Nitrogen fertilization decisions: Can we do better with adaptive N management?

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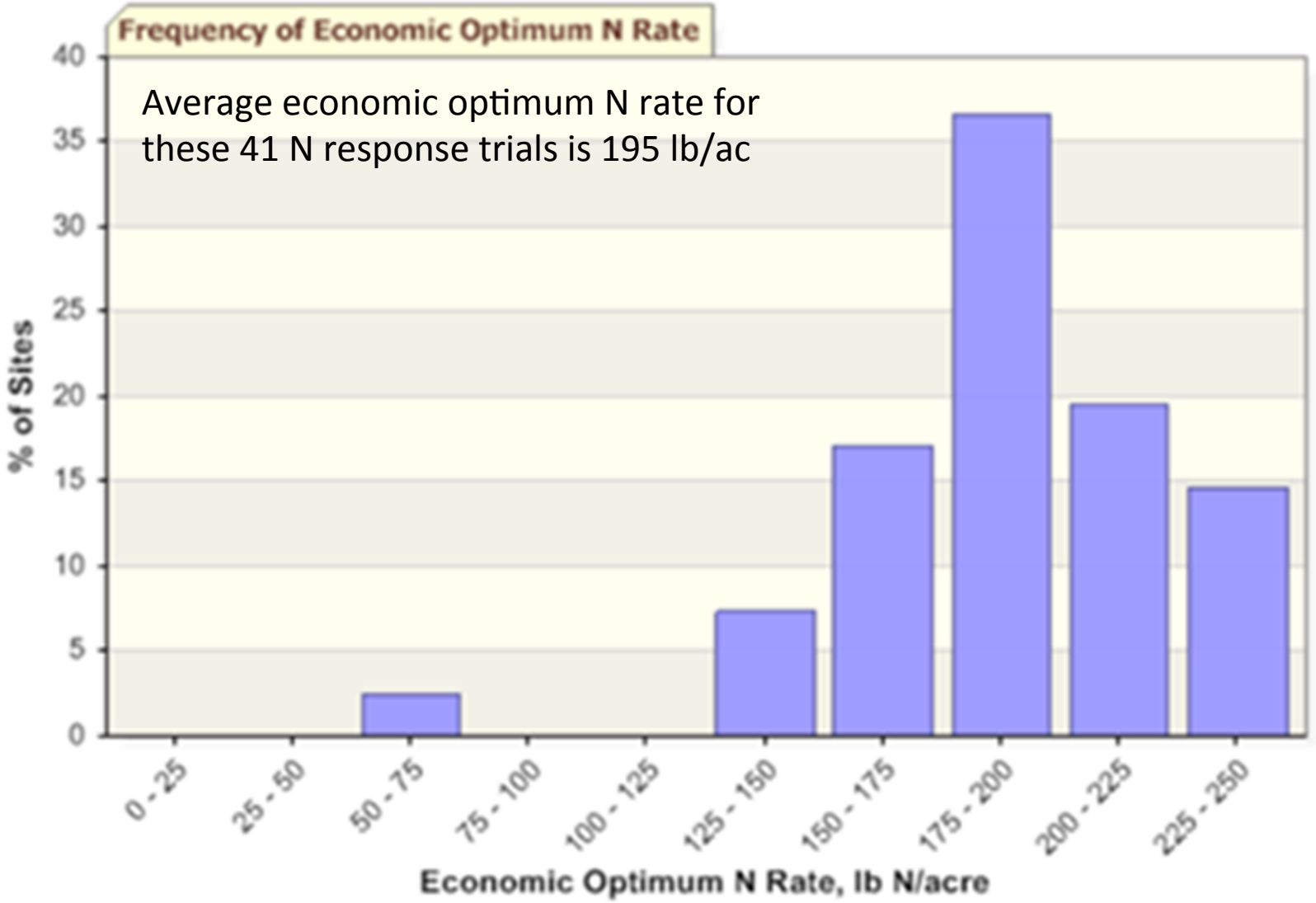
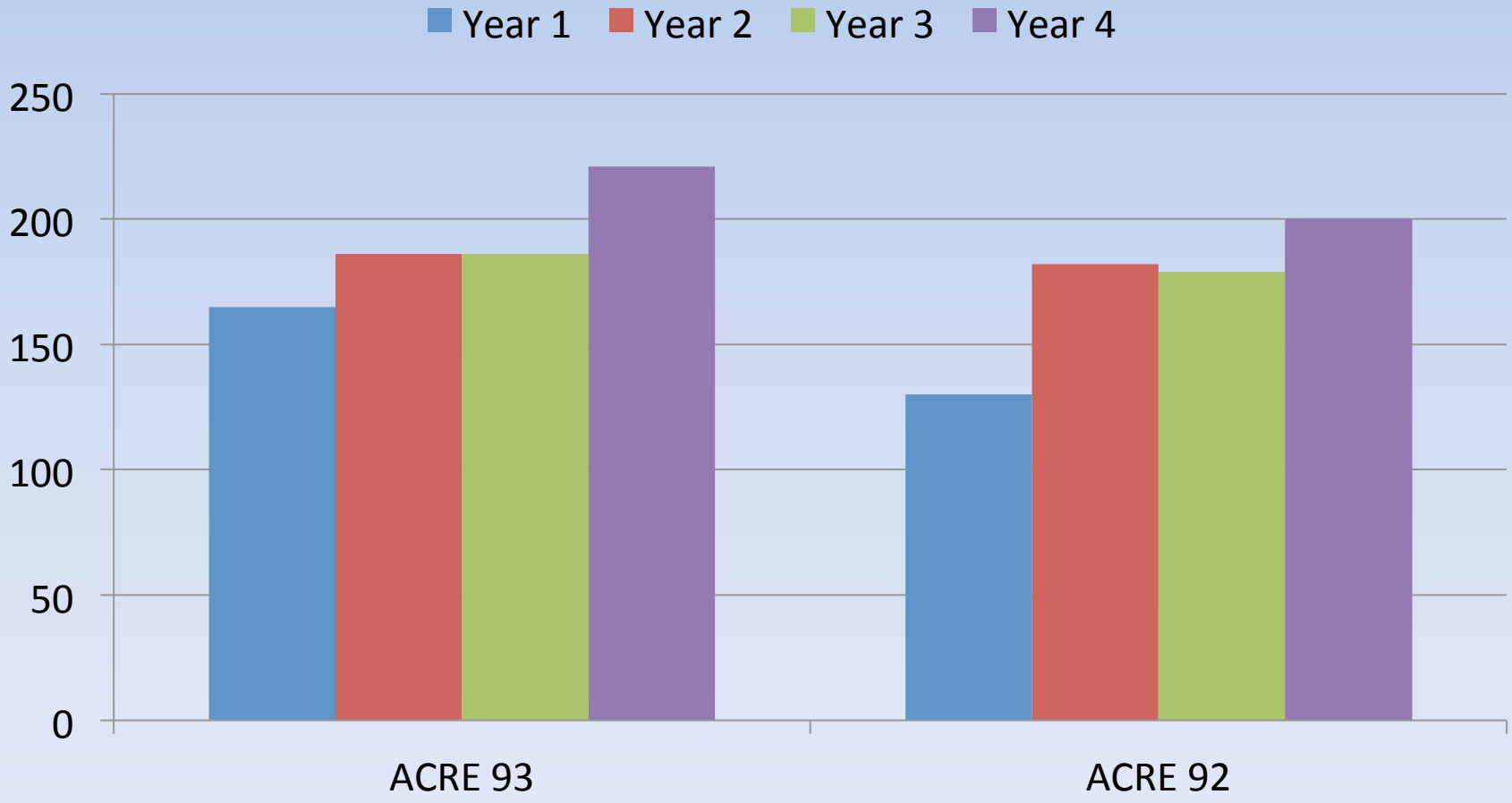
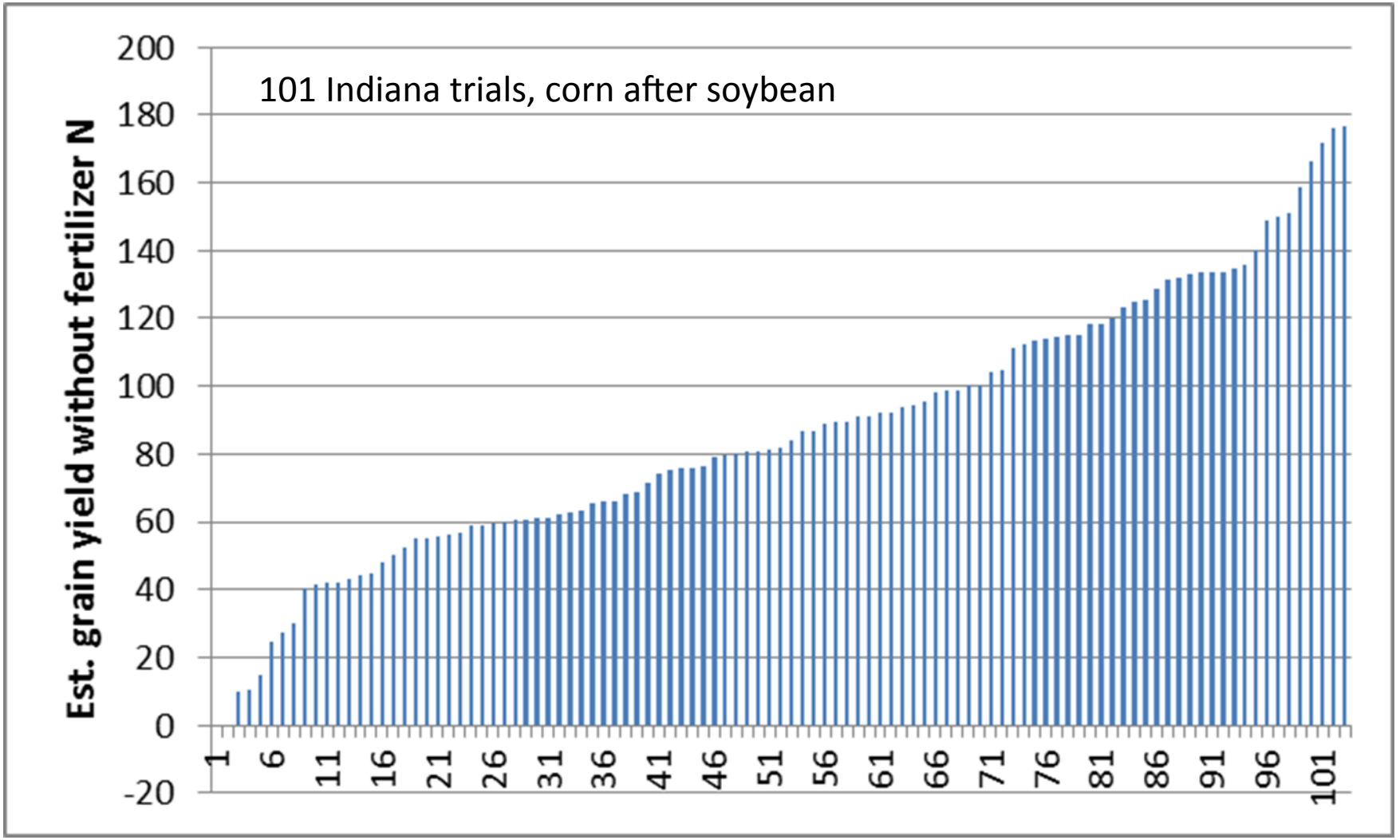
Optimum N rate varies across locations, years, and management systems



Opt. N rate varies from year to year even in the same field



Contribution of soil N varies



Adaptive N management

- Adaptive N manage. – a learning approach for identifying an opt. N rate for a spec. soil/manage. system or in a particular season that is more accurate than an ave. N rate rec.
  - Preplant or presidedress soil nitrate test
  - Spad chlorophyll meter
  - Crop sensors
  - Tissue analysis
  - N response strip trials
  - **Corn stalk nitrate**
  - **Computer modeling**

Corn stalk nitrate and Adapt-N evaluation

- Corn stalk nitrate test (35 site-years beginning in 2006)
  - Can CSNT differentiate and quantify 'excessive' N supply?
- Adapt-N (12 site years, 2012-2013)
  - Factors most affecting sidedress N rate recommendation
  - Ability to predict sidedress N rate

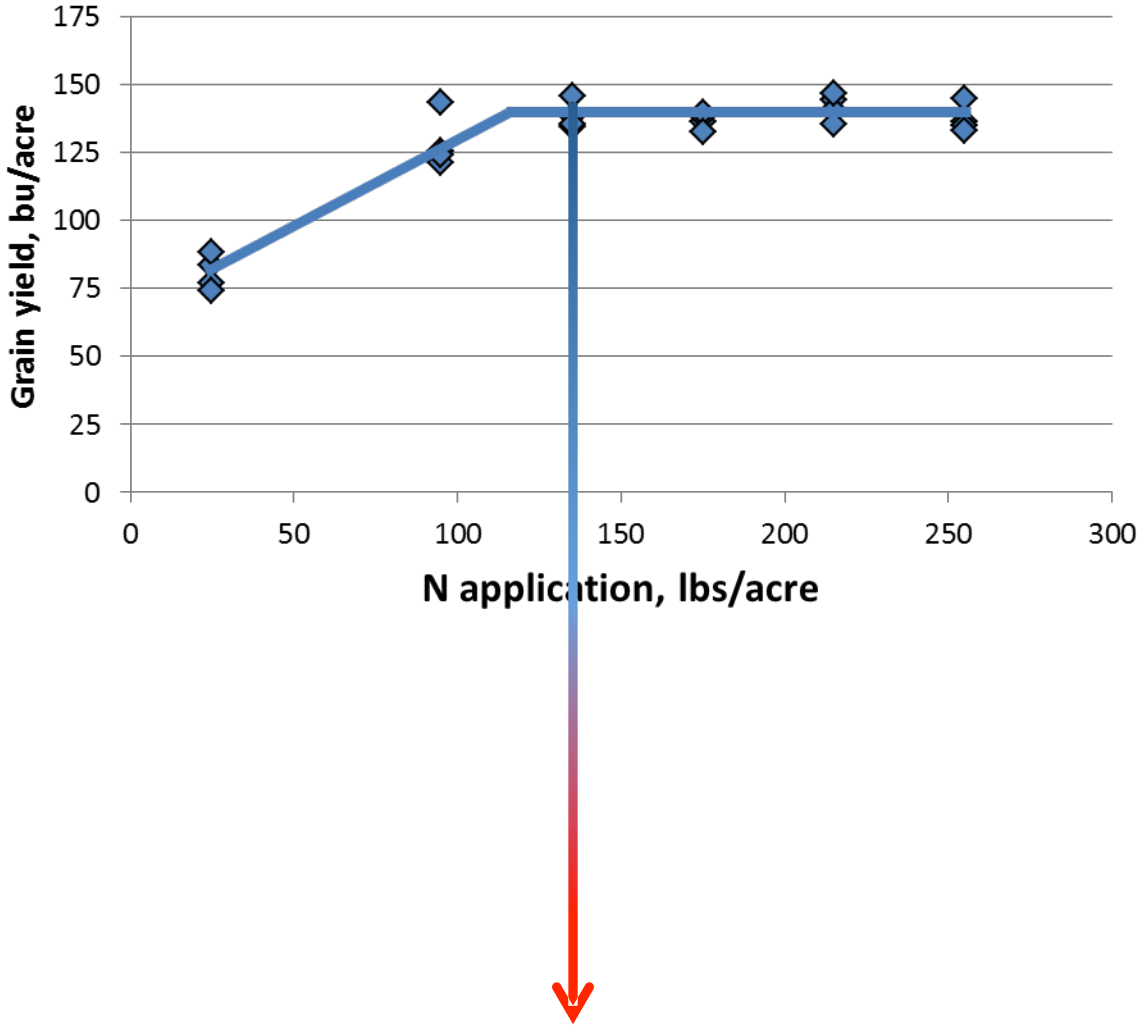
Nitrogen rate response trials

- 2006-2013
- 4-6 N rates replicated 4-6 times
- Purdue farms and farmer fields
- Calibrated yield monitor
- Yield response fit with linear- or quadratic-plateau or quadratic eqns. to determine optimum N rate and yield

Stalk Nitrate-N

- 16-24 lower corn stalks per N rate strip
- NO_3-N analysis by A&L Great Lakes
- Relative yield and N surplus/deficit calculated on a per plot basis by dividing the plot value by the optimum N rate and yield for the experimental area

Lower stalk NO_3-N accumulates often when N rate exceeds that needed for maximum yield



Stalk nitrate and relative yield

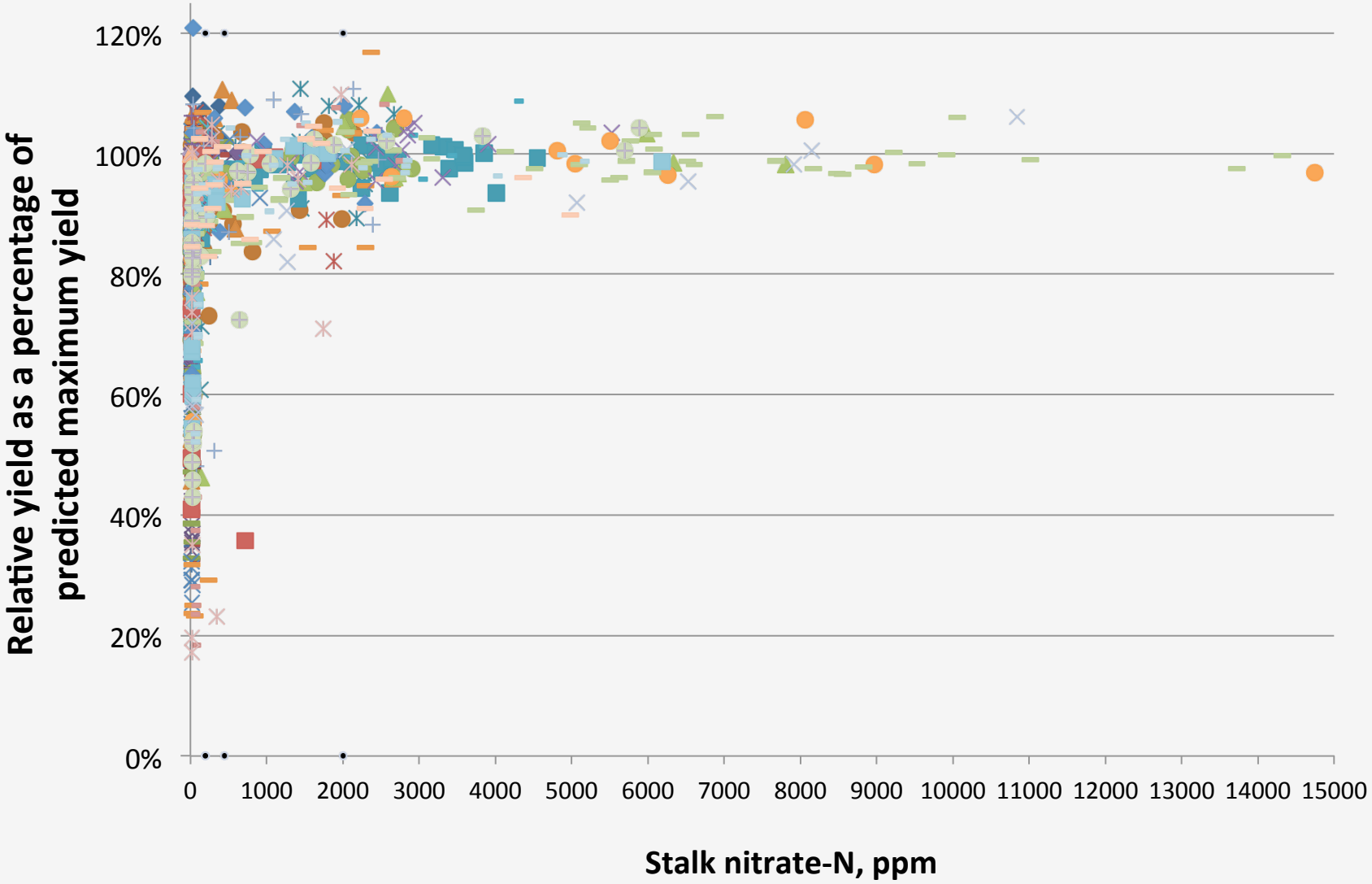
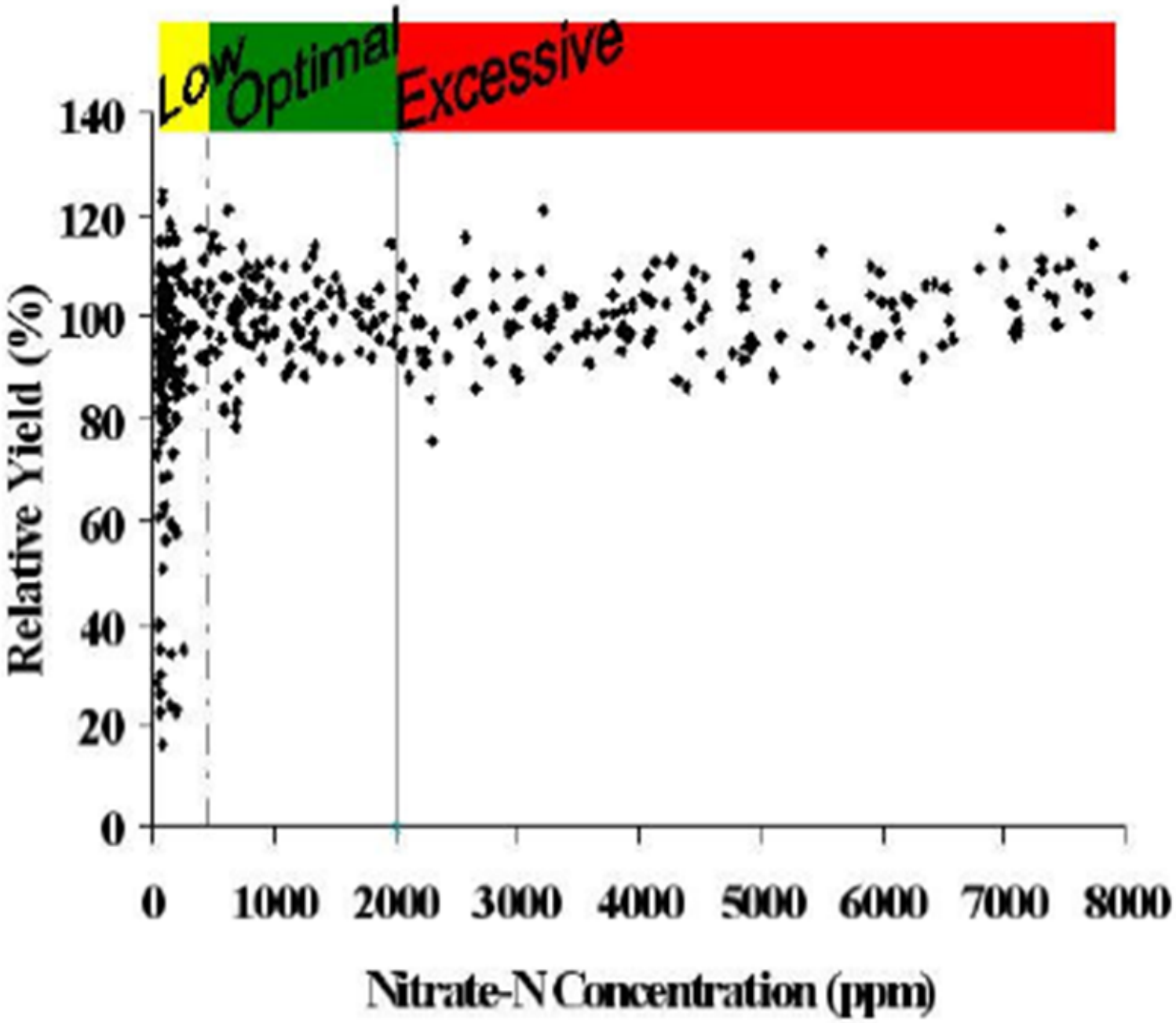
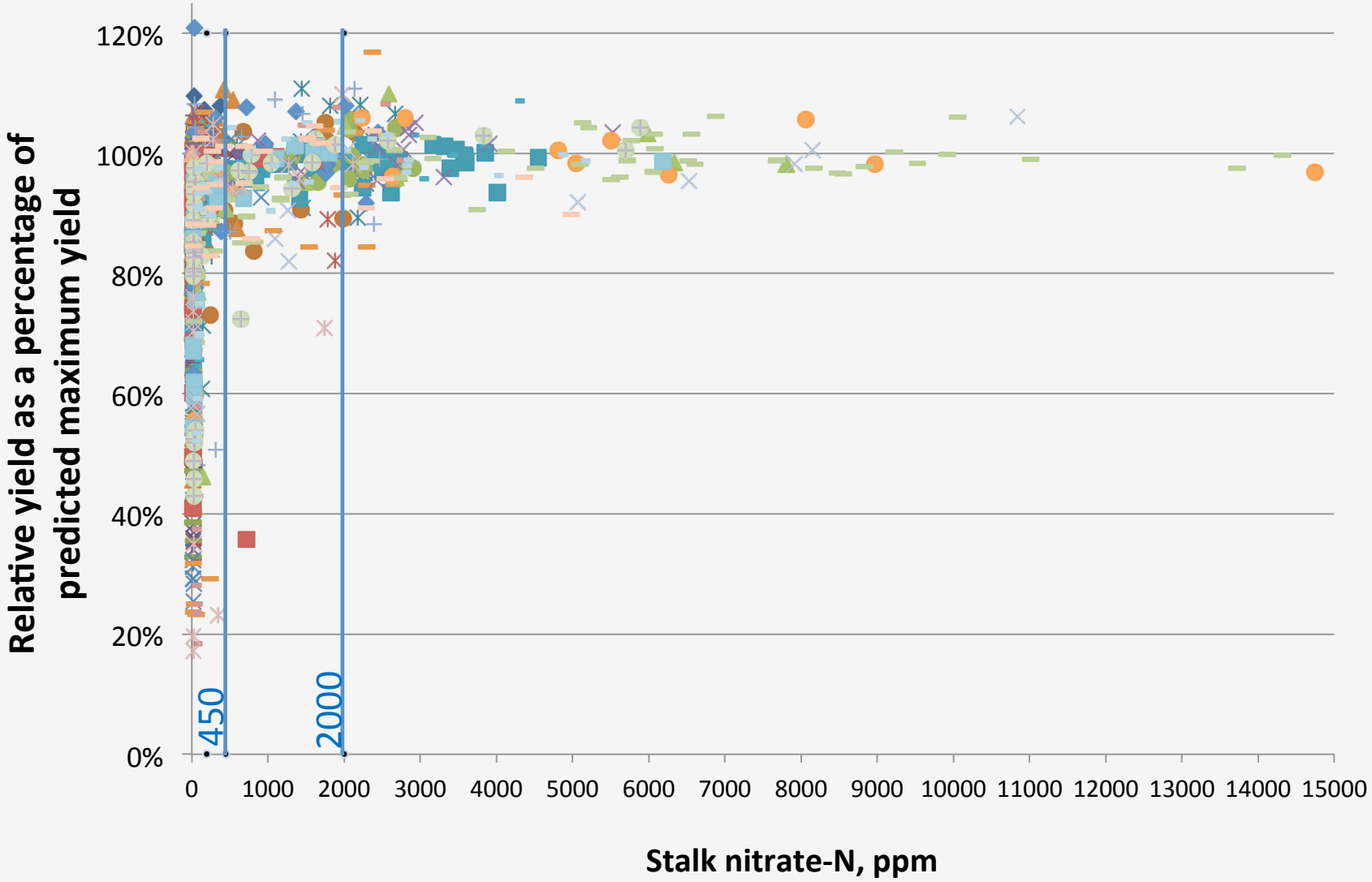


Figure 3. Diagnosis of in-season N to corn.

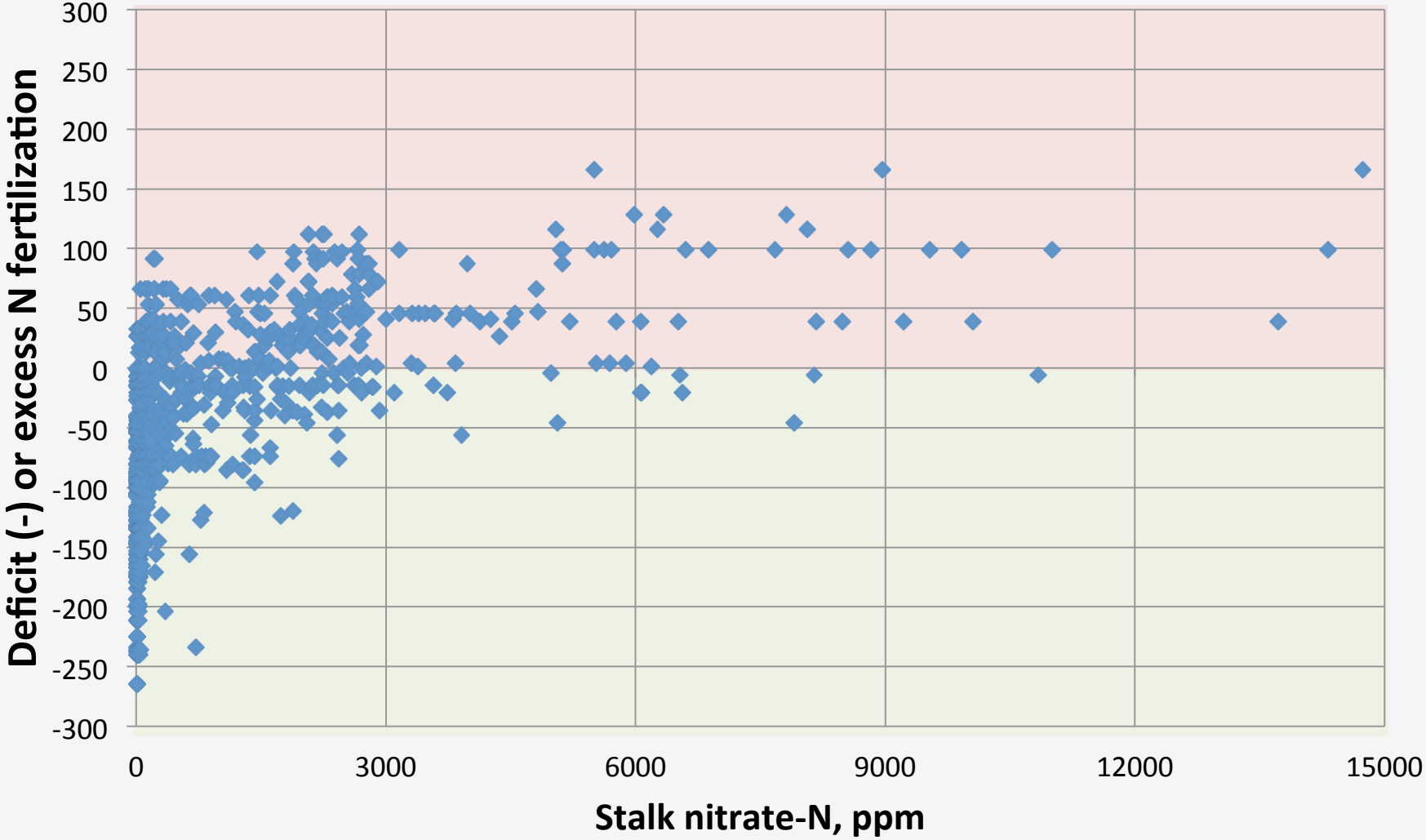


Brouder, 2006. AY-322-W

Existing Purdue guidelines



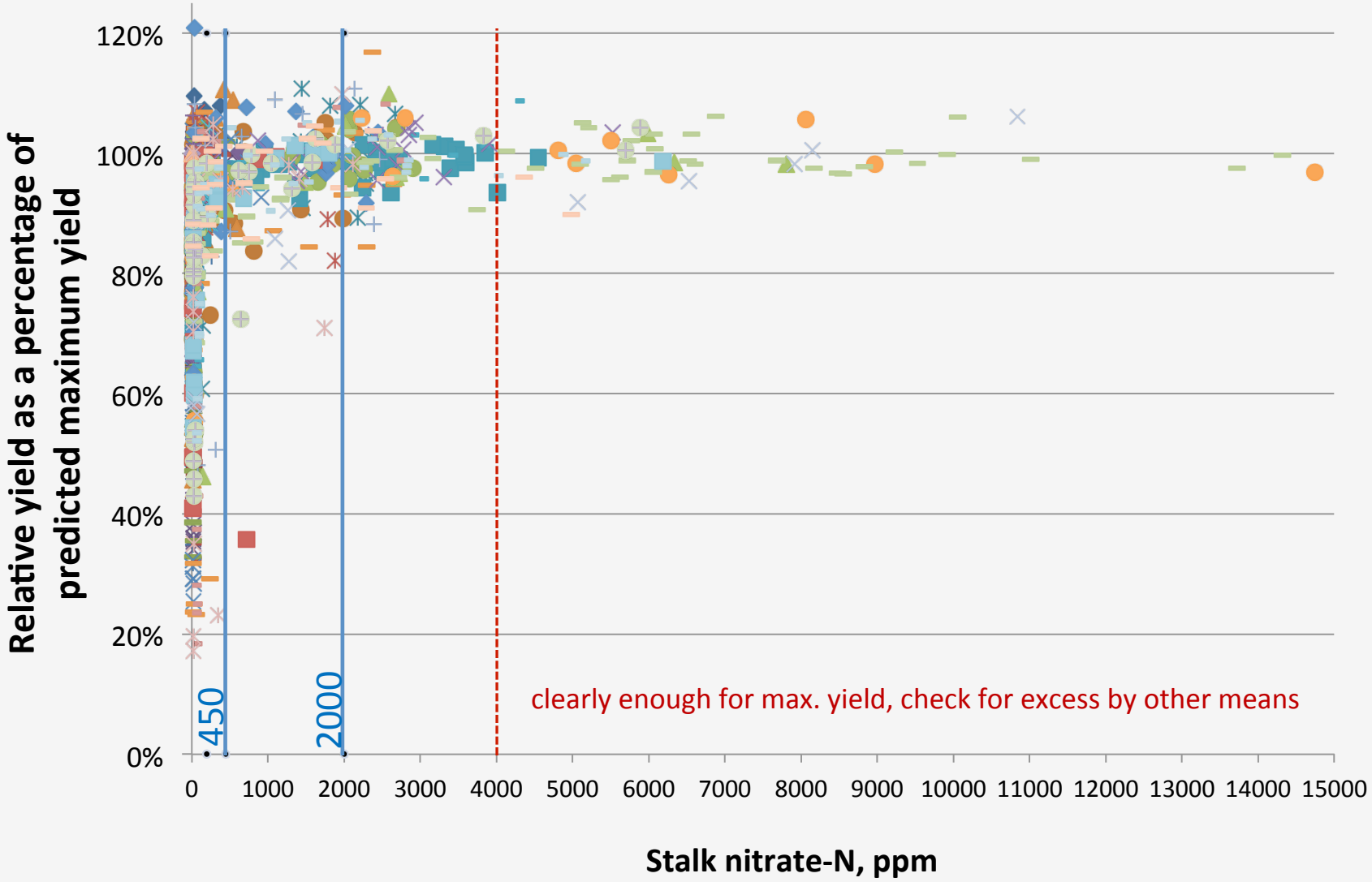
Nitrogen deficit or excess



Stalk NO_3-N vs. deficit or excess N

	Stalk NO_3-N range, ppm						
Statistic	<450	-1000	-2000	-3000	-4000	-6000	-15000
% max. yield	82	96	98	100	99	99	100
N deficit (-) or excess, lb/acre	-87	-22	-2	34	26	**58**	**62**
No. observ.	715	72	90	93	17	24	30

Existing Purdue guidelines



Summary

- Assessment of corn stalk nitrate levels is similar (or the same) today as 20+ years ago
- Corn stalk nitrate levels are not a particularly good indicator of the amount of surplus N
- Additional information is warranted to determine how much to reduce N rates when corn stalk nitrate levels are consistently high (>4000 ppm)

Web-based nitrogen management decision tool

Adapt-N Sign in

Get account | View manual

Join the Adapt-N email list - Stay in the loop. Get the latest news and updates in your inbox. More info.

Try Adapt-N

- Predict corn N needs more precisely based on field-specific conditions
- Adjust N applications based on weather on your farm
- Reduce fertilizer rates, costs and losses in the long-term, while maintaining yield
- Fine-tune sidedress N rates
- Determine if manured fields need additional fertilizer N
- Determine if you need rescue N after heavy spring rains
- After the growing season – is there excess N?
- Explore this learning tool and evaluate alternatives: "What if I had…?"
- Adapt-N is mobile enabled – use it on your smartphone, iPad, Tablet

Adapt-N is an online tool that will help you precisely manage your N inputs for grain, silage or sweet corn. It uses a well-calibrated computer model, high resolution weather information available for your fields, and soil, crop and management information you provide. All user inputs are kept confidential.

View the webinar: **Precision Nitrogen Management in Corn using the Adapt-N Tool** - View the individual sessions broadcast to multiple locations in the Northeast and Midwest on March 21, 2013. More info.

Featured article:

New!
Adapt-N Chosen Top Product of the Year - *AgProfessional*

Space Age Sidedressing Ties N Dose to Weather | New Online Tool Brings New Accuracy Level to N Prescriptions - *Corn and Soybean Digest*

See publications and resources for more articles and case studies

Adapt-N recommendation basis

Recommended N =

Crop N at harvest (yield goal x 1 lb N/bu)

– predicted soil and crop N at sidedress

– predicted soil N mineralization

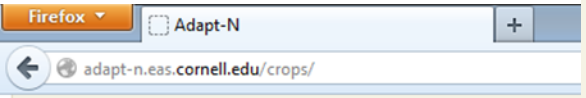
– soybean N credit

+ predicted loss of soil and fertilizer N

- profit correction

Adapt N inputs

- Location
  - Rainfall and temperature up to sidedress, historical weather from sidedress through predicted season end
- **Yield goal**, CRM, planting date
- N application timing, source, and rate
- Soil series or texture, **OM**, rooting depth
- Manure application rate, timing, N content
- Tillage type, timing



1. Calculation of Sidedress N Rate

Sidedress N rate estimated by AdaptN = Cro

$CropN_{Harvest}$	225 *(lbs N/acre)*
$CropN_{Current}$	7 *(lbs N/acre)*
$SoilN_{Current}$	98 *(lbs N/acre)*
$SoilN_{postsidedress}$	25 *(lbs N/acre)*
$SoybeanN_{Credit}$	25 *(lbs N/acre)*
$Loss_{postapplication}$	11 *(lbs N/acre)*
$Correct_{profit}$	8 *(lbs N/acre)*

Root Zone Crop Available Water

Note that these estimates are for non-irrigated co

Current root zone crop available water:	**3 *inches***
Crop available water at field capacity	3 *inches*

- Full Report and Graphs (pdf file)
- Sidedress N Definitions

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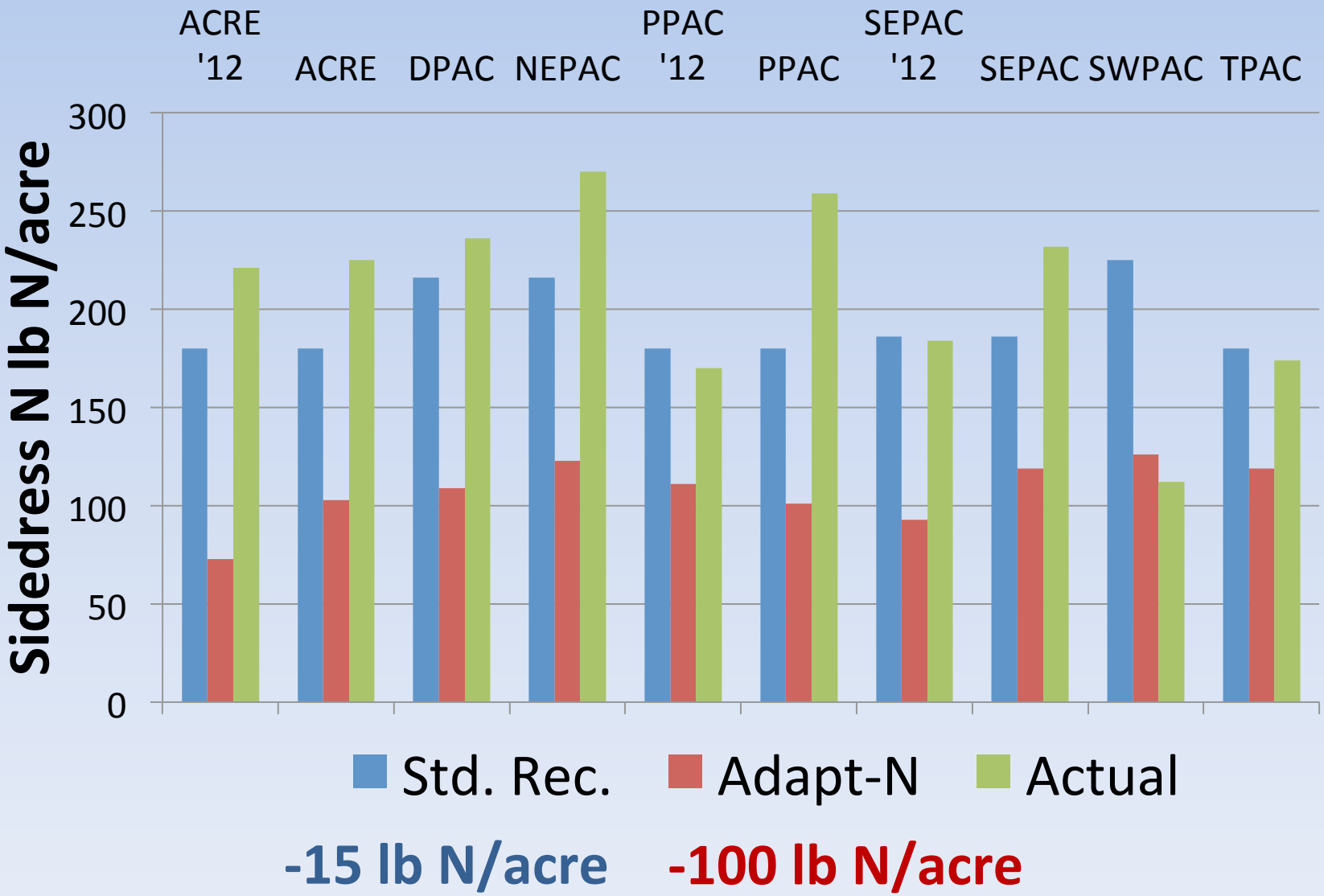
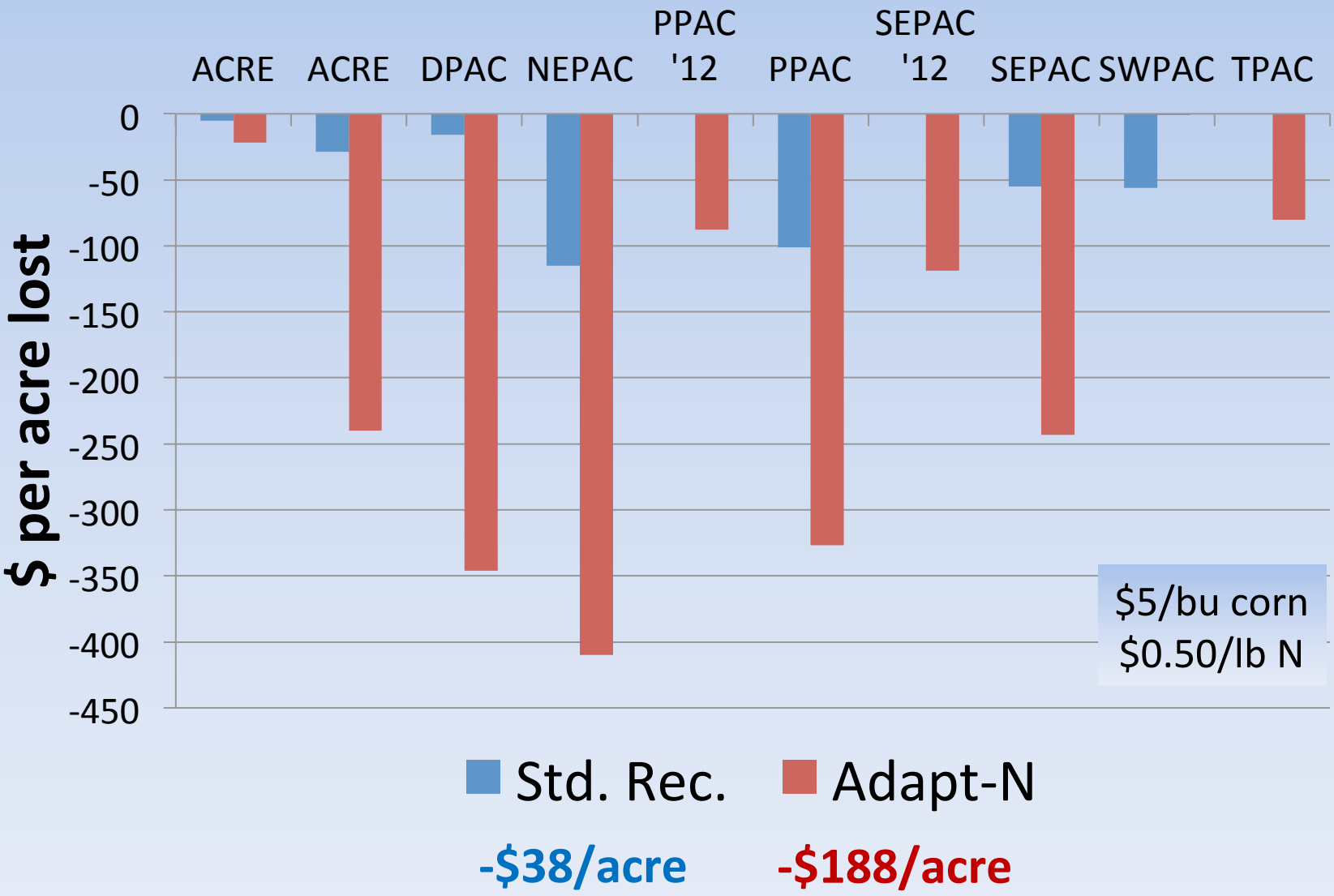
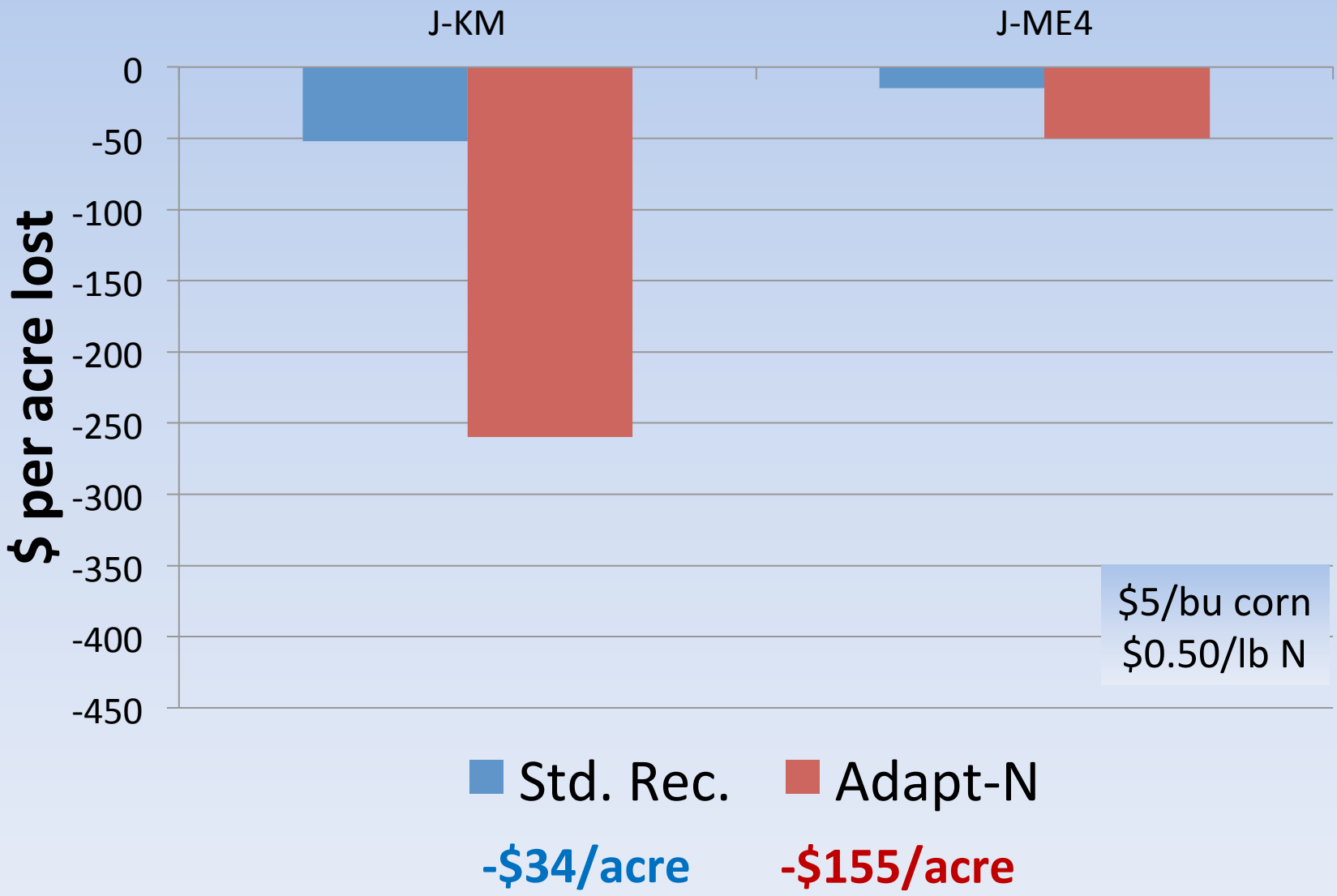
Comparison standard to Adapt-N rec.



Loss in profit from true optimum

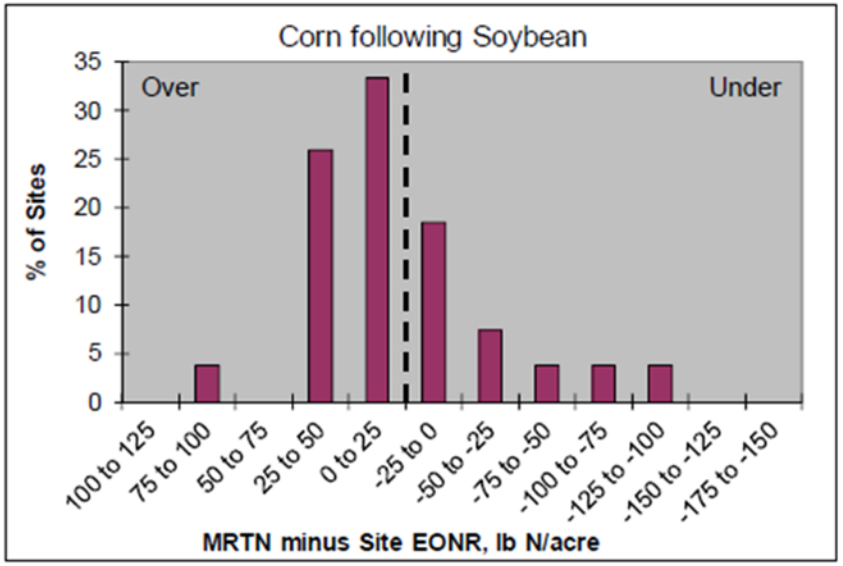


Additional on-farm locations



Iowa – MRTN-based N rec. better than Adapt-N

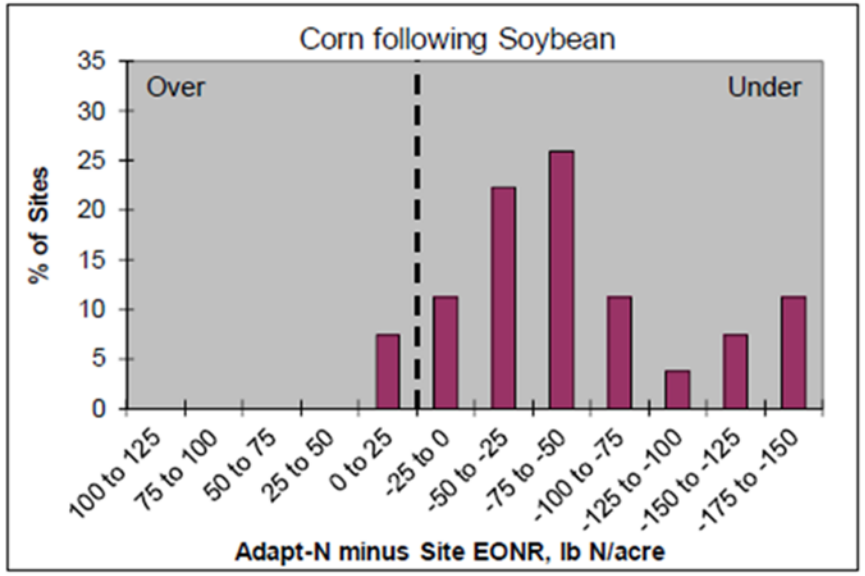
MRTN



Mean	2010	2011	2012	All	
Diff.	.	-15	21	4	lb N/acre
EONR	.	148	114	130	lb N/acre
MRTN	.	133	135	134	lb N/acre
n	.	13	14	27	

Percent of Sites +/- 25 lb N/acre of the EONR: 52%.

Adapt-N



Mean	2010	2011	2012	All	
Diff.	.	-75	-57	-66	lb N/acre
EONR	.	148	114	130	lb N/acre
n	.	13	14	27	

Percent of Sites +/- 25 lb N/acre of the EONR: 19%.

Summary

- Although promising, Adapt-N needs further calibration to be useful in Indiana for making N recommendations to corn