CURRENT NITROGEN RATE RESEARCH FOR: OATS, WINTER WHEAT, AND SWEET CORN

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INTRODUCTION

- Nitrogen studies have been conducted on oat, winter wheat, and sweet corn over the past three years.
- The goal of this presentation is to educate the agricultural community about this research and to demonstrate the value of current N recommendations.
- Date presented here will be uploaded to our Soils Extension website (www.soils.wisc.edu/extension)

INTRODUCTION

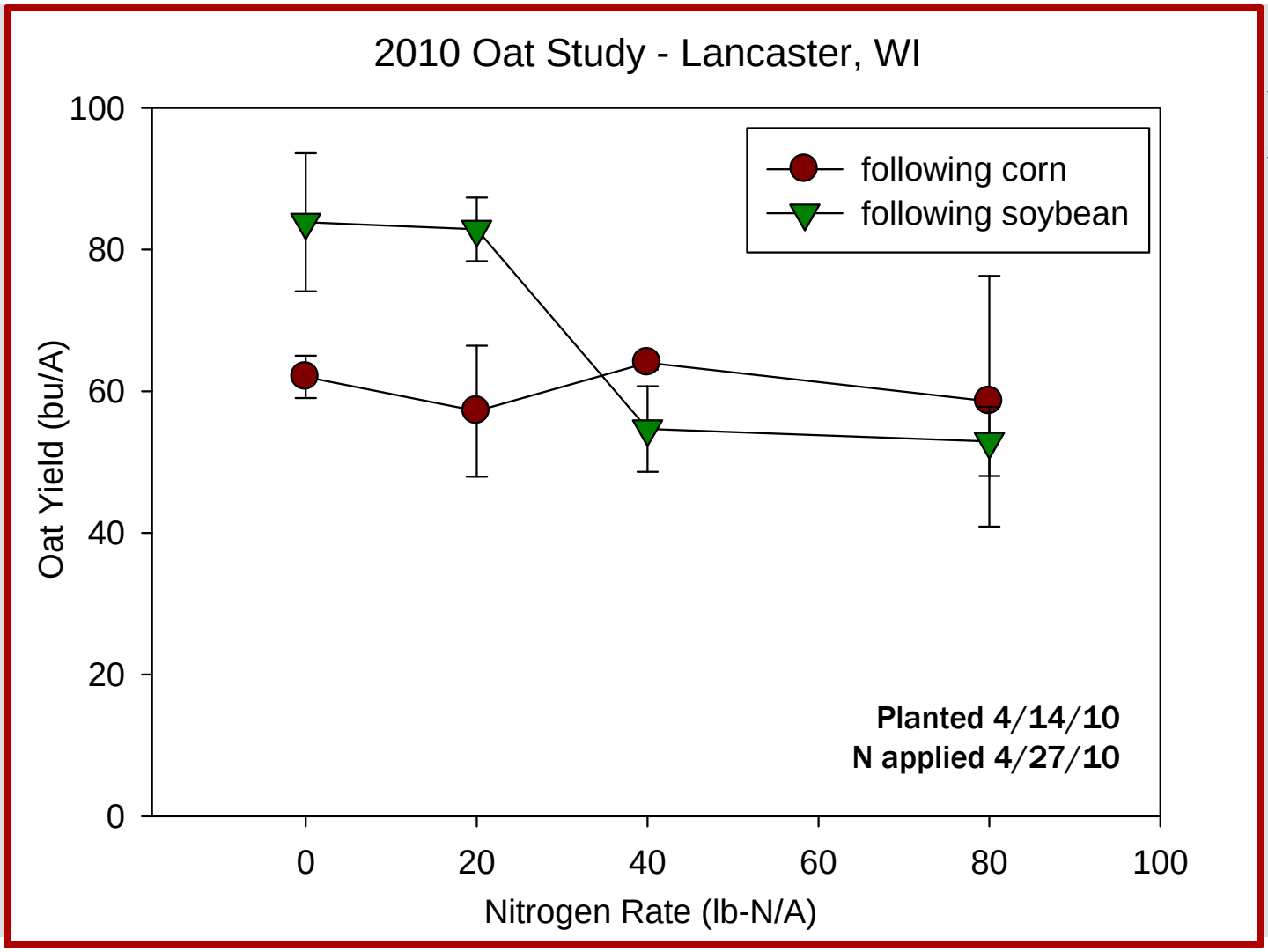
- Wisconsin is a “minor” state for oat and wheat.
- Oat: 310,000 acres in 2010; 210,000 acres in 2011
  - 58 bu/A in 2010, 62 bu/A in 2011
- Winter wheat: 240,000 acres in 2010; 345,000 acres in 2011
  - 64 bu/A in 2010, 65 bu/A in 2011

OAT STUDY, 2010 & 2011

- Conducted by Tim Wood at the Lancaster Agricultural Experiment Station
- Oats were grown after corn or after soybean
- Four nitrogen rates: 0, 20, 40, 80 lb/ac
- Measured yield and lodging
- Variety: Esker @ 3 bu/ac

OAT YIELD 2010

UW guidelines
40 lb/ac for 2-10% SOM
60 lb/ac for <2% SOM

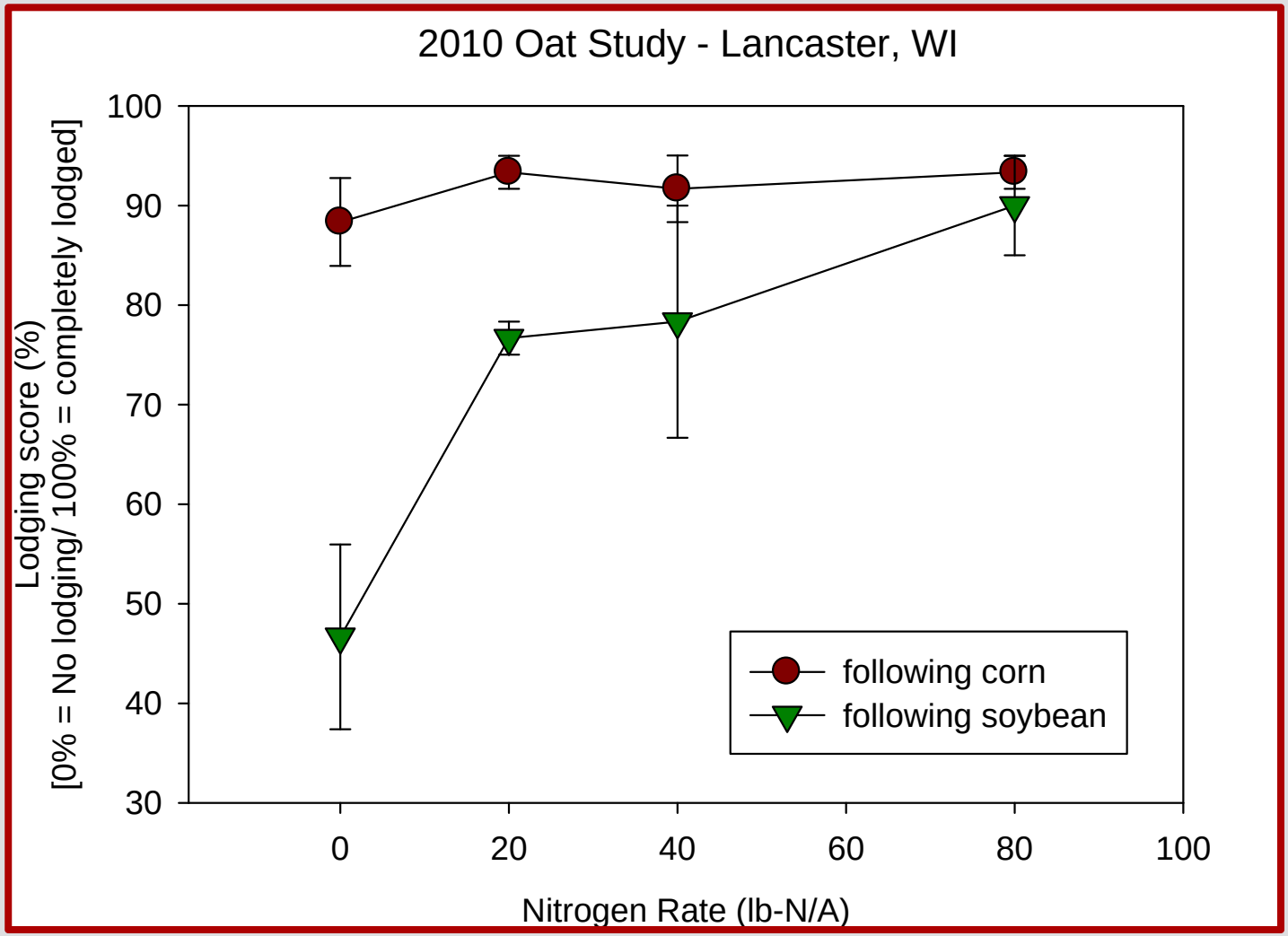


40 lb N credit when following soybean

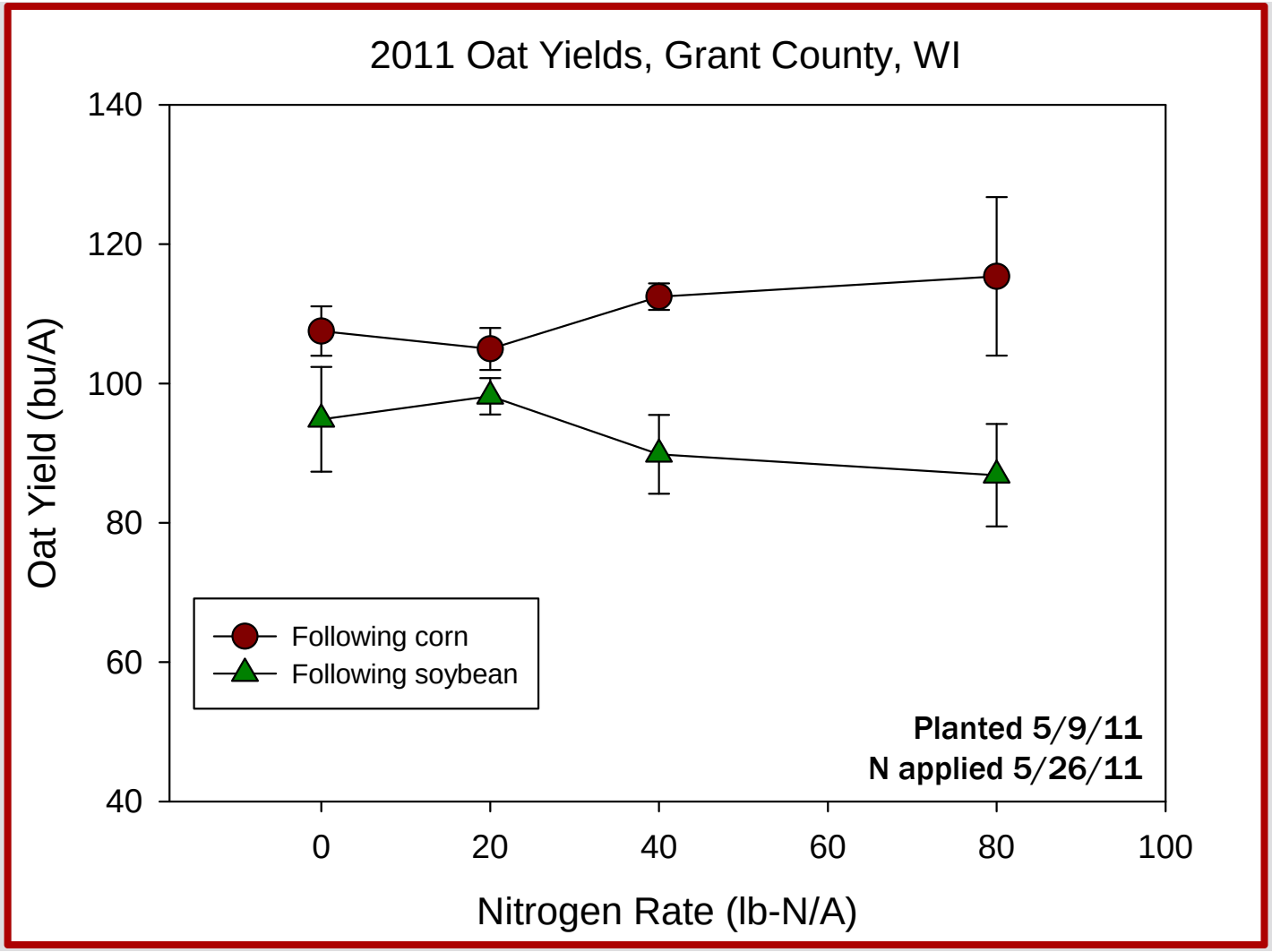
PPNT
85 after soybean

87 after corn

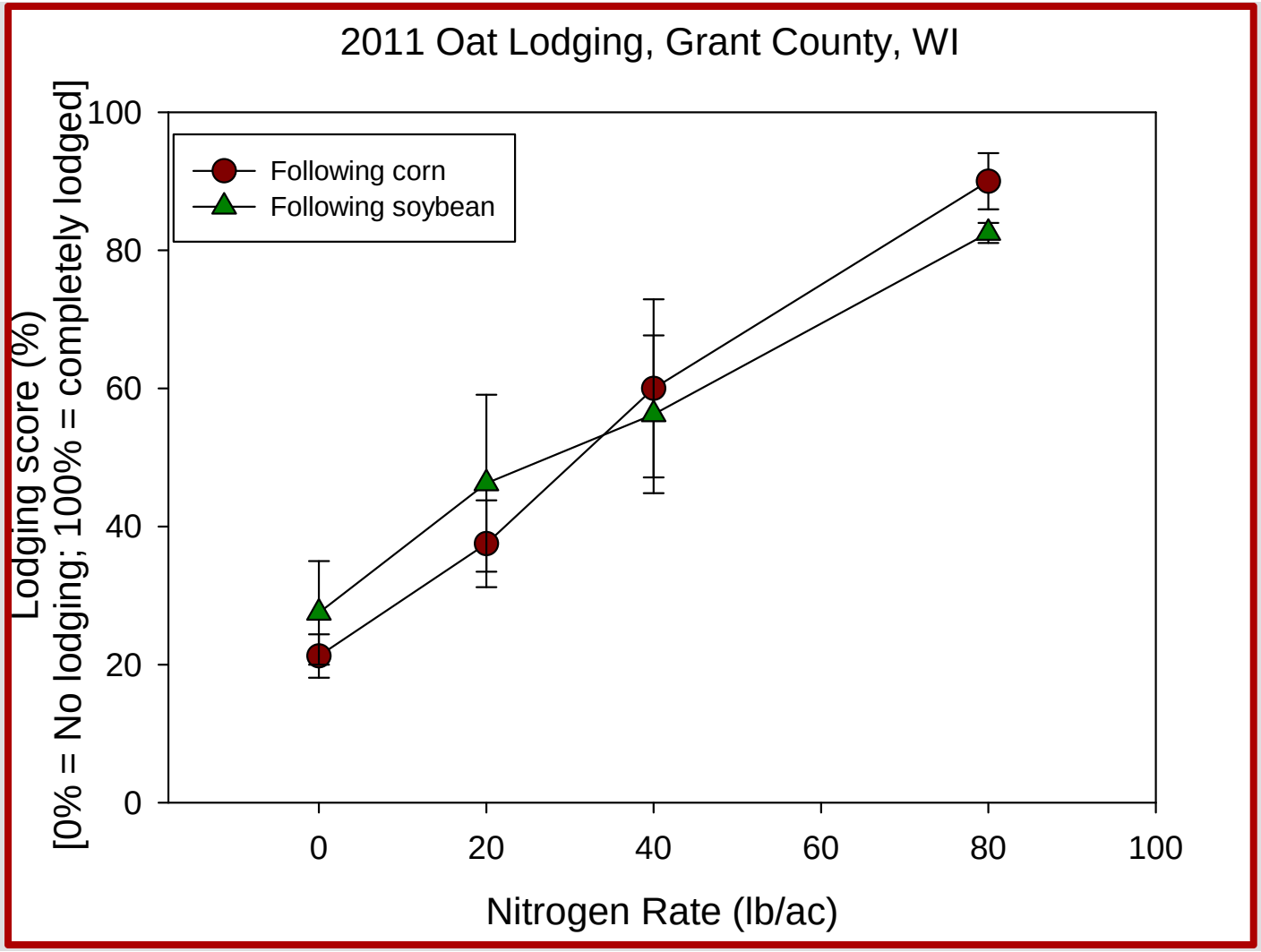
OAT LODGING, 2010



OAT YIELD, 2011



OAT LODGING, 2011



OATS

- When grown in a “high nitrate environment” – no need for N.
- PPNT can provide some value for oats – to identify high nitrate environments. It is not “calibrated” for oat – i.e. the adjustments.
- Oat remains sensitive to over-applications of N

WHEAT

NITROGEN RATE

- Current UW-guidelines for winter wheat:
- 20 to 100 bu ac^{-1} yields

SOM	Nitrogen rate
%	lb ac^{-1}
<2%	90
2 to 9.9%	70
10 to 20%	40
>20%	0

Over-application of N to wheat can cause excessive vegetative growth and lodging may occur

NITROGEN

Field studies at Arlington and Janesville (S. Conely and J. Gaska, Dept. of Agronomy)

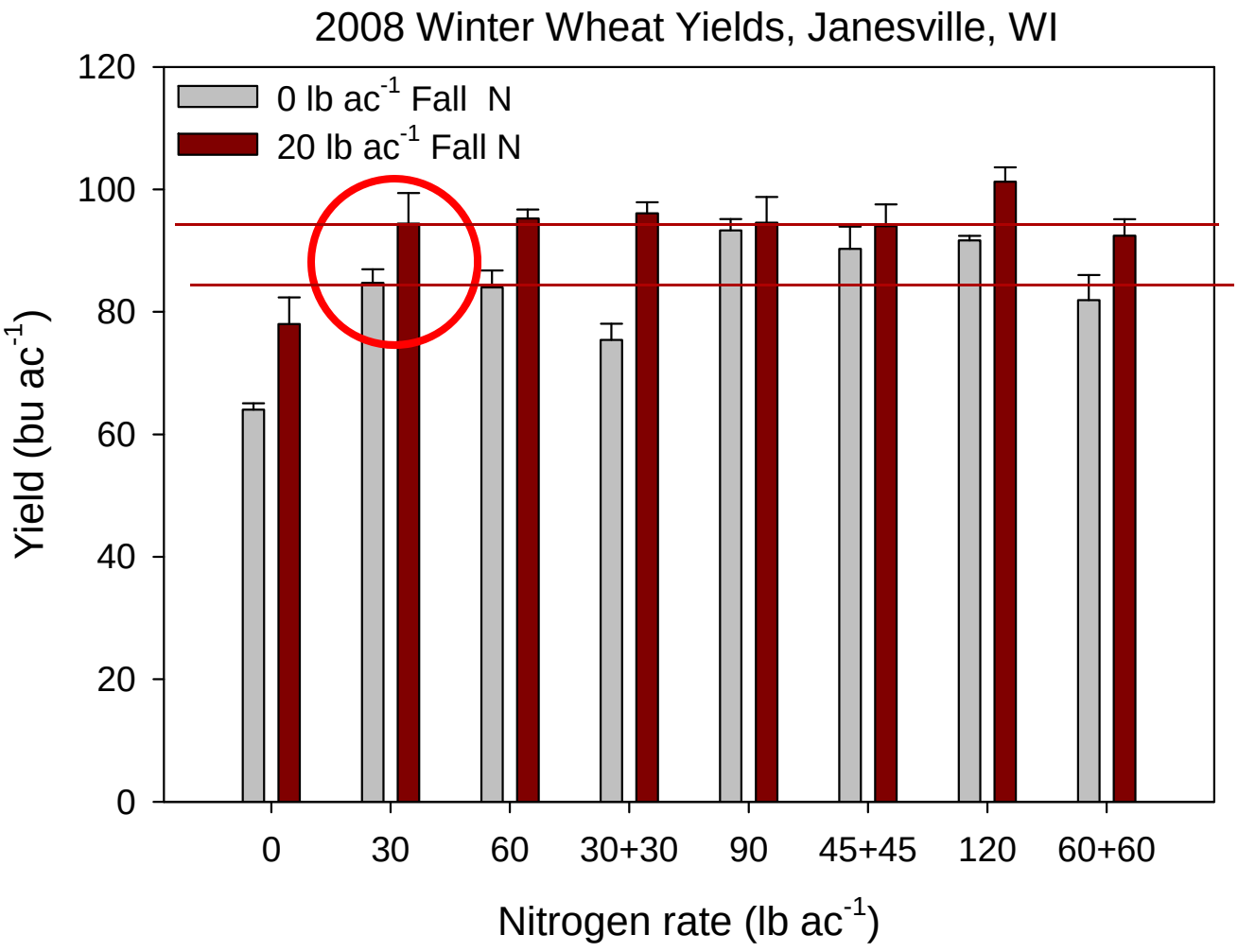
Nitrogen rate & timing

- Yield response to spring N (0, 30, 60, 90, 120 lb/ac) – applied as urea
- Fall N rate (0 or 20 lb ac^{-1})
- 5 locations; 2008 (2), 2009 (1), 2010 (2)

Nitrogen rate

- Yield response to spring N (0, 30, 60, 90, 120 lb/ac) – applied as urea
- 1 location; 2009, 2010

NITROGEN - RATE



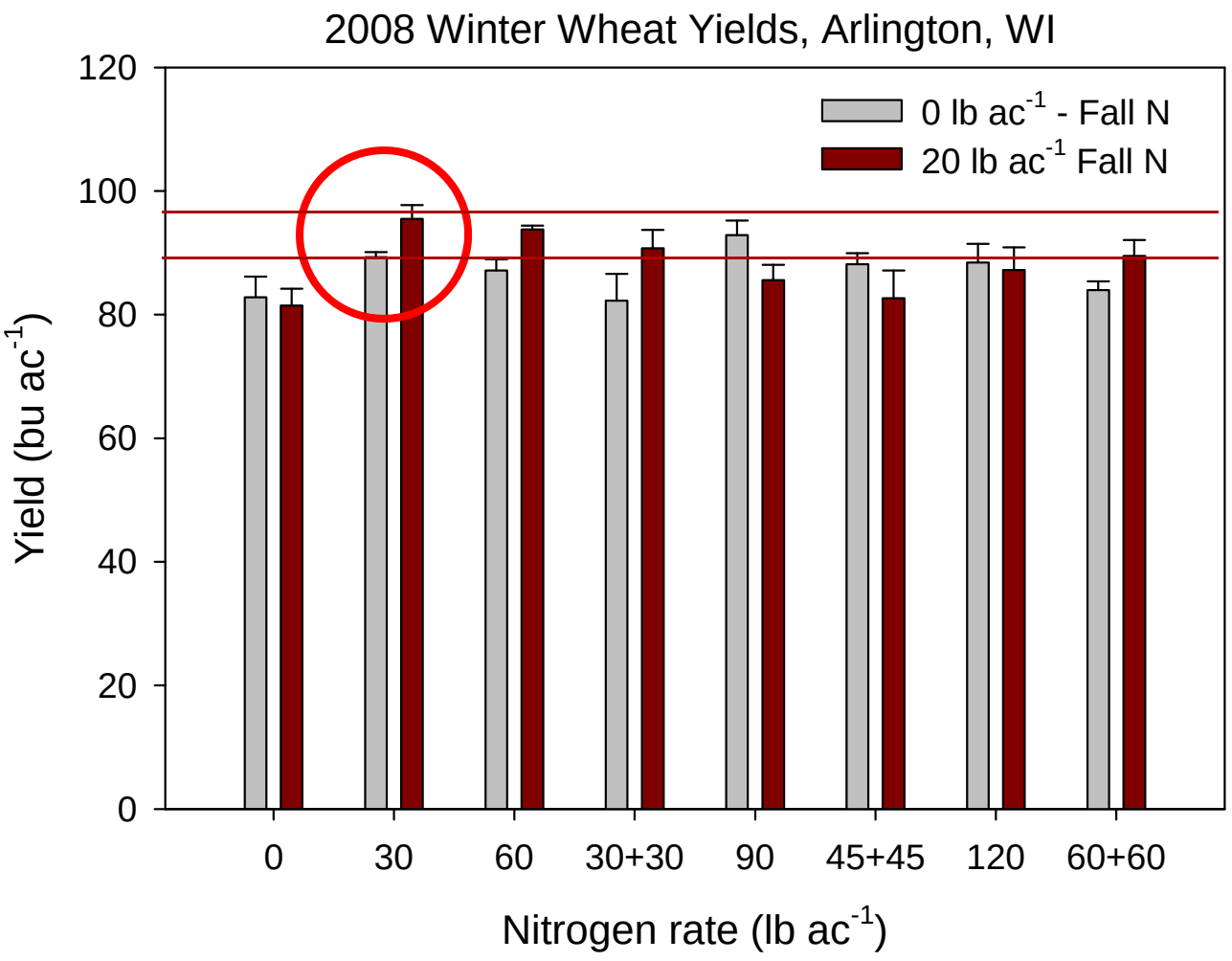
Following soybean; Recommended N rate = 30 lb ac^{-1}

No significant increase in yield above 30 lb ac^{-1} of N when 20 lb ac^{-1} of N was applied in fall.

Benefit from 20 lb ac^{-1} of N in the fall?

No benefit from split applications.

NITROGEN - RATE



Following oats; Recommended N rate = 70 lb ac^{-1}

PPNT = 94 lb/ac

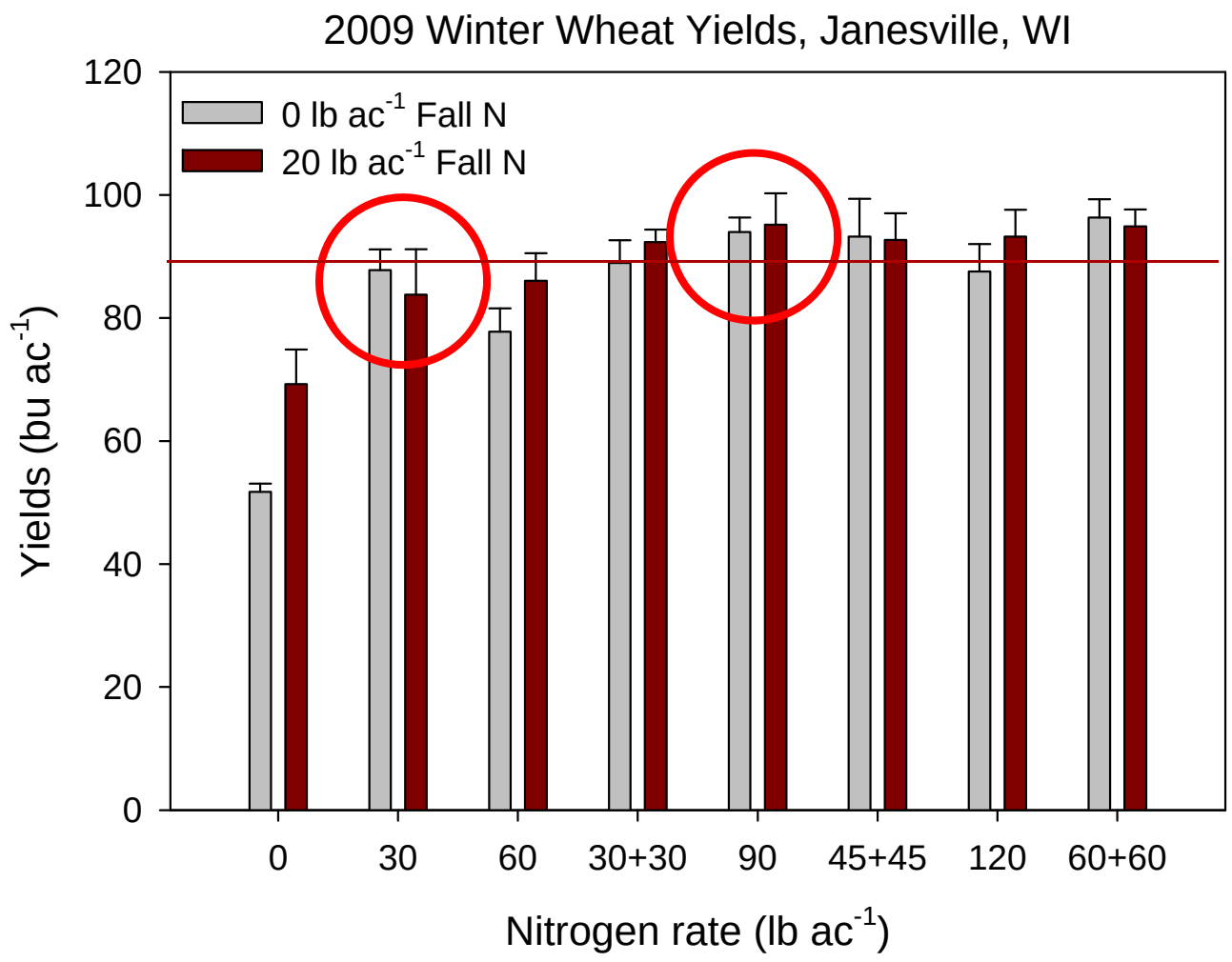
New rec = 34 lb/ac

No significant increase in yield above 30 lb ac^{-1} of N.

Benefit from 20 lb ac^{-1} of N in the fall?

No benefit from split applications.

NITROGEN - RATE



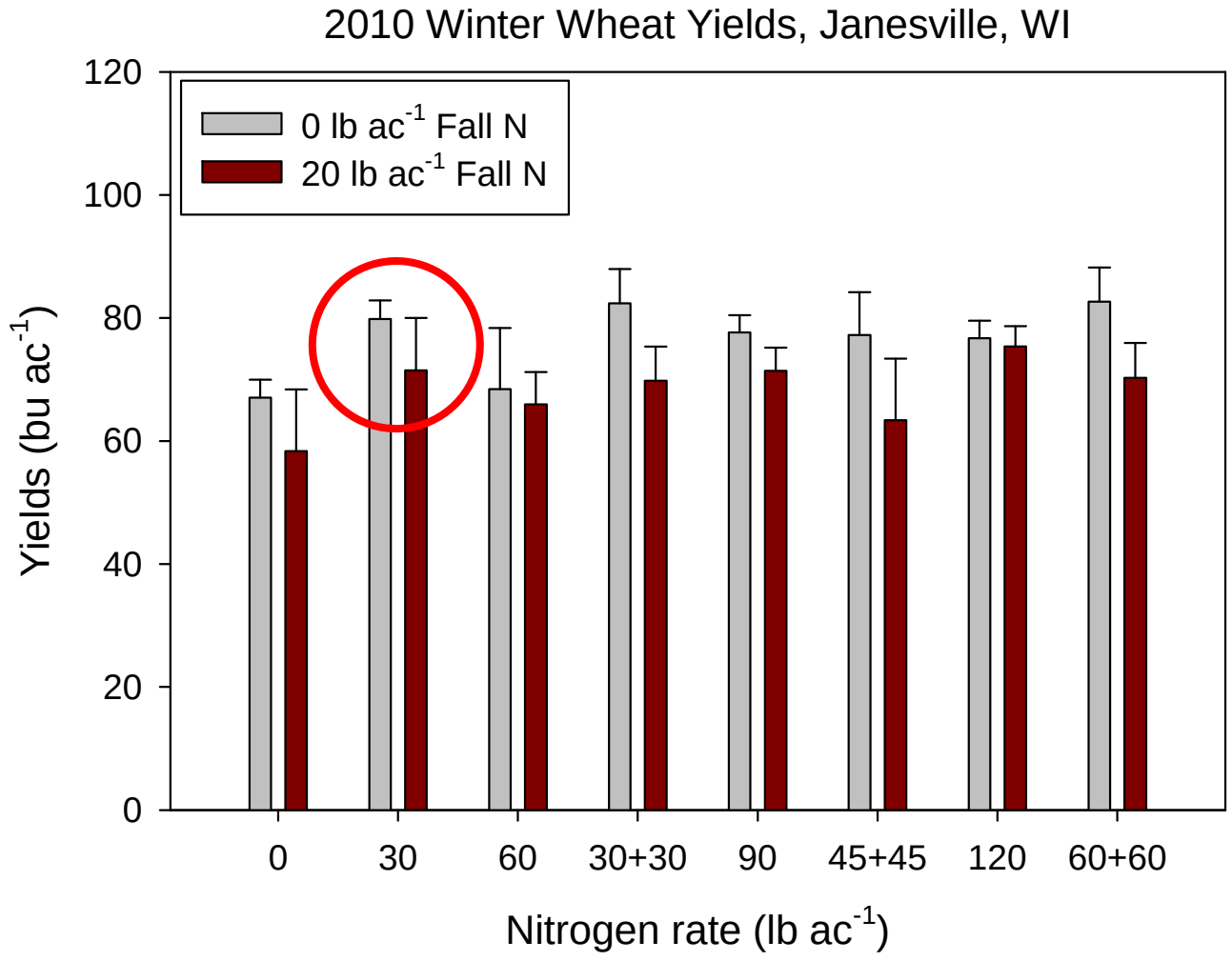
Following soybean; Recommended N rate = 30 lb ac^{-1}

No significant increase in yield above 30 lb ac^{-1} of N with no fall N.

No benefit from 20 lb ac^{-1} of N in the fall.

Benefit from split applications?

NITROGEN - RATE



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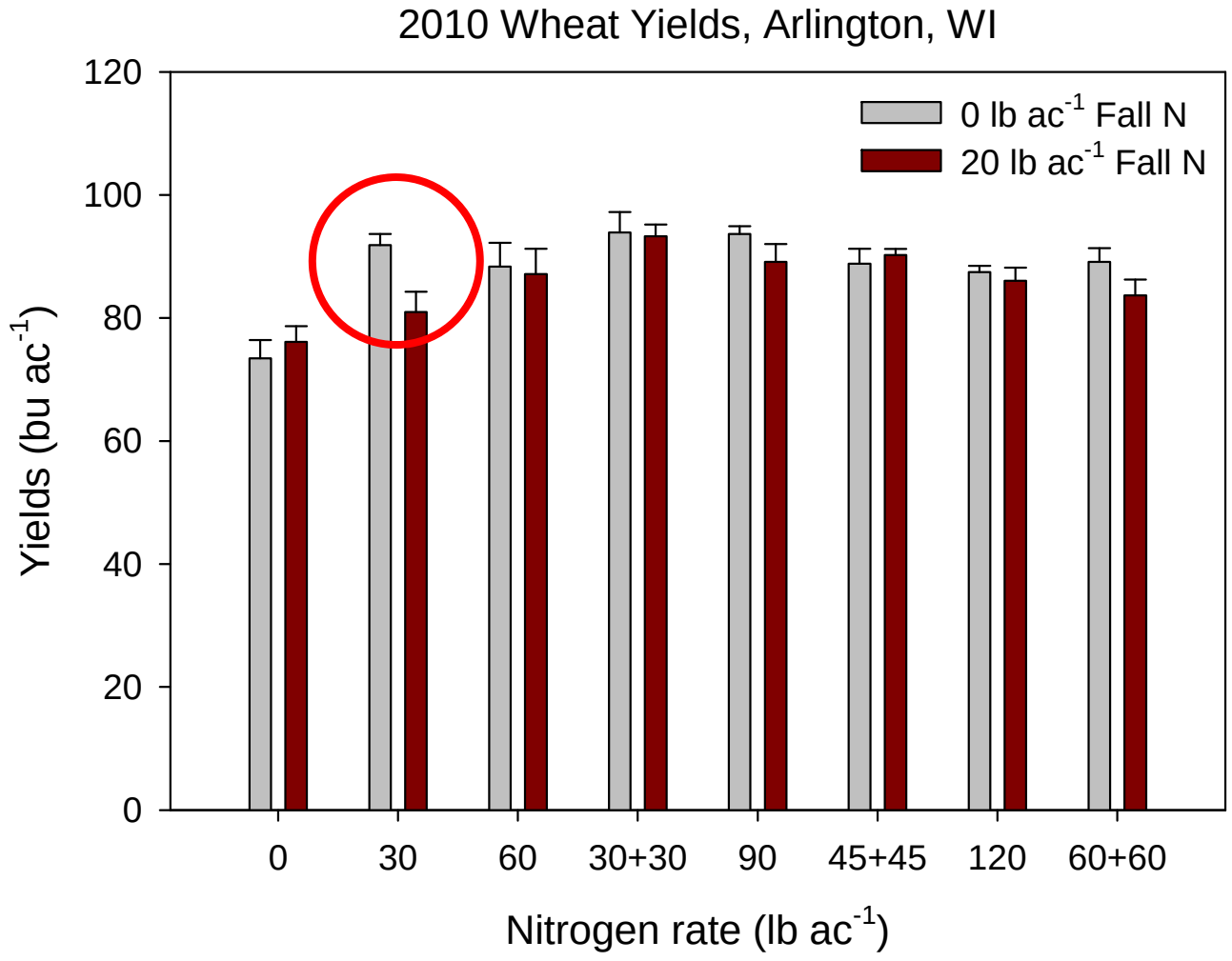

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N RESPONSE AT CHILTON

N Rate (lb/ac)	2008 Yield (bu/ac)	2010 Yield (bu/ac)
0	79	56
30	87	56
60	92	60
90	89	53
120	92	63

Both sites had SOM >3%
Previous crop = oats
No recent manure
Chisel plow

NITROGEN

- If <70 tillers ft^{-2}, then apply N as early as you can
- Otherwise wait until jointing
  - Improved NUE
  - Avoid excessive vegetative growth
  - Better diagnosis of plant N

http://www.youtube.com/watch?v=OVAbs_OZT-0

WINTER WHEAT

- New data supports N recommendations rates and credits
  - Yields maximized with 30 lb/ac (4 of 5 sites)
- Demonstrates utility of PPNT and soybean credit
- Benefit of fall applied N?
  - 2008 – maybe?
  - 2009 – no
  - 2010 – no (negative)
- Split applications – probably not worth it, but know your soil

SWEET CORN

SWEET CORN

Wisconsin is a major state for sweet corn

Processing

- 69,100 acres in 2011 in Wisconsin
- 338,500 acres in 2011 nationally

Fresh Market

- 6,700 acres in 2011 in Wisconsin
- 101,700 acres in 2011 nationally

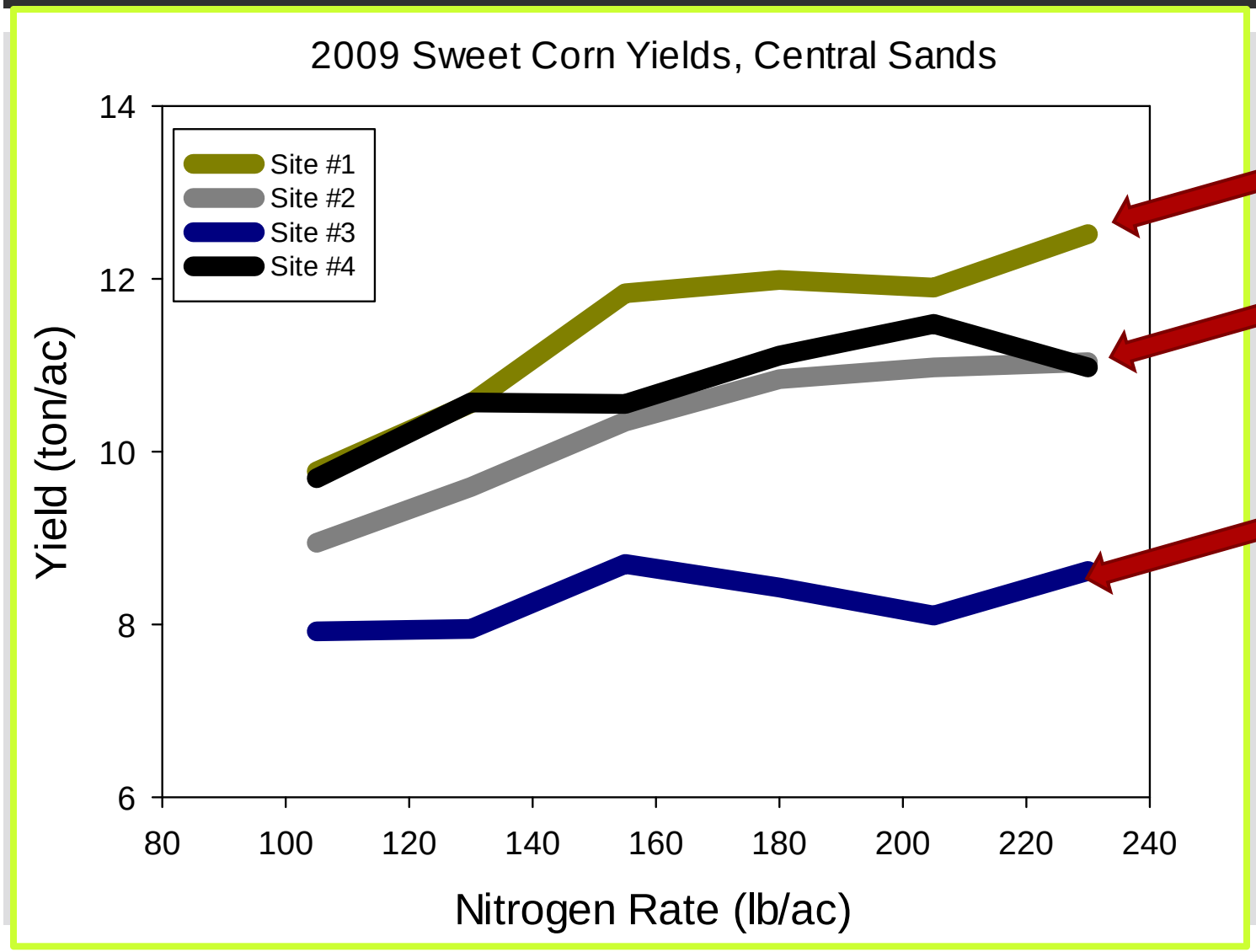
ON-FARM SWEET CORN TRIALS

- Irrigated – conducted with Ken Schroeder (Portage County) and Don Genrich (Adams County), with help from Seneca Foods
- Rainfed – conducted with Mike Rankin (Fond du Lac County) and A.J. Bussan (UW-Horticulture)

ON-FARM SWEET CORN TRIALS

- Irrigated
- 2009, 2010, 2011 – on grower fields
- Grower skipped application of N, small plots were established (skipped 90 lb-N/ac of AA)
- N rates: 105, 130, 155, 180, 205, and 230 lb/ac of N
- Yield determined by hand harvest

SWEET CORN YIELD BY YEAR

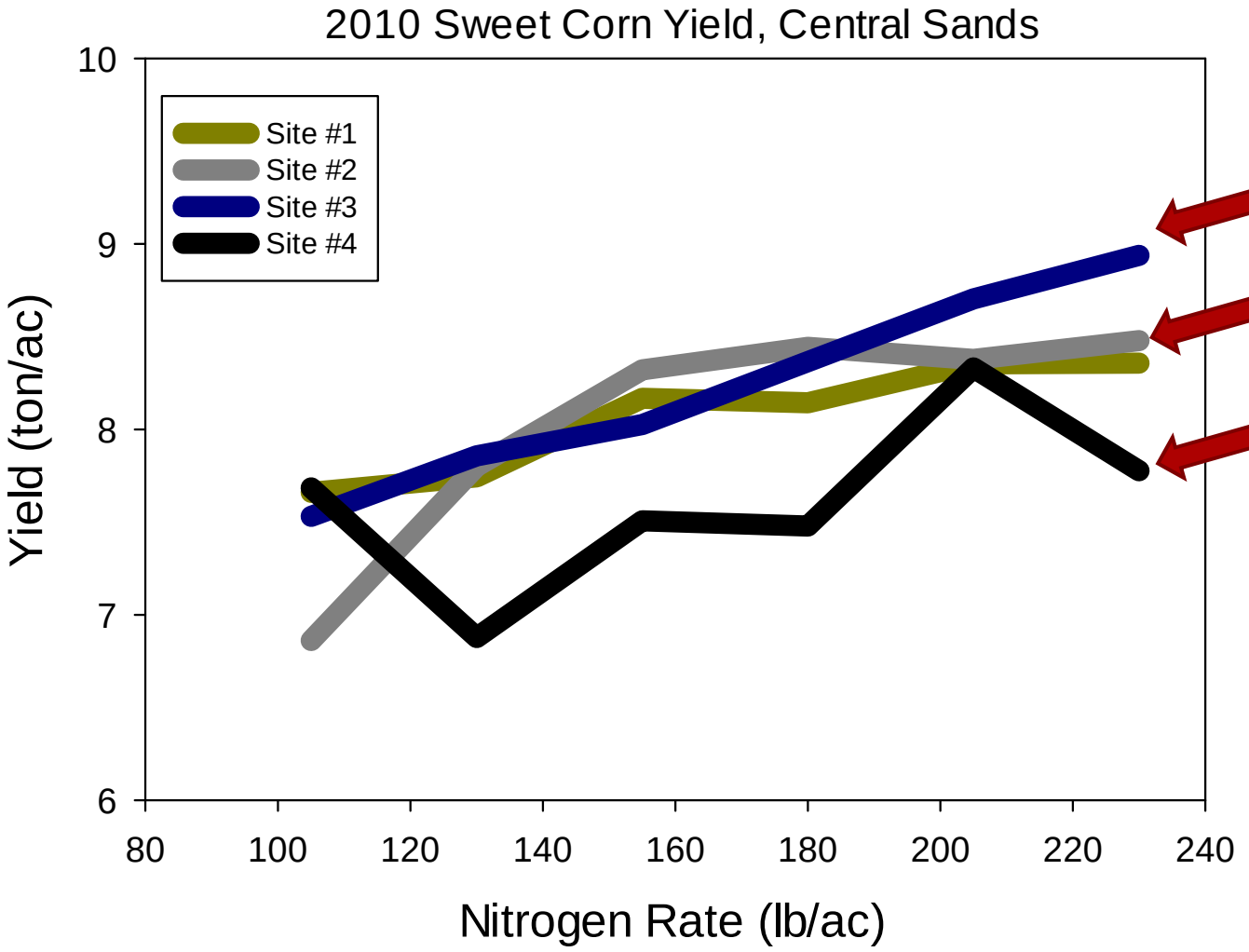


Plateau

Continue to rise

Odd response

SWEET CORN YIELD BY YEAR

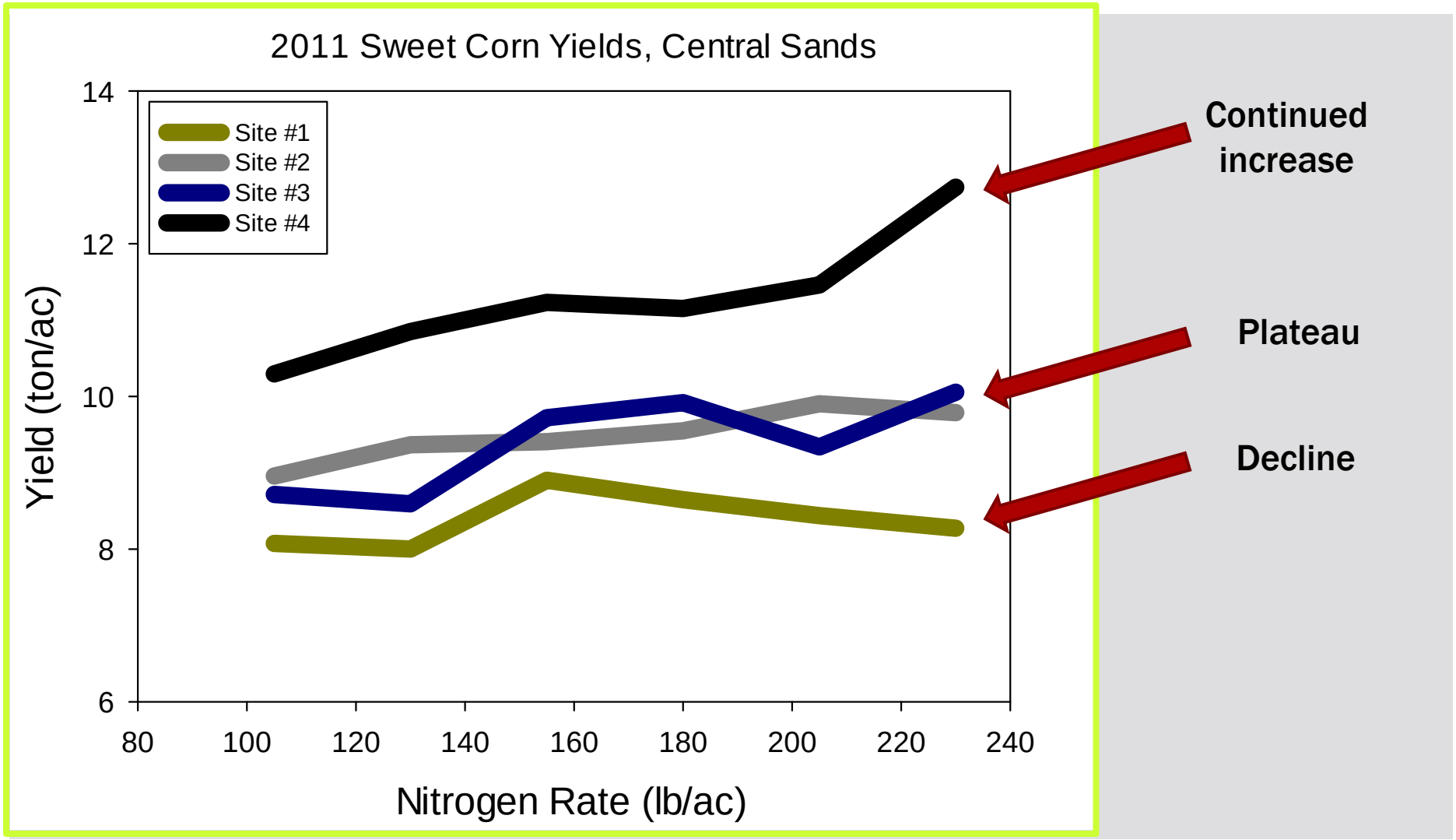


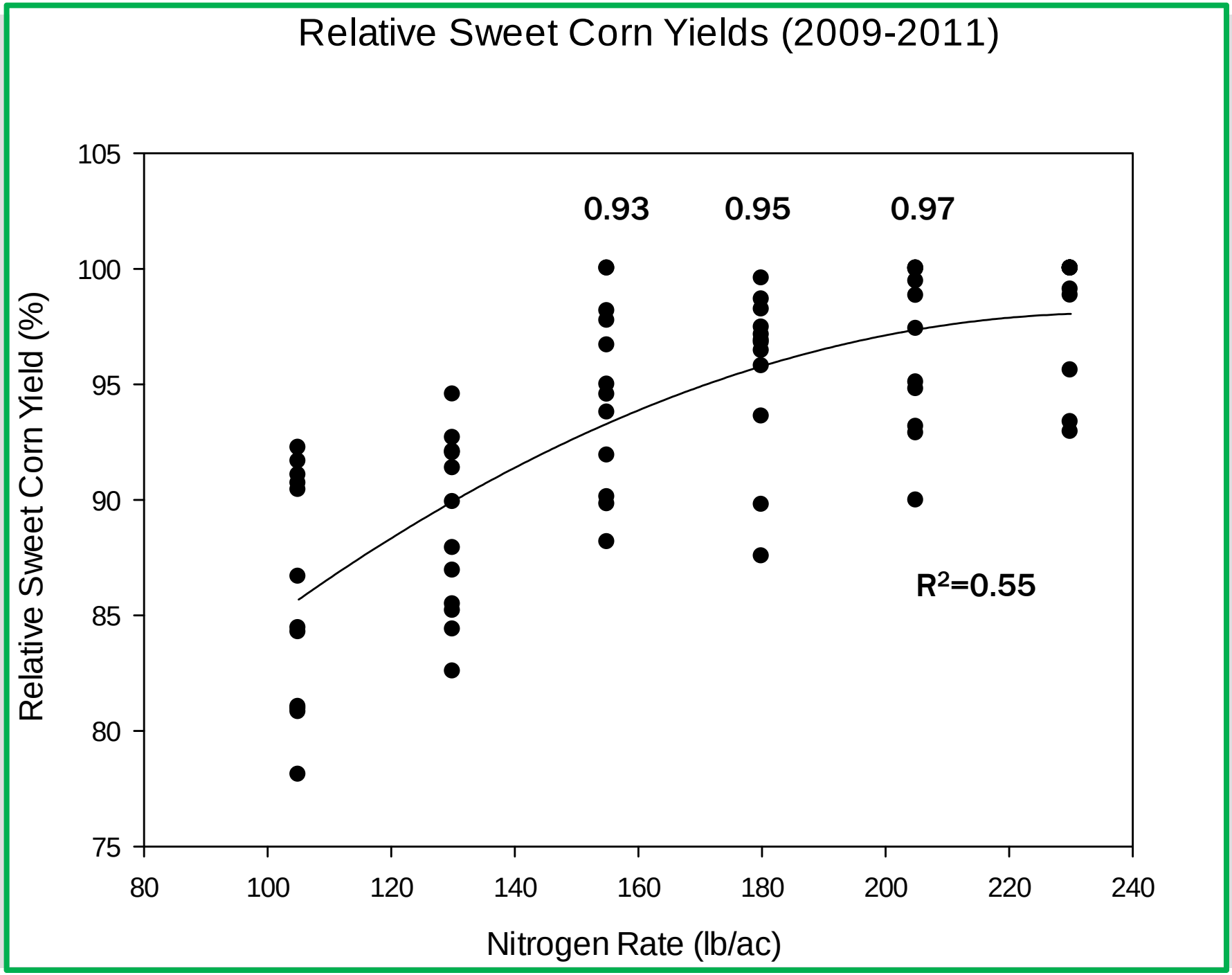
Continued increase

Plateau

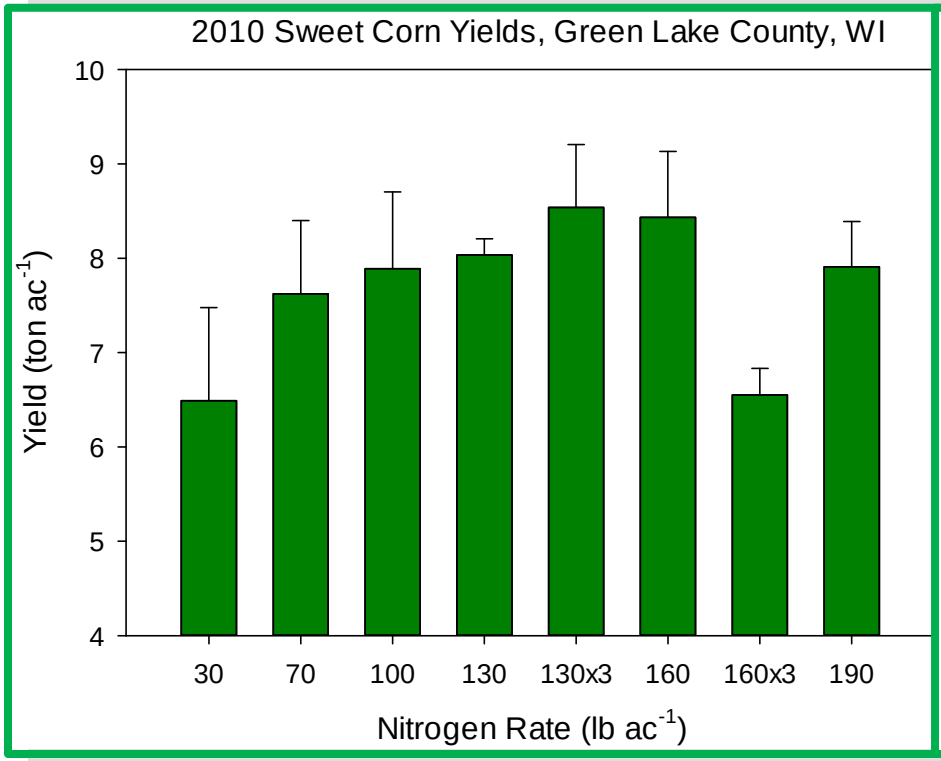
Odd response

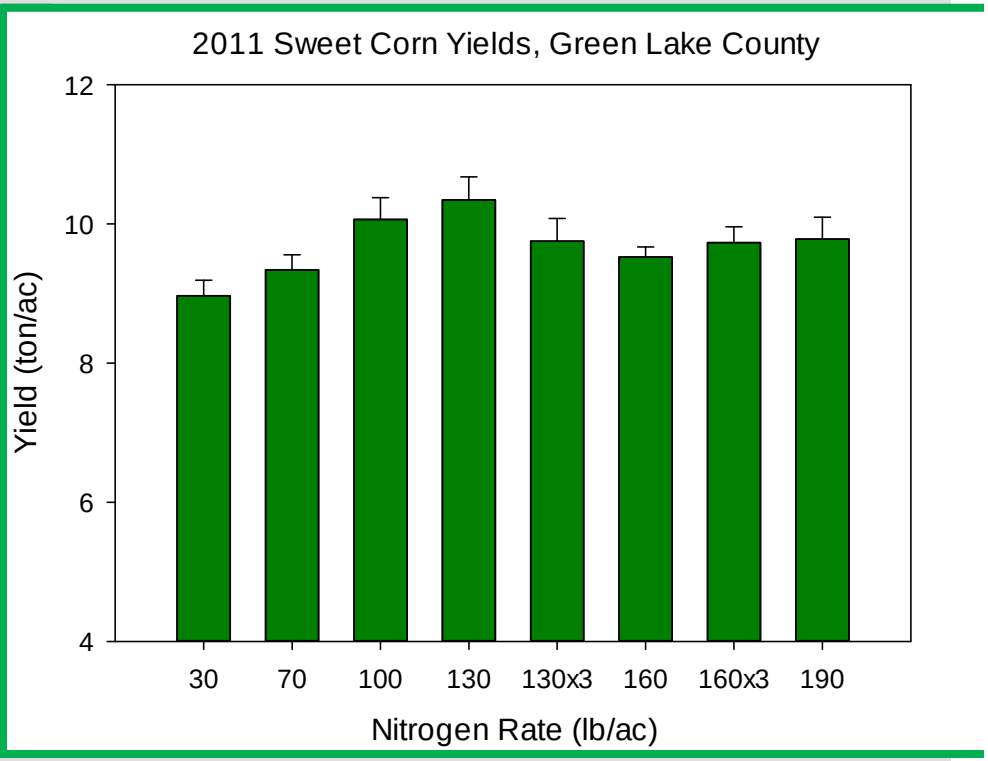
SWEET CORN YIELDS BY YEAR




Relative Sweet Corn Yields (2009-2011)
Relative Sweet Corn Yield (%)
105
100
95
90
85
80
75
0.93
0.95
0.97
R²=0.55
80
100
120
140
160
180
200
220
240
Nitrogen Rate (lb/ac)

RAINFED SWEET CORN





Recommended rate is 130 lb/ac of N

NITROGEN GUIDELINES FOR:

- Oats – still adequate
- Winter wheat – still adequate
- Rainfed sweet corn – still adequate
- Irrigated sweet corn – working on full analysis to develop new recommendation if needed. A new recommendation would involve “caveats” such as the number of split applications.

FUTURE NITROGEN RESEARCH

Priority areas

- Corn
- Potato, sweet corn, snap bean
- Sandy soils

Other?

- Interest in more N work on small grains?
- Other crops?