NITROGEN MANAGEMENT IN 2005
Rates & Economics

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NITROGEN MANAGEMENT QUESTIONS

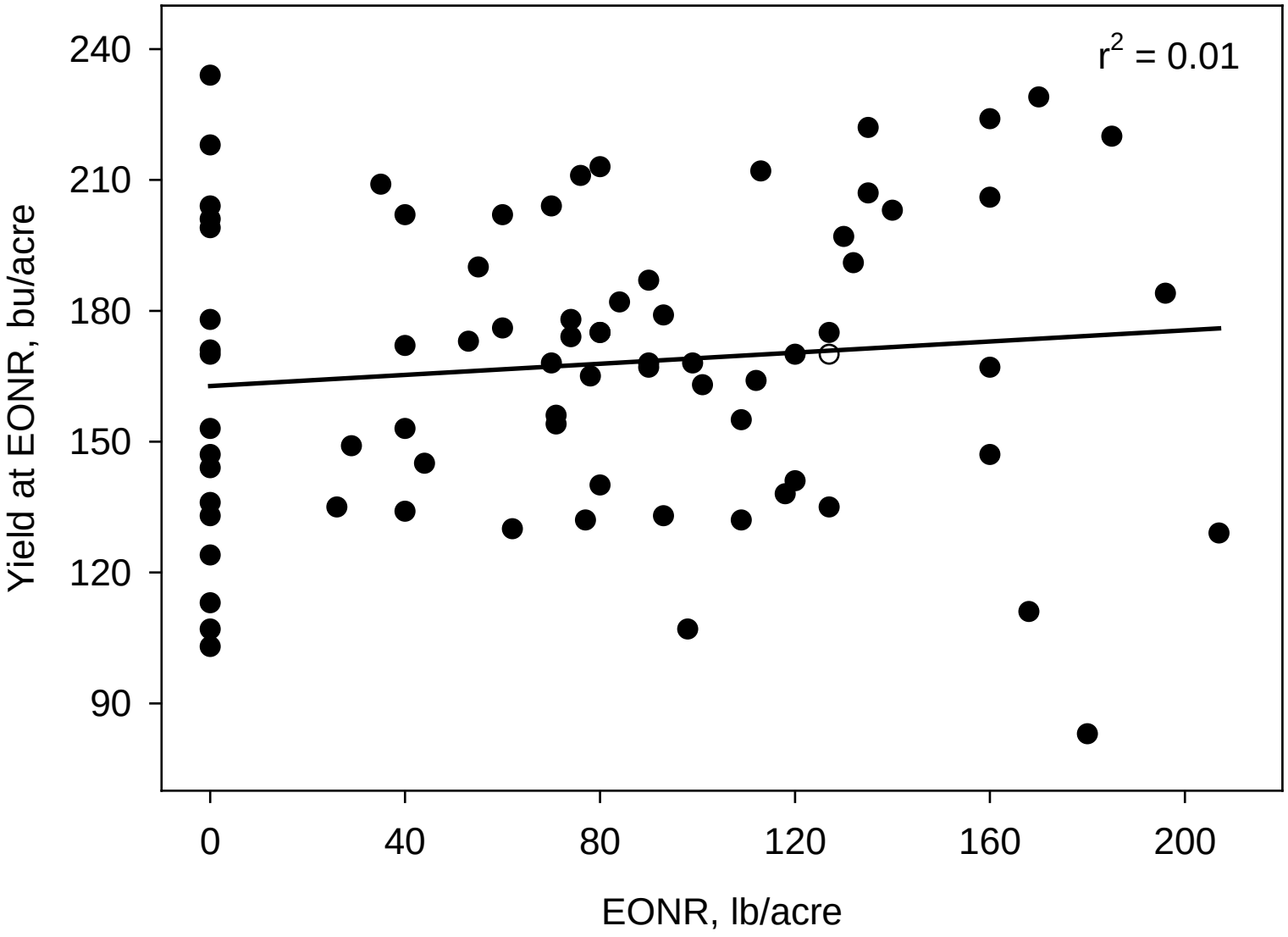
- Is optimum N rate related to yield?
- Is 1.0 to 1.2 lb N/bu a good indicator of N need?
- Has optimum N rate changed over time?
- Does corn:N price ratio affect optimum N rate?

Is optimum N rate related to yield?

- Yield-based N recommendations:
  - Historically and currently used
  - Wisconsin recs. based on N response data since 1990
  - Current interest in approaches to N recommendations

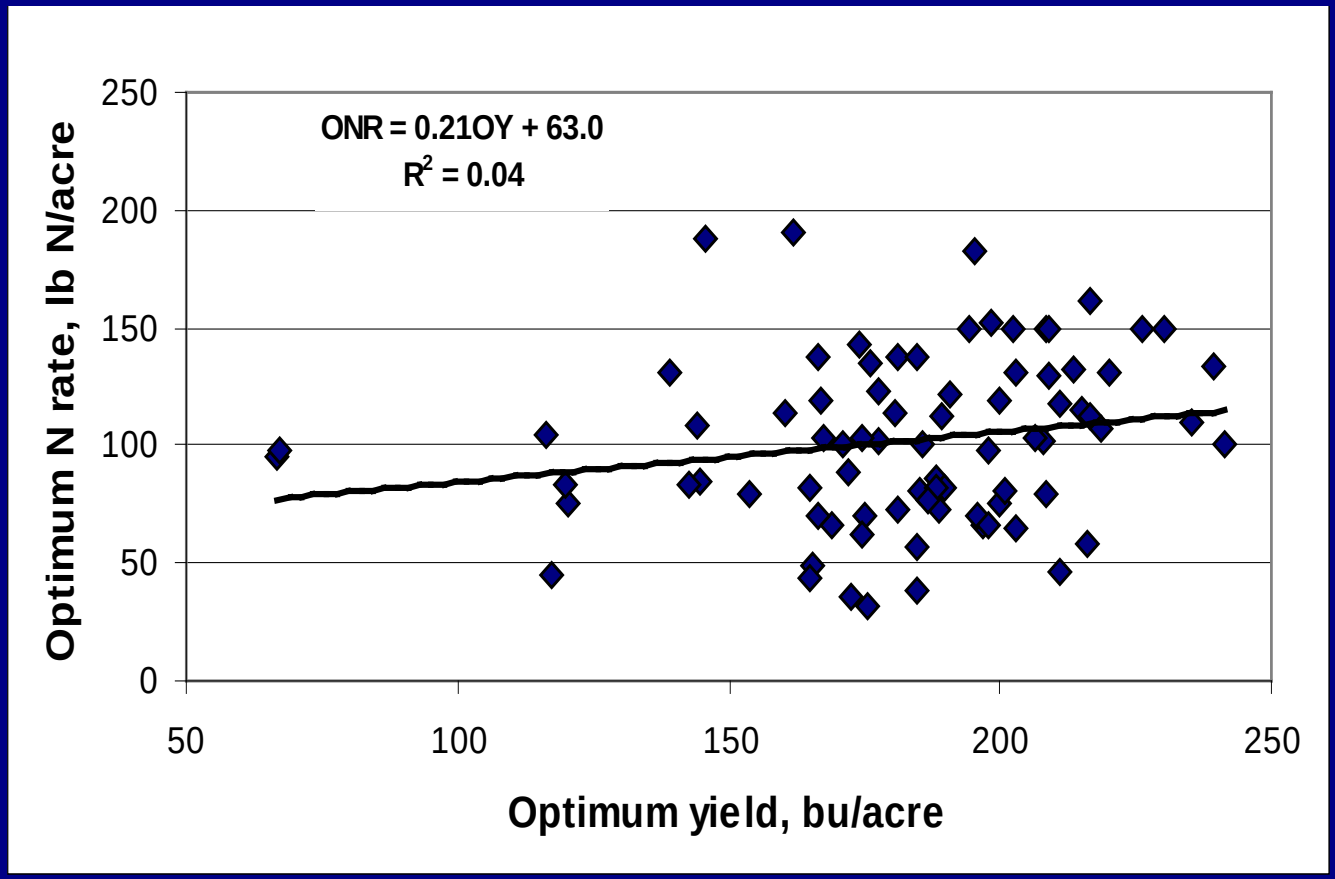
Nitrogen Recommendations for Corn

Organic matter	Sands & loamy sand		Other soils	
			Yield Potential	
	Irrigated	Non-irrigated	Med/ low	Very high/ high
---%---	----------lb N/acre----------			
<2	200	120	150	180
2-9.9	160	110	120	160
10-20	120	100	90	120
>20	80	80	80	80



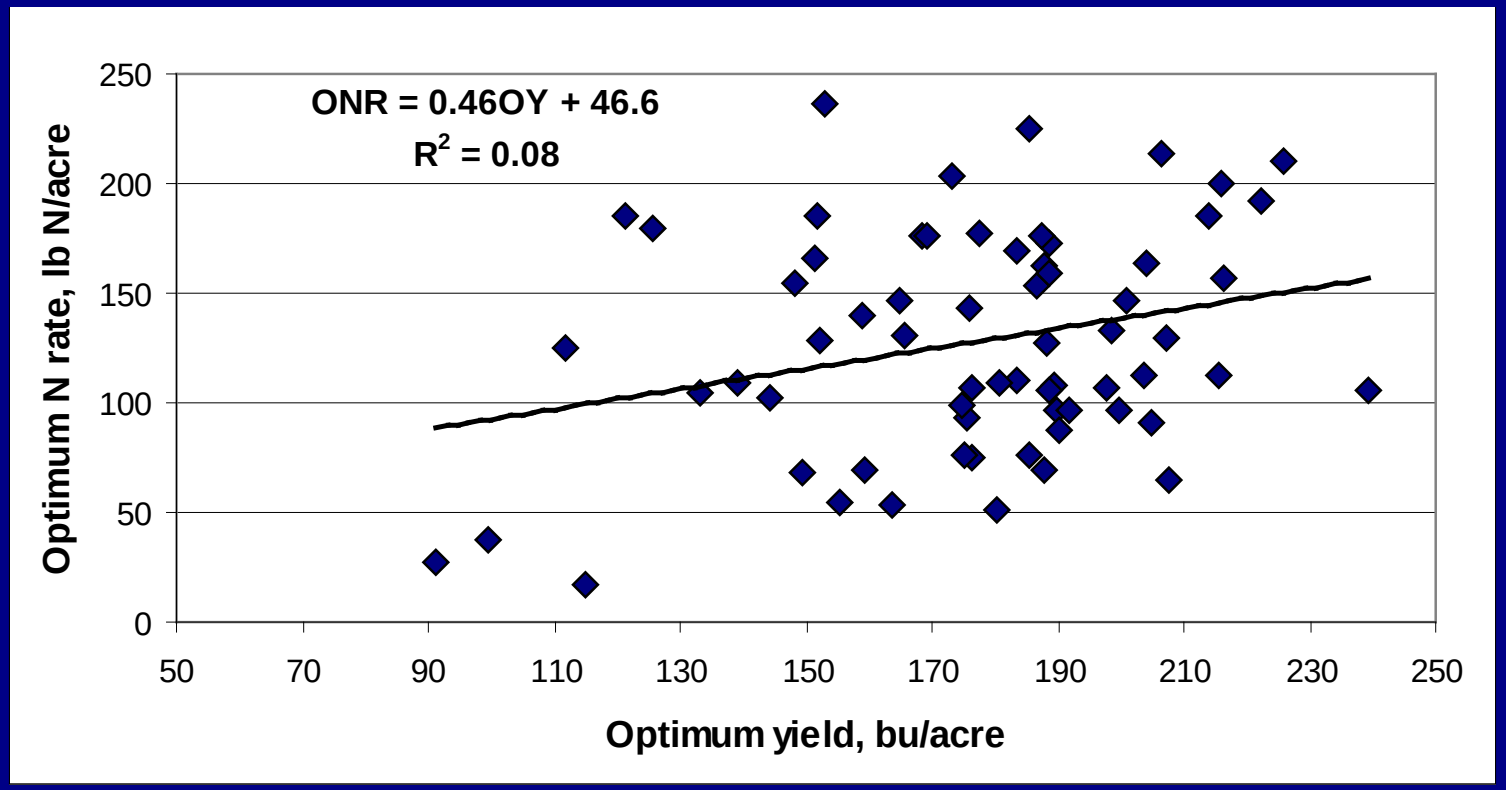
Relationship between economic optimum N rate (EONR) and corn yield at EONR for 77 HYPS, 1992 to 2003.

Relationship between optimum N rate and yield in IA (81 site years; pc = soybean)



From Nafziger et al., 2004

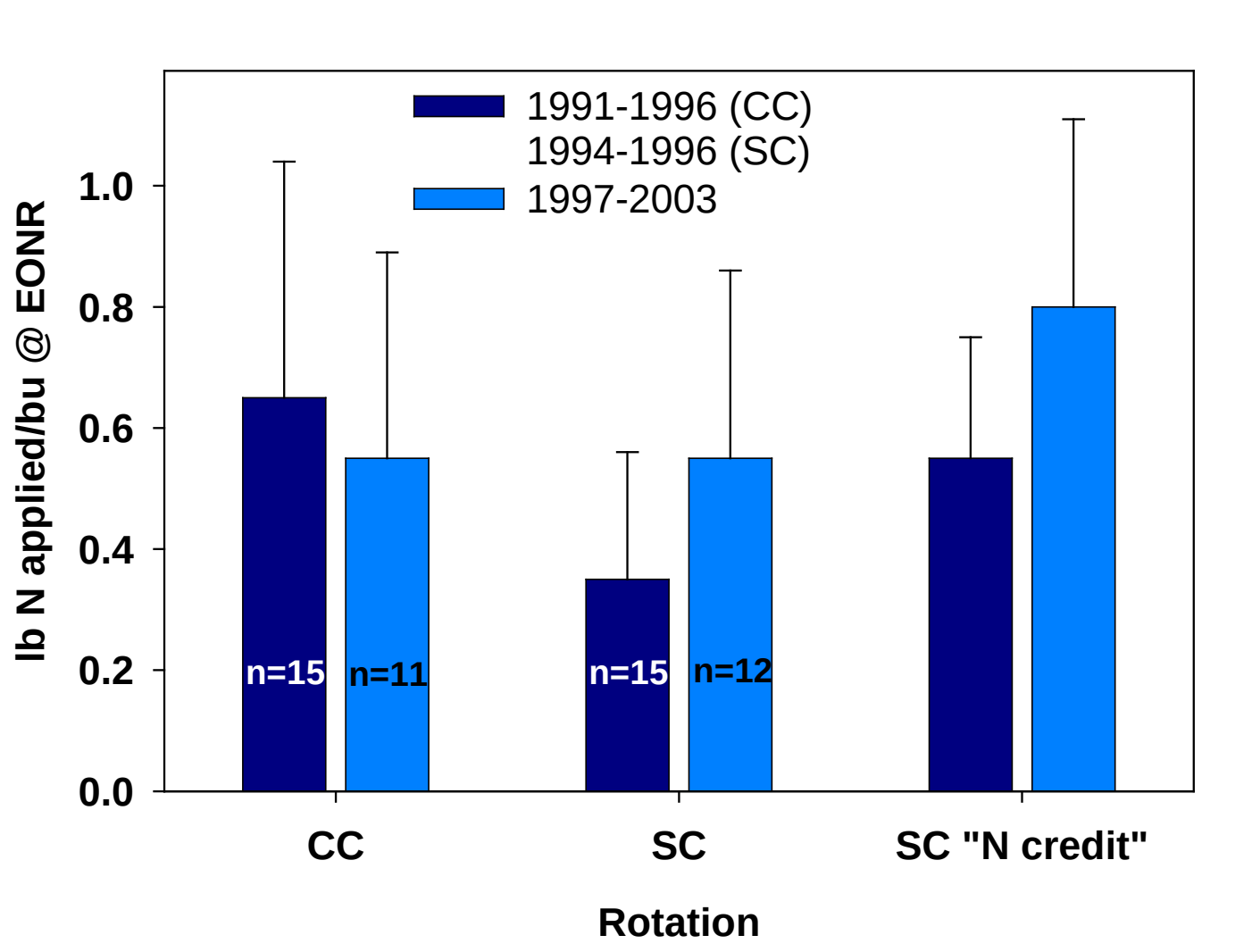
Relationship between optimum N rate and yield in IL (72 site years; pc = soybean)



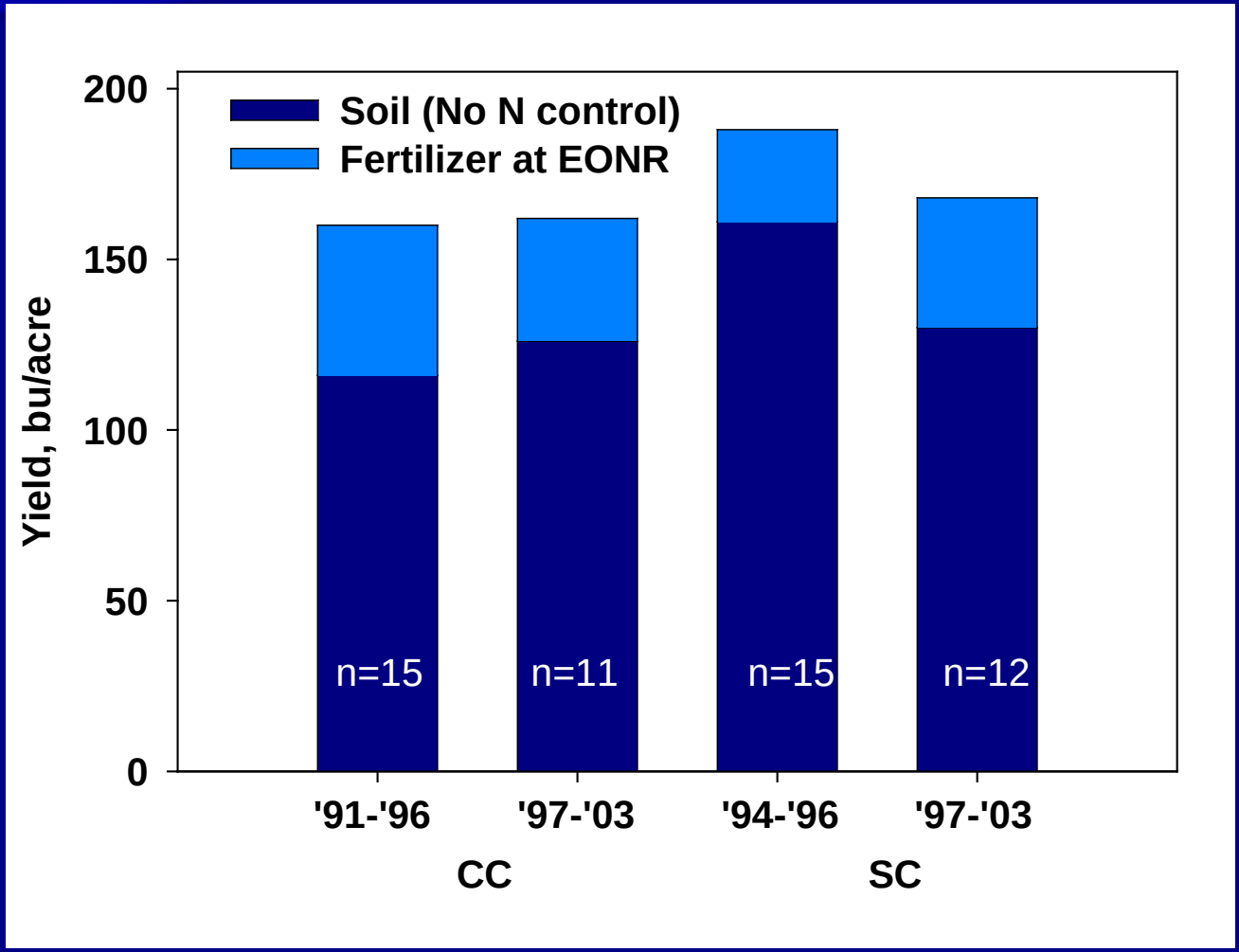
From Nafziger et al., 2004

Is 1.0 to 1.2 lb N/bu a good indicator of N need?

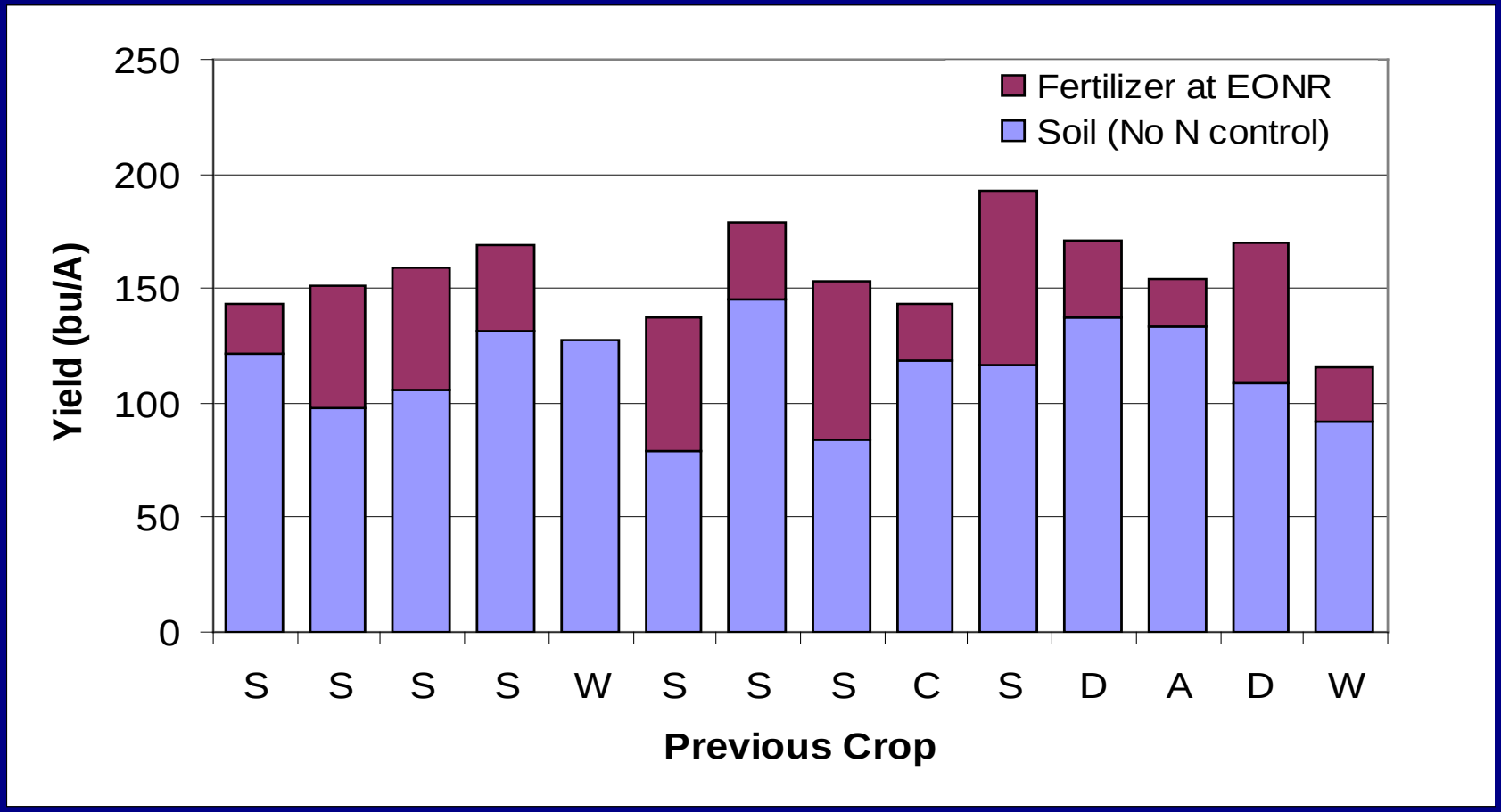
N required per bushel in WI with and without 40 lb N credit added to EONR



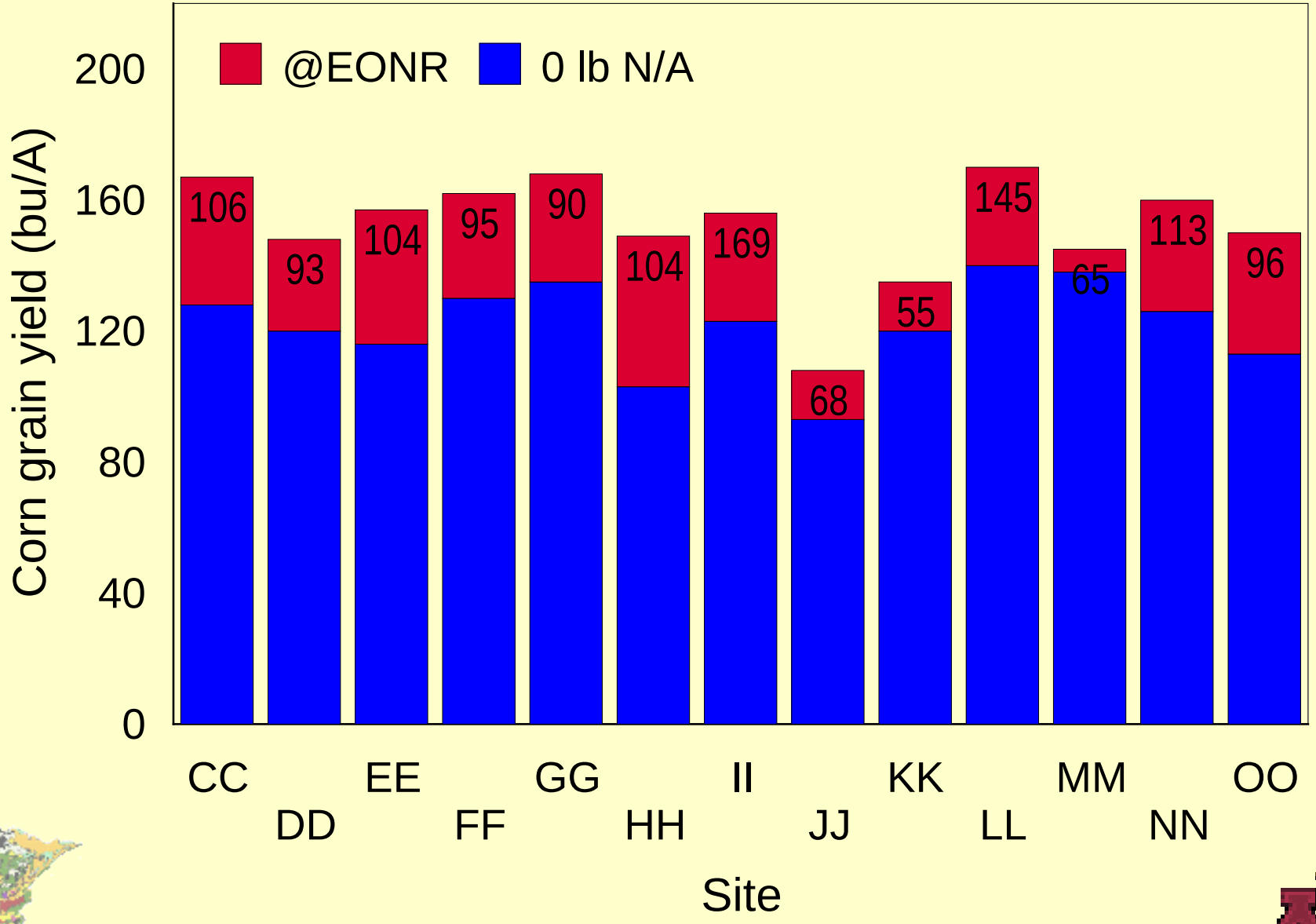
Contribution of soil N and fertilizer N to yield in WI



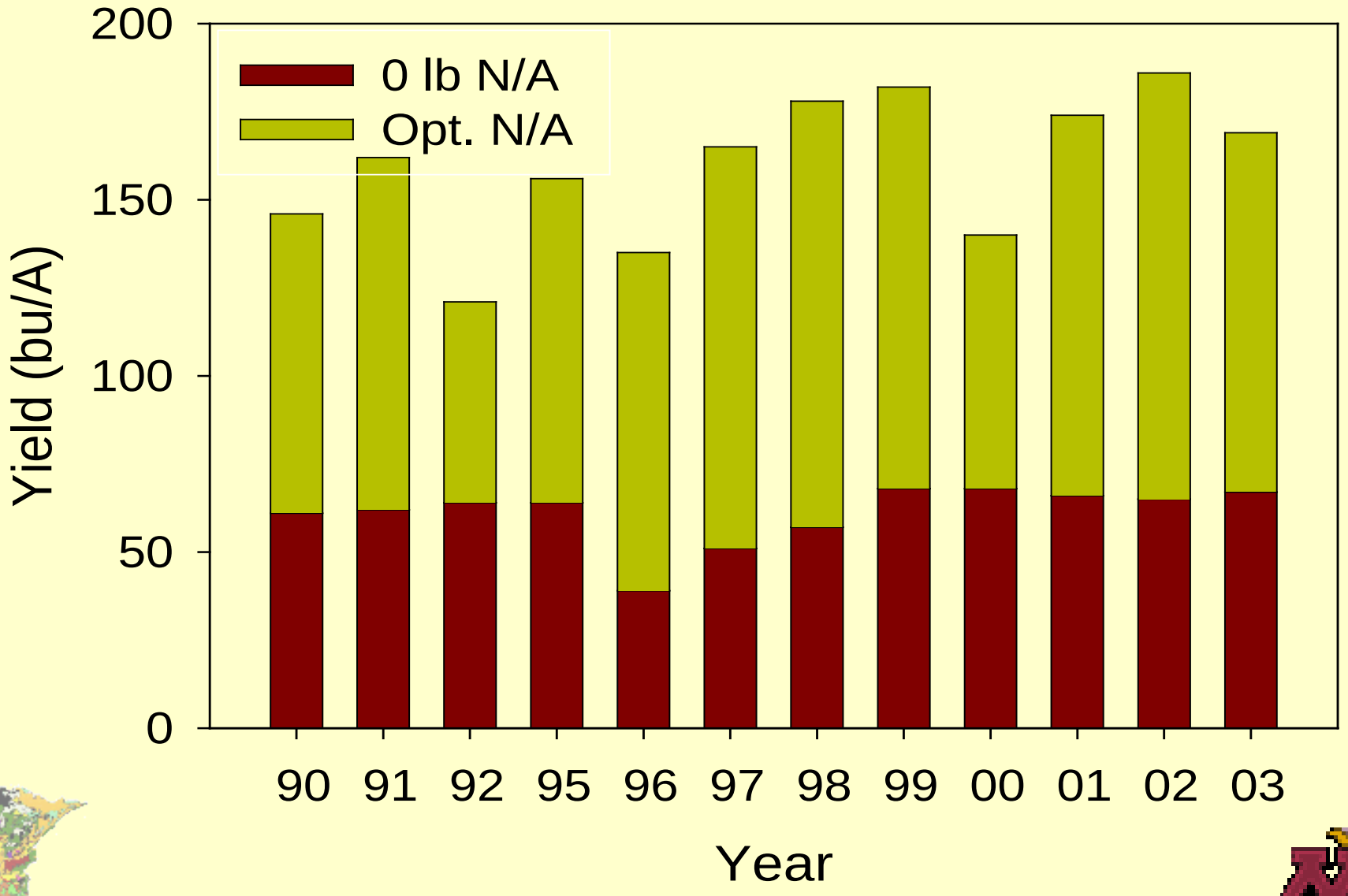
Contribution of soil N and fertilizer N to yield in MI (2002-2003)



Field-size strip trials, Corn-soybean rotation



Continuous Corn
Webster Clay Loam, 1990-2003



How much N does soil supply?

- A majority of N needed is supplied by the soil
  - WI: Soil N contributed 79% of total yield
    - 53 sites, 1991-2003, v. high/high YP sites
    - PC = corn and soybean
  - MI: Soil N contributed 74% of total yield
    - 14 sites, 2002-2003
    - PC = corn, wheat, soybean, dry bean, alfalfa

Has optimum N rate changed over time?

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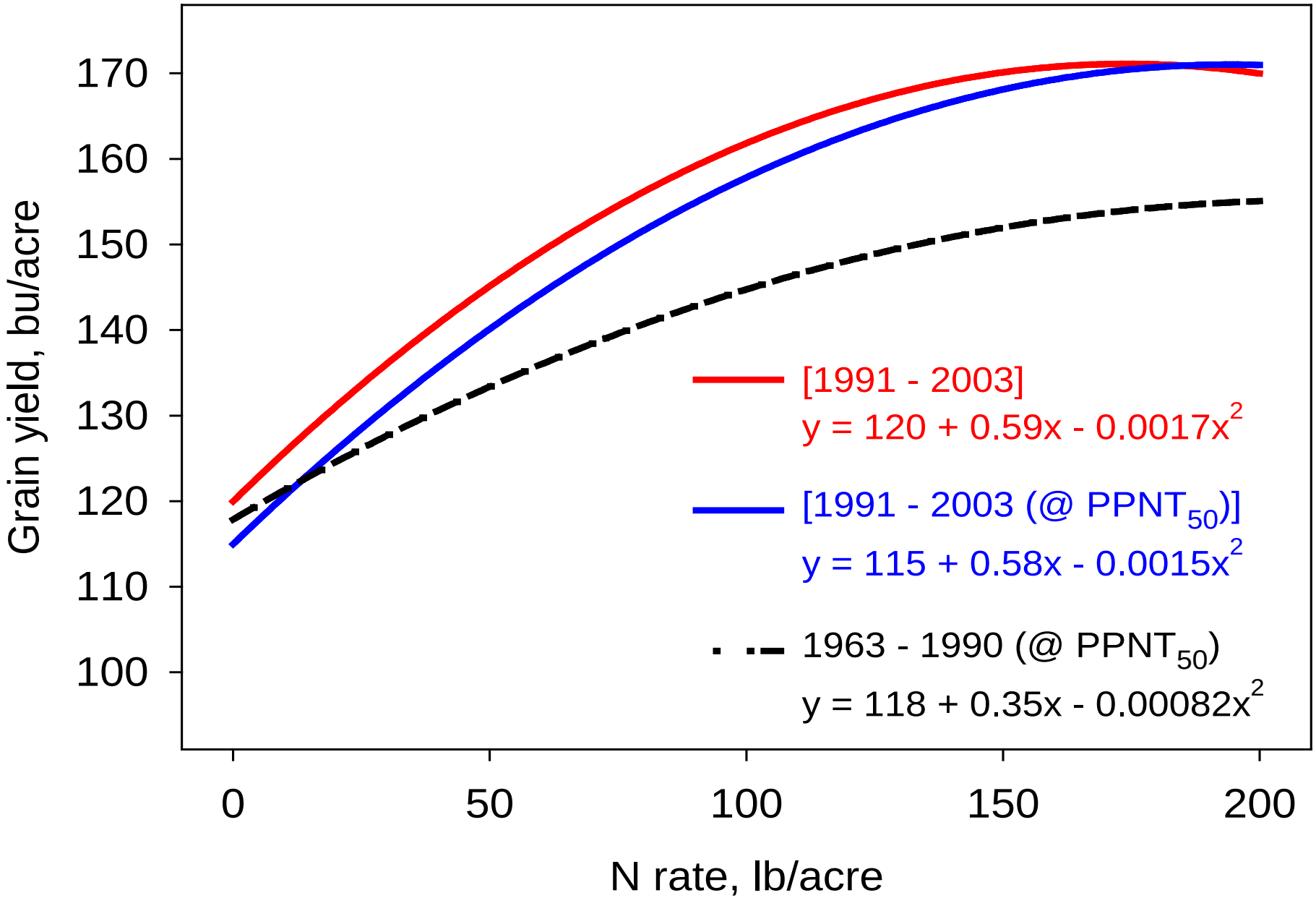
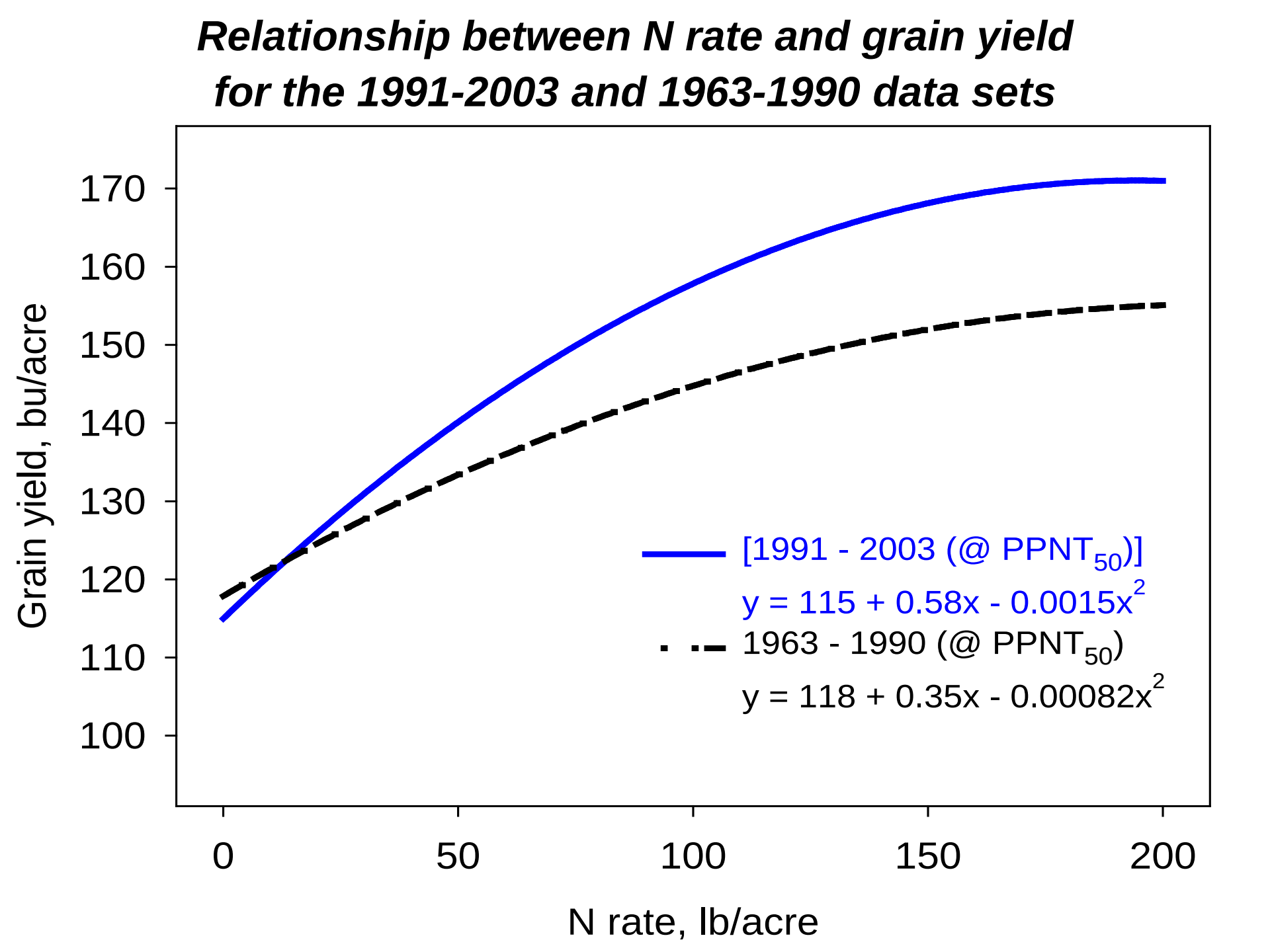
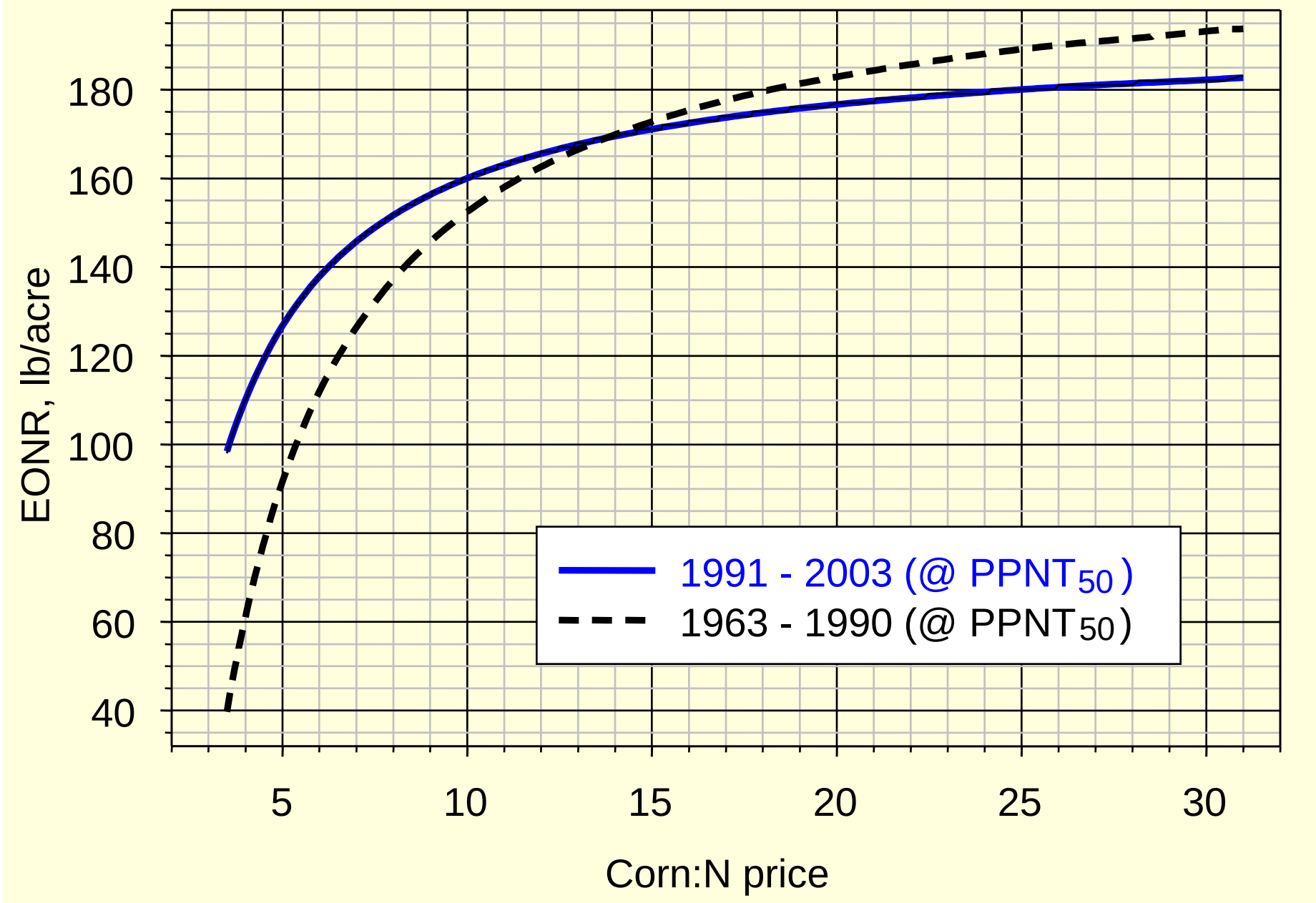
- Initial Wisconsin recommendations developed from 1963-1990 corn N response data
- Comparison with current N response data (1991-2003)

N rate – grain yield relationships for 1963 to 1990, and with and without PPNT adjustment for 1991 to 2003




Relationship between N rate and grain yield
for the 1991-2003 and 1963-1990 data sets
Grain yield, bu/acre
170
160
150
140
130
120
110
100
0
50
100
150
200
N rate, lb/acre
[1991 - 2003 (@ PPNT50)]
y = 115 + 0.58x - 0.0015x2
1963 - 1990 (@ PPNT50)
y = 118 + 0.35x - 0.00082x2

Relationship between corn:N price and EONR for 1991-2003 and 1963-1990 data sets

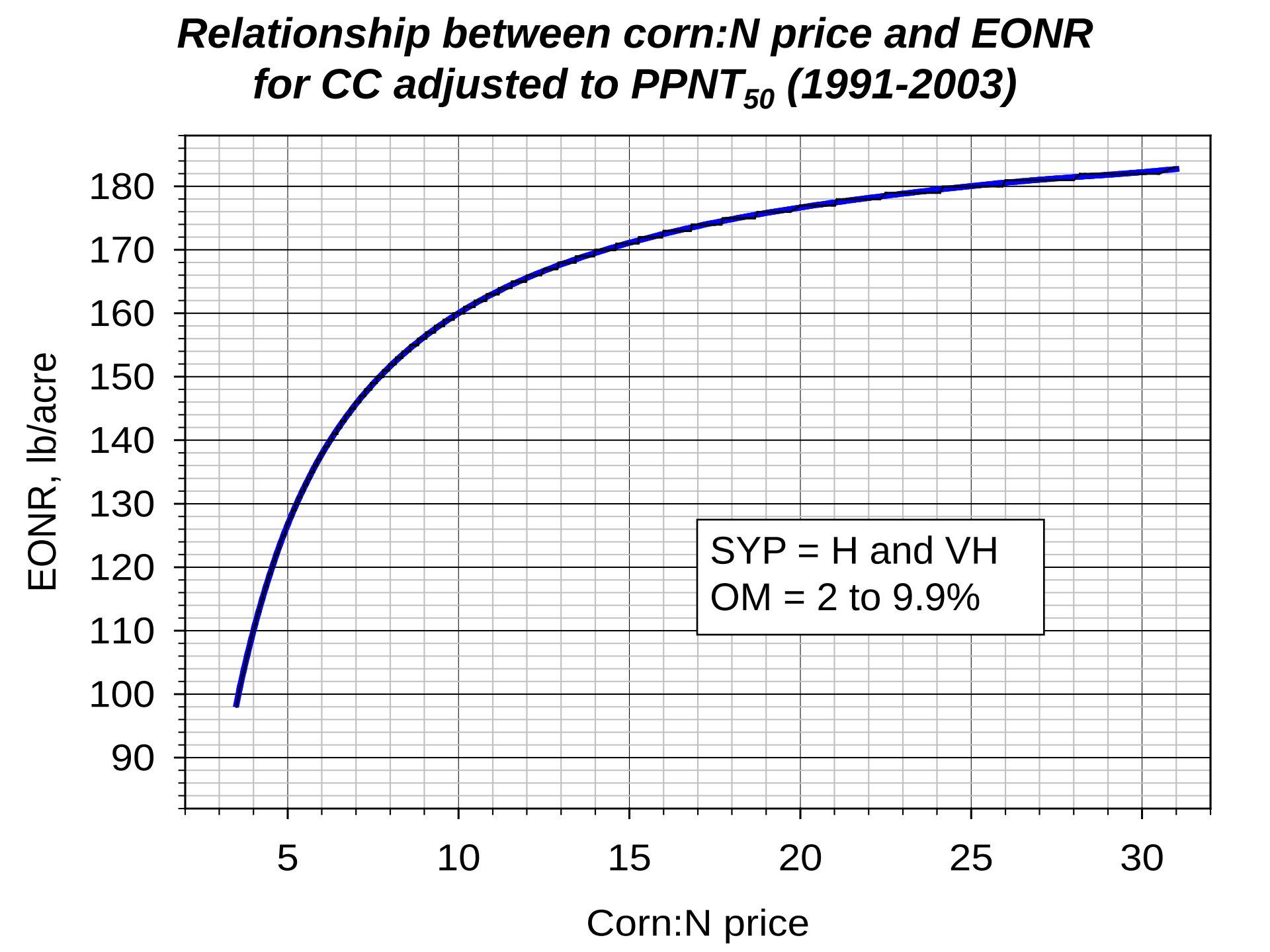


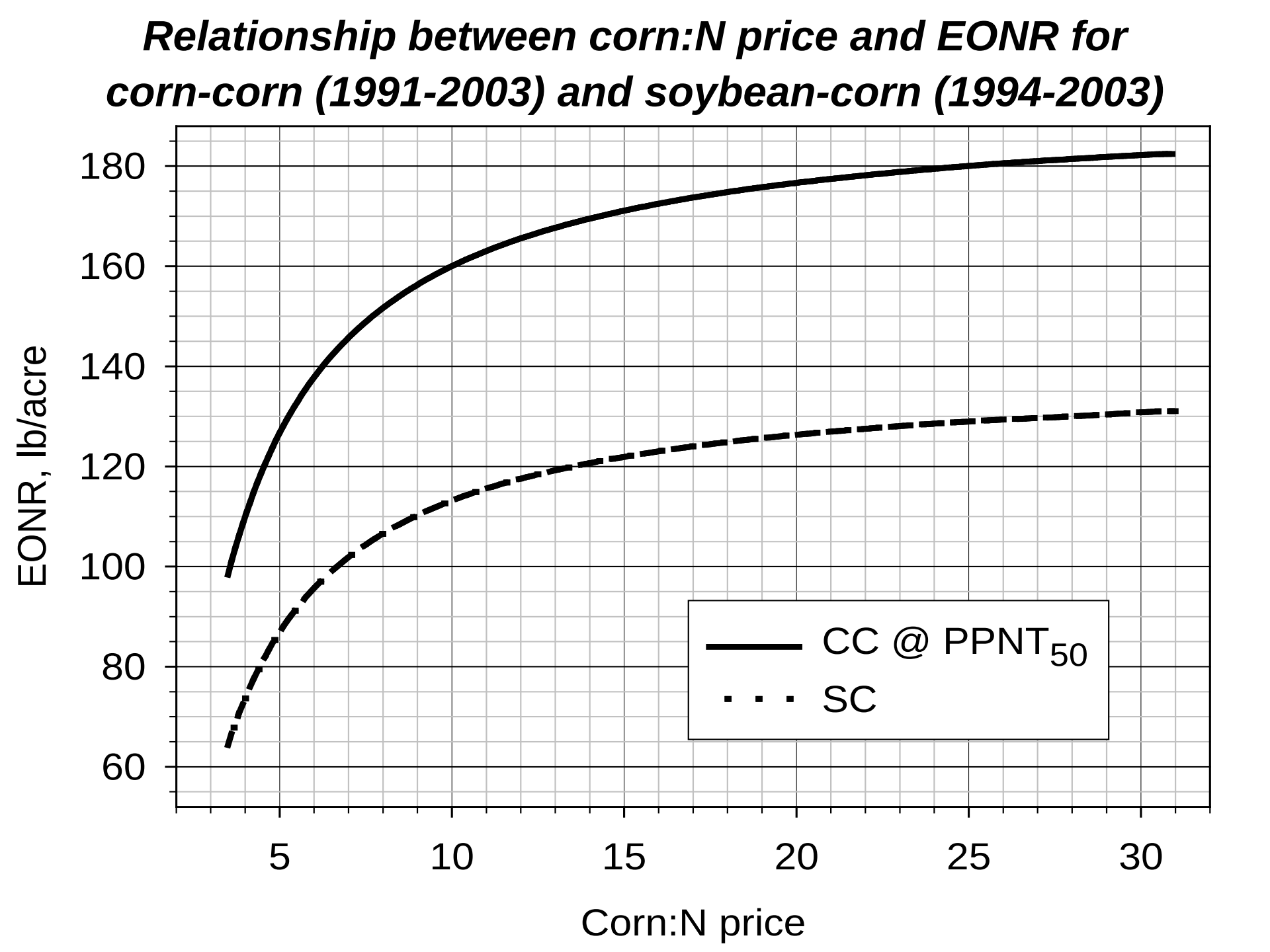
Economic optimum N rates at several price ratios and corn yields in two time periods

	Corn:N price			
Equation	6.7:1	10.1:1	13.3:1	16.6:1
	------- EONR, lb N/acre ---------			
1963–1990*	121	151	166	176
(Yield, bu/a)	148	152	153	154
1991–2003	143	160	168	173
(Yield, bu/a)	167	169	170	170

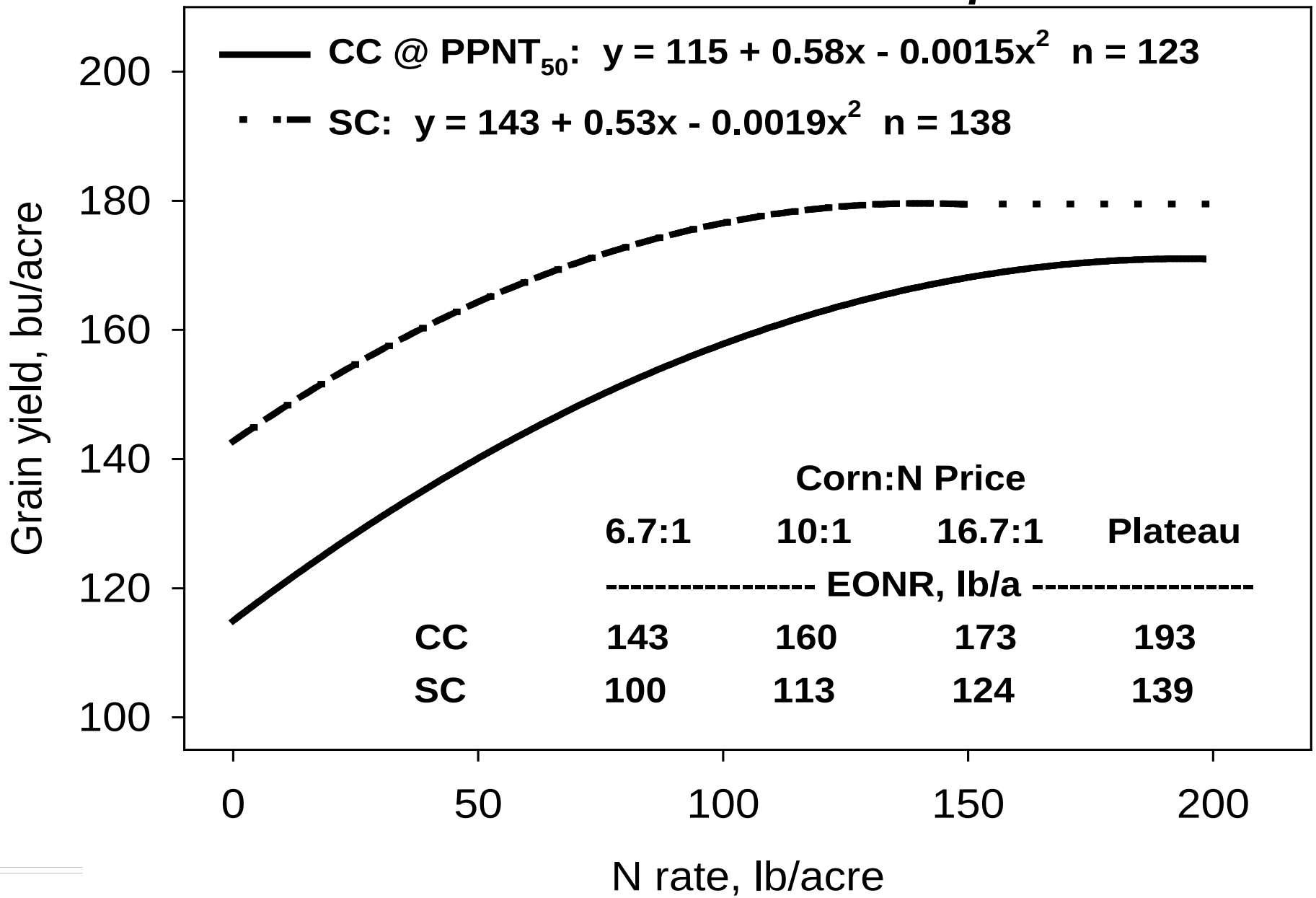
* Vanotti & Bundy (1994).

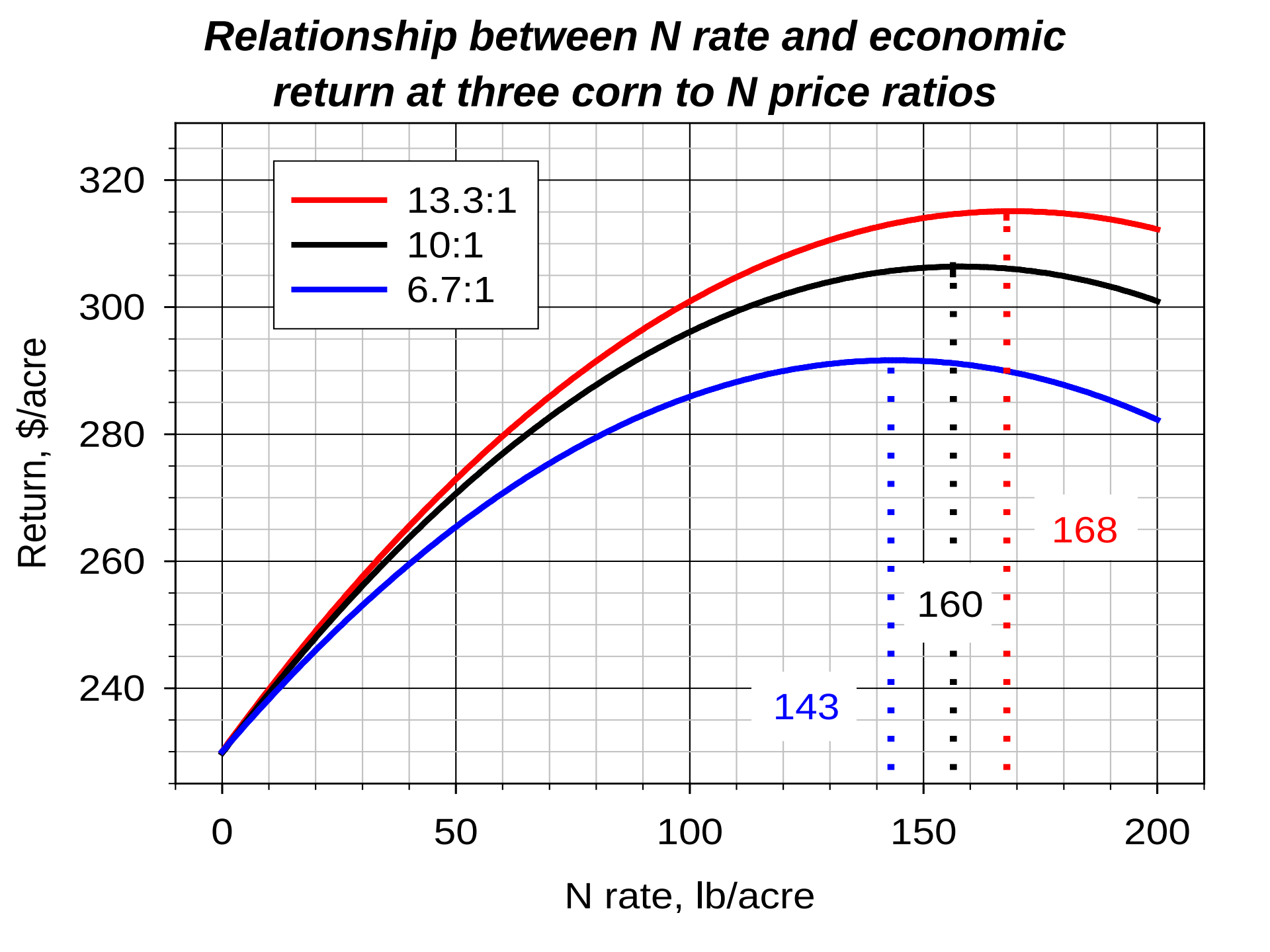
Does corn:N price ratio affect optimum N rate?


Relationship between corn:N price and EONR
for CC adjusted to PPNT50 (1991-2003)
EONR, lb/acre
180
170
160
150
140
130
120
110
100
90
5
10
15
20
25
30
Corn:N price
SYP = H and VH
OM = 2 to 9.9%


Relationship between corn:N price and EONR for corn-corn (1991-2003) and soybean-corn (1994-2003)
EONR, lb/acre
180
160
140
120
100
80
60
5
10
15
20
25
30
Corn:N price
CC @ PPNT50
SC

Relationship between N rate and yield for CC and SC and the EONR at several corn to N price ratios.




Relationship between N rate and economic return at three corn to N price ratios
13.3:1
10:1
6.7:1
320
300
280
260
240
Return, $/acre
0
50
100
150
200
N rate, lb/acre
168
160
143

Nitrogen Economic Return Calculator

- Developed by Mike Rankin, Fond du Lac County Crops and Soils Agent.
- Based on N response data for major Wisconsin soil groups
- Accessible at : http://www.uwex.edu/ces/crops/NComparison.htm

Prioritizing N Applications

- Apply some N to all potentially responsive acreage.
- Credit N from non-fertilizer sources
- Use diagnostic tests to identify N needs
- Manage N to avoid losses

Recommended Timing of Nitrogen Applications for Corn

Soil	Fall	Preplant	Sidedress
Medium/Fine Texture Well-Drained	OK*	Optimum	OK
Medium/Fine Texture Poorly Drained	No	OK	Optimum
Coarse texture	No	No	Optimum

*Includes use of BMPs for fall-applied N.