ILLINOIS
Crop Sciences
COLLEGE OF AGRICULTURAL, CONSUMER & ENVIRONMENTAL SCIENCES

2026 Spring Fertilizer Planning Webinar

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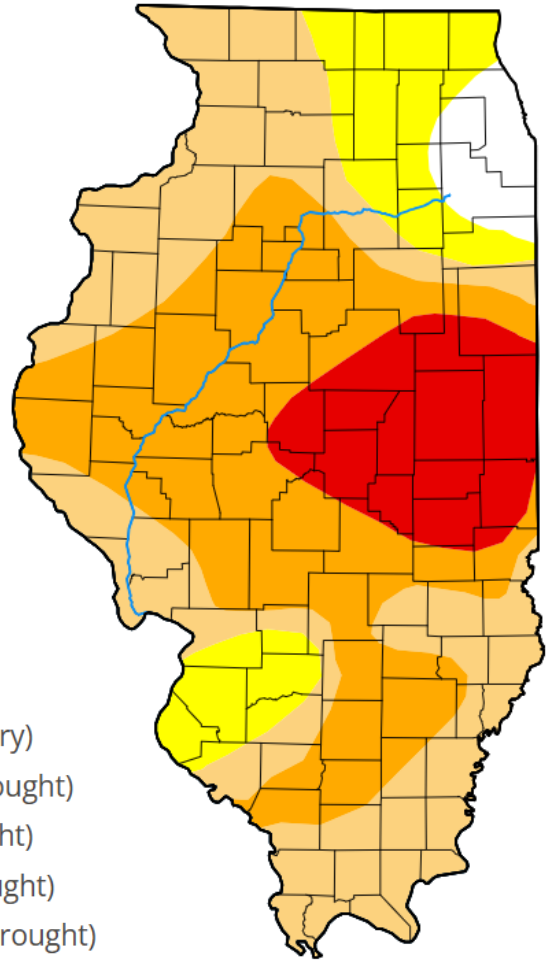
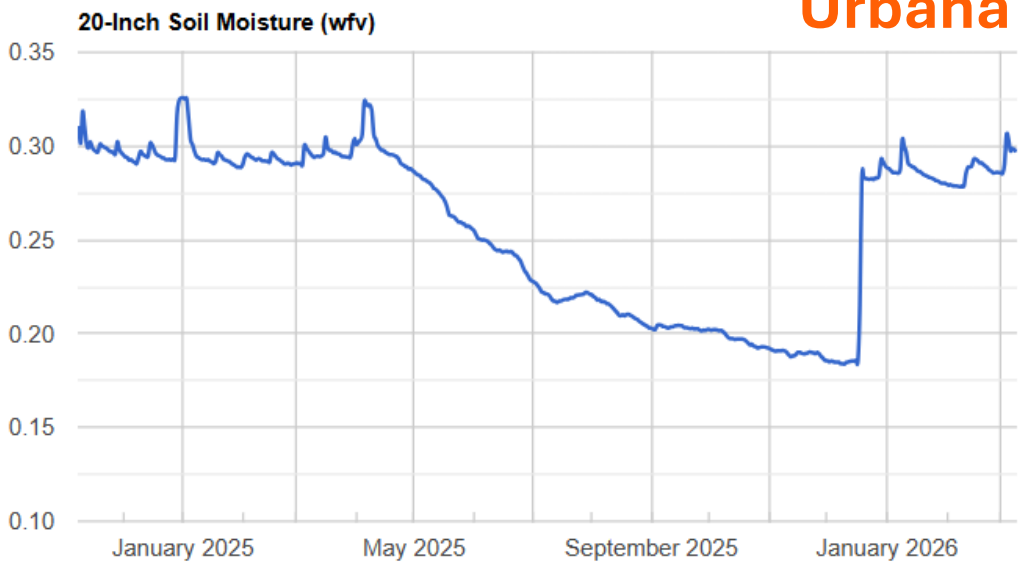
Soil Conditions Heading Into 2026

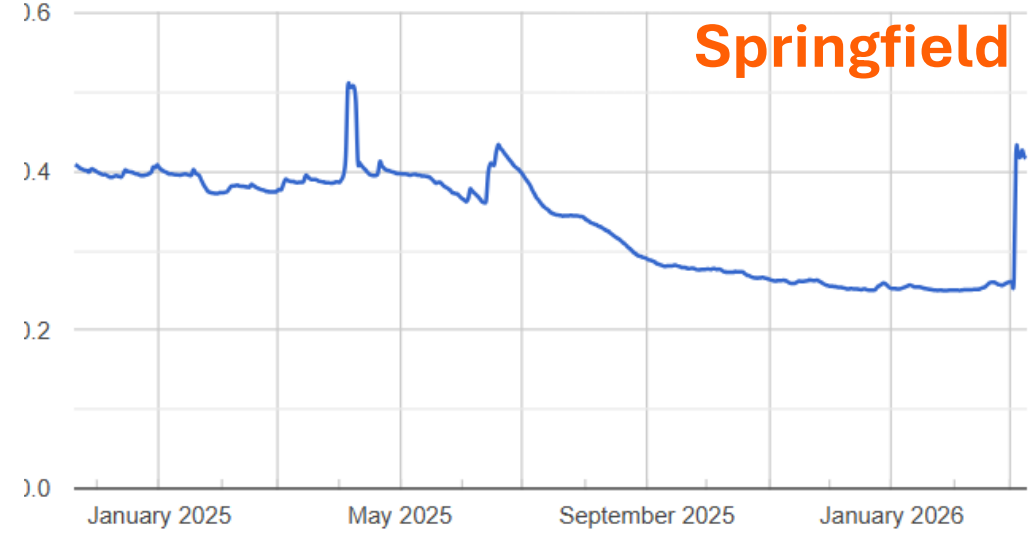
- Rainfall March 3rd to 7th more than 2-4” in many areas
- Max soil temperatures nearing 60 in central & southern IL
- Preplant application window favorable after Tuesday forecast

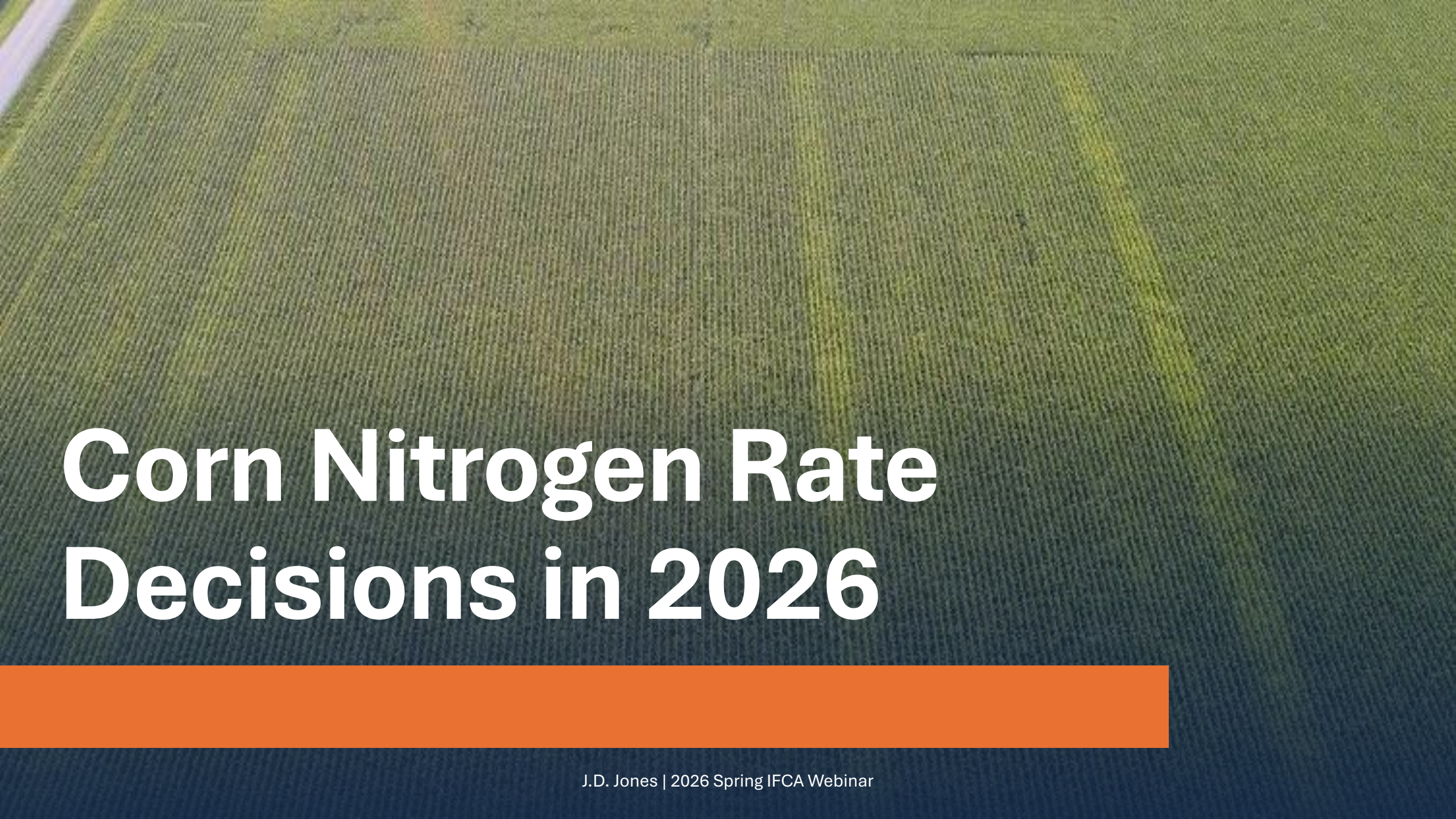


Urbana



Springfield





Corn Nitrogen Rate Decisions in 2026

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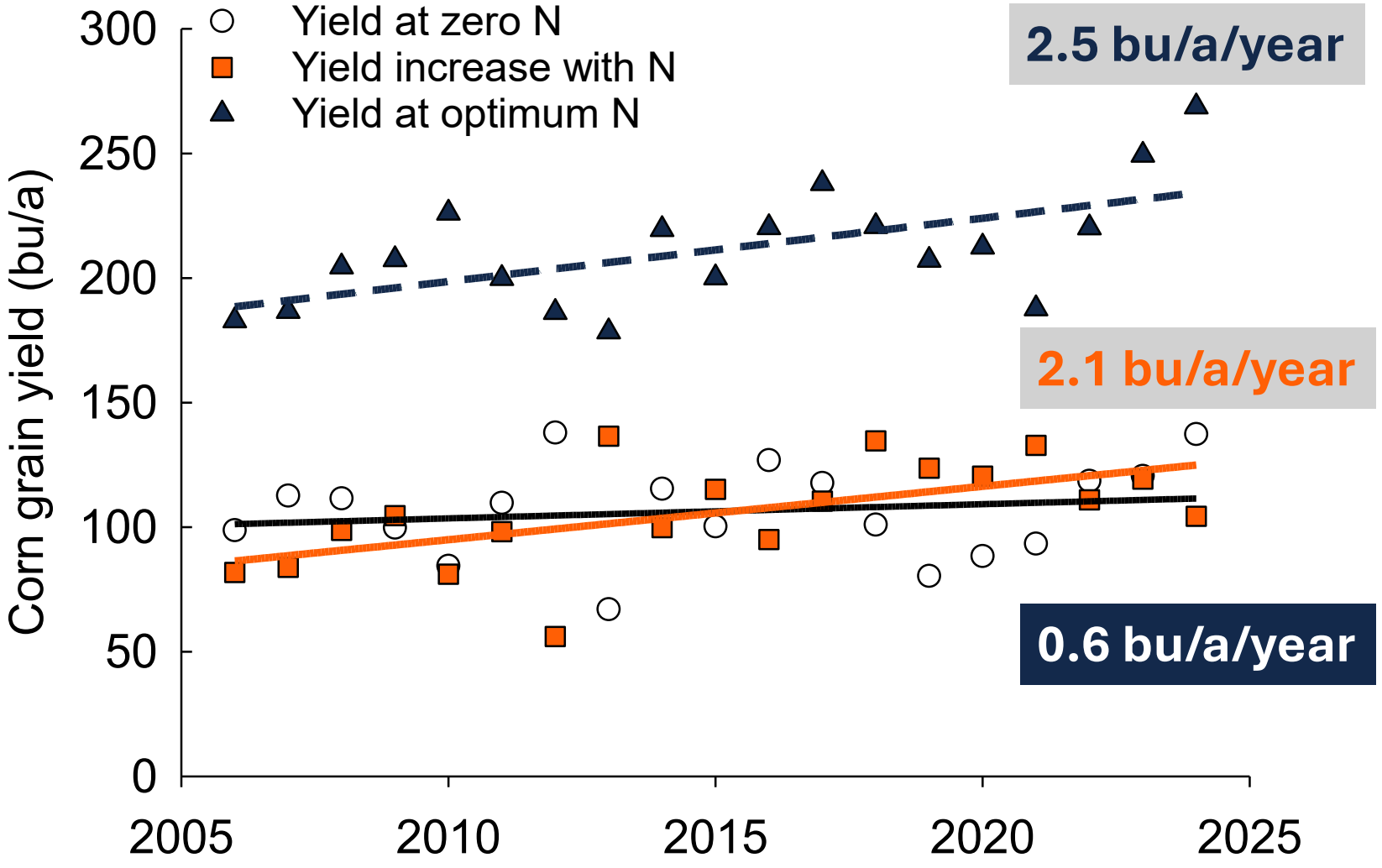
Challenges in Predicting Soil Supply and Plant Demand of Nitrogen

- Two key drivers that determine the fertilizer N demand
  - Nitrate in the soil profile
  - Transformation of organic N (mineralization) from 2 weeks before planting to silking
- Conversion of organic and ammonium (NH_4^+) N to nitrate (NO_3^-) is largely affected by soil temperature and moisture
- Nitrate mobility and losses with rainfall, and large potential for conversion to gaseous loss pathways major concerns in Illinois
- Annual variability tends to confound many efforts to predict site-specific N supply or crop demand

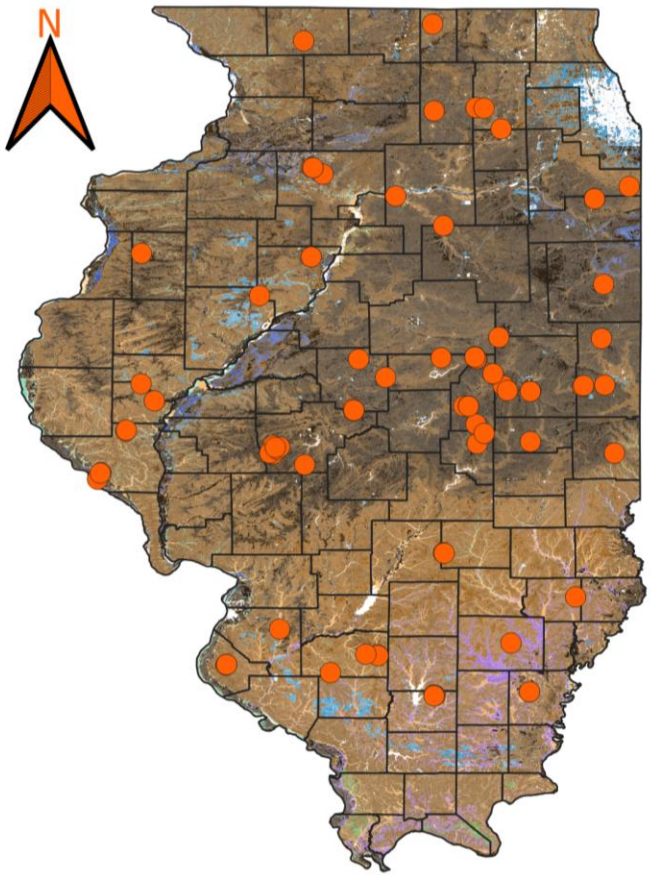
Yield Response to Applied Nitrogen Increasing

- Illinois (statewide) data showing yield with zero N, yield at the optimum N rate, and yield increase with applied N (optimum – control)
- Marked increase in yield at optimum N
- Parallel increase in yield response to N (in bushels).

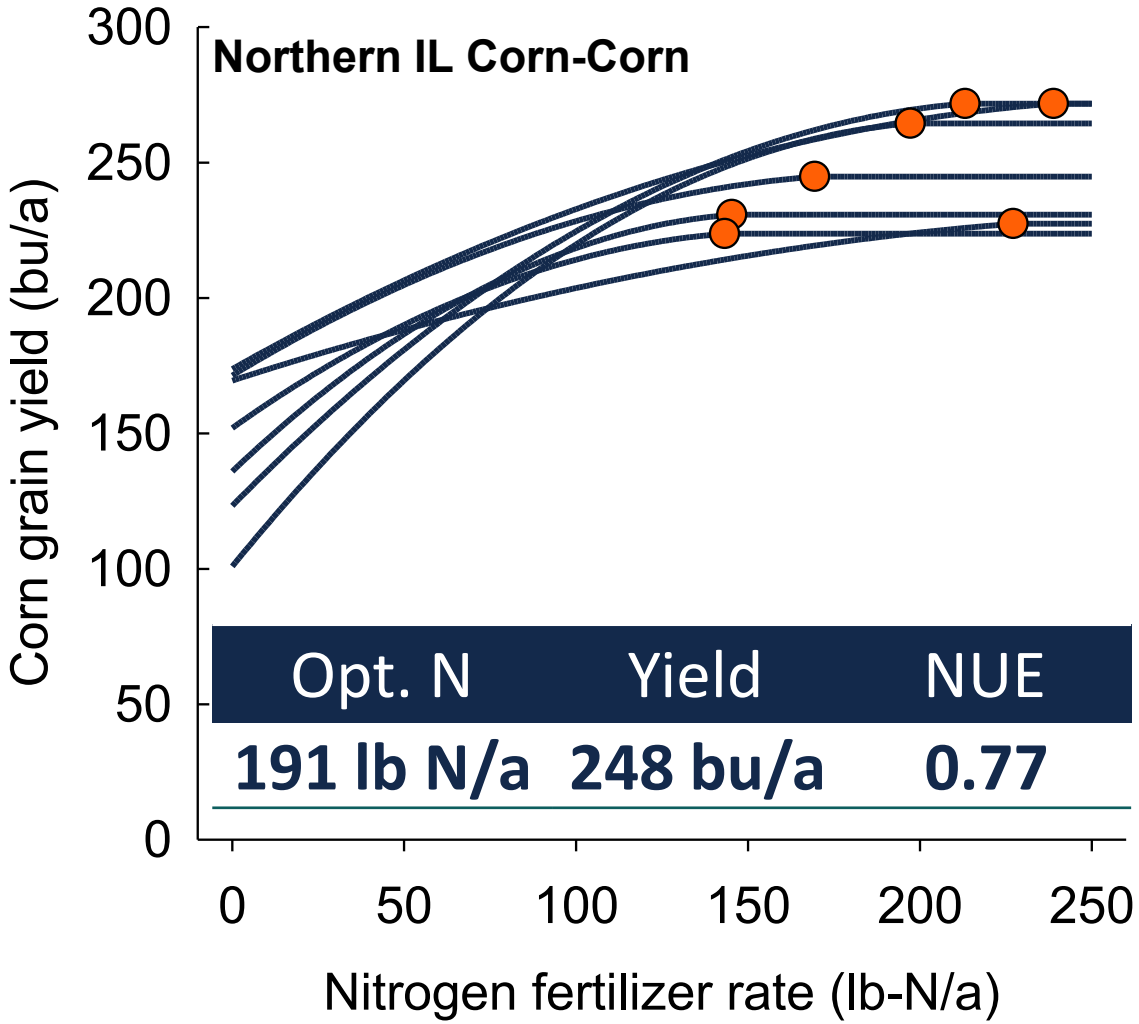


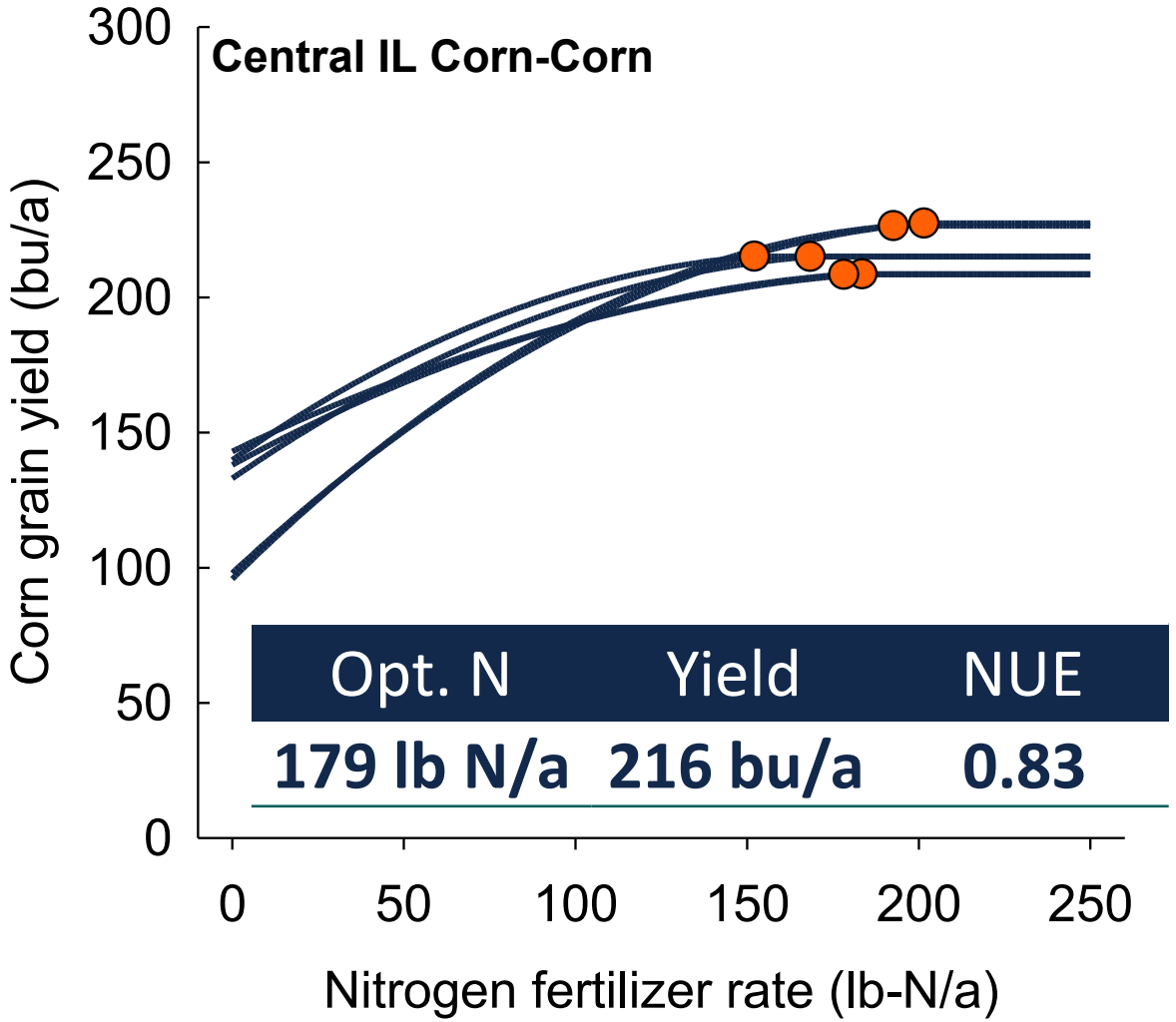
Yield and Economic Return Analyses

- Hundreds of field trials to identify maximum yield and associated N rate across cropping systems, hybrids, soils, and weather.
- Longer-term approach to aggregate data
  - Illinois uses a 10-year dataset updated annually and old data dropped
  - **73 N response curves in 2025, most with true controls and six N rates; all replicated 3-4 times.**
  - **Current guidelines supported by 760 trial locations**
- The N rate to produce a maximum yield is adjusted down for price conditions (**commonly 10-18 lb N/a and average of 1.34 bushel/a in 2025**)



2025 Corn Following Corn Trials



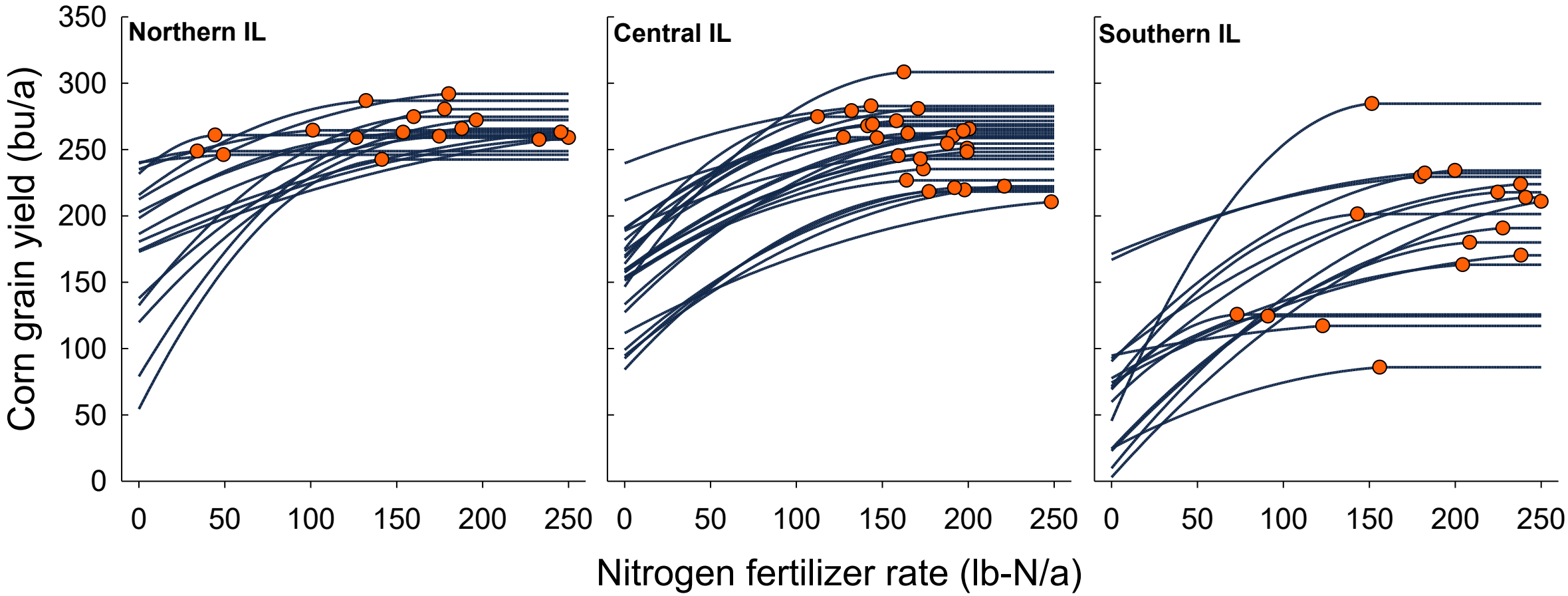


2025 Corn Following Soybean Trials

Opt. N	Yield	NUE
154 lb N/a	265 bu/a	0.58

Opt. N	Yield	NUE
173 lb N/a	239 bu/a	0.74

Opt. N	Yield	NUE
186 lb N/a	189 bu/a	1.02



MRTN Rates Observed – 2025 Trial Only

Corn at $4.50; N price as indicated; Profitable ranges: +/- 12-14 lb; 73 trials

Data will be added to the current https://www.cornnratecalc.org/ output.

		NH_3		UAN (32%)	
IL Region	Rotation	$800/t ($0.49/lb)	$350/t ($0.55/lb)	$400/t ($0.63/lb)	$450/t ($0.70/lb)
North	**Soy-Corn**	169	164	158	153
	Corn-Corn	191	186	180	175
Central	**Soy-Corn**	174	170	166	162
	Corn-Corn	179	176	171	168
South	**Soy-Corn**	207	203	196	191
	Corn-Corn	2026 corn-corn trials in southern IL (use soy-corn)			

Updated MRTN Rate Guidelines for 2026

Corn at $4.50; N price as indicated; Profitable ranges: +/- 12-14 lb; 706 trials

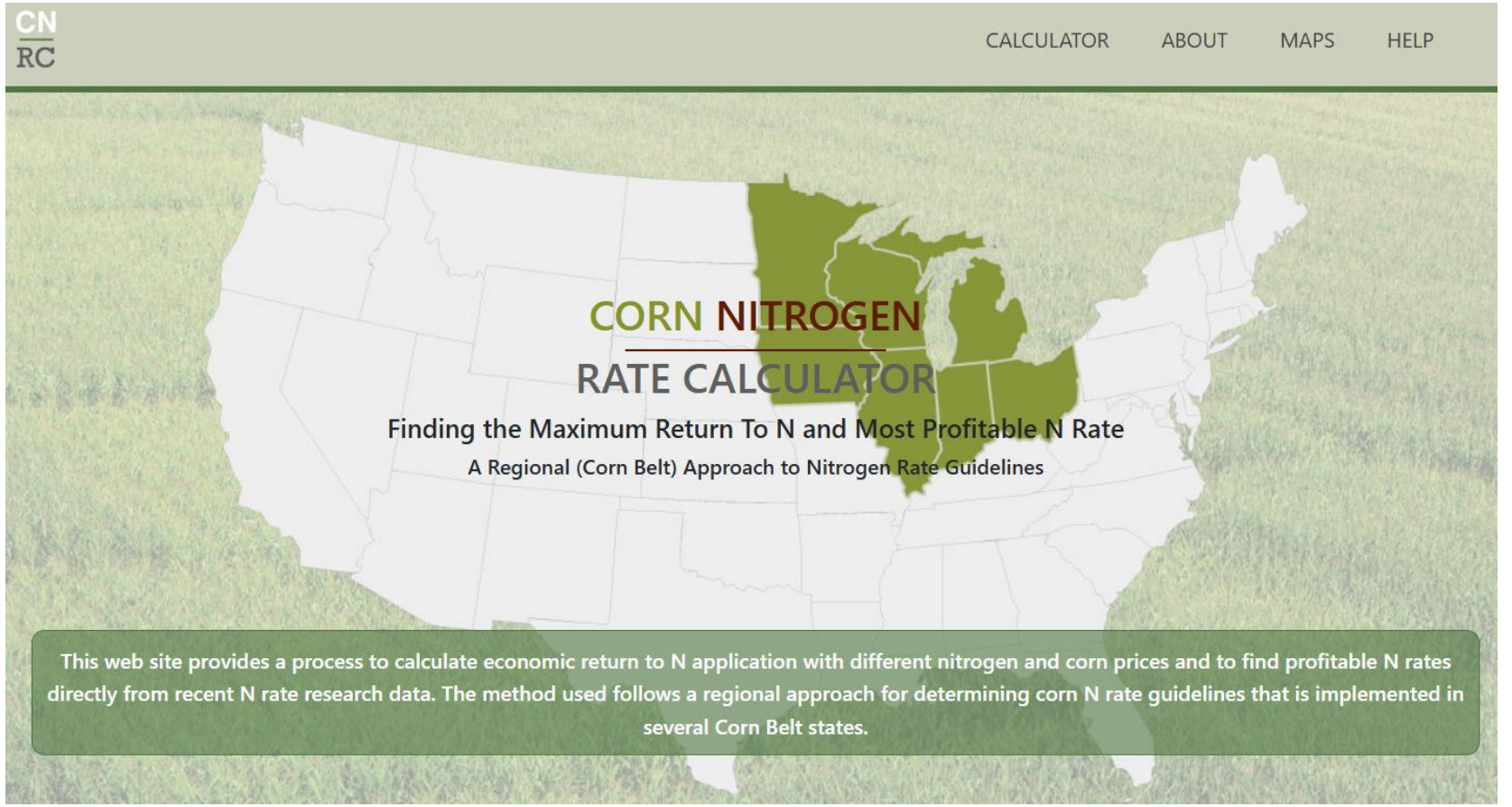
Data will be added to the current https://www.cornnratecalc.org/ output.

		NH_3		UAN (32%)	
IL Region	Rotation	$800/t ($0.49/lb)	$350/t ($0.55/lb)	$400/t ($0.63/lb)	$450/t ($0.70/lb)
North	**Soy-Corn**	184	180	174	170
	Corn-Corn	192	186	179	173
Central	**Soy-Corn**	181	176	171	166
	Corn-Corn	197	191	184	178
South	**Soy-Corn**	204	200	195	189
	Corn-Corn	2026 corn-corn trials in southern IL (use soy-corn)			

Nitrogen Rate Tools to Interpret Local Data

Most North Central states use an economic return evaluation for guidelines

https://www.cornnratecalc.org/



Regardless of approach, optimum N rates decrease with higher N to corn price ratios

State : **Illinois**
Region : **North**
Number of sites : **183**
Rotation : **Corn following soybean**

Nitrogen Price ($/lb):	$0.5	$0.6	$0.7	$0.8
Corn Price ($/bu):	$4.00	$4.00	$4.00	$4.00
Price Ratio:	0.13	0.15	0.18	0.20
MRTN Rate (lb N/acre):	181	173	166	160
Profitable N Rate Range (lb N/acre):	168 - 194	161 - 185	154 - 177	149 - 170
Net Return to N at MRTN Rate ($/acre):	$372.53	$354.82	$337.88	$321.60
Percent of Maximum Yield at MRTN Rate:	98%	98%	97%	97%
UAN (32% N) at MRTN Rate (lb product/acre):	566	541	519	500
UAN (32% N) Cost at MRTN Rate ($/acre):	$90.50	$103.80	$116.20	$128.00

Tillage Effects on Optimum N Rates?

Long-term studies initiated fall 2024 in 3 locations across Illinois
2025 crop year data (average of 3 sites)

	Conv. Till		Strip Till		No-till	
Previous Crop	Opt. N lb-N/a	Yield bu/a	Opt. N lb-N/a	Yield bu/a	Opt. N lb-N/a	Yield bu/a
Corn	**160**	**236**	**157**	**245**	**250**	**222**
Soybean	**152**	**261**	**141**	**264**	**177**	**267**

Jones (2025)

Nitrogen Management into 2026

- Use observed yield responses to N rate, not yield goals, to decide N rates
- Account for all applied N (fall N with P, weed and feed N, etc.)
- The maximum return to N concept provides the most likely range of economic optimum N rates
  - **Use the Corn N Rate Calculator (https://www.cornnratecalc.org/)**
  - **The economic optimum N rate is commonly less than 1 bushel less than the maximum yield for a given site-year**
- Hundreds of N timing trials suggest ensuring at least 50% of the needed N is either preplant or within 2 weeks of planting, and N delayed past V8-10 is not usually “adding bushels”
- Adjusting sidedress N rates is the most logical step to consider soil and crop conditions

Wheat Nitrogen Considerations

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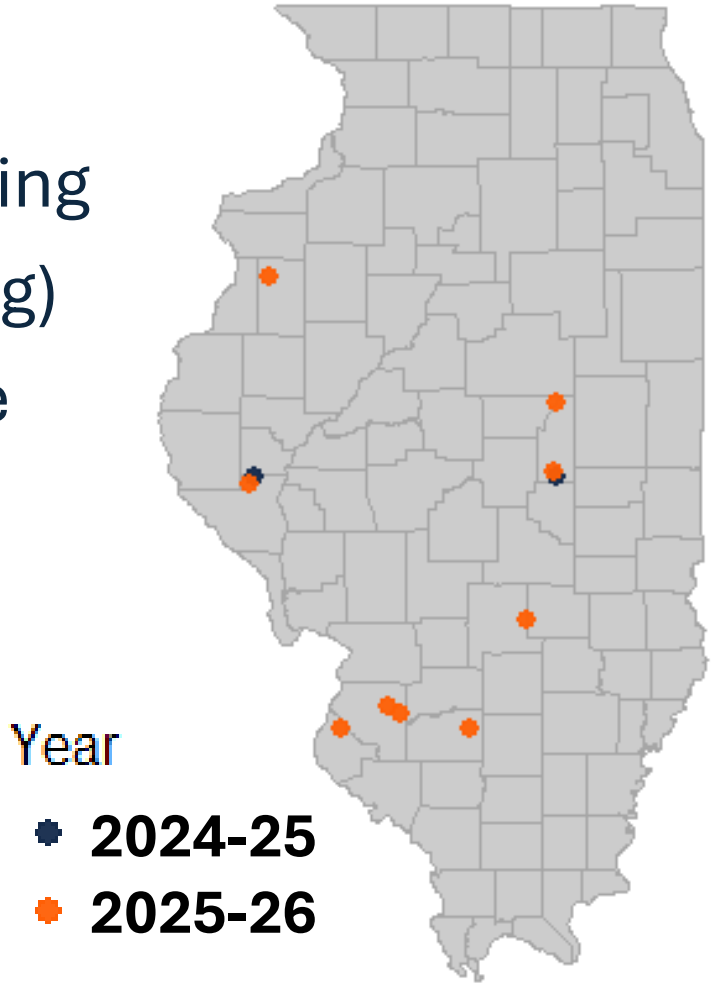
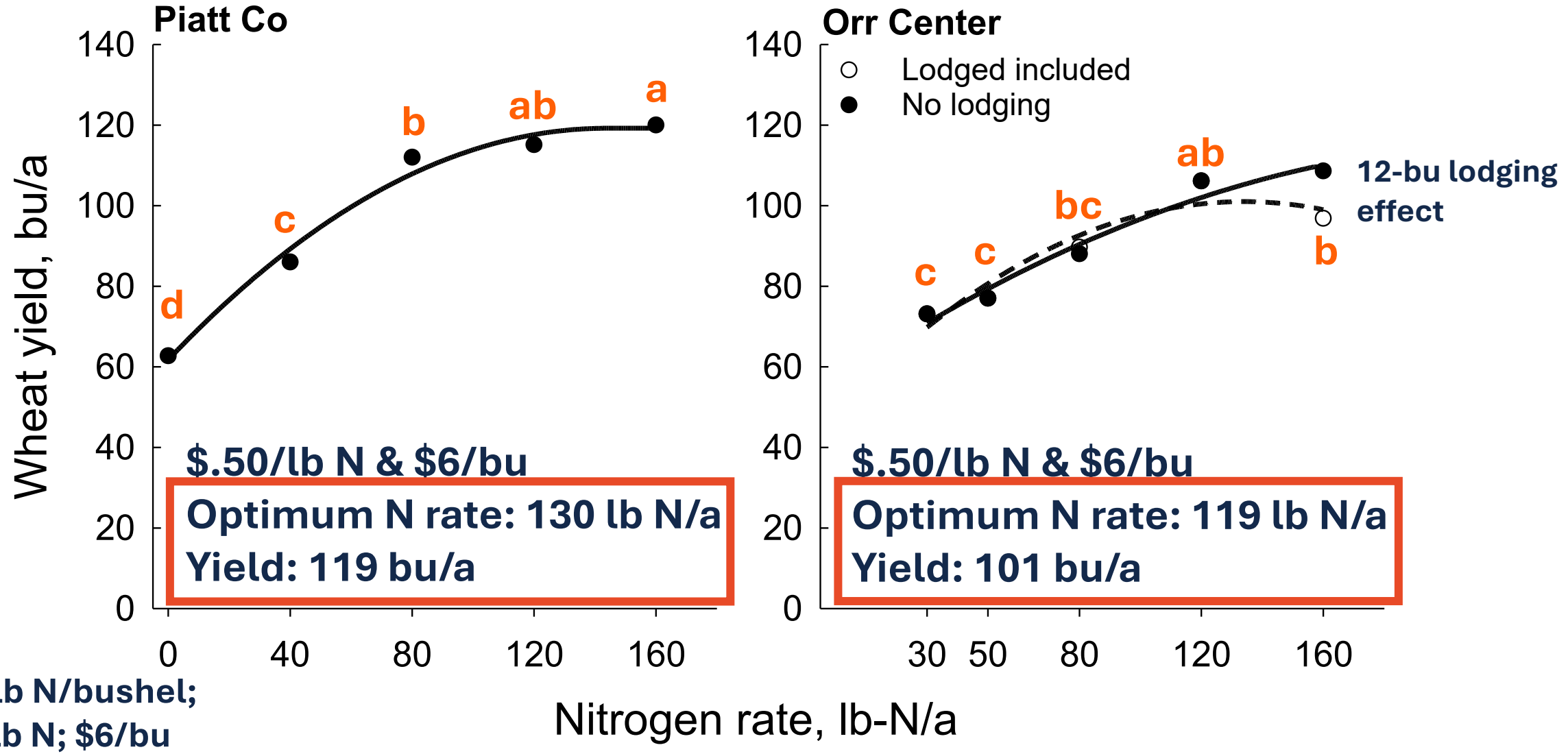
2025-26 Wheat-Double Crop Soybean Trials

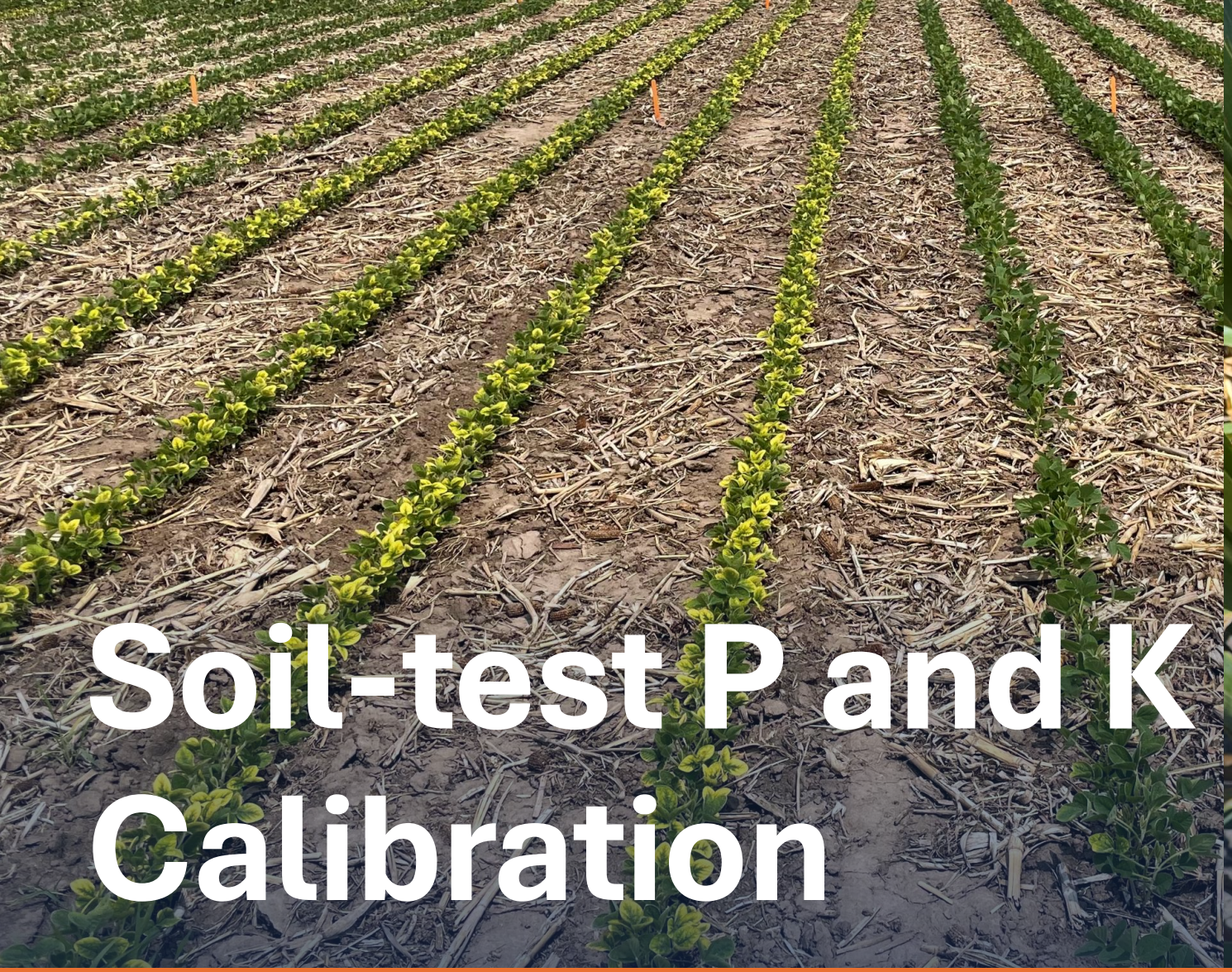
- Nine sites in 25-26; 14 per year moving forward
- Identify optimum N & S rates, P response, and N timing
- Evaluate diagnostic tools (soil, plant, canopy sensing)
- Track soil N and P throughout full double crop phase
- Develop Wheat N rate calculator for regional IL guidelines



Central Illinois wheat N response (2024-25)



$12 lb N/bushel;
$.5/lb N; $6/bu



Soil-test P and K Calibration

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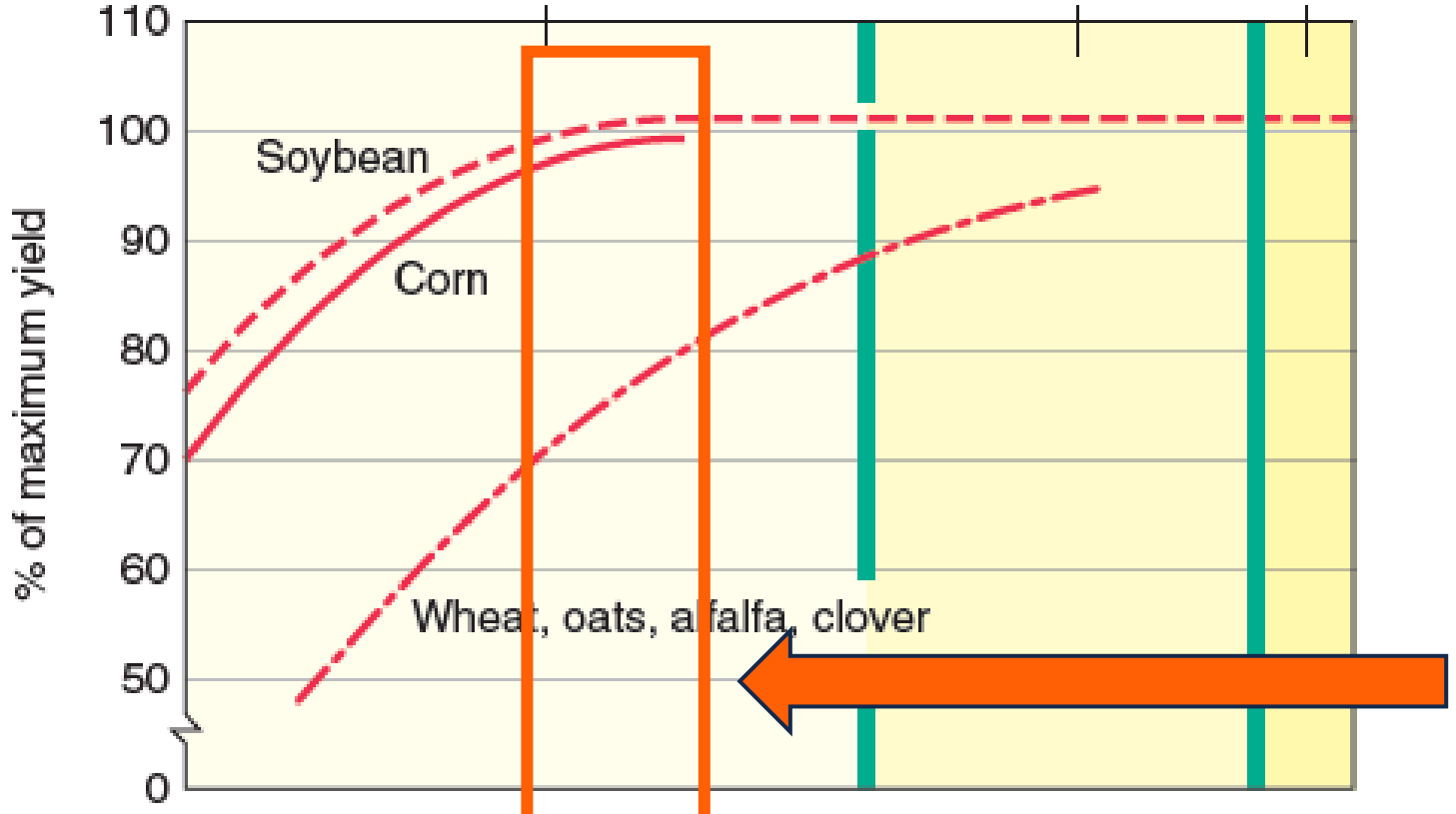
Updated Illinois Soil-test Guideline Components

Same components used for tissue calibration

1. Correlation of soil-test level and yield response to identify critical soil-test concentrations for prevalent soil test methods and sampling tactics.
2. Calibration of yield response to rate (tillage, placement, timing, and source) by soil-test level.
3. Build-up and drawdown coefficients (9 lb P_2O_5/ 1 lb STP; 4 lb K_2O/1 lb STK)
4. Regional interpretation (Subsoil, CEC, drainage class, etc.)
5. Adaptive guidelines to account for economic ROI, fine-scale removal estimates, and inherent soil properties)

Important Terminology & Clarification



P test (lb/A) for different subsoil phosphorus-supplying power regions

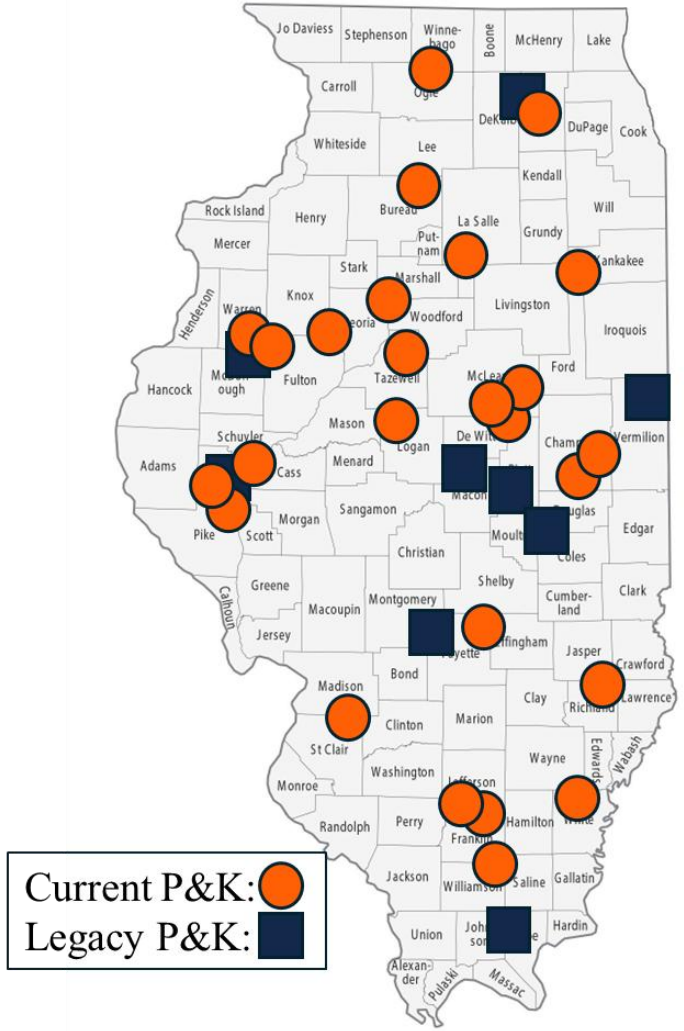
High	7	15	20	40	60
Medium	10	20	30	45	65
Low	20	30	38	50	70

The boundaries of the maintenance range should not be interpreted at the critical levels. Bray's data does not support that.

Critical Level based on Agronomy Handbook underlying data. Compare these to the new results.

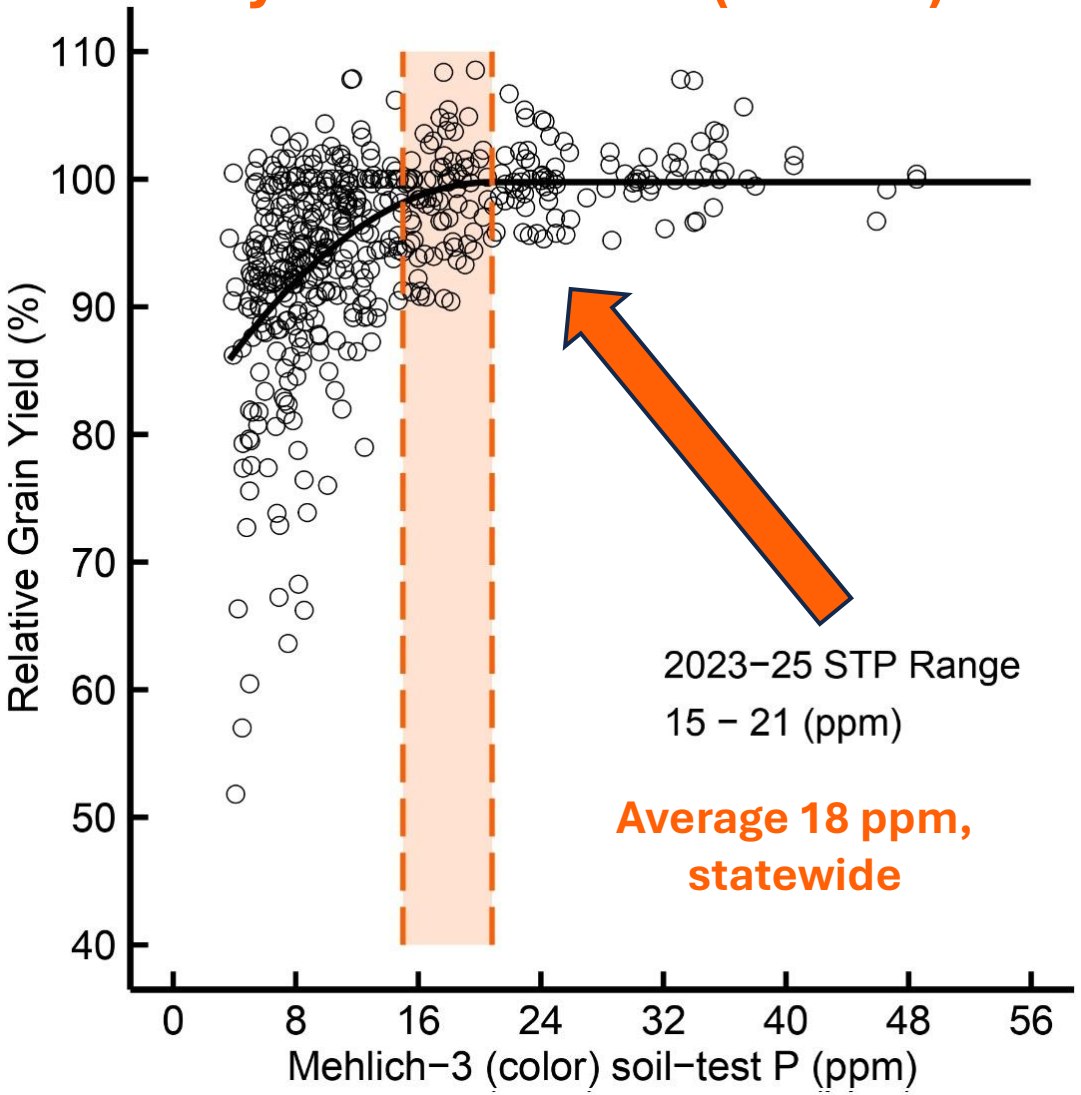
Recent research to update Illinois Agronomy Handbook P & K calibration

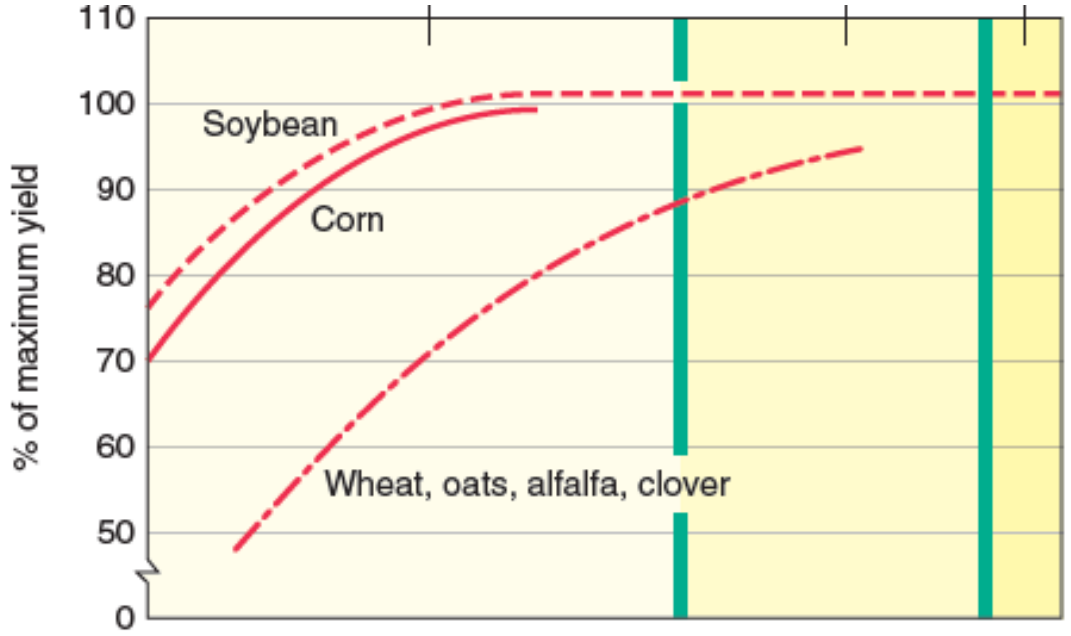
- New project funded by Illinois NREC to provide updated soil-test P & K interpretations
  - Both corn and soybean
  - Conventional, strip till, no-till
  - 4Rs (source, rate, timing, and placement; 4 sites)
  - 24+ sites in IL each year to calibrate new guidelines
- Collaboration between our lab, Precision Planting, and Cropsmith, LLC.
- MS Students Franco Bardeggia & Jenna Goeken
- Large P & K calibration effort for an individual state.



Identifying Phosphorus Critical Levels

Corn and soybean combined (n = 484)





P test (lb/A) for different subsoil phosphorus-supplying power regions

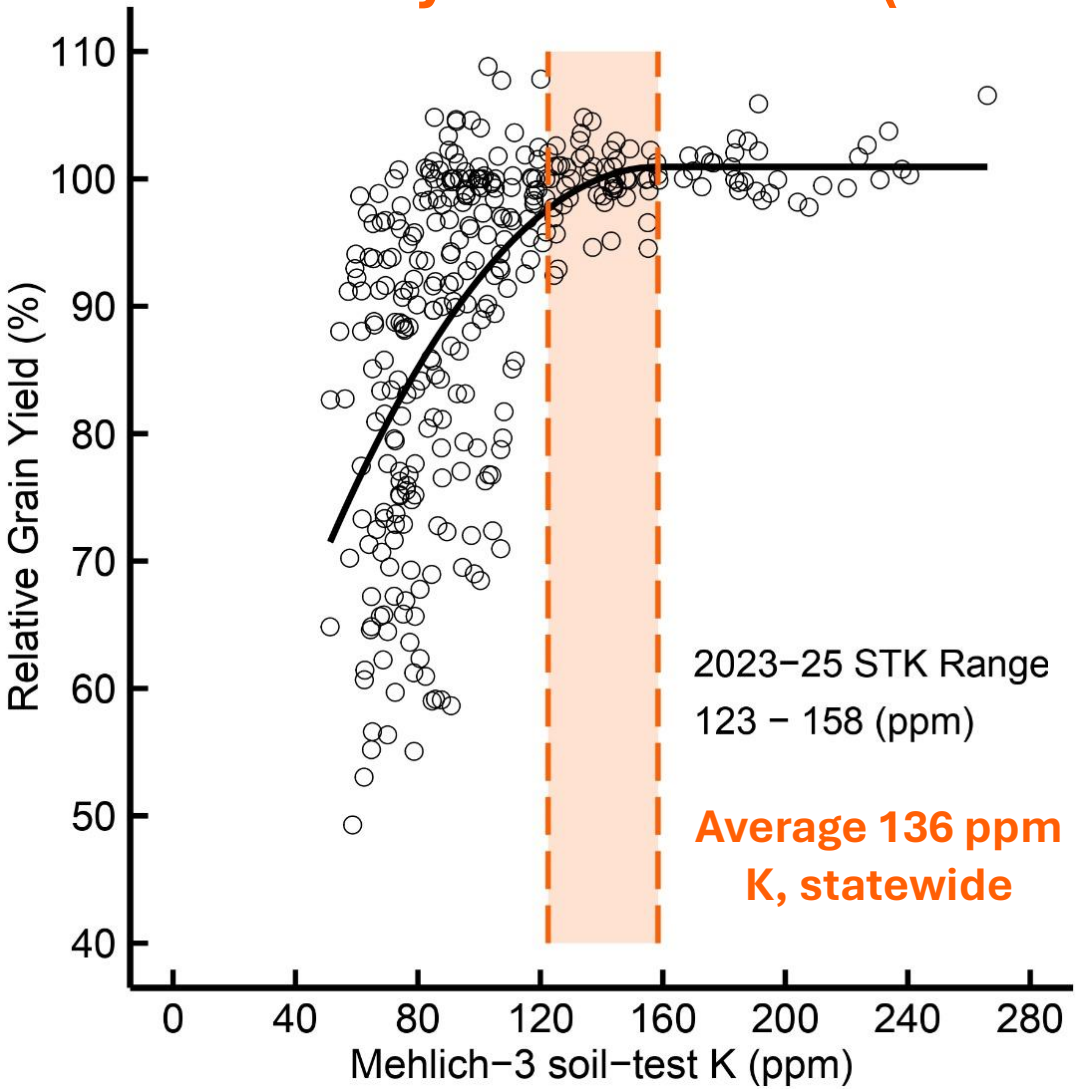
High	7	15	20	40	60
Medium	10	20	30	45	65
Low	20	30	38	50	70

Current IAH critical levels, depending on soil group, would be 20, 30, and 38 lb P/a (10, 15, or 17 ppm P).

Bardeggia, Joern, Smith & Jones (2025)

Identifying Potassium Critical Levels

Corn and soybean combined (n = 343)



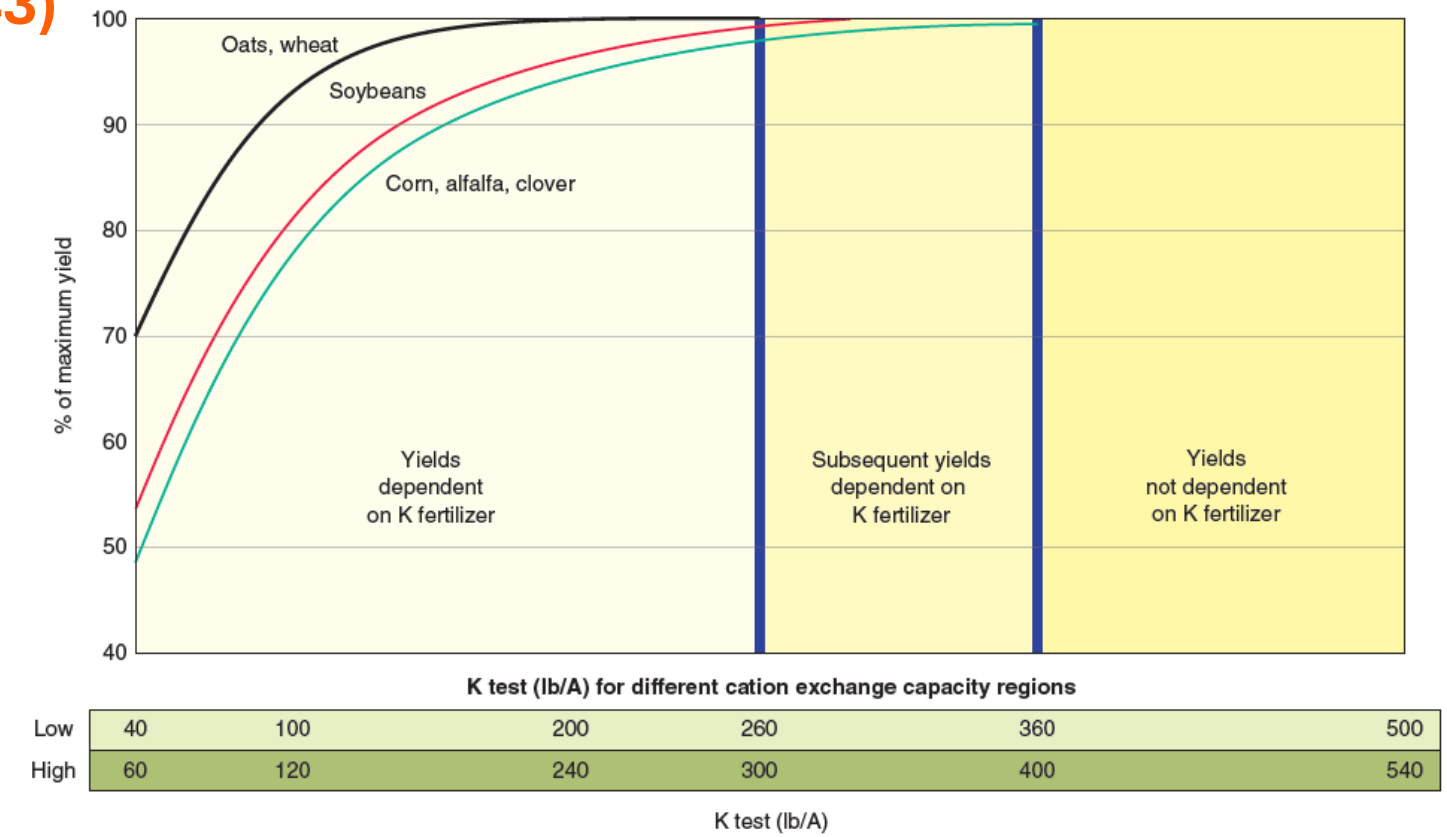
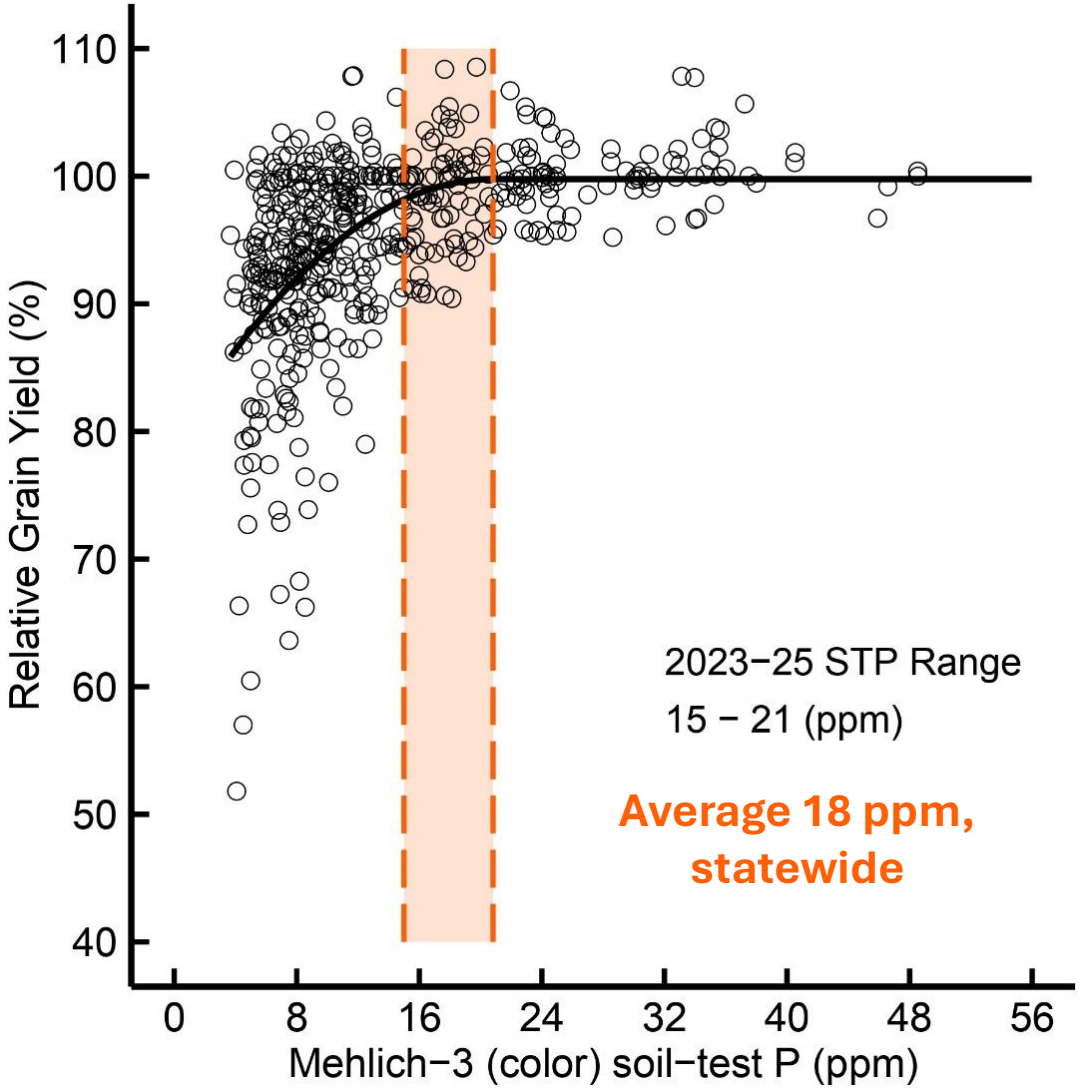


Figure 8.8. Relationship between expected yield and soil K, measured by the ammonium acetate or Mehlich-3 extractable K tests.

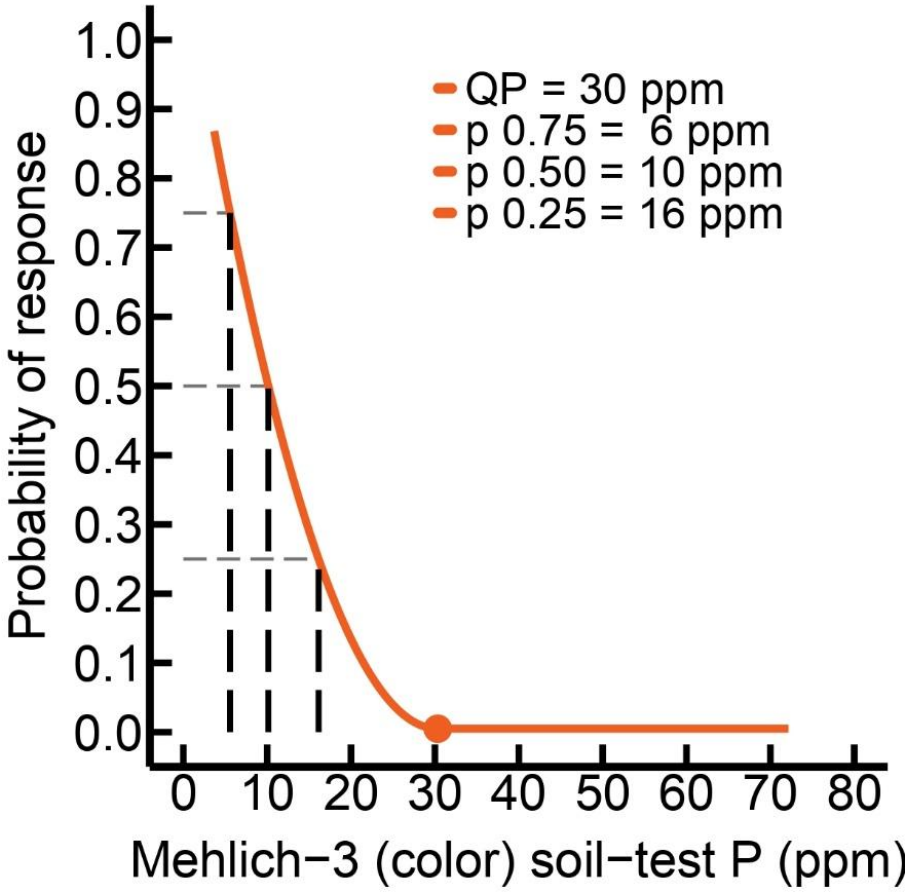
Current IAH critical levels, depending on soil group, would be 260 to 300 lb K/a (130 to 150 ppm K).

Bardeggia, Joern, Smith & Jones (2025)

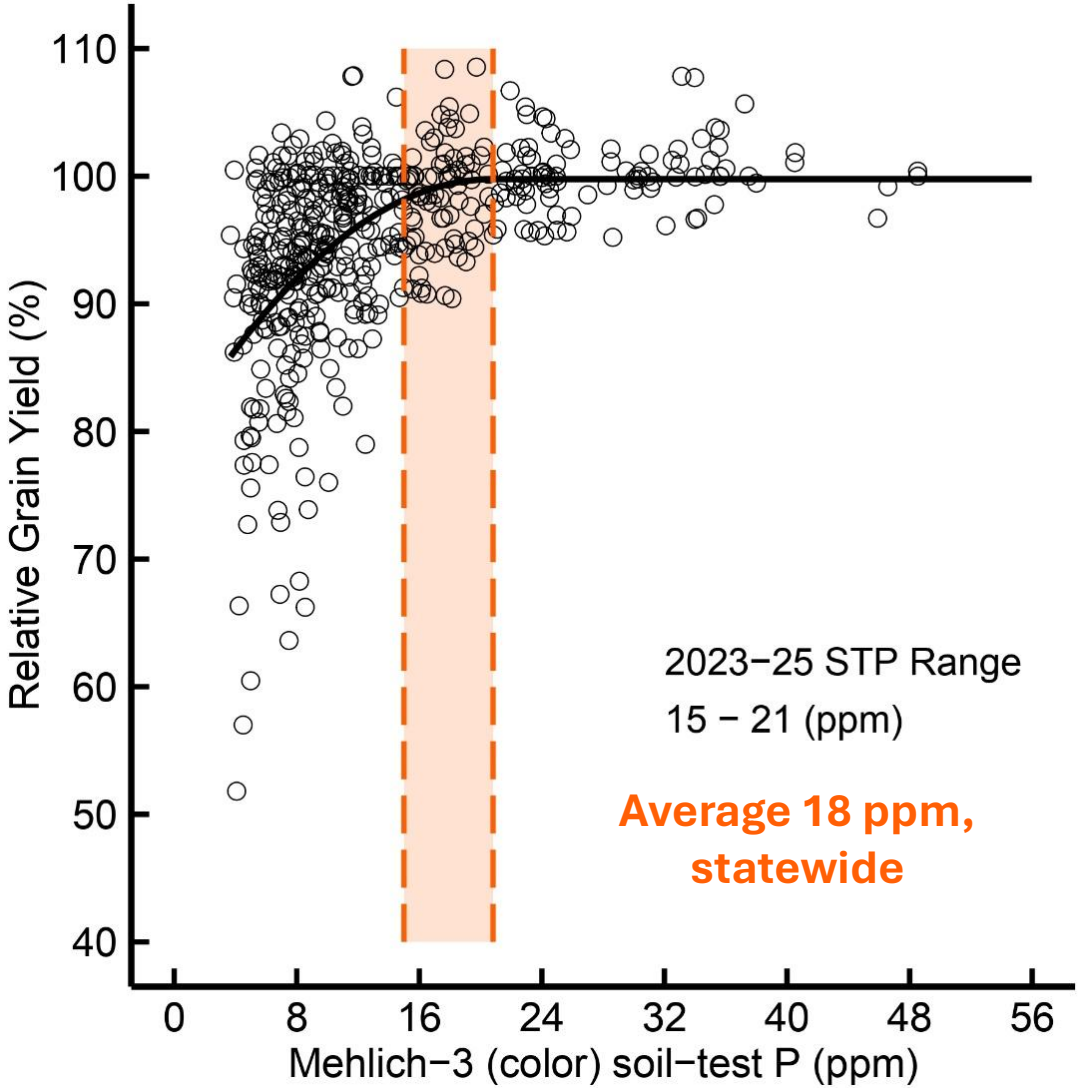
Probabilities of Response to P Fertilizer?



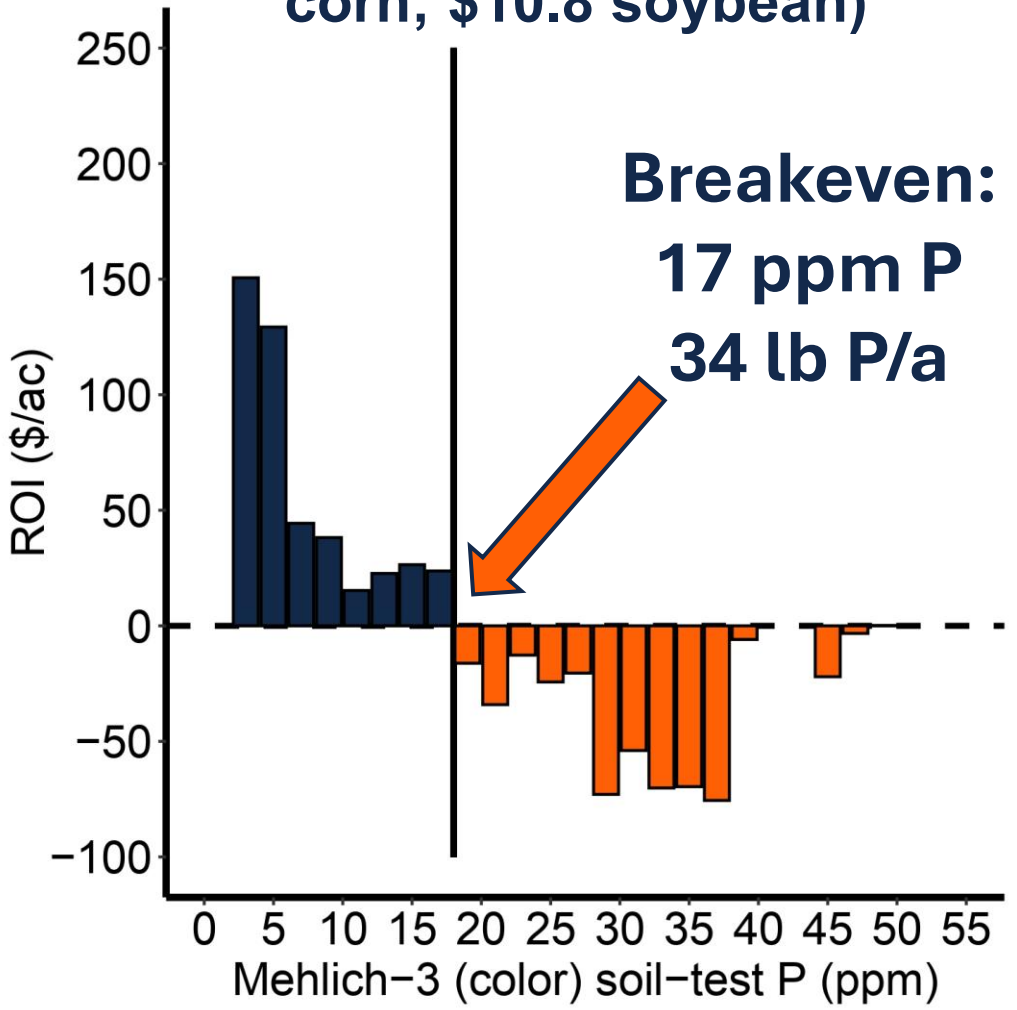
Probability of Crop Response 2023-25 Field Data



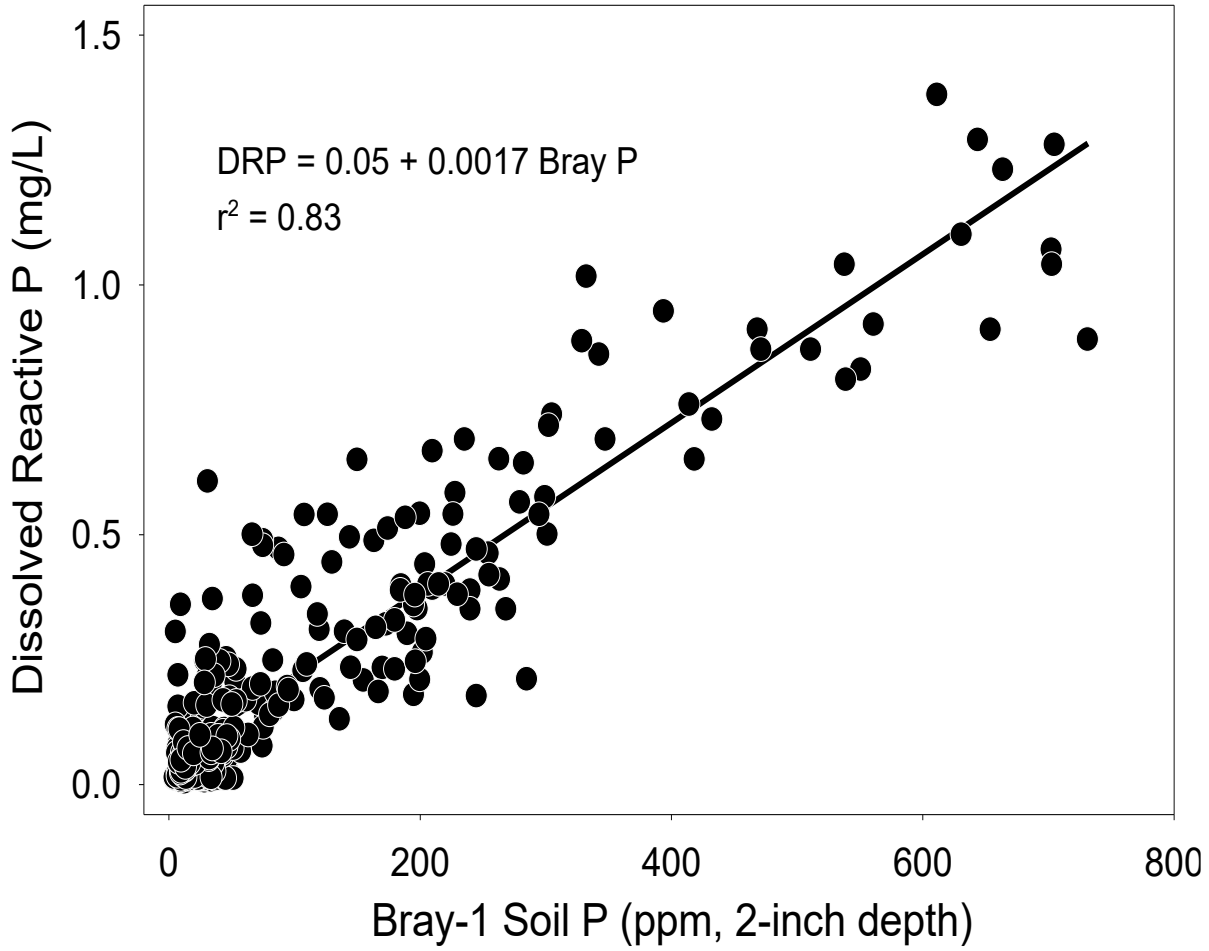
Economic Response to Phosphorus in 2026



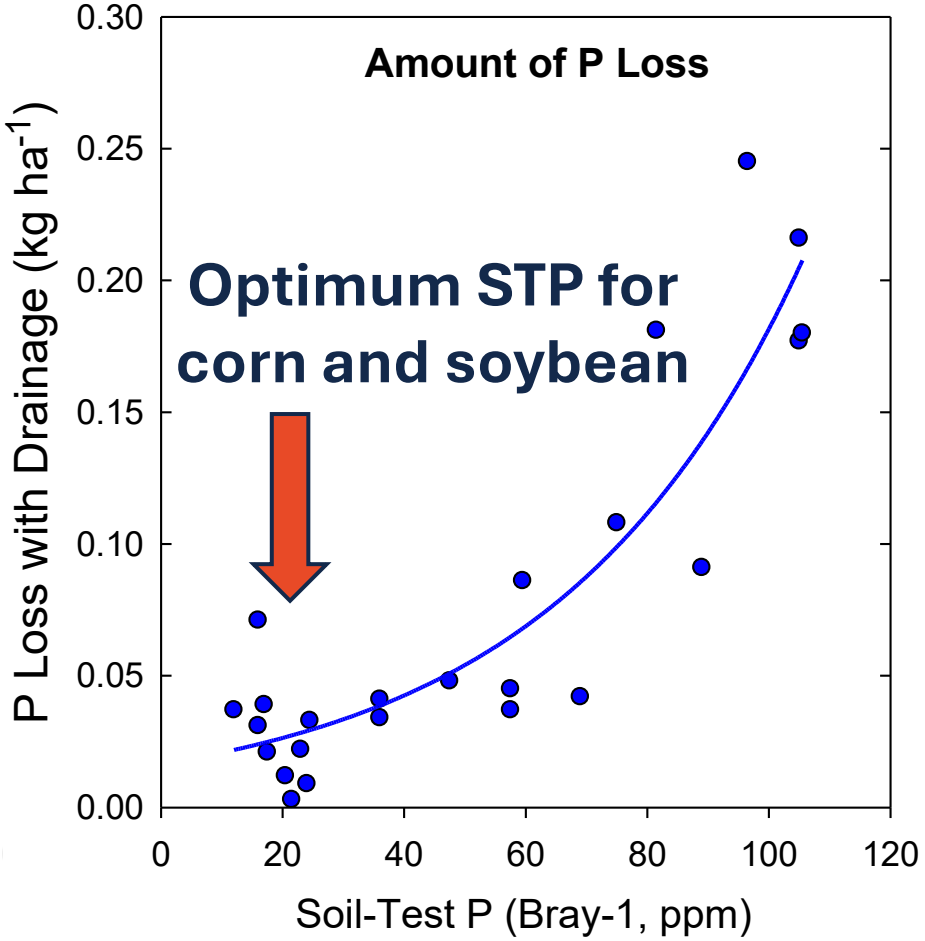
ROI to P Fertilizer ($.75/lb P_2O_5; $4.5 corn; $10.8 soybean)



Agronomic Management of STP Minimizes Surface and Subsurface P Loss



Jones and Mallarino (2021)

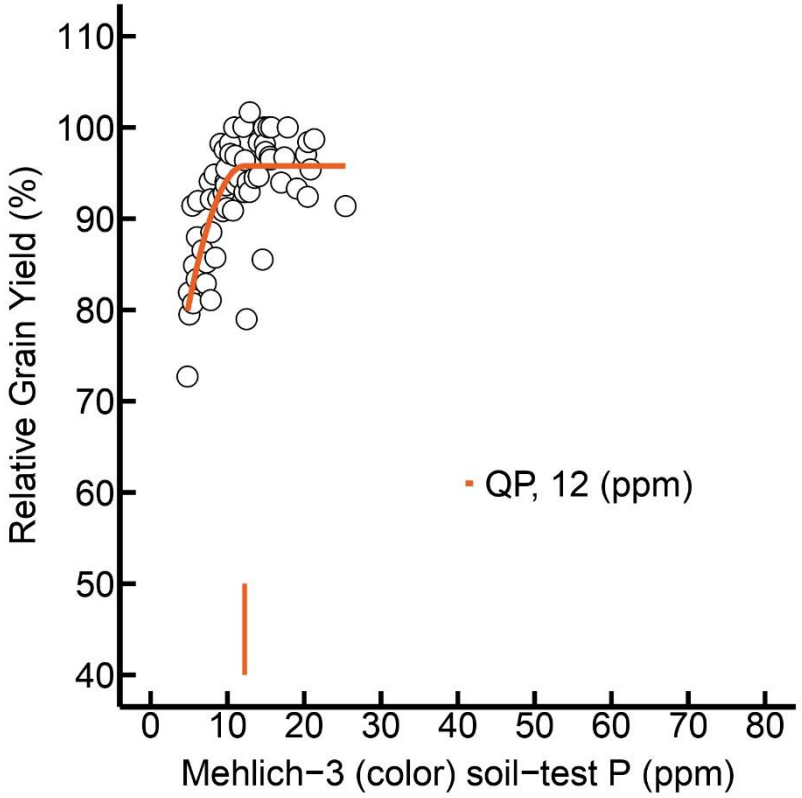


Haq, Mallarino, et al., personal communication

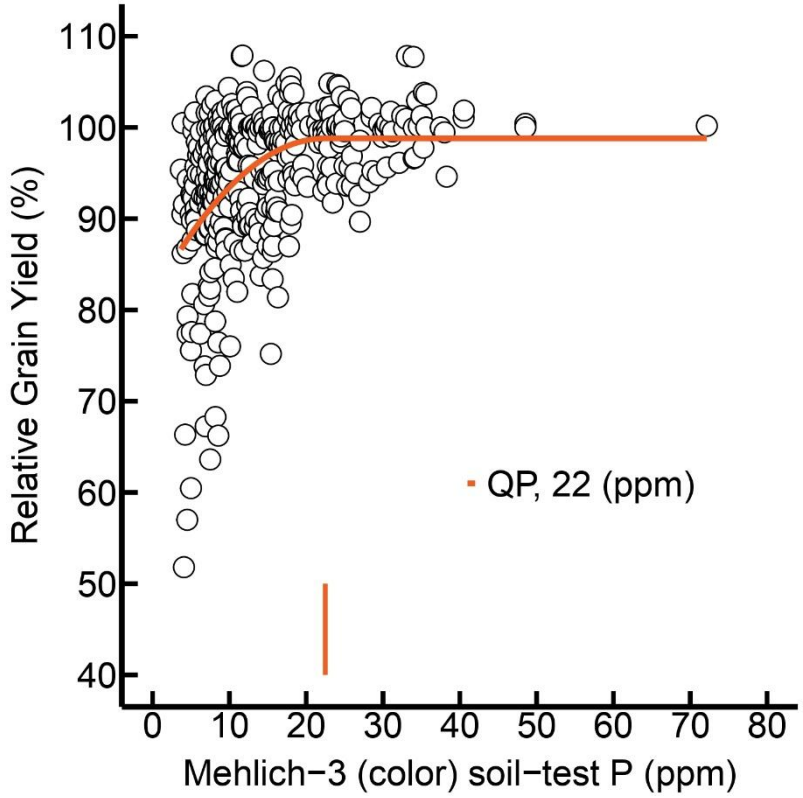
Preliminary STP Interpretation by Region

Matching current Agronomy Handbook subsoil regions (being updated by Dr. Margenot); more high testing sites added to High region in 2026.

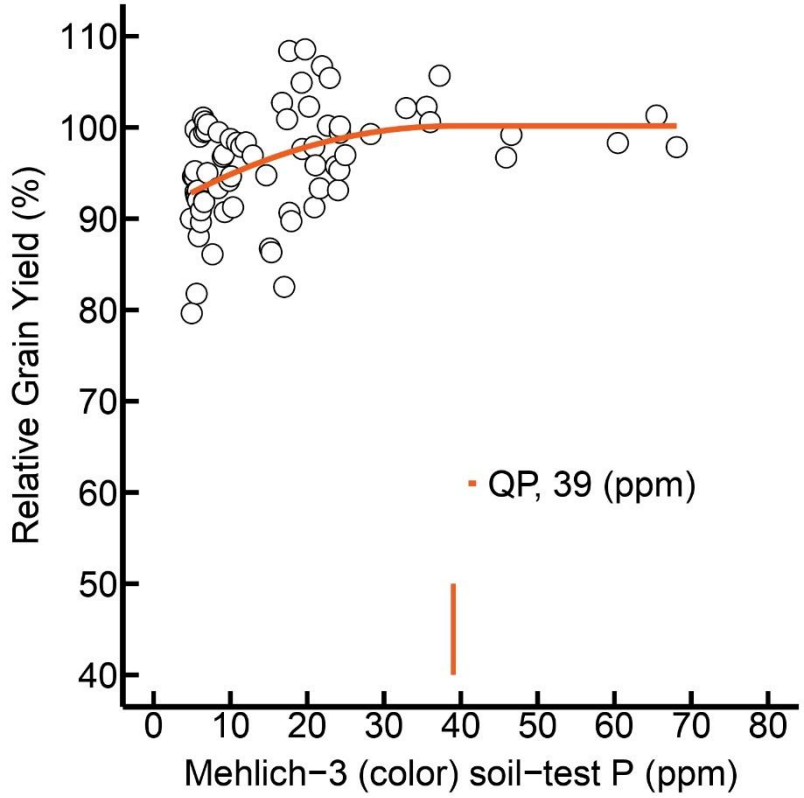
High subsoil P



Medium subsoil P



Low subsoil P

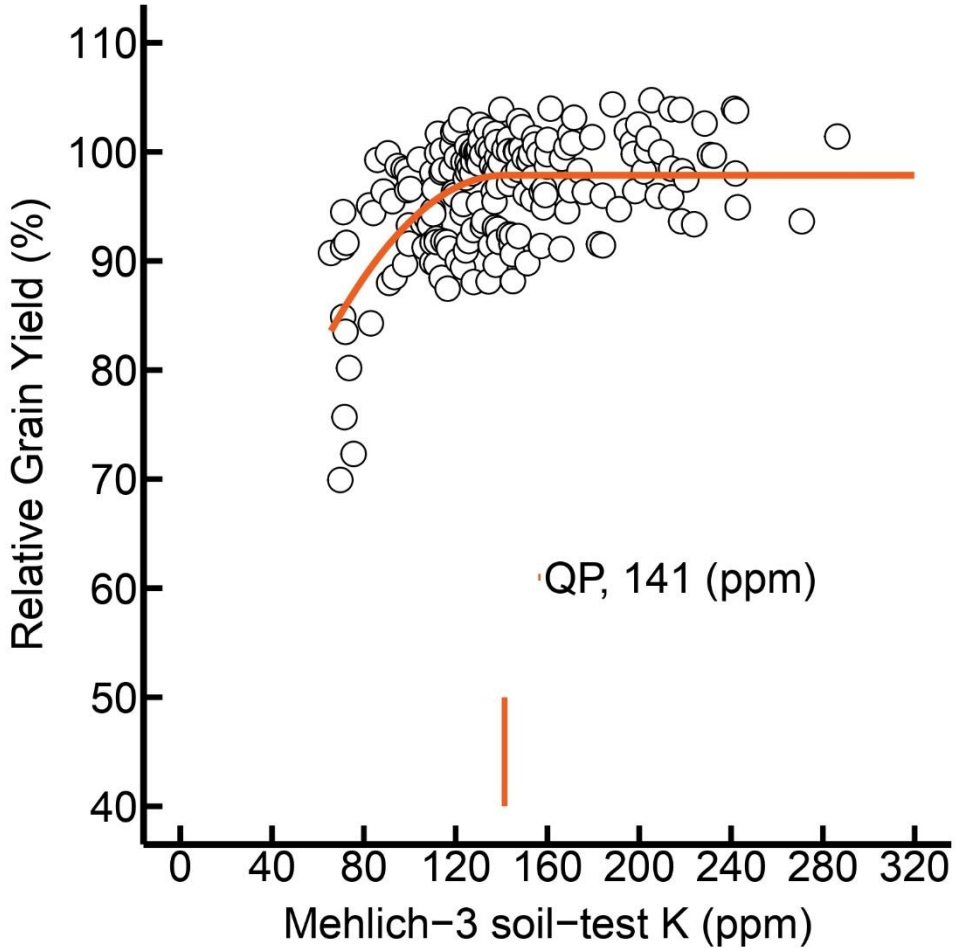


Bardeggia, Joern, Smith & Jones (2025)

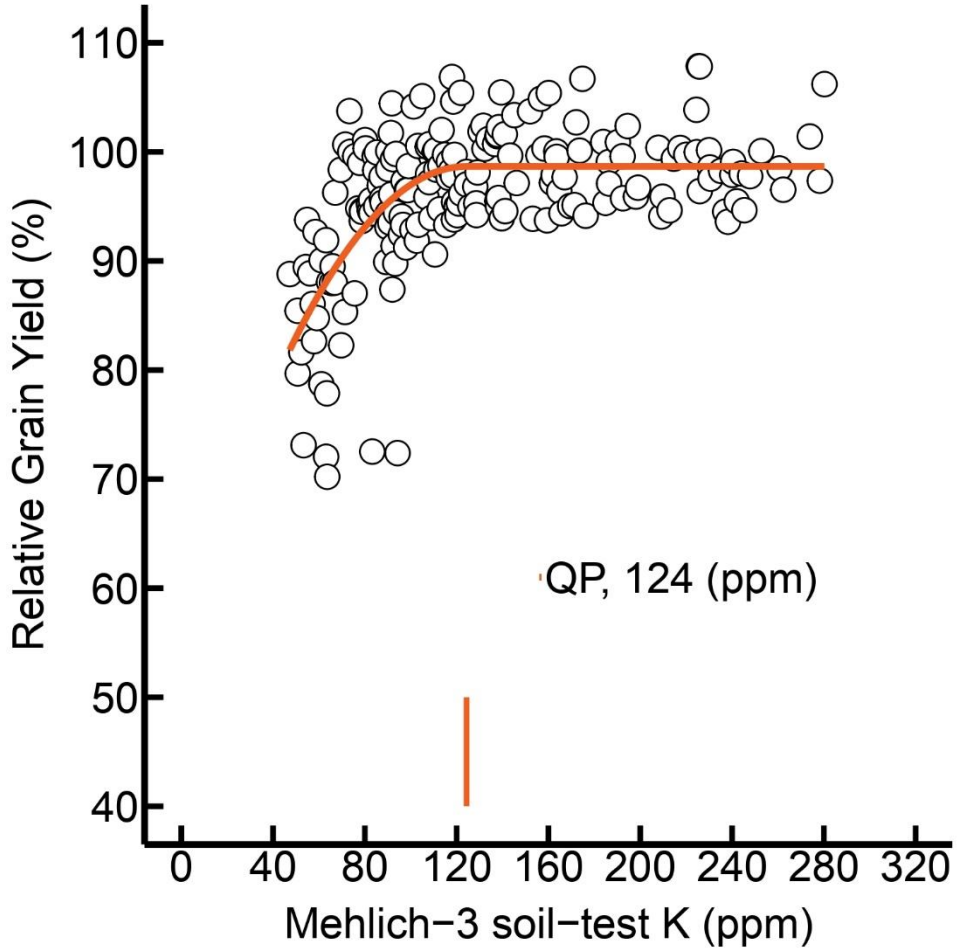
Preliminary STK Interpretation by Region

Matching current Agronomy Handbook CEC designations

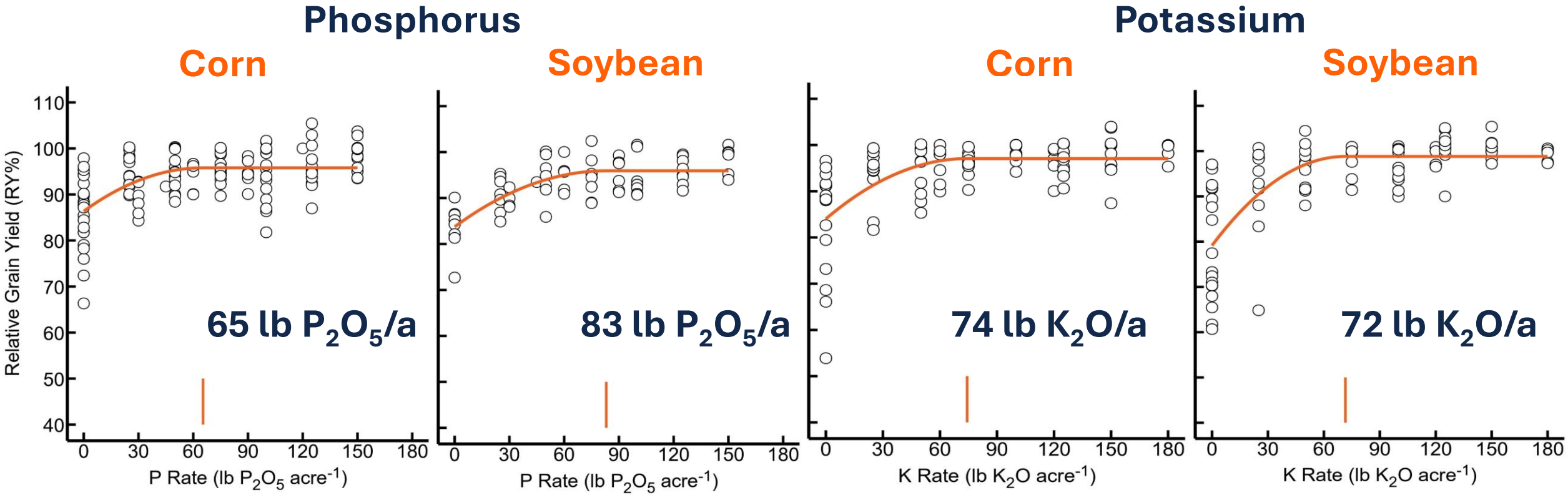
CEC > 12



CEC < 12



Optimum P and K Rates Should Maximize Yield and ROI, Regardless of soil-test level



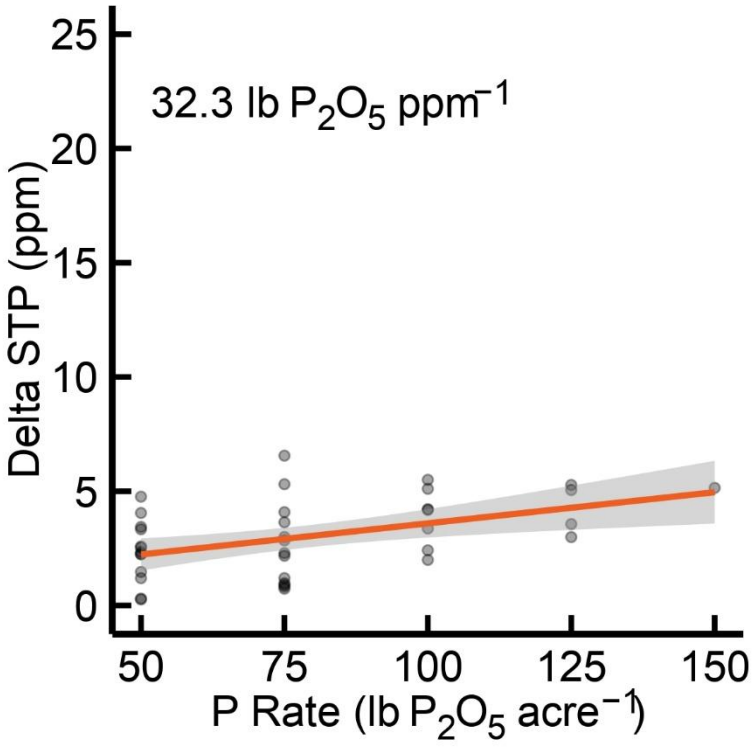
Optimum P or K rates represent annual demand, and do not include the build component.

Bardeggia, Joern, Smith & Jones (2025)

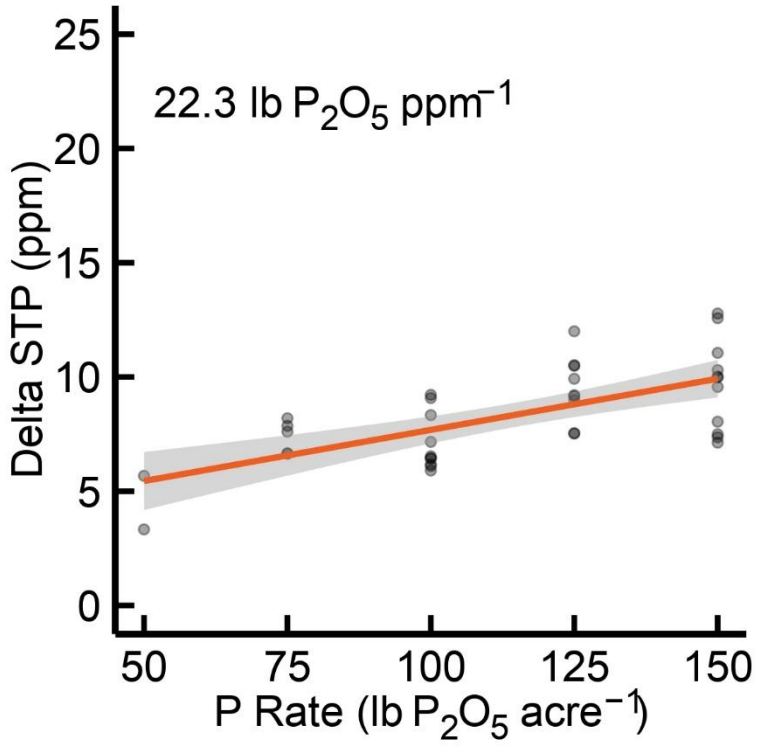
Fertilizer or Removal Required to Change Soil-test Values

The buildup requirement (lb P_2O_5 per ppm) changes by initial STP (book value is 18 lb P_2O_5 per ppm)

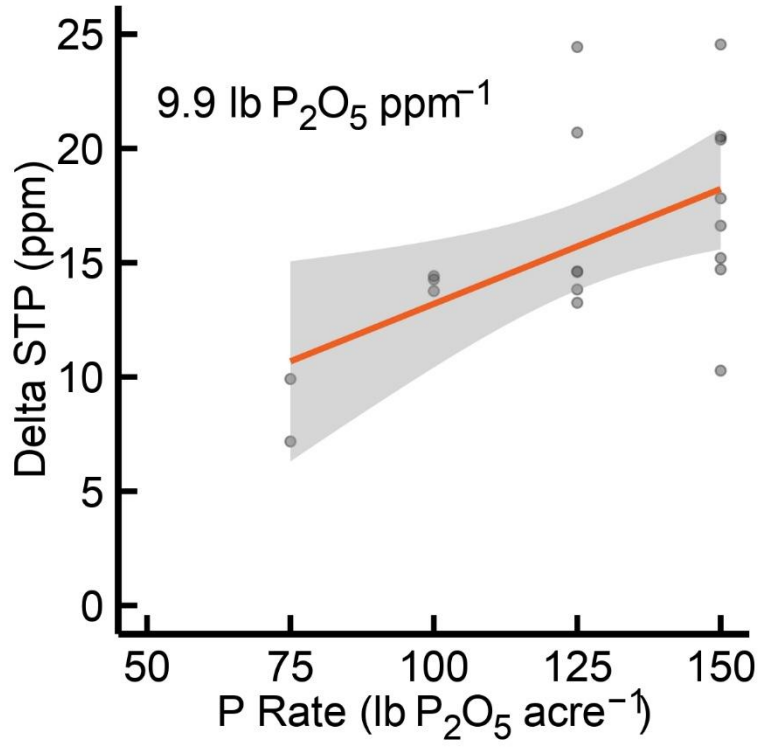
STP < 12 ppm



STP 12-19 ppm



STP > 19 ppm

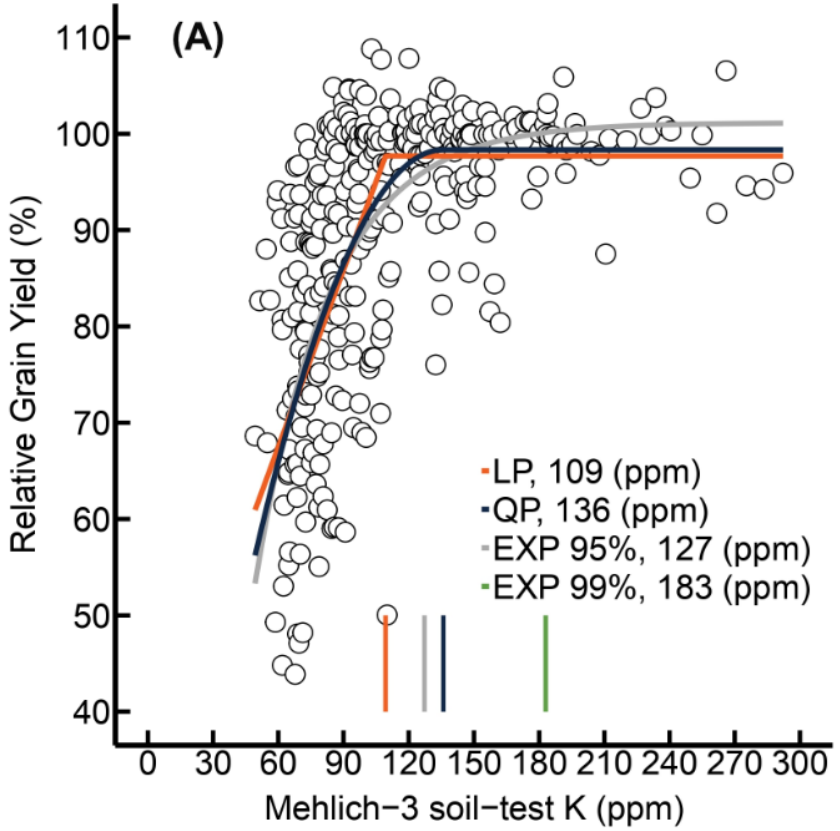


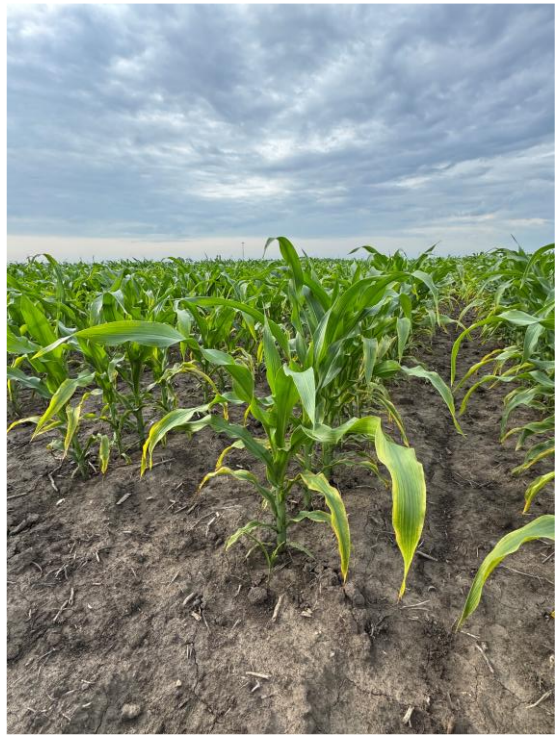
Bardeggia, Joern, Smith & Jones (2025)

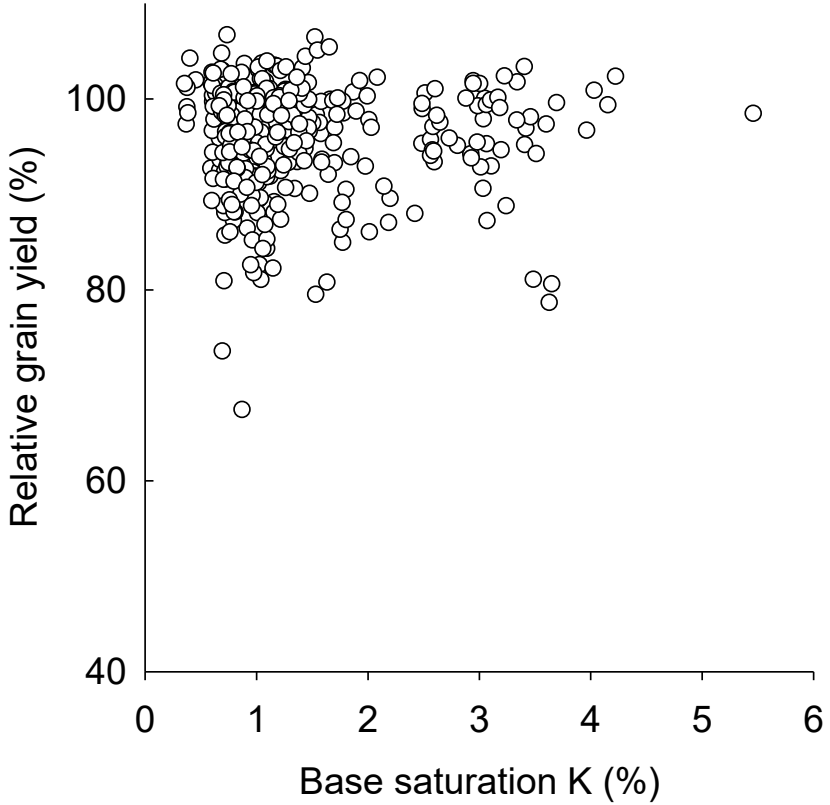
Base Saturation Evaluation for Potassium

included in new long-term, multi-site research

BS% K: poor relationship with relative yield (no response model fit). No indication you should chase 3, 4, or 8 percent K base saturation!







Bardeggia, Joern, Smith & Jones (2025)

Phosphorus and Potassium Considerations in 2026:

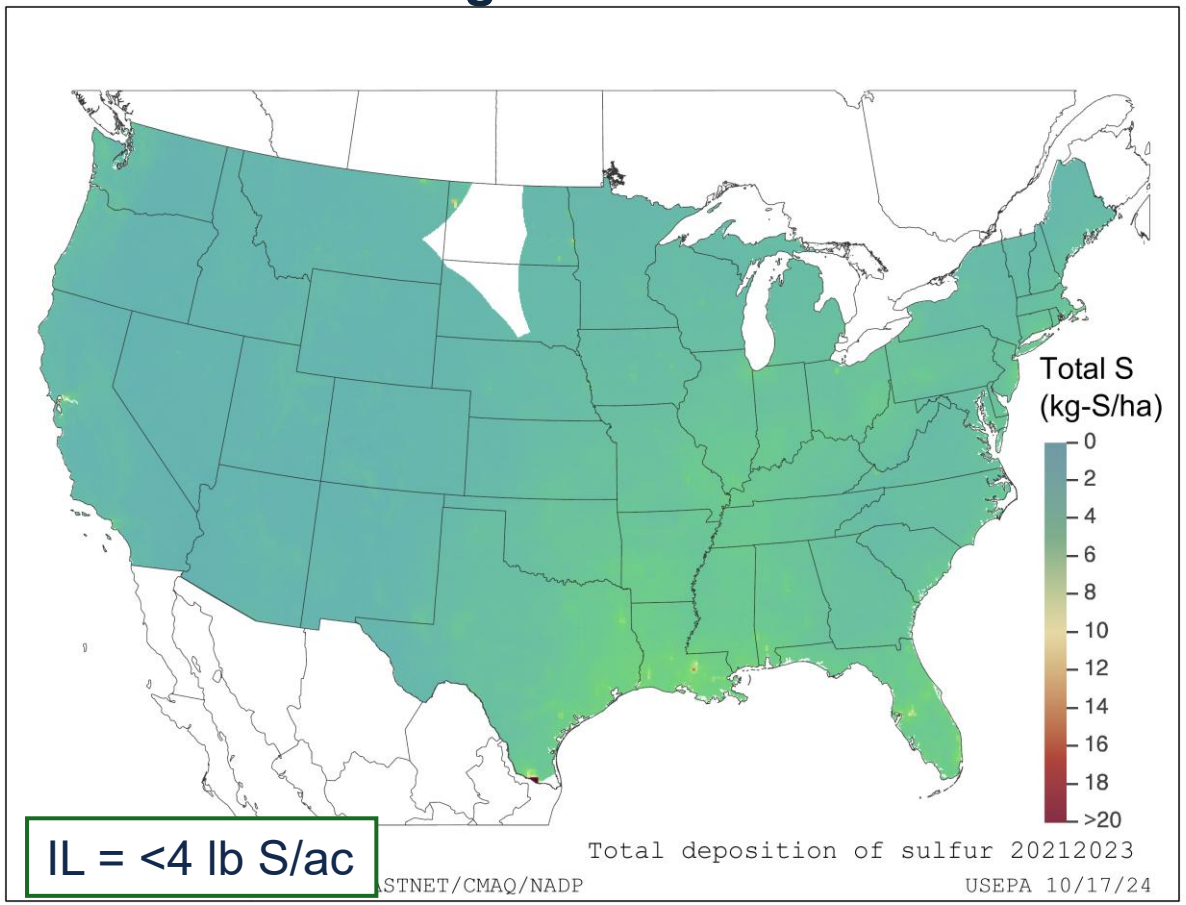
- **Use soil-testing** to identify grids or zones with little or likely responses to P or K – major value to ROI of soil-testing with current prices
- Clear relationship between yield response to P/K & soil-test levels; ROI by soil-test level; and probability of yield responses
- **Do not expect large or frequent crop responses to P when soil-test P is above 18 ppm P (36 lb P/a)** for the Mehlich-3 colorimetric or Bray-1 test (ICP P values will be higher)
- **Critical levels for soils with CEC less than 12 was 124 ppm K (248 lb K/a) and 141 ppm K (282 lb K/a) for soils with CEC greater than 12.**
- **Subsoil P and CEC regions are still ok to base local decisions** on (but likely not due to subsoil P supply).

Sulfur Management

J.D. Jones | 2026 Spring IFCA Webinar

More Frequent Sulfur Deficiencies?

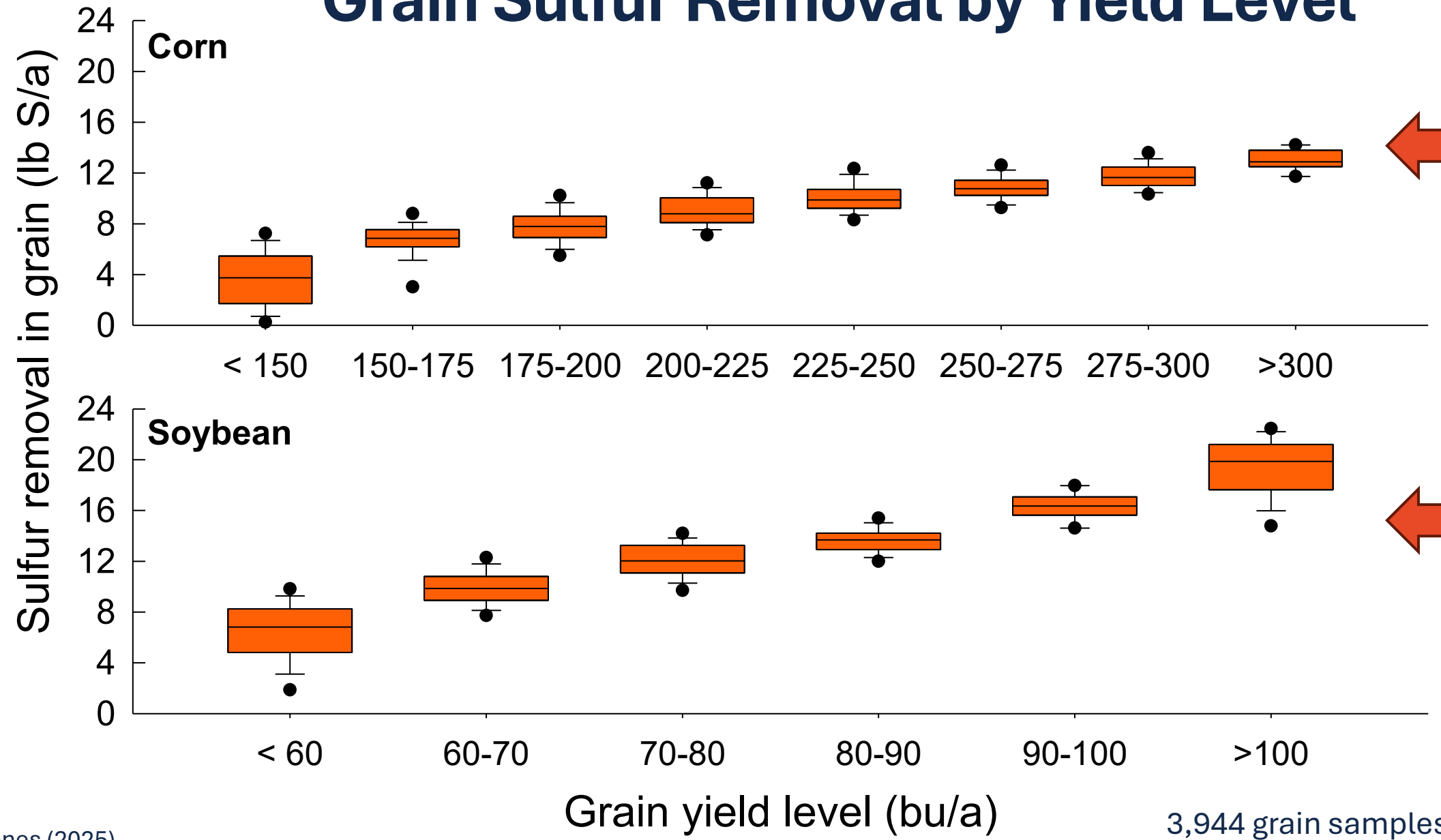
Atmospheric S deposition
Average of 2000-2002



Other reasons for lower S supply

- Crop S requirement and removal rates have increased due to yield increases
- Reduced manure applications
- Increased use of N and P fertilizers with low S concentration
- New pesticide formulations with no S
- Increased leaching due to increases in precipitation and subsurface drainage

Grain Sulfur Removal by Yield Level



15 lb S/a removal (30 for the rotation) occurs more often at 80-90 bu beans or near 300 bu corn.

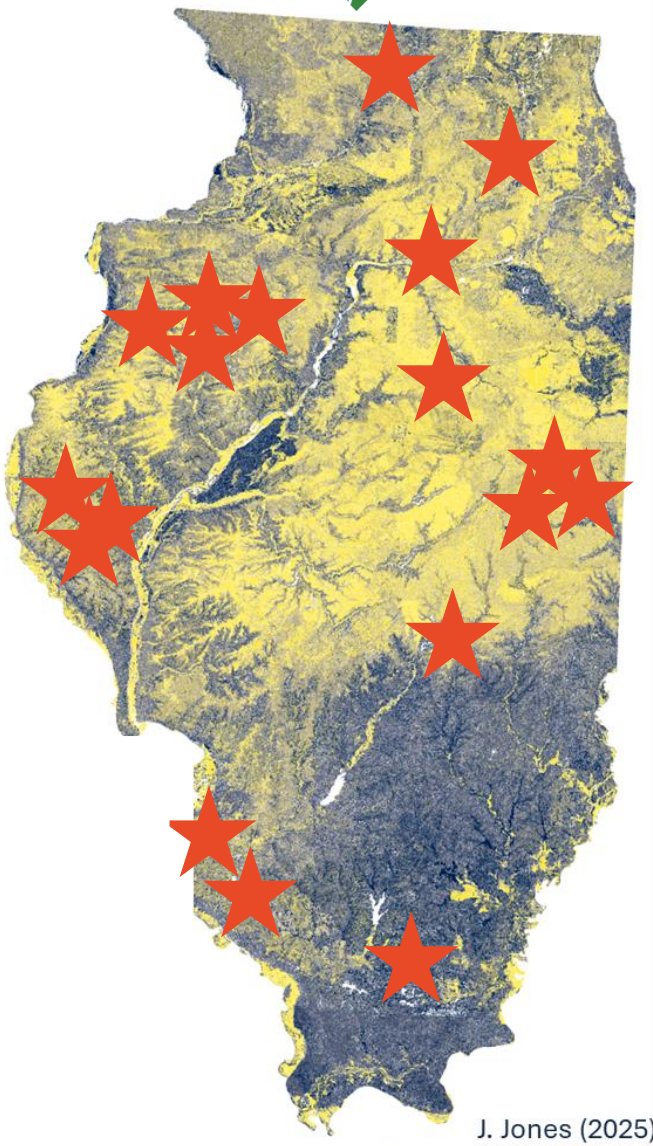
3,944 grain samples and yield values

Jones (2025)

2025 Sulfur Response Summary

11 locations; 23 corn & 10 soybean trials

- 23 corn & 10 soybean trials with and without 30 lb S/a
- Average 3 bu/a (-6 to 16) corn difference between S and no S (not statistically significant across sites)
  - 3 of 23 trials significantly responded to S (9, 11, and 16 bu/a increases with S)
- Average 2.8 bu/a (-4 to 13) soybean difference (not significant)
  - 3 of 10 trials significantly responded to S (9, 11, and 13 bu/a increases with S)
- No relationship between yield level and response to S
- No clear soil property connection, but local growing conditions suggest May-June timeframe critical



J. Jones (2025)
Data source: SSURGO

Concerned about Sulfur Sufficiency?

- Prioritize coarse textured soil with low soil organic matter
- In 2025, yield responses to sulfur occurred almost entirely in northern IL sites where conditions in May-June promoted both N and S demand.
- Soil-test S threshold of 11 ppm (22 lb S/a) has been used for decades, with little supporting evidence (current project).
- Overall, sulfur soil tests will not be as reliable as P or K at predicting crop response to fertilization
- Across all sites, corn with 30 lb S/a had an optimum N rate 11 lb N/a lower than without S, and

Thank you!

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