

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



June 26



Aug 17



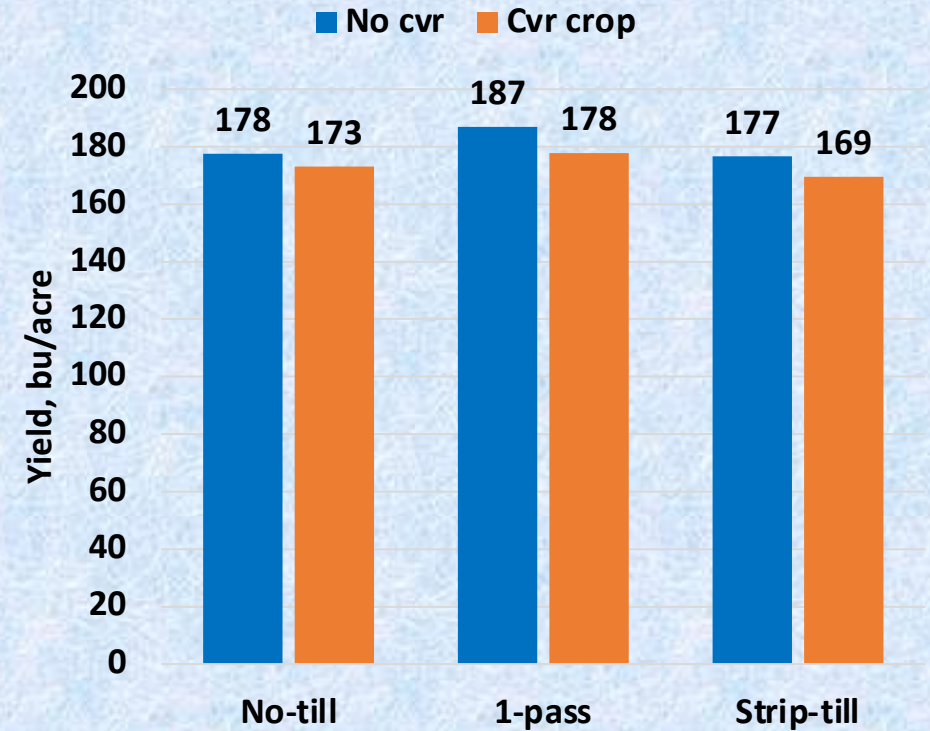
Cover crops were a problem for corn (and for soybeans) in some fields in 2023



Don't abandon cover crops after one tough year

August 22, 2023

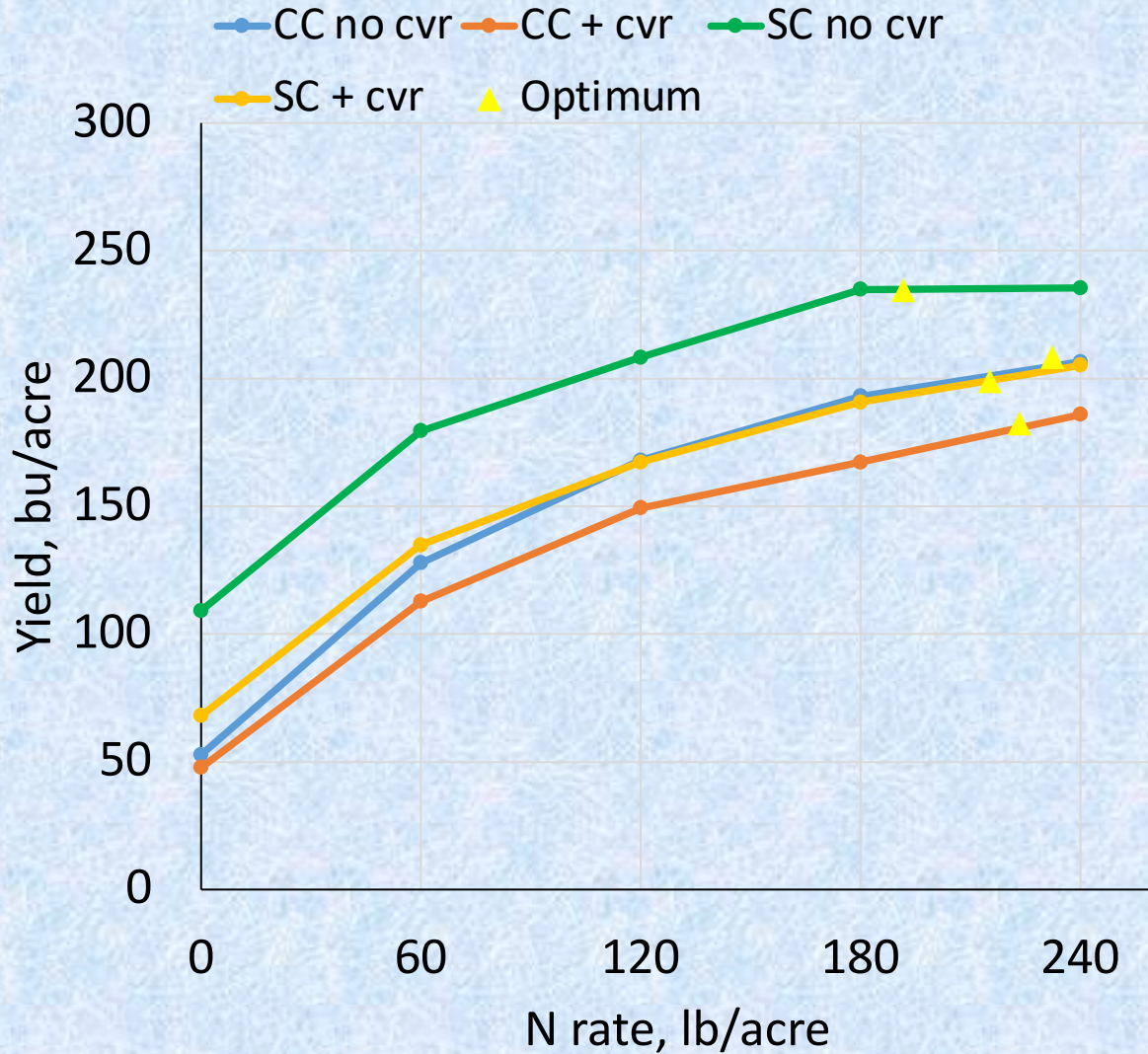
Corn tillage x cover crop, 2023



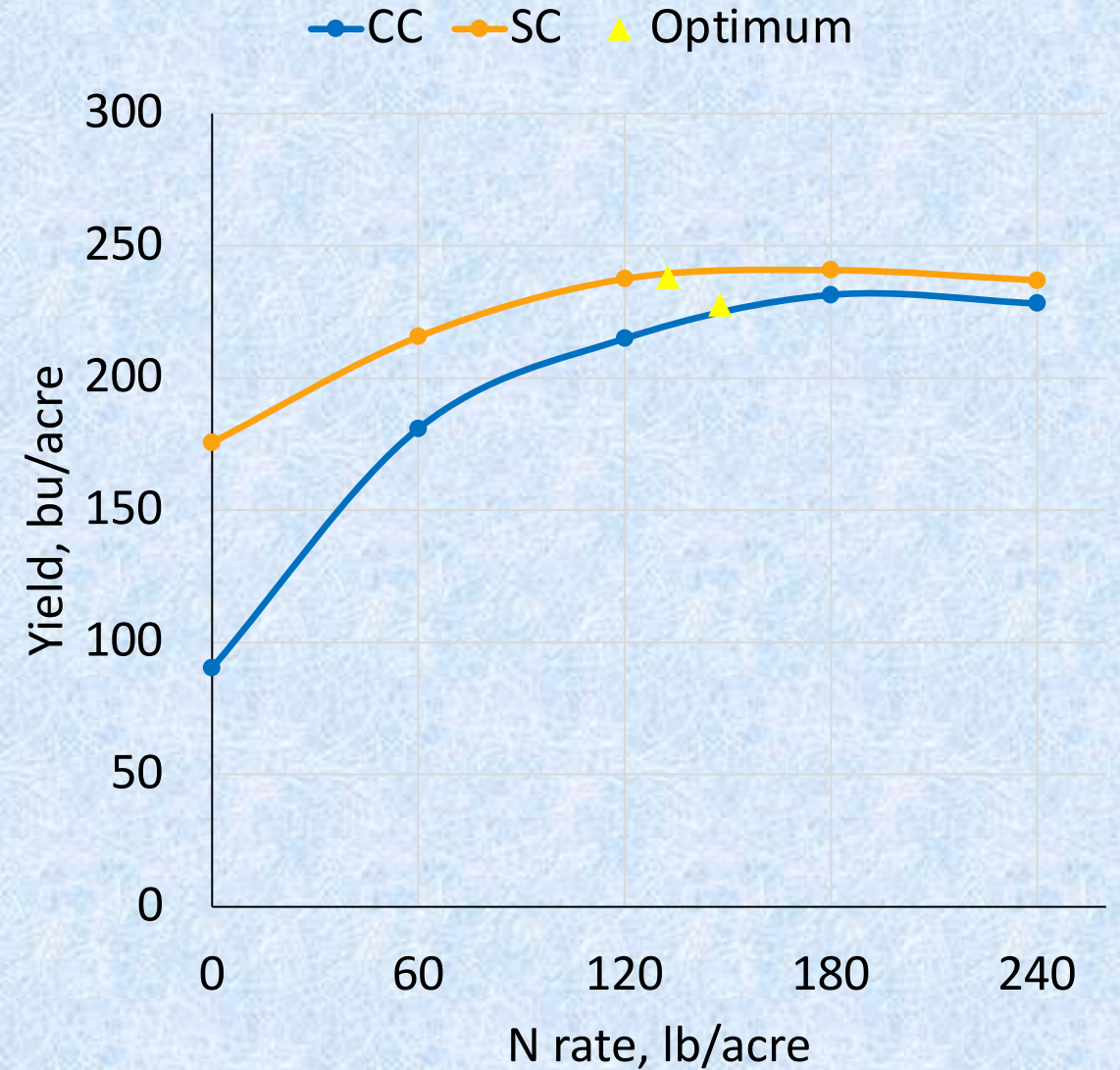
Don't "plant green," especially corn, especially into a grass cover crop, especially no-till

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

After CC, 2019-2023

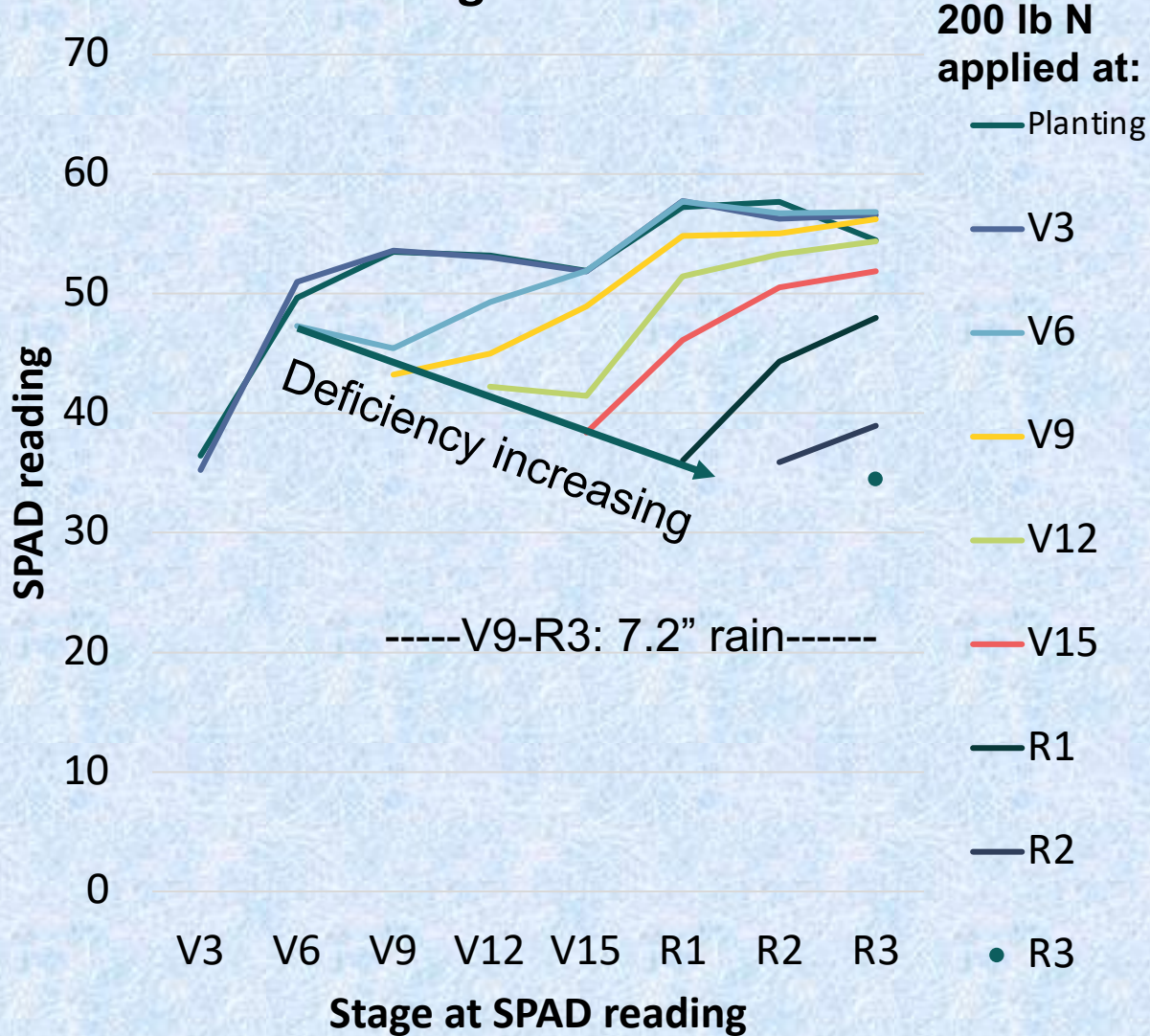


Before CC, 2014-2018

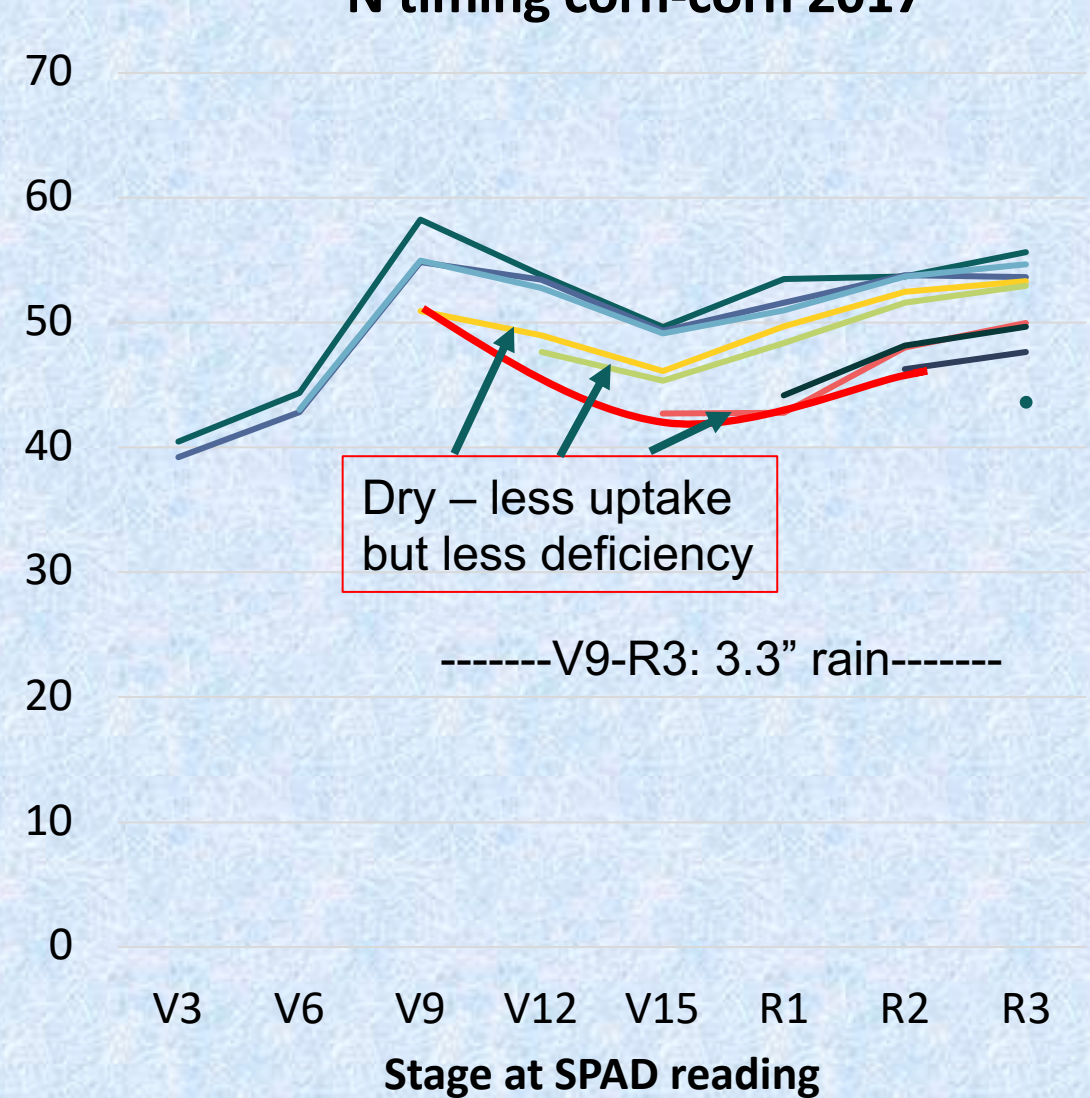


Dry weather and N timing: it's "complicated"

N timing corn-corn 2016



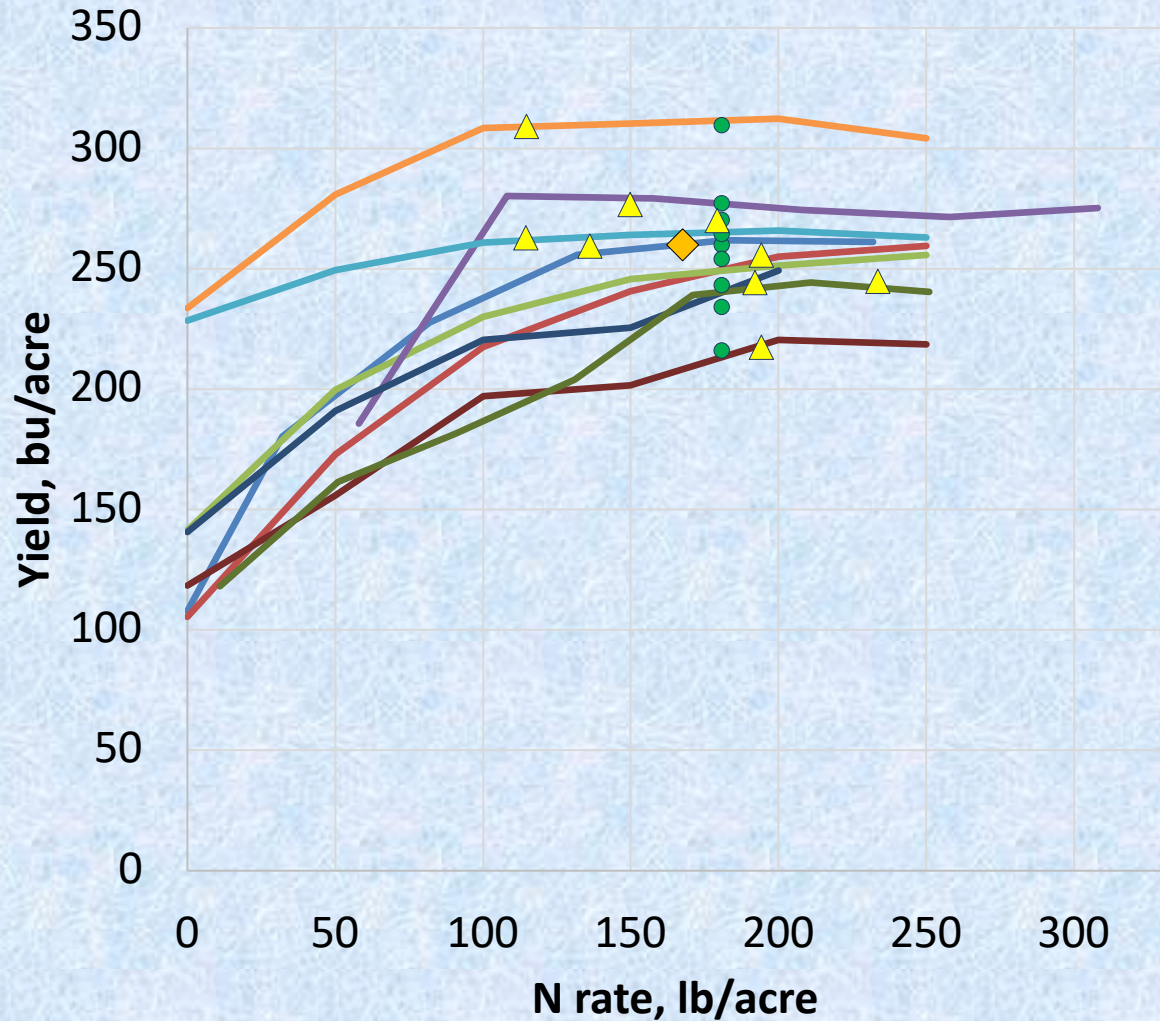
N timing corn-corn 2017



Nitrogen in 2023

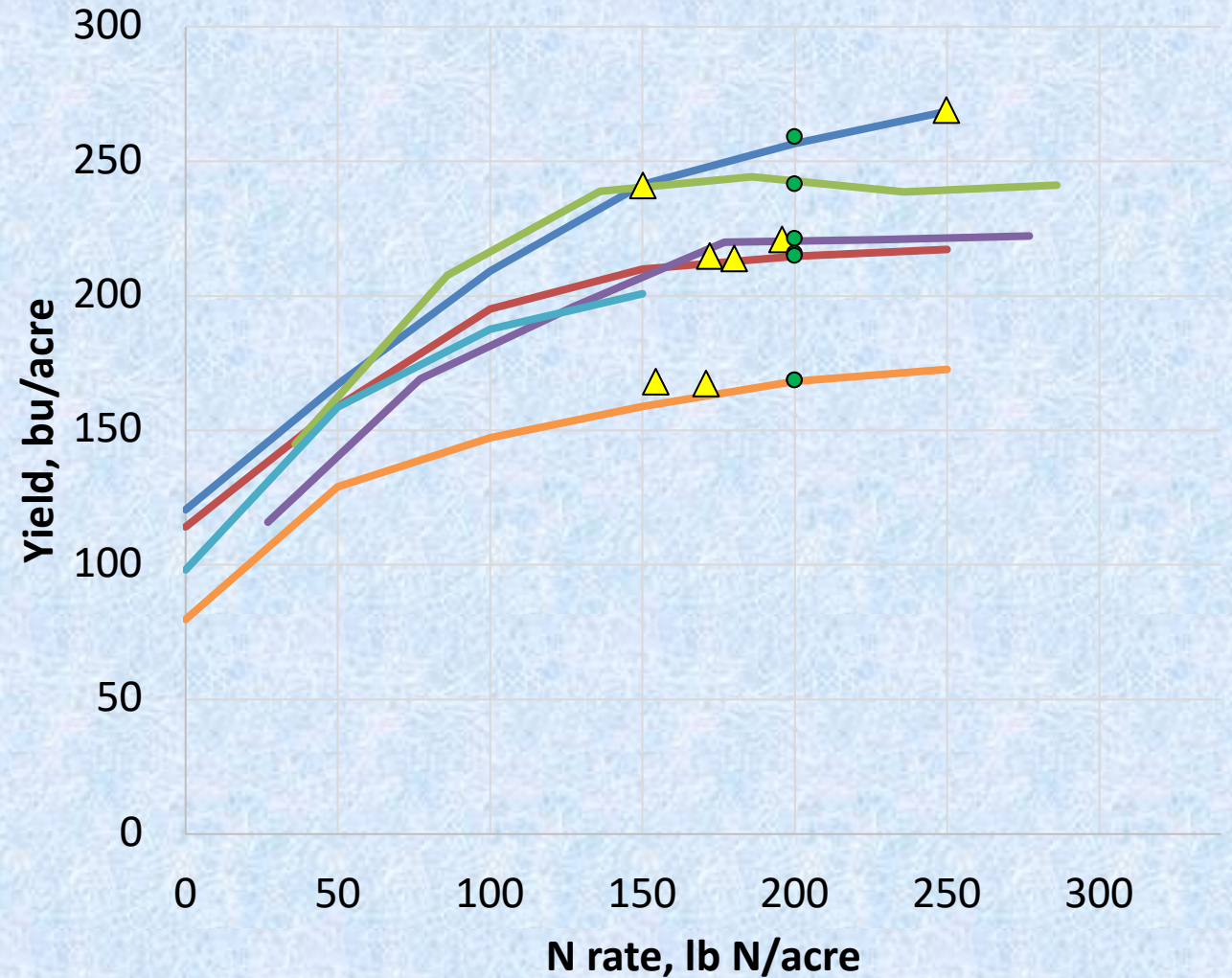
9 Soy-Corn Trials, Central IL, 2023

● At MRTN ▲ Optimum ◆ Avg optimum



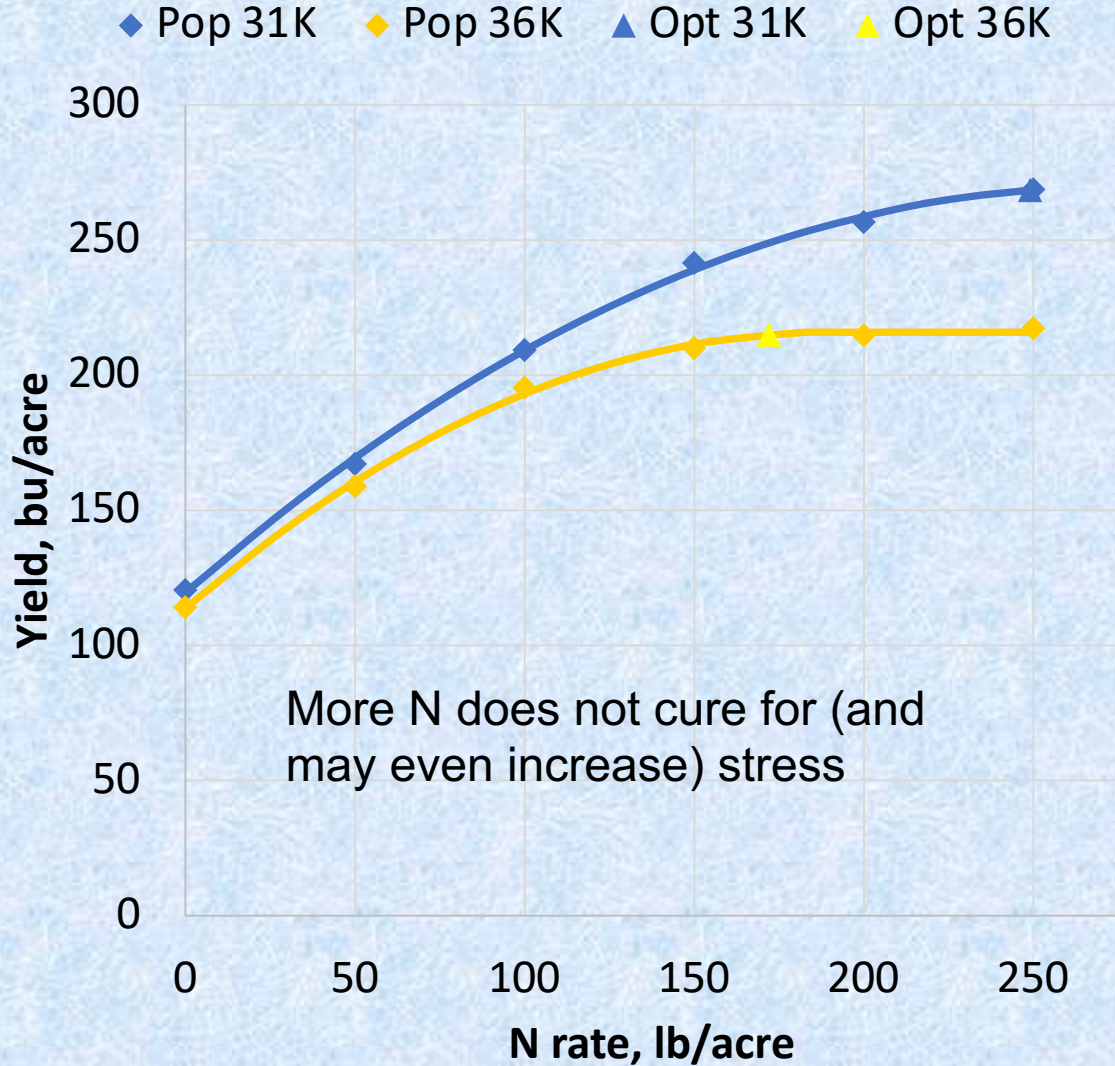
7 Soy-Corn Trials, Southern IL, 2023

▲ Optimum ● At MRTN

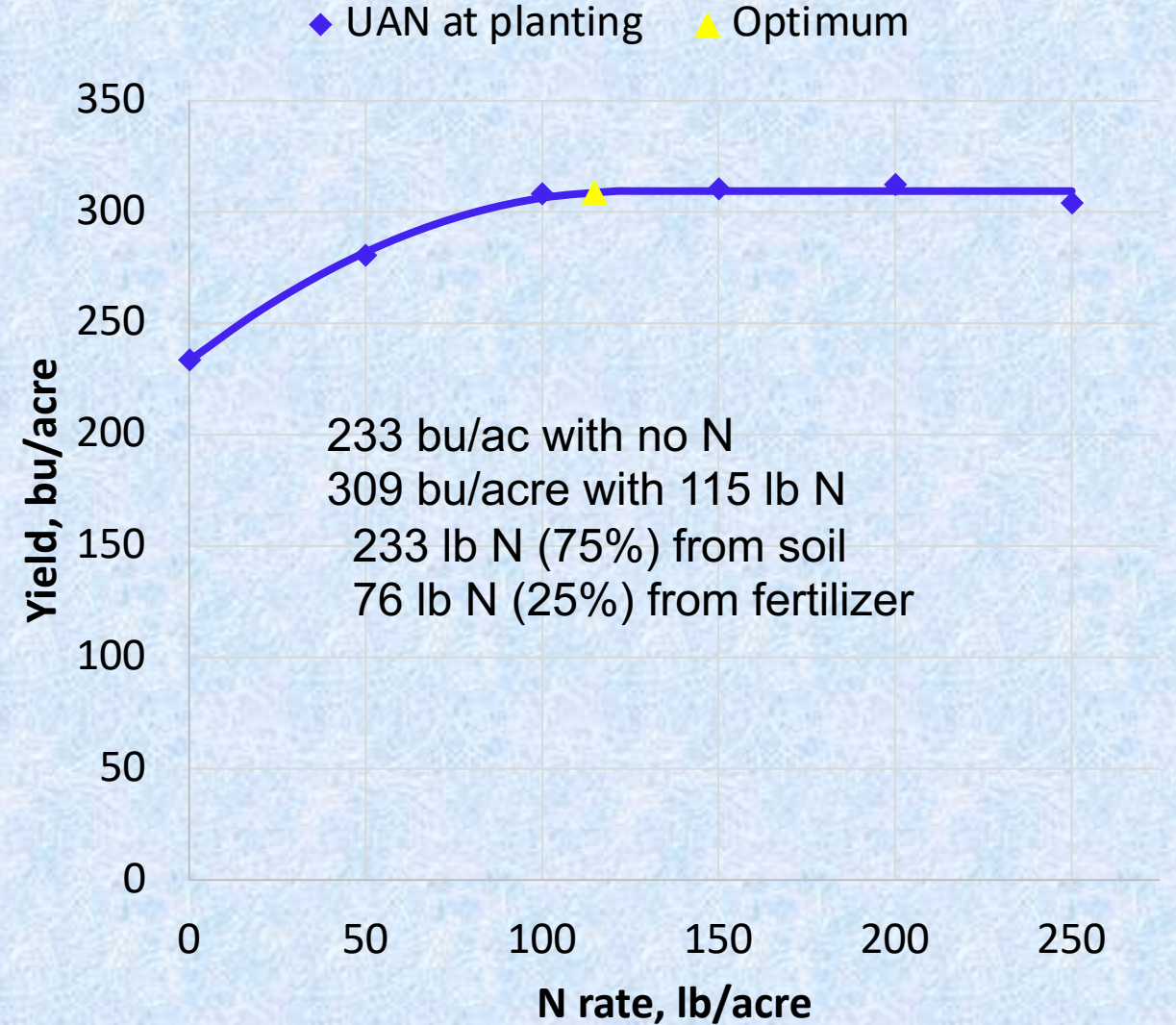


Nitrogen in 2023 – too much to too little to plenty

Richland County, Soy-Corn 2023



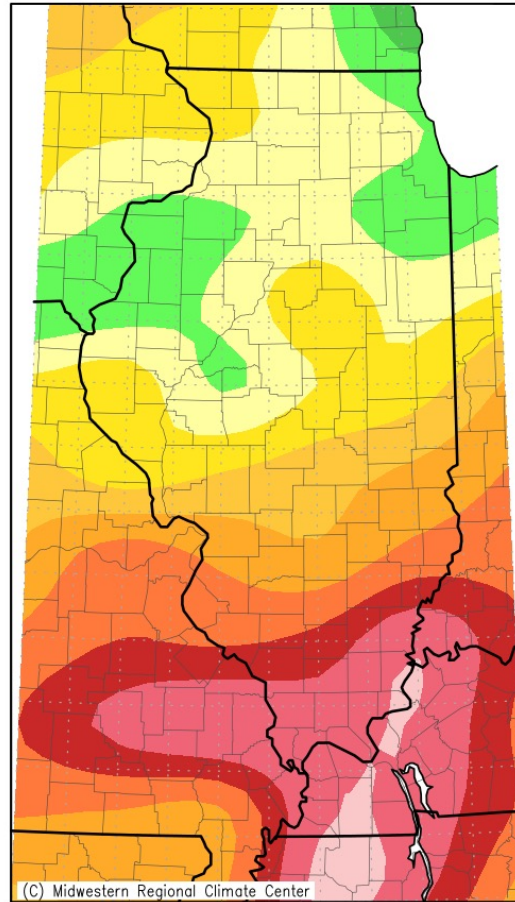
Warren County Soy-Corn, 2023



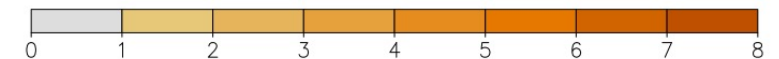
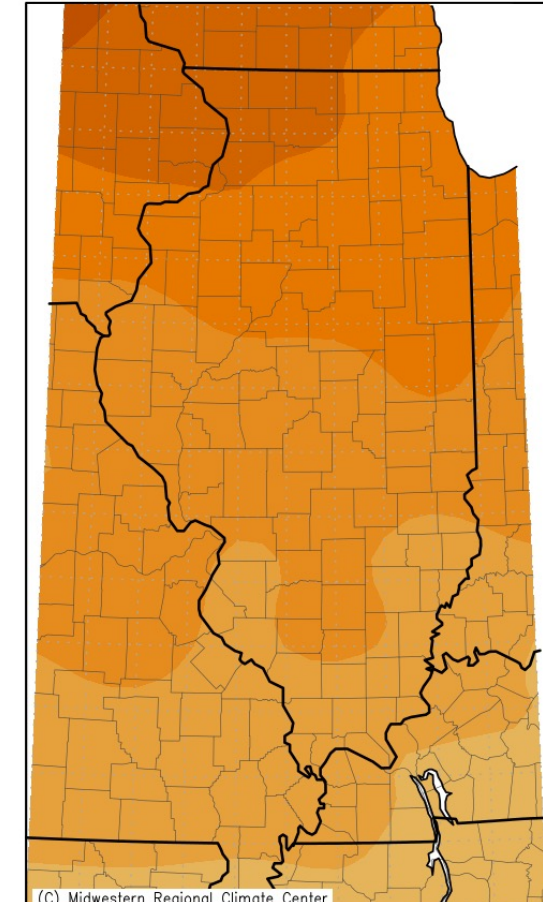
One issue: is N applied in Fall 2023 still present, and is it safe until N uptake begins (in late May)?

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

Accumulated Precipitation (in): Departure from Mean
November 1, 2023 to March 22, 2024



Average Temperature (°F): Departure from Mean
November 1, 2023 to March 21, 2024



Fall/winter weather and spring soil N

November 1 to April 30

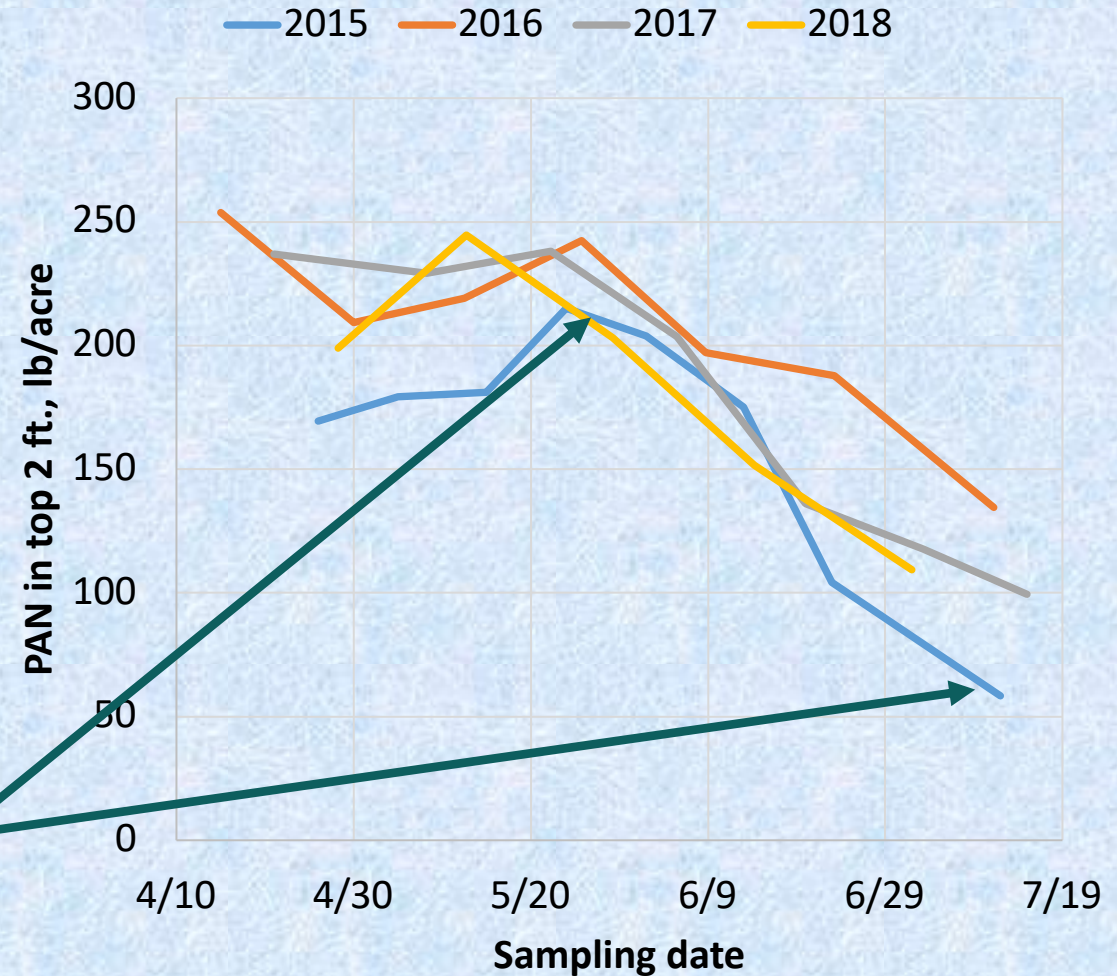
2014-22 Temp Precip
avg 36.5 15.3

Soil N to 2 ft. in April-May

	Dep from avg Temp/precip			No N	Fall	Spr.
					200+NS	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

PAN trends following NH₃ application



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

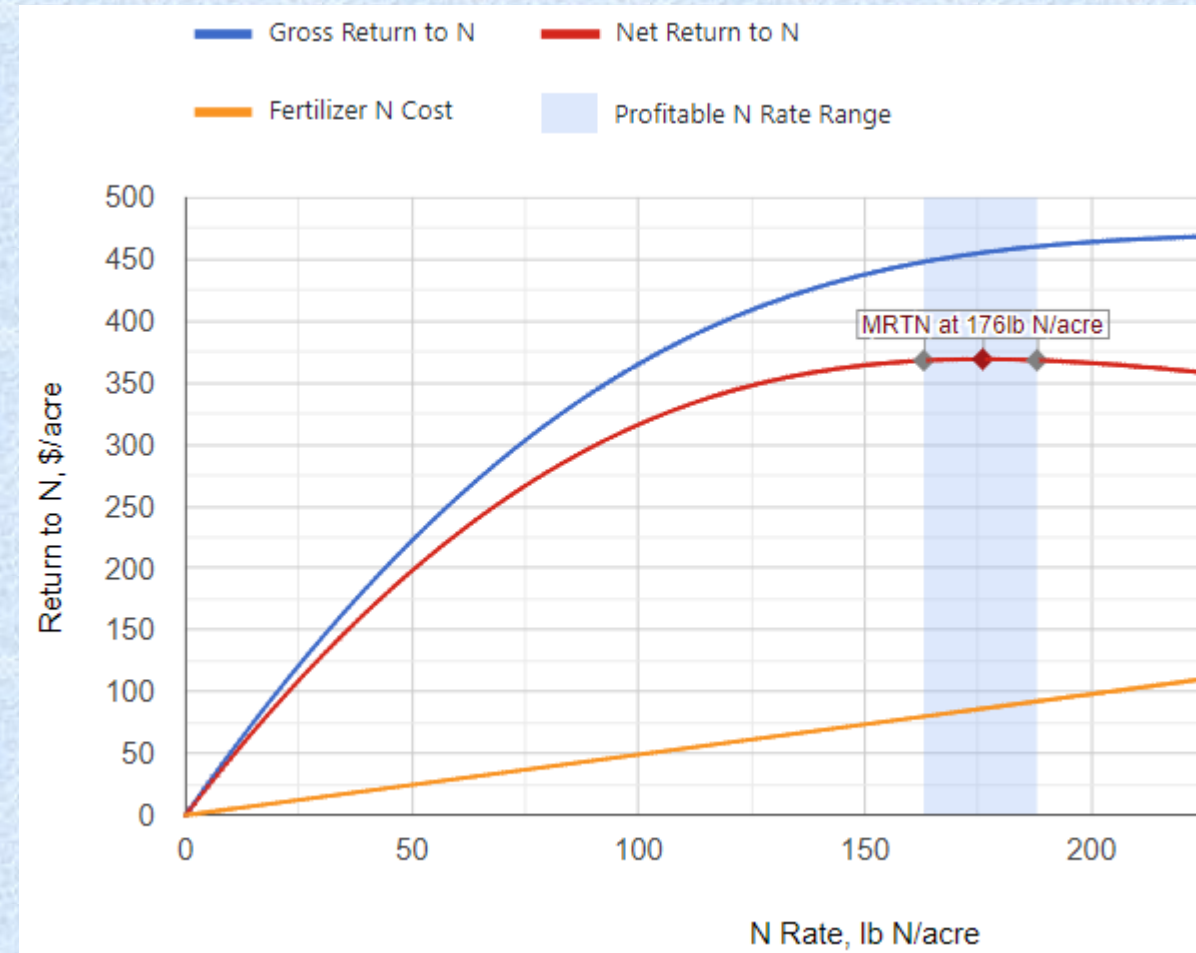
Select State *
Illinois

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 NH₃ = \$0.49/lb N \$380/t UAN28 = \$0.68/lb N				
IL Region	Rotation	No. of sites	NH₃/\$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

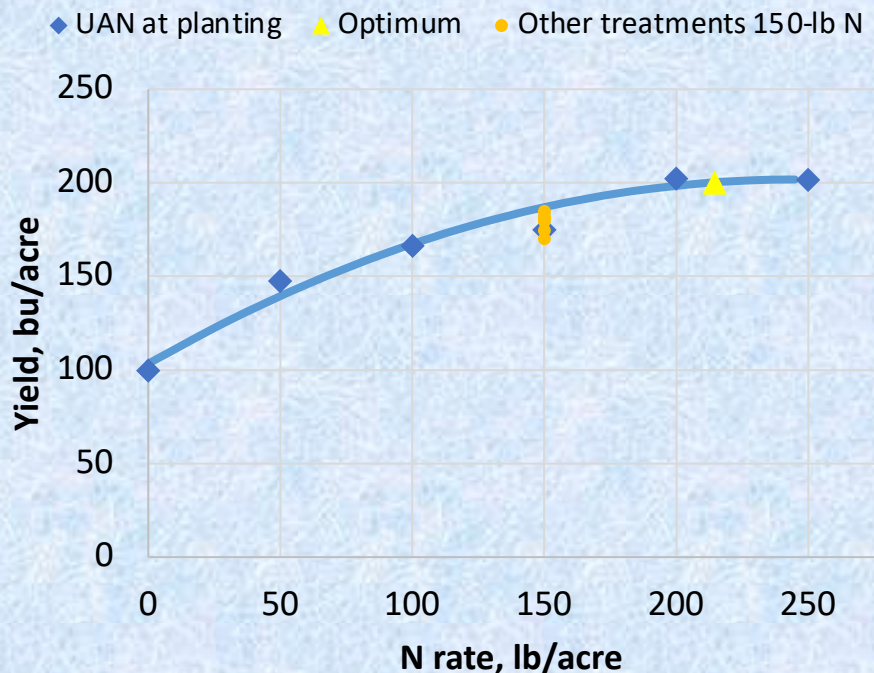
* Upper end of range

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)

UAN study Urbana 2023



Timing/placement	Yield, bu/ac					5-yr average
	2023	2022	2021	2020	2019	
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

	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
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:

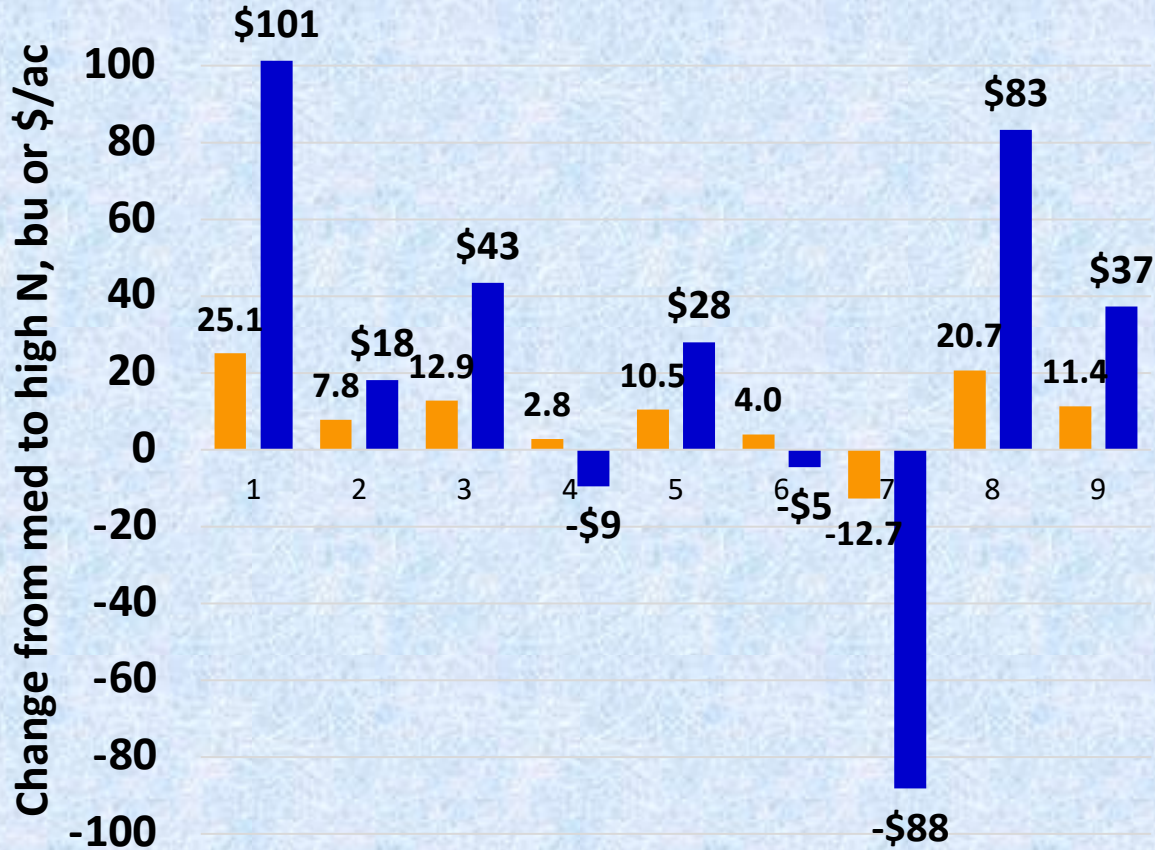
- Project in its early years, funded by NREC
- Likely to replace most full-rate trials over time
- Dan Schaefer (IFCA) coordinates



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

Northern IL, 2023: N rates 197 → 242 lb N

■ Yield response, bu ■ \$ response (\$0.50/lb N; \$5.00/bu)



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

Central IL, 2023: 181 → 231 lb N

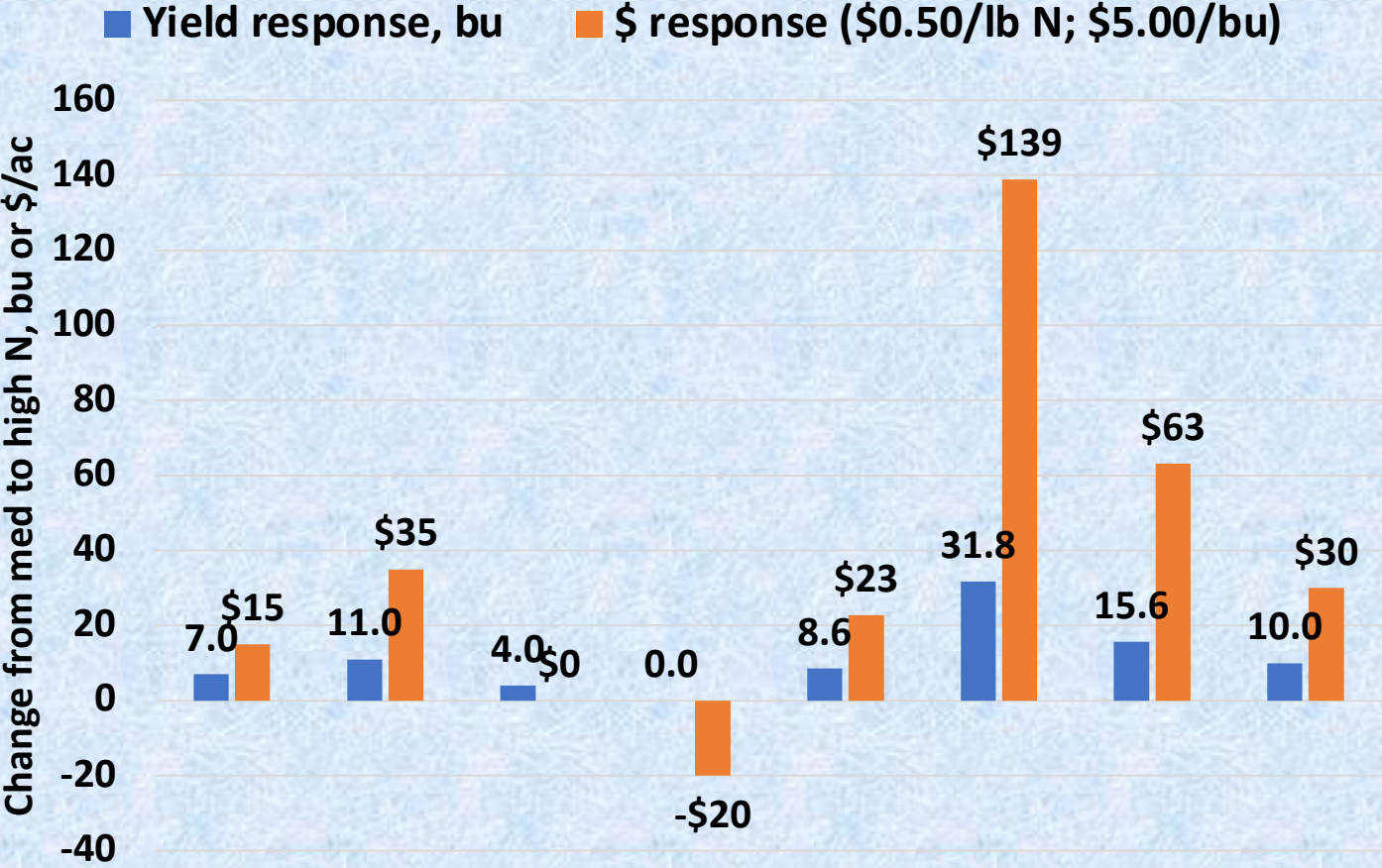
■ Yield response, bu ■ \$ response (\$0.50/lb N; \$5.00/bu)



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

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

N Strip Trials, Southern IL, 2023
Avg med N: 195 lb/ac: high N: 234 lb/ac



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

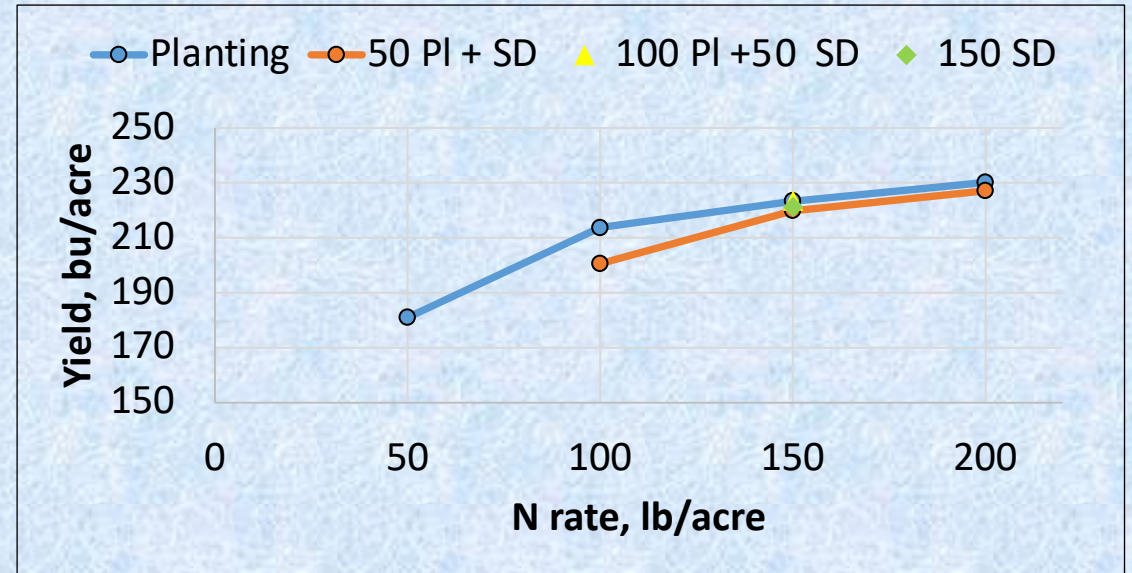
- This was probably not fixable in-season in 2023

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

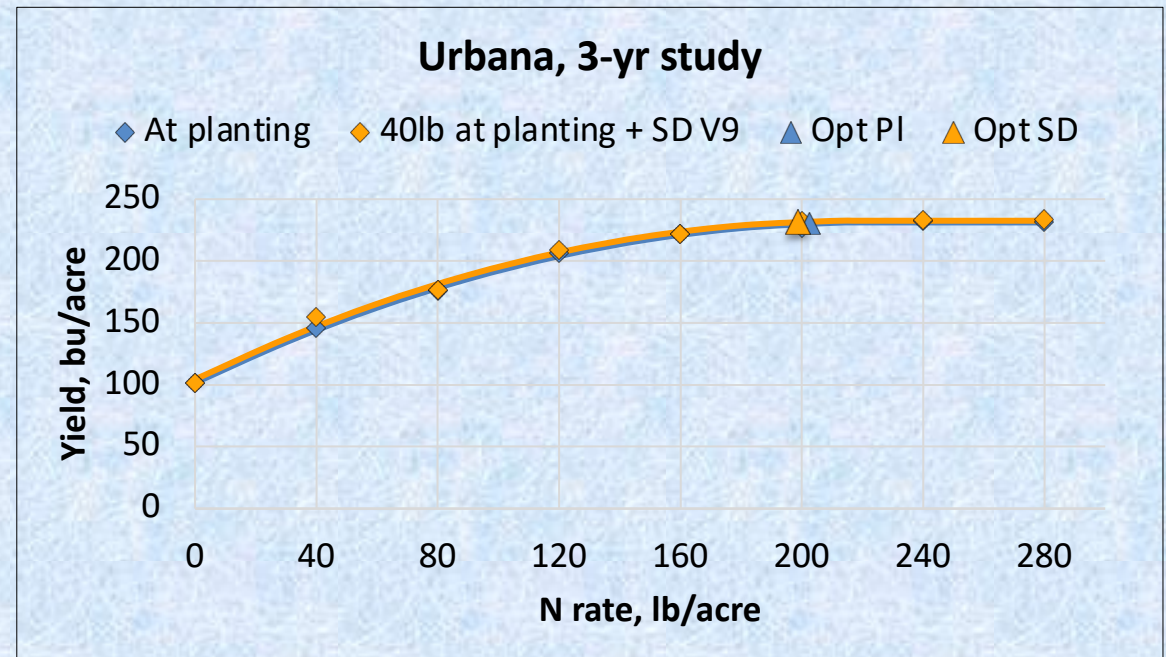
What about splitting N?

- 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?

18 site-years, C & N IL



Urbana, 3-yr study



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?

N-Serve® and Instinct NXTGEN® Nitrogen Stabilizers

The effect of nitrapyrin on grain yield consisted of 189 observations comprising 437 mean comparisons across 158 locations – years of experiments, with 141 of 189 observations showing a positive effect of nitrapyrin on yield. The grand mean represents a relative yield increase from nitrapyrin of 7.0% when used with fall nitrogen applications and of 5.2% when used with spring applications.

Fall-applied
7%
average yield
increase

Spring-applied
5.2%
average yield
increase

Source: Wolt, J. D. 2004. A meta-evaluation of nitrapyrin agronomic and environmental effectiveness with emphasis on corn production in the Midwestern USA. Nutr. Cycl. Agroecosyst. 69: 23–41. doi:10.1023/B:FRES.0000025287.52565.99.

Source: NutrientStar

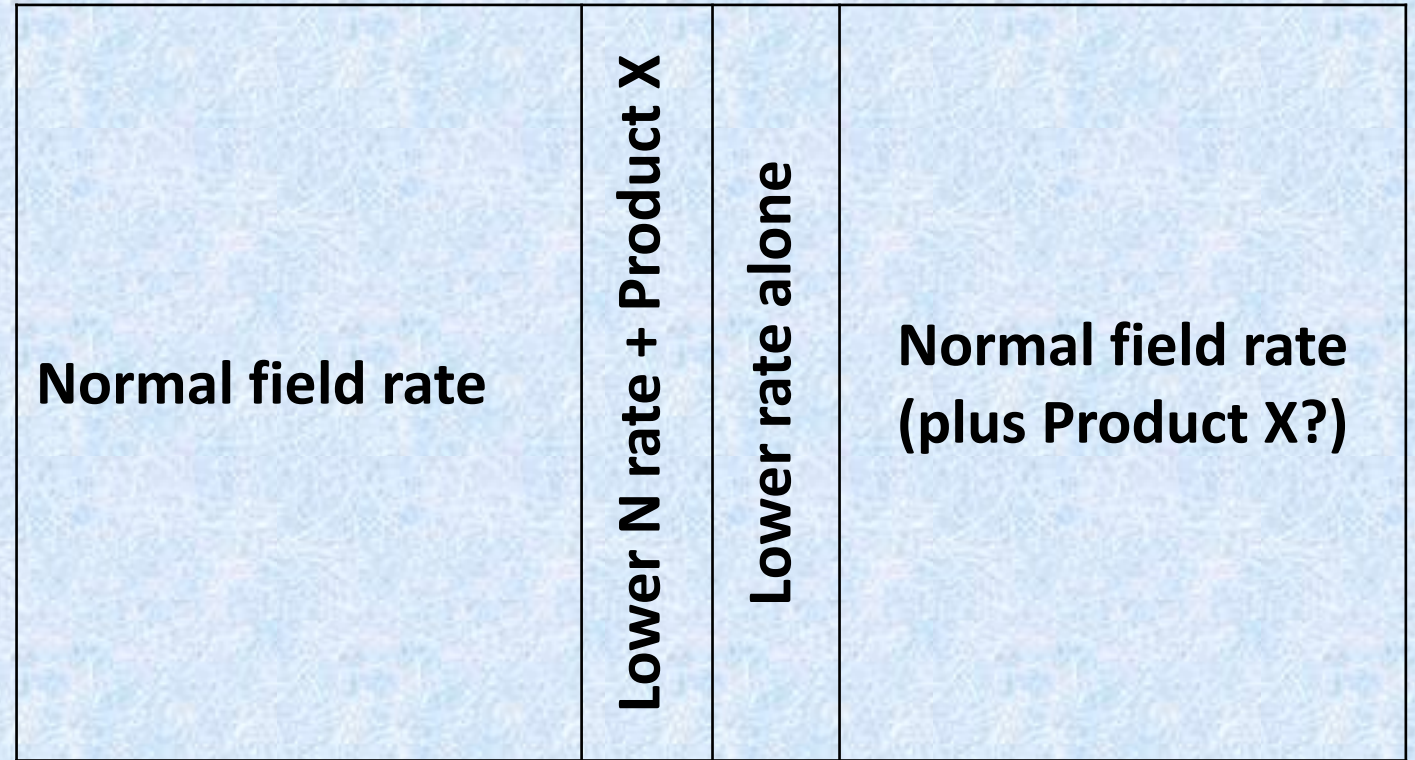
“DCD did not have any beneficial yield impacts for either wheat or corn.”

“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

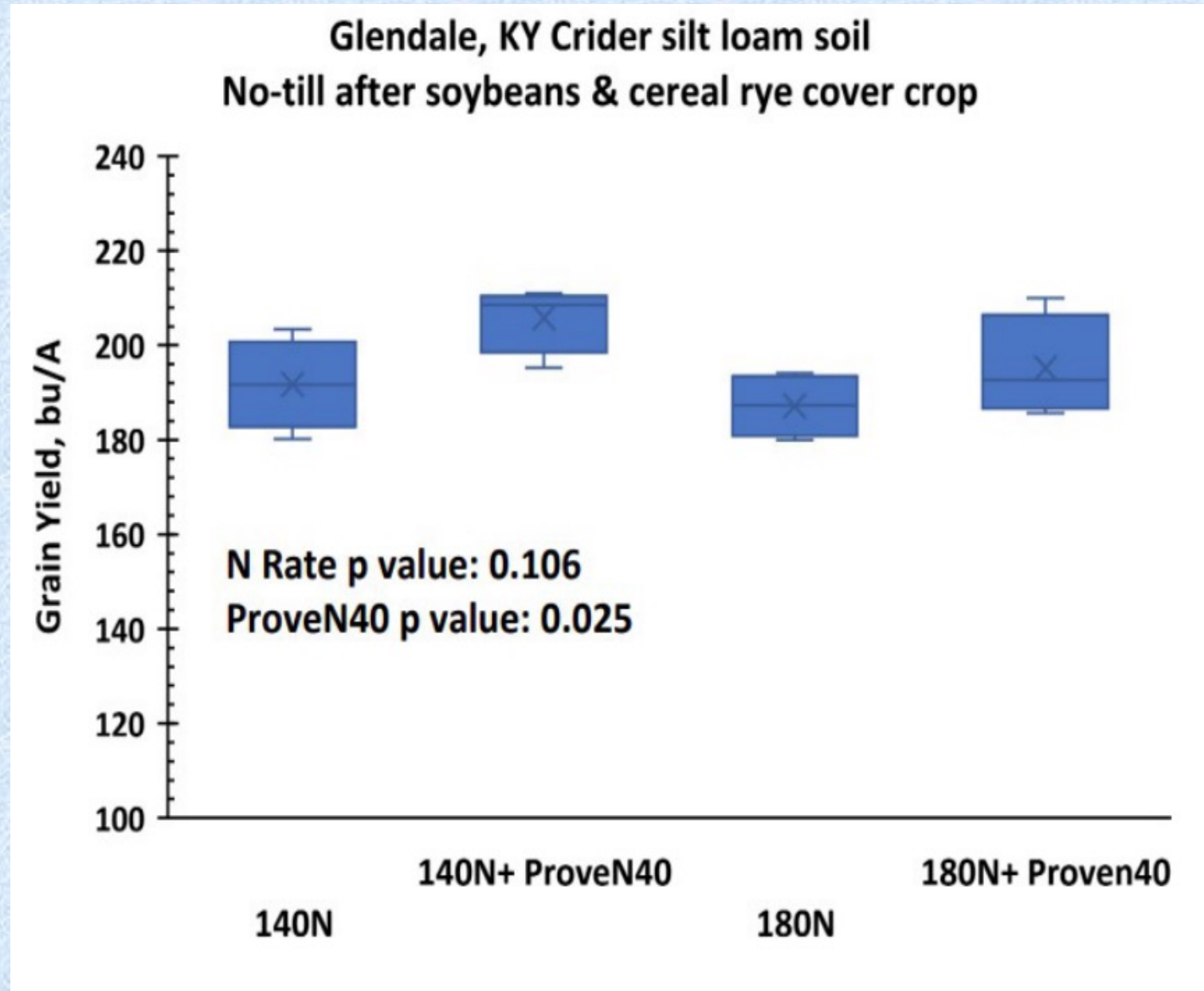
Going from 140 to 180 lb N
reduced yield by about 8 bu

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>

Nitrogen Management for Corn

*by Emerson Nafziger | Reviewed by Dr. John Sawyer,
Iowa State University and Jean Payne, Illinois Fertilizer
& Chemical Association*

THANK YOU



ILLINOIS

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