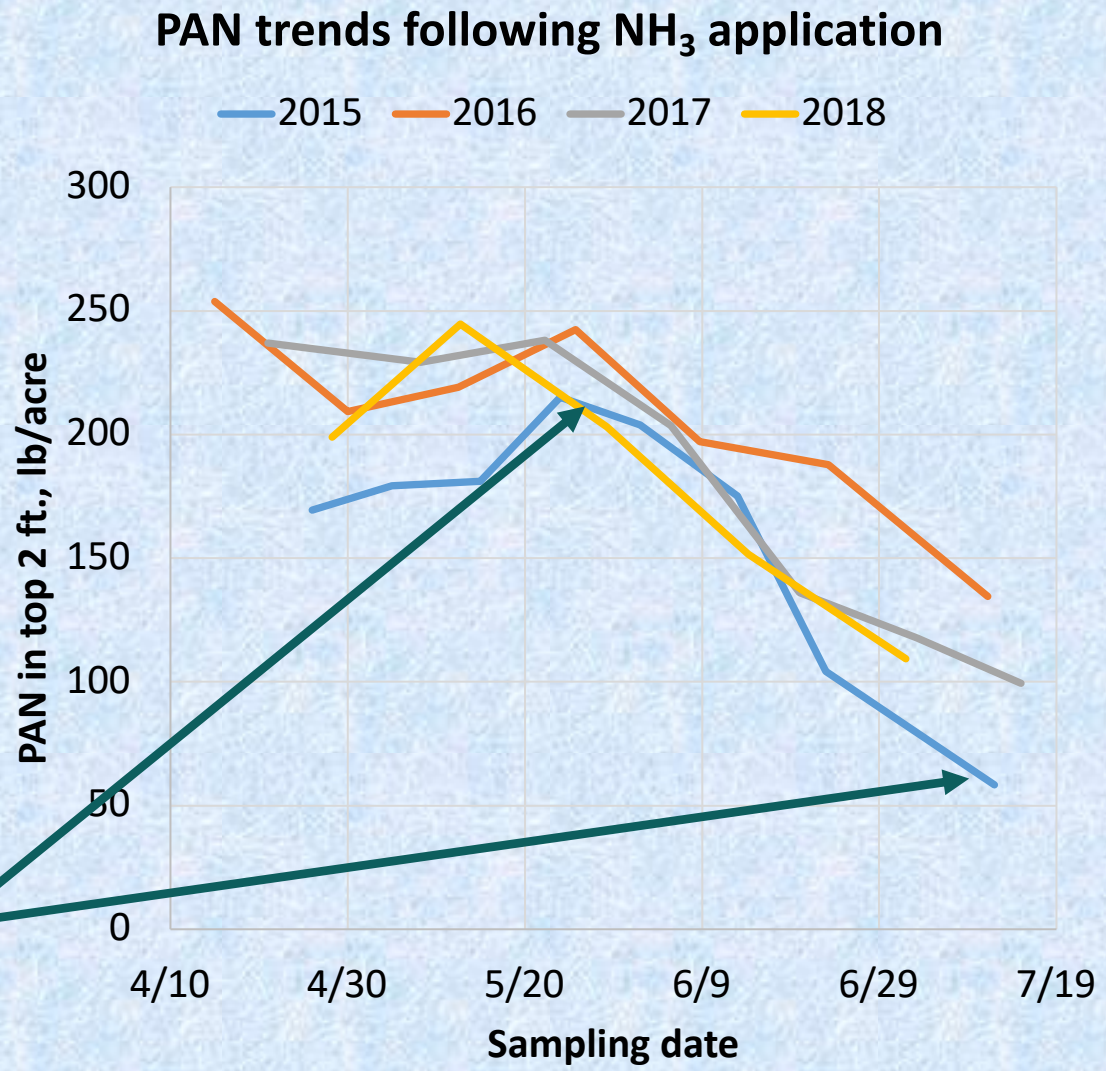
Fall/winter weather and spring soil N

November 1 to April 30

2014-22	Temp	Precip
avg	36.5	15.3

	Dep from avg		Temp/precip	Soil N to 2 ft. in April-May: No N	Fall 200+NS	Spr. 200-NS
2014-15	-2.9	-5.7	cold/dry	88	180	189
2015-16	+4.2	+3.1	warm/wet	82	215	214
2016-17	+4.4	+0.7	warm/avg	105	228	221
2017-18	-2.3	-2.0	cold/md dry	80	222	216

Of these years, yield from fall ammonia was lower than for planter + sidedress N only in 2015, with a very wet June. Low soil N was not visible in early June



N rate calculator: https://www.cornnratecalc.org/

Select State *

Illinois

Select Rotation *

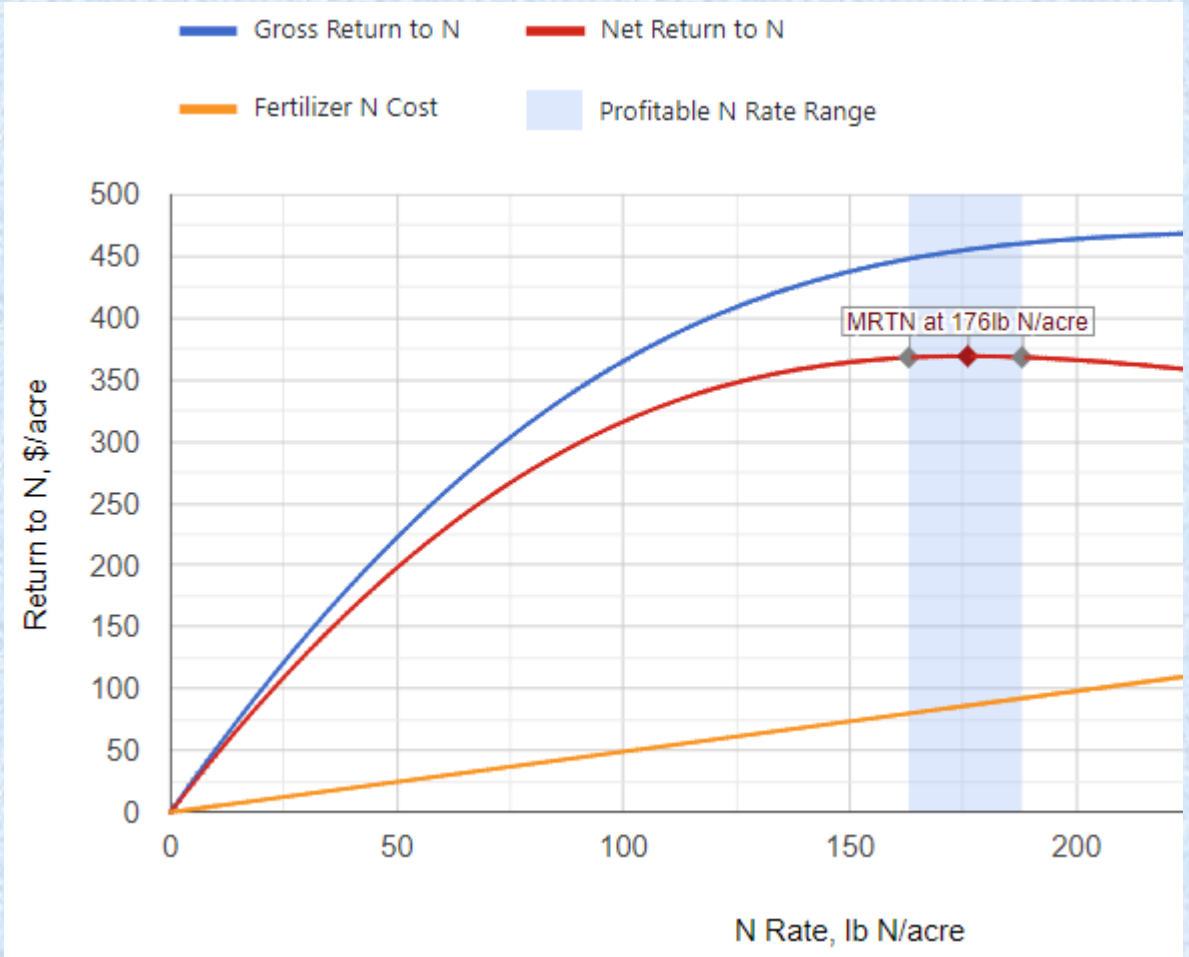
Corn following soybean

Select Region

Central

Set Corn and Nitrogen Prices *

Anhydrous Ammonia (82% N)	800	($/Ton)
Nitrogen Price	0.49	($/lb N)
Corn Price	4.25	($/bu)



MRTN with changing prices for 2024

Corn at $4.25/bushel; N price as indicated

Added 2022 and 2023 results to MRTN calculator to produce these numbers
Little change from 2022/2023 version

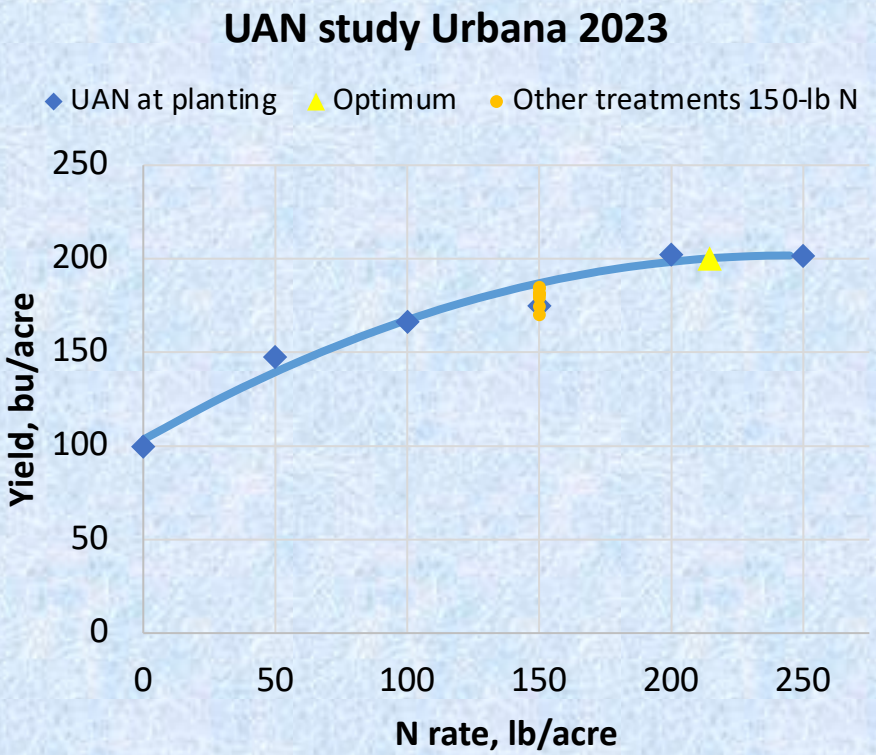
			$800/t NH_3 = $0.49/lb N $380/t UAN28 = $0.68/lb N	
IL Region	**Rotation**	**No. of sites**	**NH_3/$0.49**	**UAN28/$0.68**
North	**Soy-Corn**	65	**170 – 185***	**153 - 165**
	Corn-Corn	67	200 - 213	179 - 193
Central	**Soy-Corn**	308	**175 - 188**	**162 - 173**
	Corn-Corn	155	195 - 207	178 - 191
South	**Soy-Corn**	154	**195 - 207**	**179 - 191**
	Corn-Corn	22	190 - 205	174 - 187

*** Upper end of range**

Note that price used for N should be that of the last N form used – previous costs are already sunk. Count all N applied.

UAN timing/placement

- Study with UAN rate, timing, and placement at Urbana
- Included a full N rate study w/ UAN injected at planting
- 2023 trial: planted 4/27; V6 appl 6/2; V9 appl 6/17 (0.73" rain 6/2-6/17)



Timing/placement	Yield, bu/ac 2023	2022	2021	2020	2019	5-yr average
150 injected at planting	175	183	176	164	172	174
50P+100 injected at V6	182	186	**189**	167	**184**	182
50P+100 dribbled at V6	181	188	**181**	165	176	178
50P+50inj/50dr at V6	175	196	174	166	178	178
50P+50inj V6+50dr V10	184	190	176	170	173	179
50P+50dr V6+50dr V10	179	**201**	168	**173**	162	177
50P+100dr at V10	**170**	190	165	179	172	175
75inj/75dr at planting	185	187	175	165	169	176
150 dribbled at planting	181	197	**156**	**155**	**195**	176
EONR	***214***	***111***	***213***	***187***	***149***	

Rainfall by year

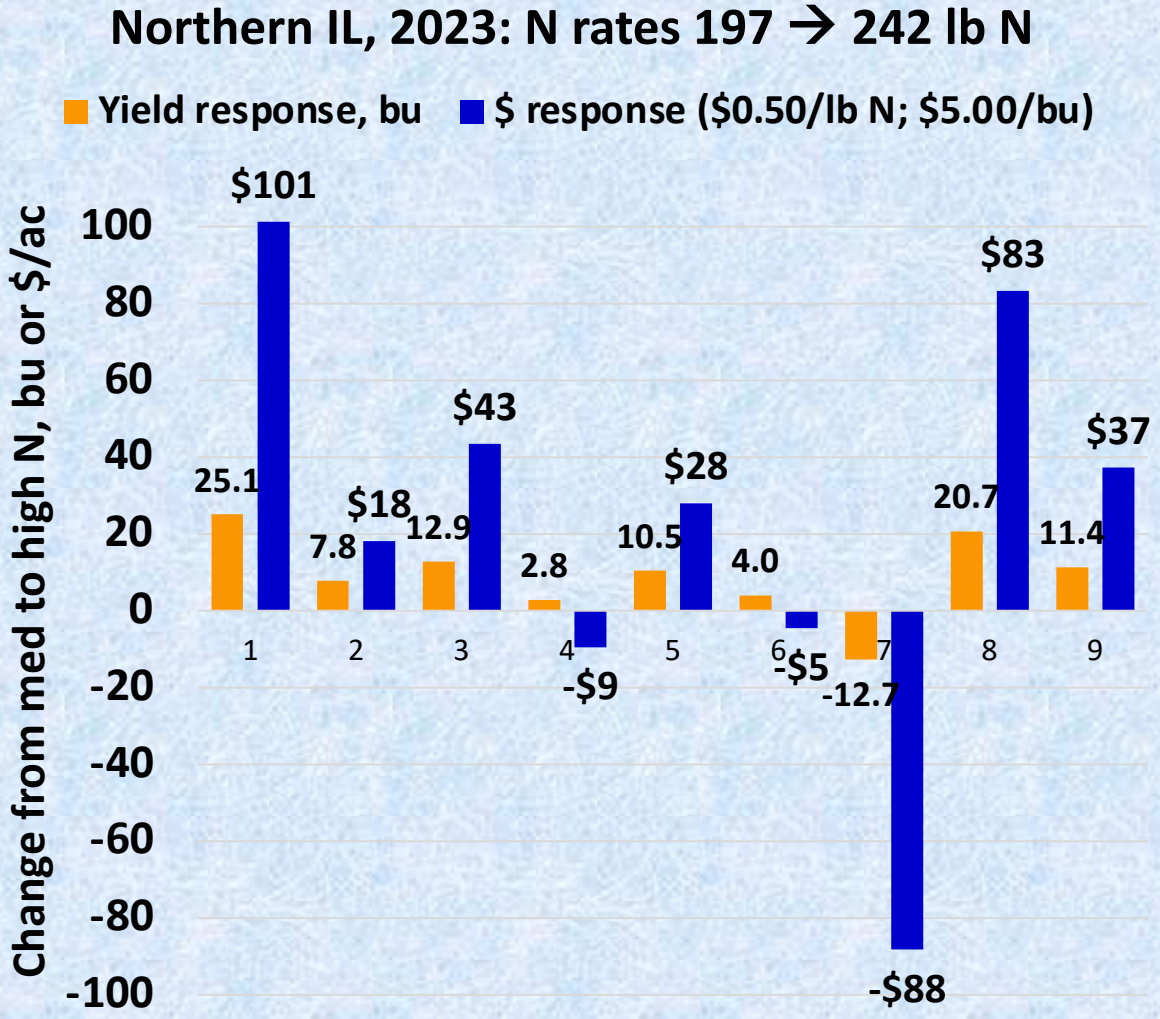
	2019	**2020**	**2021**	**2022**	**2023**
Plant to V6	3.15	7.25	3.49	1.54	2.29
V6 to V9	2.87	3.28	0.81	1.05	0.73
V9 to silk	1.77	3.63	6.62	2.79	2.77

This, in 500(?) IL fields each year

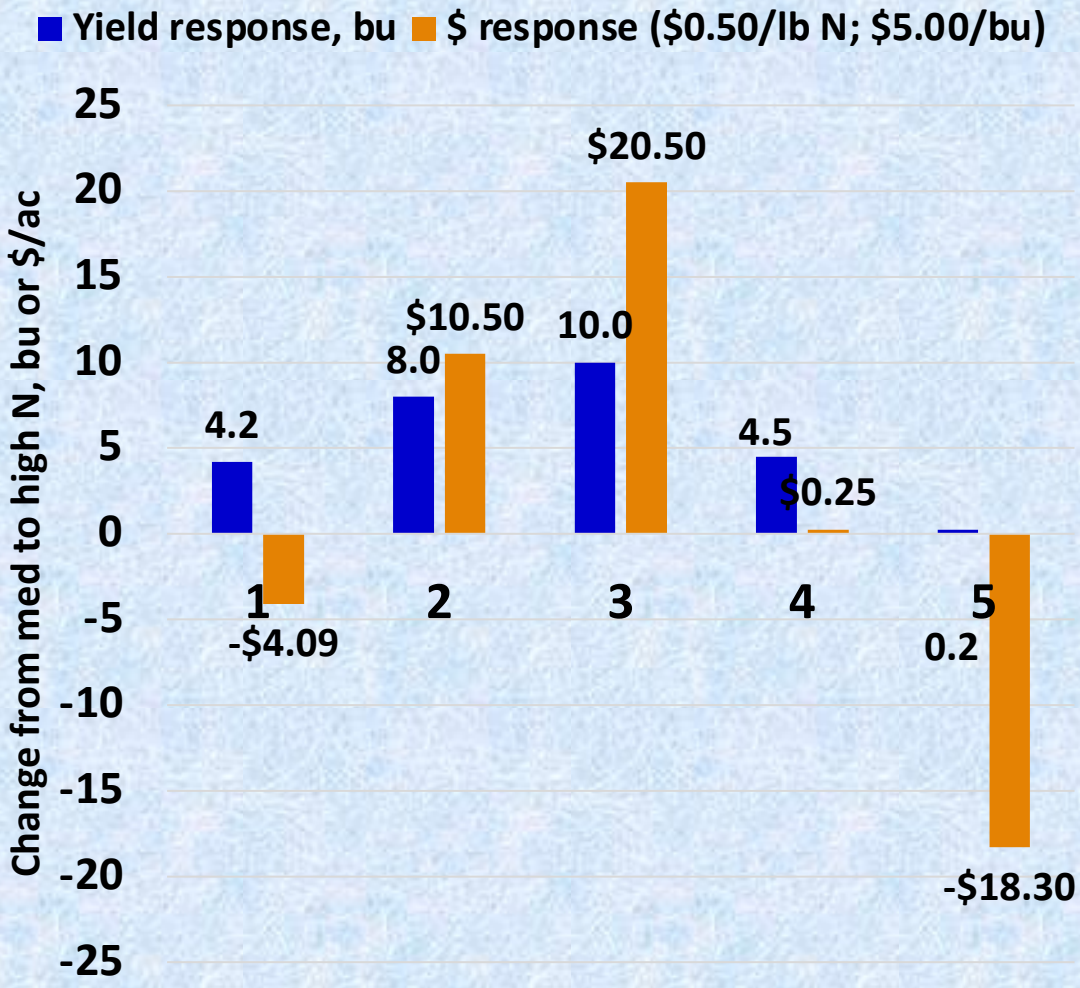
N Rate Verification Trials:

- Project in its early years, funded by NREC
- Likely to replace most full-rate trials over time
- Dan Schaefer (IFCA) coordinates

N Rate Verification Trials (2-rate strips) in 2023



Adding 45 lb N added an average of 9.1 bu and $23 net per acre



Adding 50 lb N added an avg of 5.4 bu and $2 net/ac

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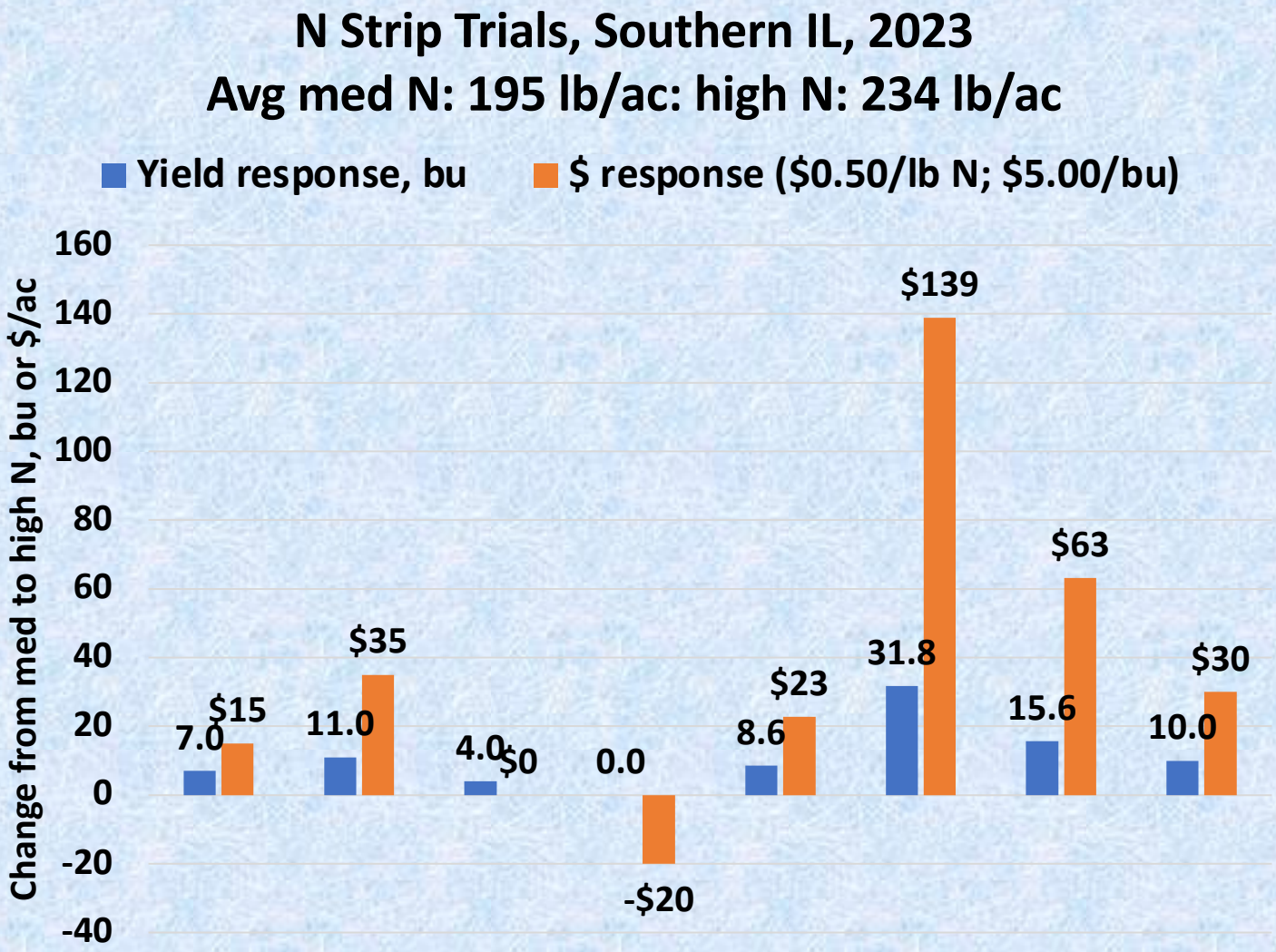
N Rate Verification Trials (2-rate strips) in 2023



Adding 49 lb N added an average of 11.0 bu and $36 net/ acre

2-rate strip trials in Illinois in 2023 generally showed more positive yield and net $ responses than in 2022

This was less the case in full-rate N response trials in 2023

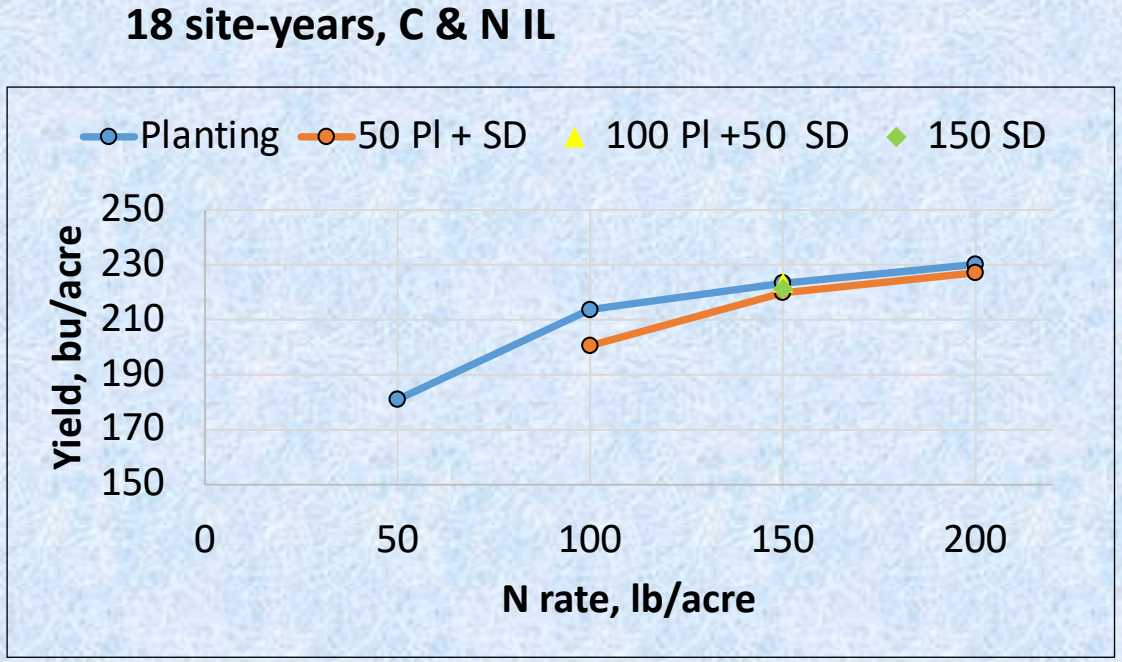
Although N loss conditions (wet soils) were absent in Illinois in 2023, root access to N was likely limited by dry soil conditions in some fields, and adding N may have helped prevent this

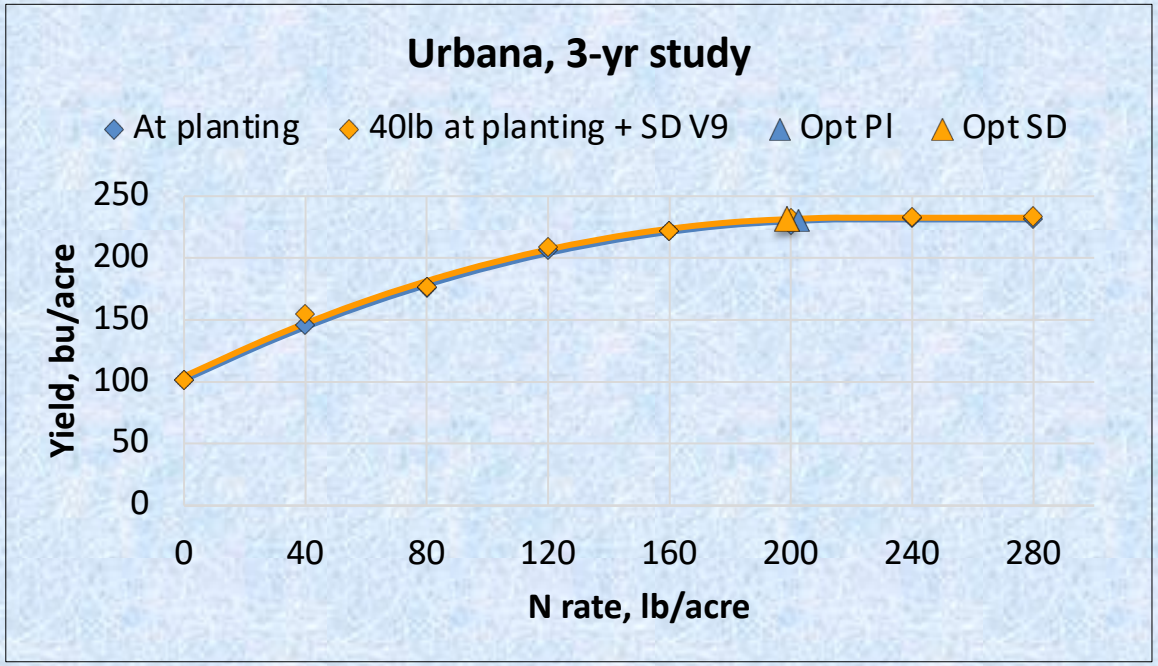
- This was probably not fixable in-season in 2023

What about 2024? “Preventative” higher N rates are not justified (but very wet June weather might…?)

What about splitting N?

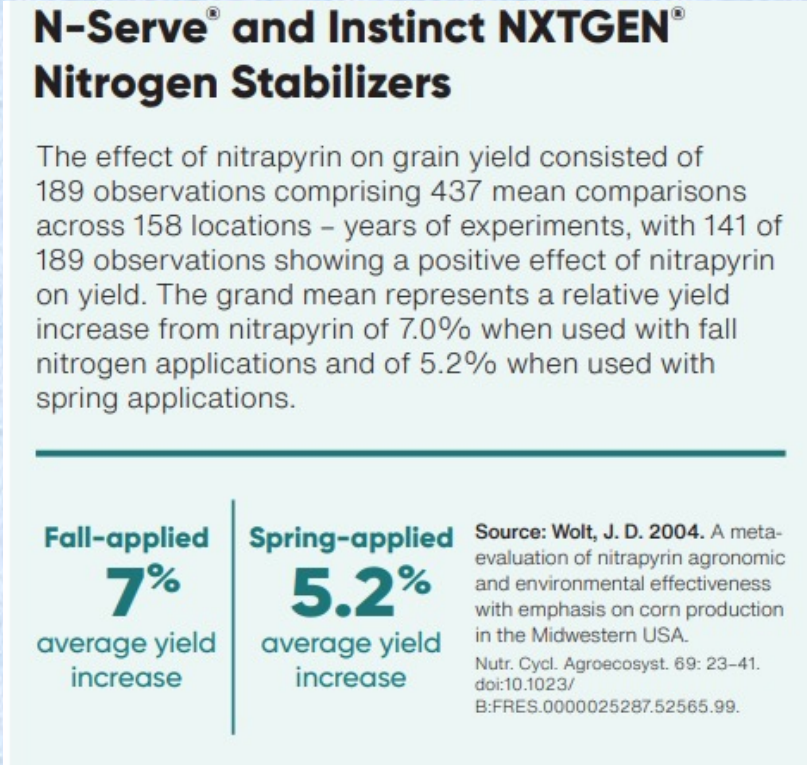
- It's a very reasonable way to apply some N for many
- It has seldom produced higher yield with the same N rate or the same yield with less N than all-early N, in silt loam or silty clay loam soils
- Might occasionally be needed to supply additional N (e.g., wet early)
- Small plants need N early
- Timing of split is not critical in most soils and years, as long as there is N there early
- Sidedress NH_3 instead of UAN?

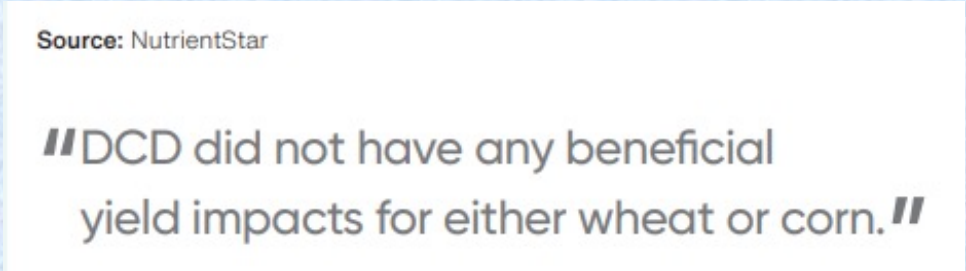




Stabilizers?

- The value of any inhibitor in any field situation depends what N rate is used, and on what happens between N application and plant N uptake
- Two main chemical types:
  - Nitrification inhibitors (nitrapyrin, DCD) slow microbial conversion of ammonium to nitrate
  - Urease inhibitors (NBPT) slow release of NH3 from urea
- Slow-release stabilizers: coatings (ESN); chemical agents (methylene urea)
- THINK before using – is loss likely, and will stabilizers pay their way?



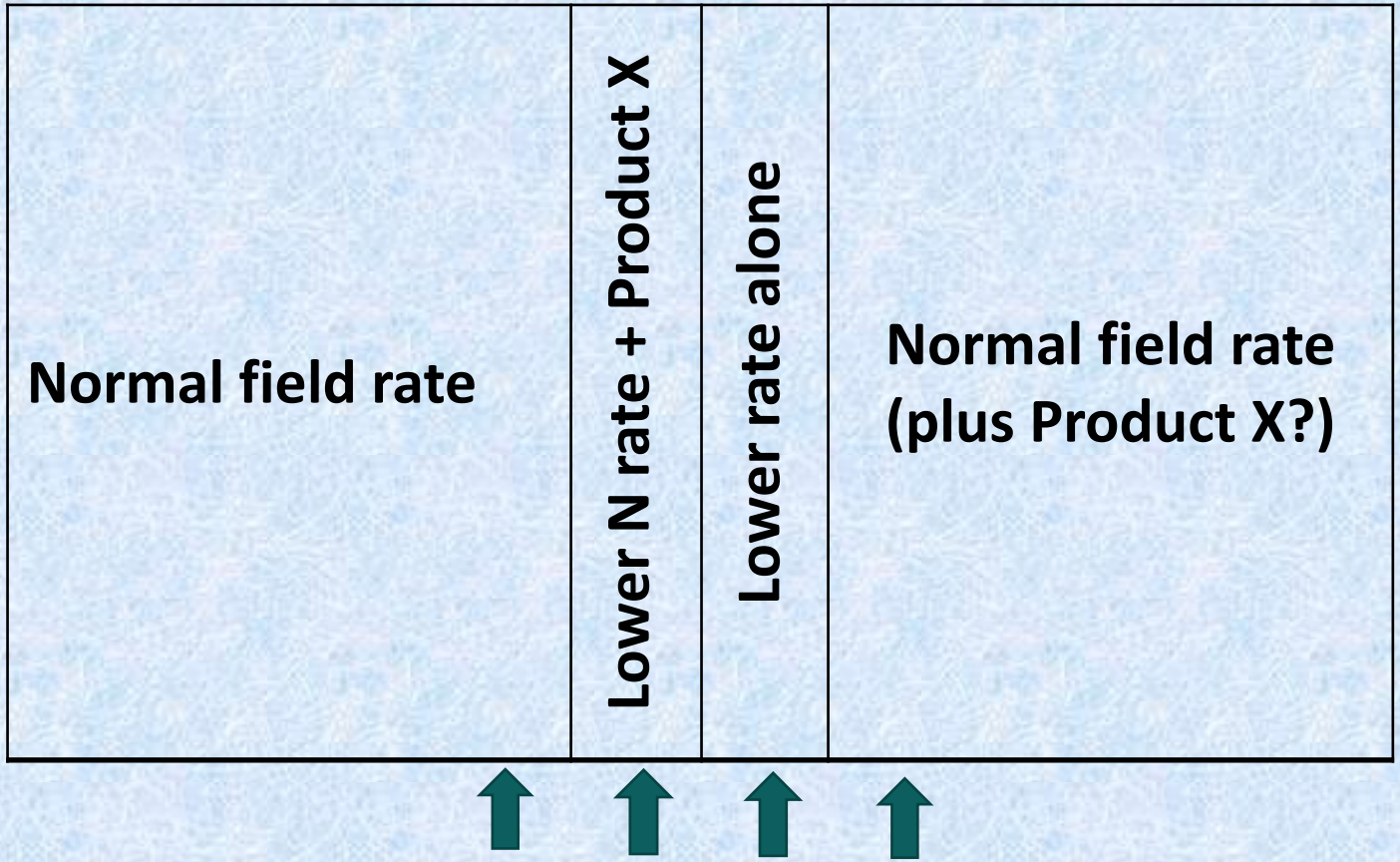


“Lower the N rate and add Product X” – a winning strategy?

If we compare a normal (higher) N rate without Product X to a lower N rate with Product X:

We do not know what the yield at the low N rate by itself would have been, so do not know if Product X affected yield

We need the lower N rate both with and without Product X to know if Product X affected yield



Make strips wide enough to take YM data, in strips and next to strips

A second set of strips in the same or another field would be very useful

N rate x ProveN40 trial in Kentucky, 2023

Very dry first part of season
Approximate yields:

140 N no PN	193
140 N + PN	207
180 N no PN	187
180 N + PN	197

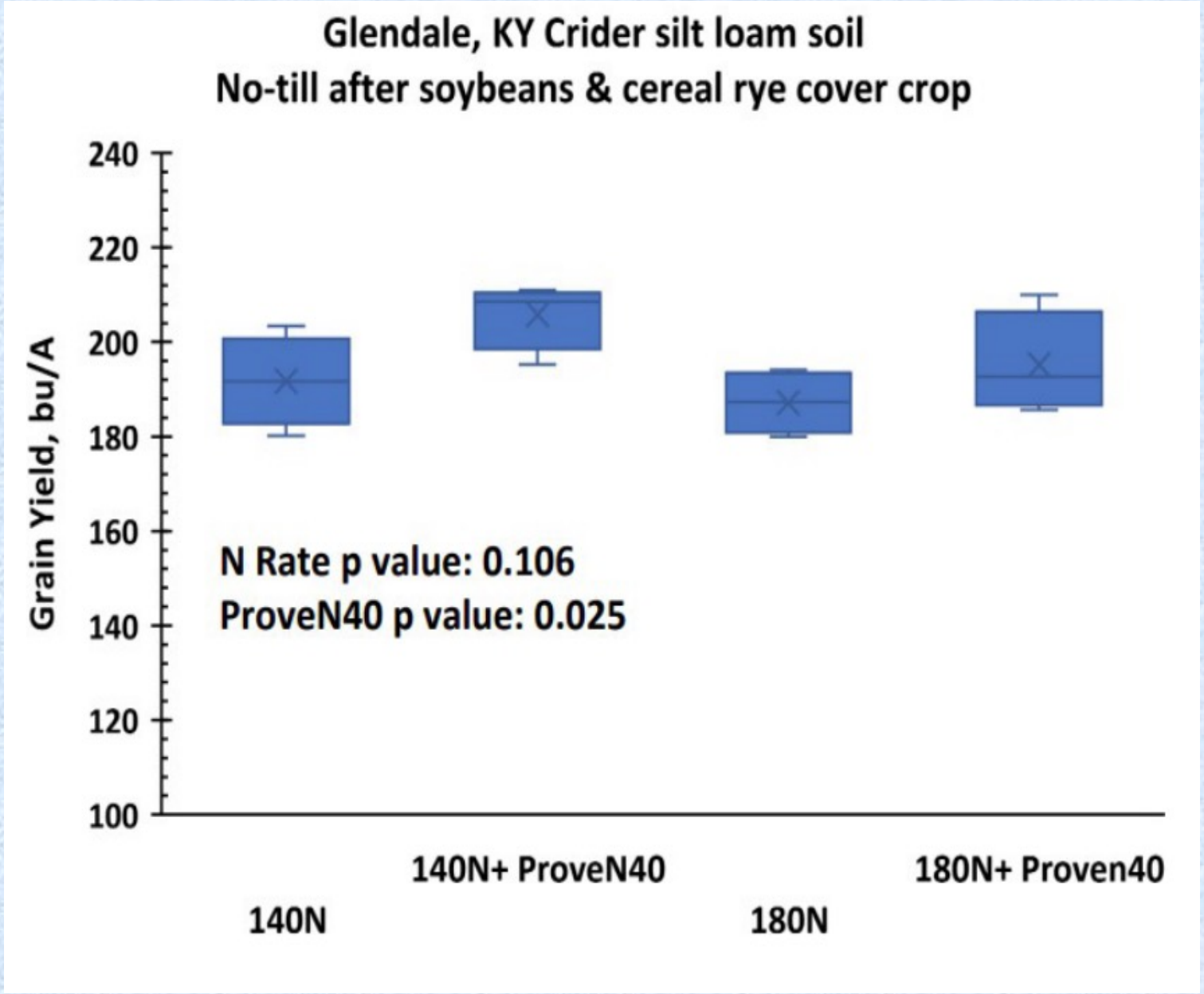
Going from 140 to 180 lb N reduced yield by about 8 bu

Adding ProveN increased yield by about 12 bu

Likely: Higher N meant more stress

ProveN increased root growth to help N uptake

This combination is rare (other KY sites showed little response)



Revised Illinois Agronomy Handbook chapter

Website: https://extension.illinois.edu/global/agronomy-handbook

THANK YOU

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