2022 fertility management options and high fertilizer prices

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Overview

- Phosphorus: sufficiency vs draw down options
  - $$ return to P fertilizer across soil test levels
  - Value of starter fertilizers (macros and micros)
- Nitrogen: Economic optimum N, and management for efficiency
- Sulfur, pH and manure options

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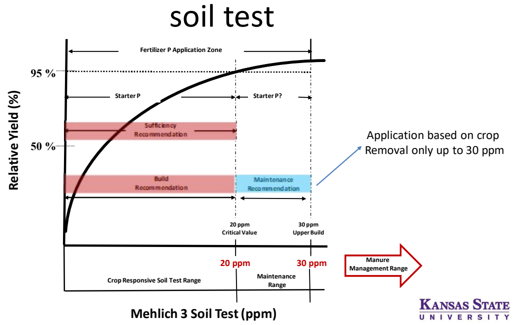
Phosphorus management model based on soil test



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Sufficiency recommendations

- Traditional recommendation system used in the Great Plains/ Corn Belt.
- Estimates the amount of P and/or K that provides optimum economic returns in the year of application.
- Over time soil test values equilibrate in the crop responsive range (low).
- Nutrient application required for every crop, every year.

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Build and maintain recommendations

- Focus on maintaining soil test values in non-responsive range, slightly above “critical level”.
- Nutrient application is not required every year.
- Provides flexibility in nutrient application, time management and cash flow.
- Higher fertilizer costs than sufficiency programs in early years. Requires an investment to “Build” soil test.

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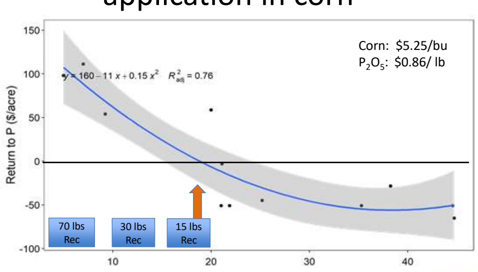
<u>$ return</u> to 60 lbs of P2O5 in the year of application in corn



12 locations in 2021

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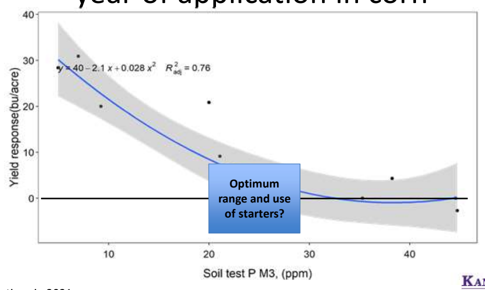
Yield response to 60 lbs of P2O5 in the year of application in corn



12 locations in 2021

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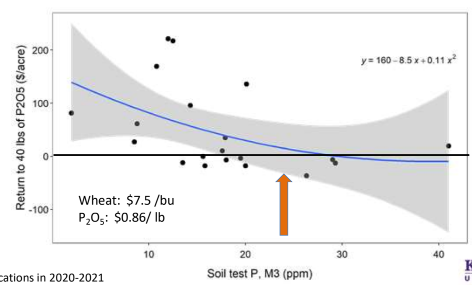
$ return to 40 lbs of P2O5 in the year of application in wheat (broadcast)



21 locations in 2020-2021

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Soil sampling

- Soil test is very useful, especially during unfavorable prices.
- Use good sampling methods for good quality information.
  - Use the right sampling depth for right recommendations.
  - Good number of subsamples
  - One sample should represent the field variability.

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Variable rate application?

- Identify parts of a field that could respond to higher rates of fertilizer.
- Savings from reduced fertilizer application: if non-responsive areas of a field are identified.
- Benefits can only be determined on a field-by-field basis.

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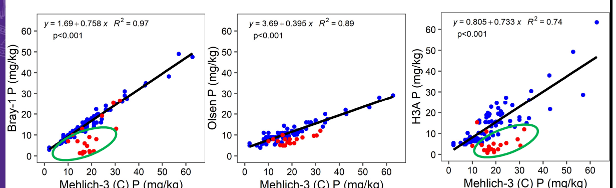
Mehlich-3 vs other methods

- Normal Soil (used)
- High pH Soil (removed)



Weber and Ruiz Diaz, 2021

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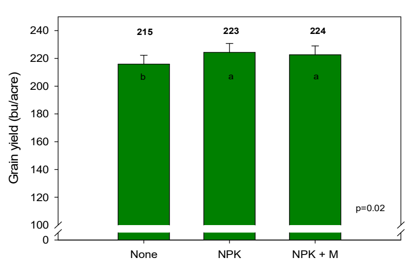
Starter fertilizers: the role of P (and N)



Low soil test P
Non-responsive locations to micros

Micros: Fe, Mn, Zn, Cu, B

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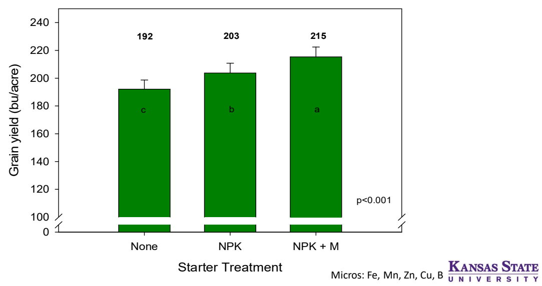
Starters: efficient option for micros (when needed)



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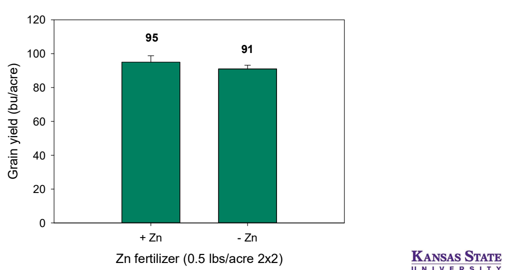
Sorghum yield with band-applied Zn Soil test Zn (DTPA) 0.6 ppm



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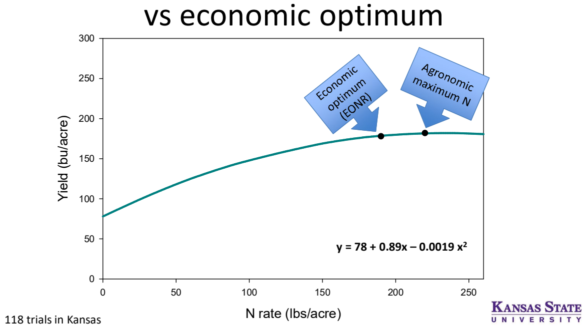
Yield response to N: maximum agronomic vs economic optimum



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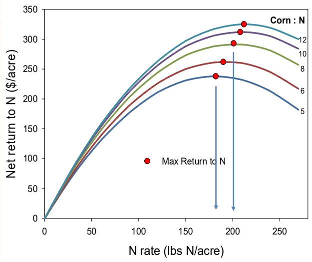
Economic optimum N rate at different corn: N price ratios



- EONR and return to N decrease with decreasing corn : N price ratio
- Corn : N price ratio >10: max. return is not very sensitive to over-application of N
- Corn : N price ratio <10: max. return is very sensitive to over-application of N

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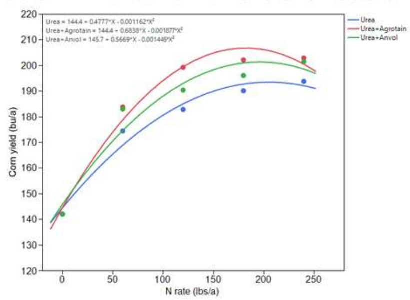
Nitrogen additives:
Urease inhibitors for side-dress urea



2017-2018

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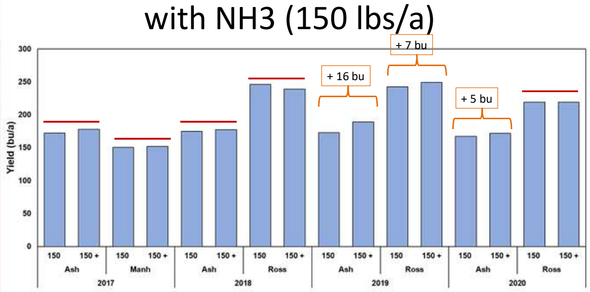
Use of nitrification inhibitor (N-serve) with NH3 (150 lbs/a)



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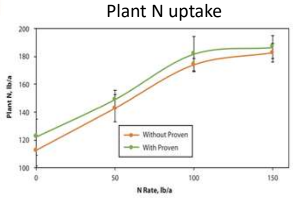
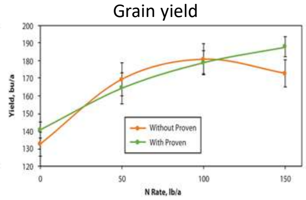
Corn response to nitrogen (N) applied with and without PivotBio-Proven





Manhattan, 2020

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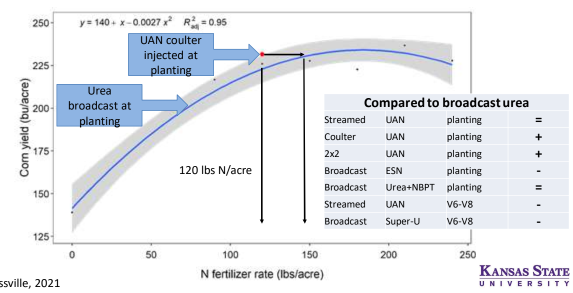
Nitrogen fertilizer efficiency with improved management in corn



Compared to broadcast urea			
Streamed	UAN	planting	=
Coulter	UAN	planting	+
2x2	UAN	planting	+
Broadcast	ESN	planting	-
Broadcast	Urea+NBPT	planting	=
Streamed	UAN	V6-V8	-
Broadcast	Super-U	V6-V8	-

Rossville, 2021

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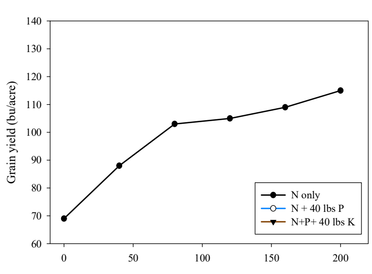
What nutrient is limiting yield?



10-year average, Tribune Schlegel, 2012

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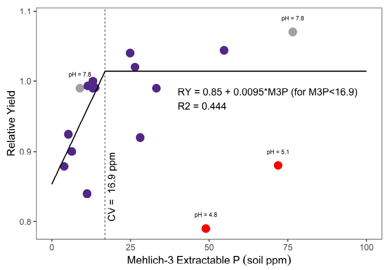
Soybean response to P fertilizer vs soil test P (and pH)



18 Locations 2019-2020, Rutter and Ruiz Diaz

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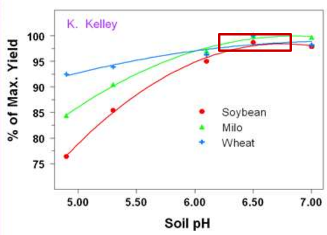
Target pH and yields



- For most cropping situations target pH of 6.0-6.4
- pH values can vary significantly across the field: use variable rate application!

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Sulfur management and soil test

- Soil organic matter and soil texture can help with interpretation
- Need profile samples
- Rate of mineralization can be difficult to estimate
- High demand for S during the rapid growth of corn and wheat, and relatively shallow rooting can contribute to poor correlation

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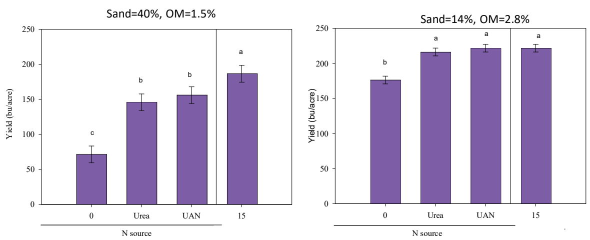
Sulfur in corn for contrasting soil texture



Responsive to S:

- Sand content: > 20%
- Profile S: < 2 ppm

Husa and Ruiz Diaz, 2021

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Manure nutrients

	% Dry Matter	Total N	NH_4	P_2O_5	K_2O
		- - - - - - - lbs/ton - - - - - -			
Dairy	21	9	5	4	10
Beef	50	21	8	18	26
Swine	18	8	5	7	7
Poultry	75	56	36	45	34

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Average animal manure micronutrient content of different sources

Manure source	Iron	Manganese	Boron	Zinc	Copper
	-----------------lb/wet ton--------------------				
Dairy solid	0.5	0.06	0.01	0.03	0.01
Swine solid	19.0	1.09	0.04	0.79	0.50
Poultry	3.0	0.61	0.08	0.48	0.66
	-----------------lb/1000 gal--------------------				
Dairy liquid	0.9	0.11	0.03	0.11	0.12
Swine liquid	2.5	0.23	0.06	1.03	0.62

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Manure nitrogen and phosphorus availability

- Inorganic N is all available.
- Organic N available the first year compared with fertilizer (MF-2562):
  - ✓ Liquid manure: 30%
  - ✓ Solid manure: 25%
  - ✓ Compost: 20%
- Phosphorus: Research show near 100% availability

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Considerations with current economics

- Use good soil test information to make the right decision.
- Don't reduce P in low testing fields, profits are very likely.
- Return to fertilizer in high testing soils may be limited with current conditions (use "reserve soil nutrients").
- Current prices may require more soil sampling, and focus on nutrients with highest ROI.

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Thank you!

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