SOIL NITRATE TESTS FOR WISCONSIN CROPPING SYSTEMS

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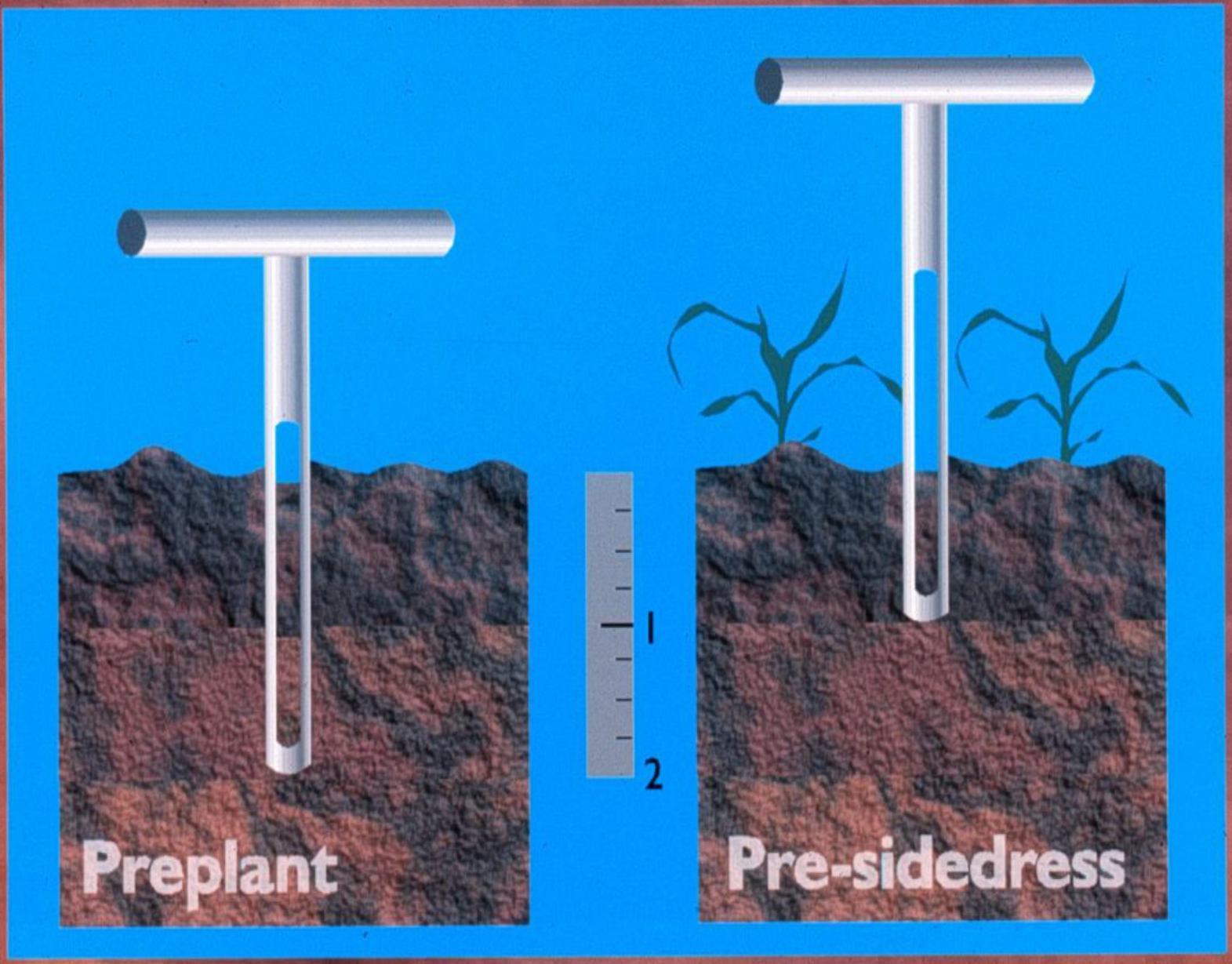
Why Use Soil Nitrate Tests?

- Agronomic and environmental benefits
- Predict corn N needs
  - Improved accuracy
  - Site-and year-specific
- Minimize nitrate loss


Preplant
1
2
Pre-sidedress

Preplant Soil Nitrate Test (PPNT)

- Measures residual (carryover) nitrate
  - Corn after corn
  - Medium and fine textured soils
  - Normal or below normal rain
  - Available N exceeds crop need
- Not useful on sands, loamy sands

Preplant Soil Nitrate Test (PPNT)

- Collect samples in early spring (preplant)
- Sample 0-1 ft. and 1-2 ft. depths
- Combine 15 cores per 20 acres
- Dry or freeze soon after sampling
- Nitrate in 2-3 ft. depth predicted
- Nitrogen recommendations

Nitrogen Recommendations Based on the Preplant Soil Nitrate Test

Example:

STD. N REC.

160 lb N/a

SOIL NITRATE

140 lb N/a

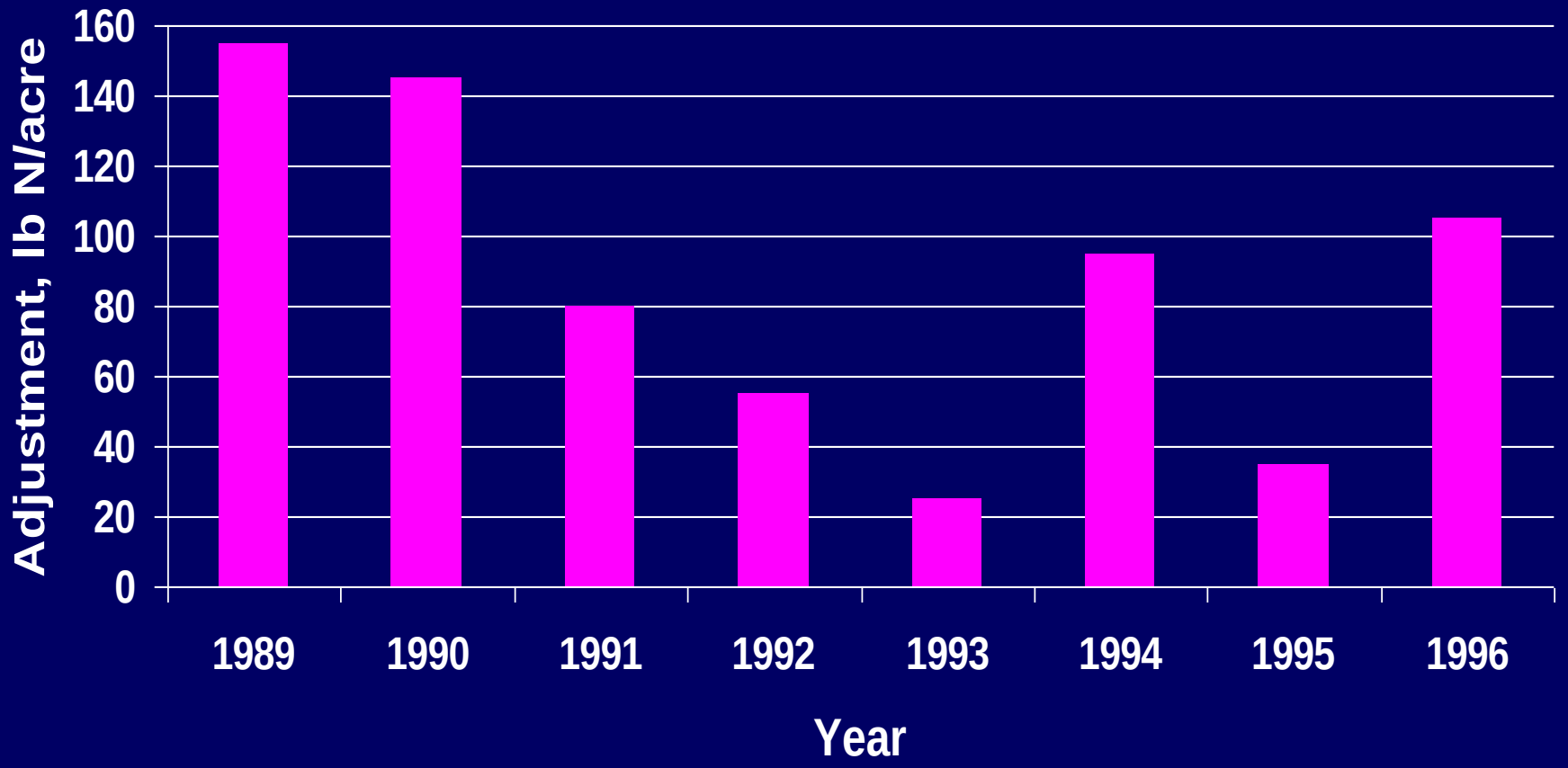
CORRECTED SOIL NITRATE

140 – 50 = 90lb N/a

N RECOMMENDATION

160 – 90 = 70 lb N/a

Average adjustment in corn N recommendations based on preplant nitrate tests, 1989-1996.

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MADE IN U.S.A.

Pre-Sidedress Soil Nitrate Test (PSNT)

- Estimates N availability from organic N sources
  - Confirm N credits
  - Manure and legume history
  - Corn after alfalfa
- Not useful on sands, loamy sands

Pre-Sidedress Soil Nitrate Test (PSNT)

- Shallow samples (0-1 ft.)
- Legume and manure N included
- Partial accounting for carryover nitrate
- Short sampling and analysis time
- Sidedress N required

Corn Nitrogen Recommendations Based on Presidedress Soil Nitrate Test (PSNT)

	Soil Yield Potential*	
PSNT Result	Very High/High	Medium/Low
— ppm N —	— N Application Rate, lb/a —	
> 21	0	0
20-18	60	40
17-15	100	40
14-13	125	80
12-11	150	80
< 10	160 **	120 **

* To determine a soil's yield potential, consult UWEX publication A2809, Soil test recommendations for field, vegetable and fruit crops, or contact your agronomist or county agent.

** Unadjusted nitrogen application rate.

Using Soil Nitrate Tests

- Corn after corn:
  - Preplant test
    - Highest potential for carryover
    - Adjust N credits separately
      - Second year credits
      - Manured sites
  - PSNT
    - Direct adjustment for N credits
    - Partial carryover measurement

Using Soil Nitrate Tests

- Corn after alfalfa:
  - Use standard legume N credit
  - PSNT
    - Confirms legume credit
    - For PSNT <21 ppm N, apply up to 40 lb N/acre
  - Do not use preplant test

Using Soil Nitrate Tests

- Corn following soybean:
  - Reduce base N rate by 40 lb N/acre
  - Use preplant soil nitrate test
  - Use both 40 lb N/acre and N test adjustments

Using Soil Nitrate Tests

- Manured sites:
  - PSNT
    - Direct assessment of N credit
    - Confirms N credit
    - Useful for unknown manure rates
  - Preplant Test
    - Accounts for carryover nitrate from previous years
    - Separate N credit needed for current or second year additions.

Summary

- Preplant test
  - Corn after corn
  - Sites without organic N
  - Manure & legume history with standard N credits

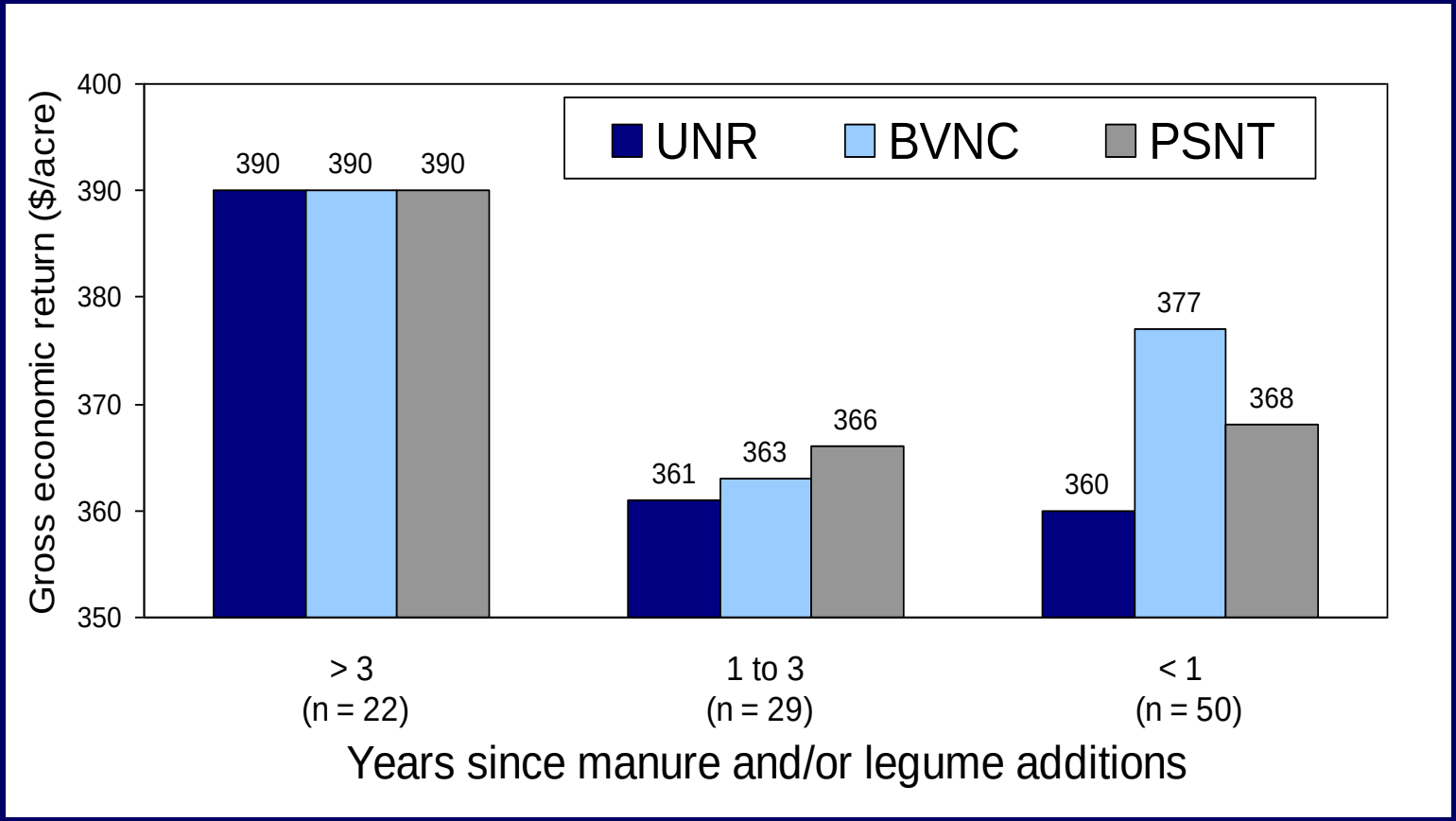
Summary

- Presidedress test (PSNT)
  - Manure & legume history
  - Confirm N credits

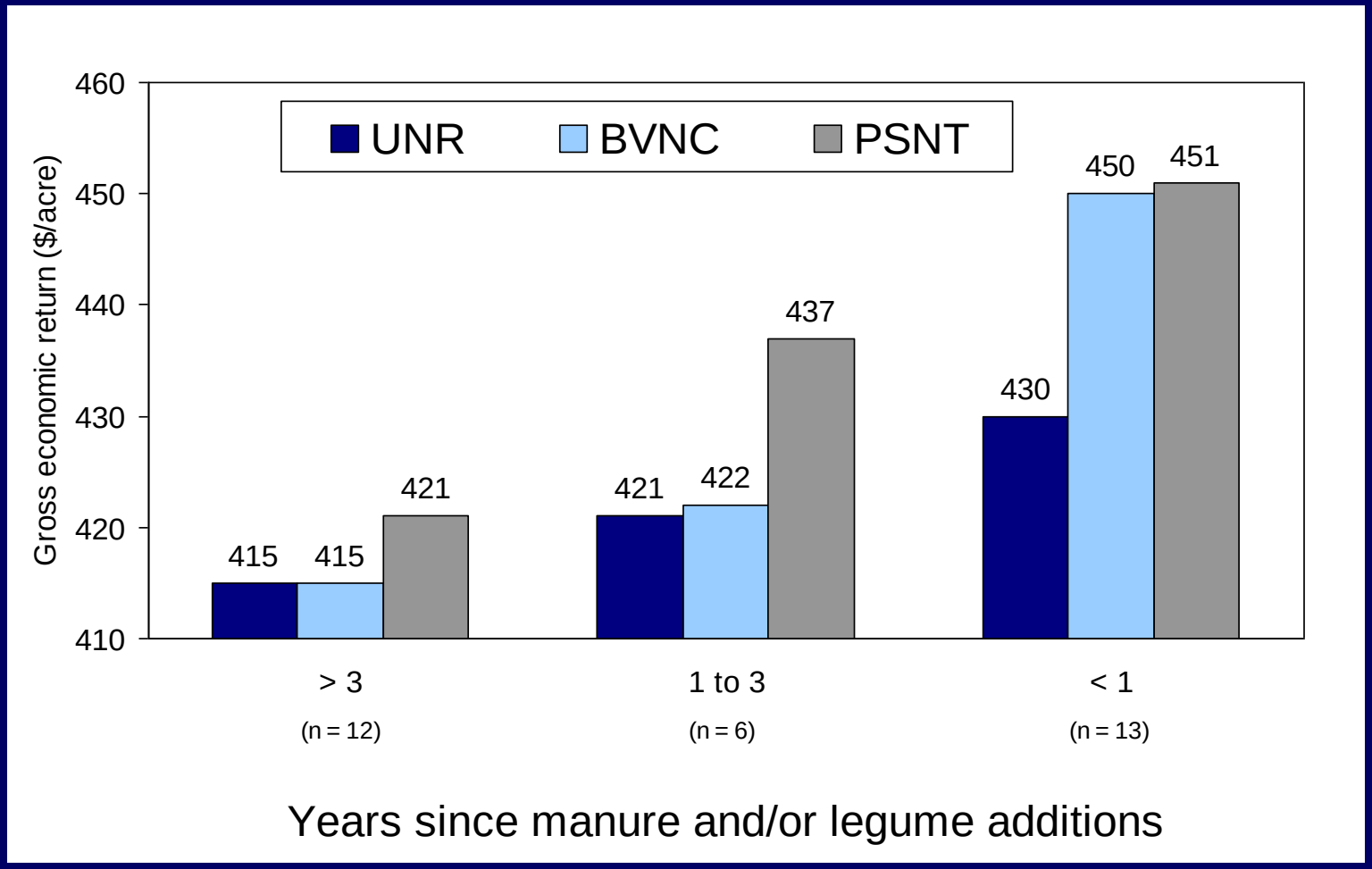
Procedure for N Crediting/PSNT Evaluation

- 101 corn N response trials on research and private farms, 1989-1999.
- High (56%) and medium (45%) yield potential soils.
- Sites include N fertilizer, manure, legume N, and rotation variables.
- Soil nitrate tests, EONR determined.

Gross economic return from three N recommendation methods at 101 Wisconsin locations, 1989 to 1999.



Gross economic return at 31 sites with high yield potential soils and average to above average May-June air temperatures, 1989 to 1999.



Effectiveness of N test in predicting optimum corn in rate, inorganic sites

Recom. Method	Accuracy*		
	Correct	Over Applied	Under Applied
	- - - - - - - - - - - % - - - - - - - - - - -		
STD.	22	67	11
PPNT	89	0	11
PSNT	67	11	22

*High yield potential soils. Correct if ± 30 lb N/a of observed optimum.

Effectiveness of N test in predicting optimum corn N rate, organic sites

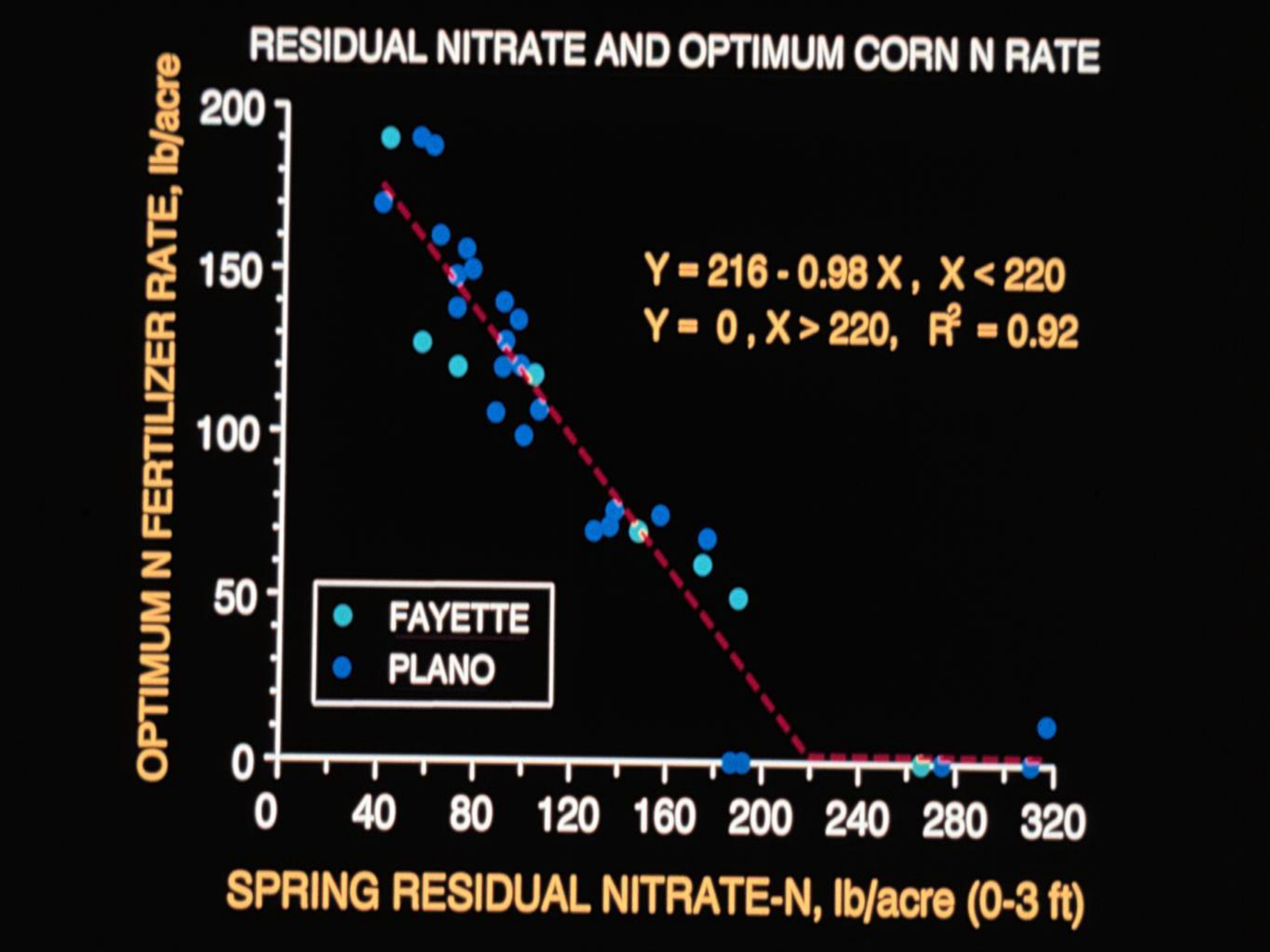
Recom. Method	Accuracy*		
	Correct	Over Applied	Under Applied
	- - - - - - - - - - - - - - - % - - - - - - - - - - - - - - -		
STD.-BVNC	8	77	15
PPNT-BVNC	38	38	24
PSNT	62	23	15

*High yield potential soils. Correct if ± 30 lb N/a of observed optimum.

BVNC = Book value N credit

Nitrogen recommendations based on soil nitrate test compared to standard method

- Increased % of correct recommendations
- Reduced % over applied
- Increased % under applied


RESIDUAL NITRATE AND OPTIMUM CORN N RATE
OPTIMUM N FERTILIZER RATE, lb/acre
200
150
100
50
0
Y = 216 - 0.98 X , X < 220
Y = 0 , X > 220, R² = 0.92
FAYETTE
PLANO
0
40
80
120
160
200
240
280
320
SPRING RESIDUAL NITRATE-N, lb/acre (0-3 ft)

Nitrogen Recommendations for Corn

	Sands & loamy sand		Other soils	
			Yield Potential	
Organic matter	Irrigated	Non-irrigated	Med/ low	V. 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

USING SOIL NITRATE TESTS

Corn after soybean:

- Use 40 lb N/acre credit
- Use preplant test
- Use both credit and test adjustment

END-OF-SEASON SOIL NITRATE TEST

Interpretation	Nitrate-N (lb/acre, 0-2 ft)
Low	--
Optimal	46-91
Excess	>91

University of Wisconsin, 1996