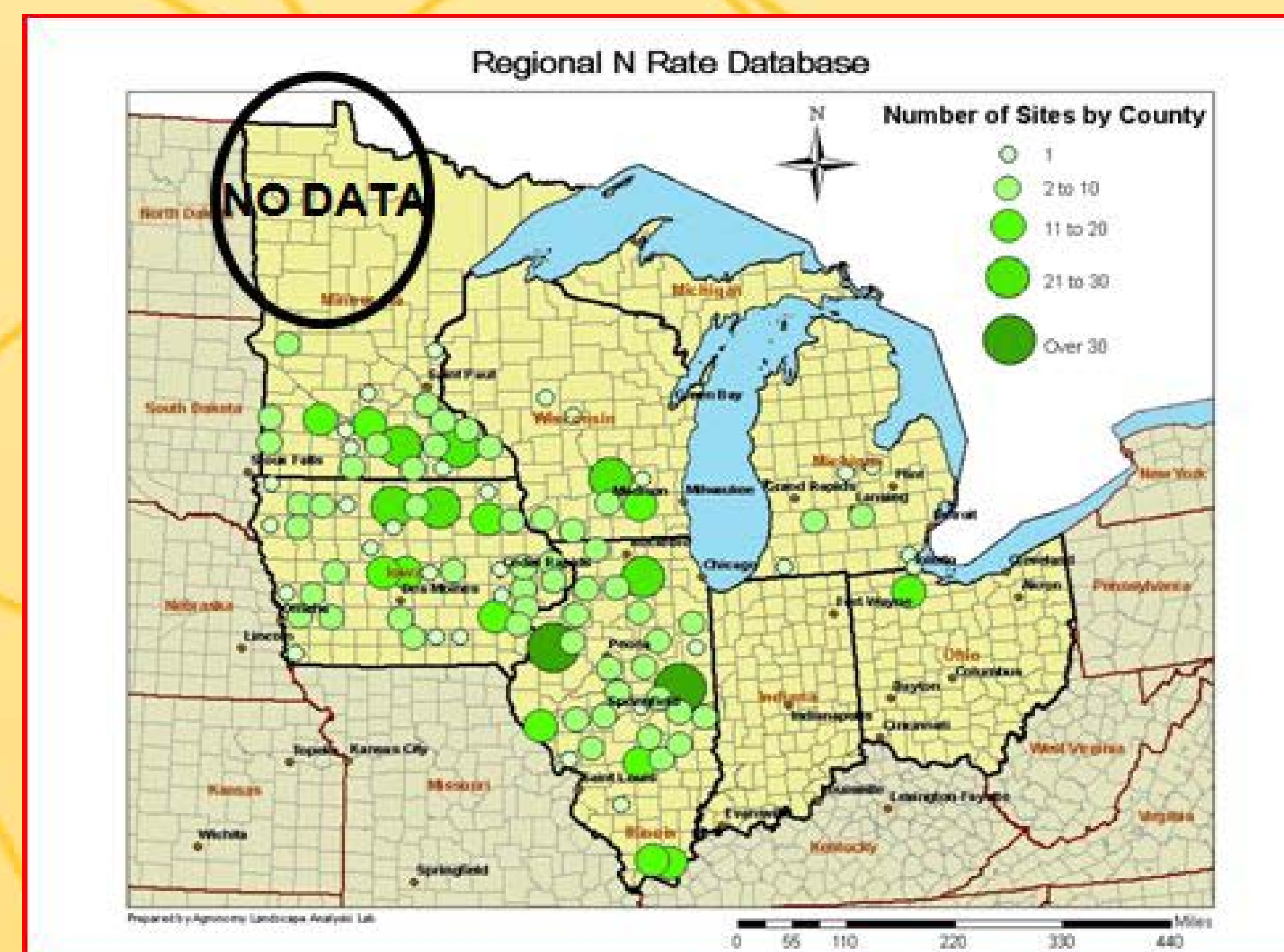


Corn Nitrogen Rate Response Trials in NW & WC Minnesota 2007-2009

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Introduction

With the growing number of corn producers and increased acres of corn in NW and WC Minnesota along with the revisions in the University of Minnesota Corn Nitrogen Guidelines (2006) many northern corn growers were asking about the validity of the new nitrogen guidelines for corn production in the region. Prior to 2007, University of Minnesota calibration and correlation data used for establishing the new guidelines did not include any research sites north of Interstate 94.

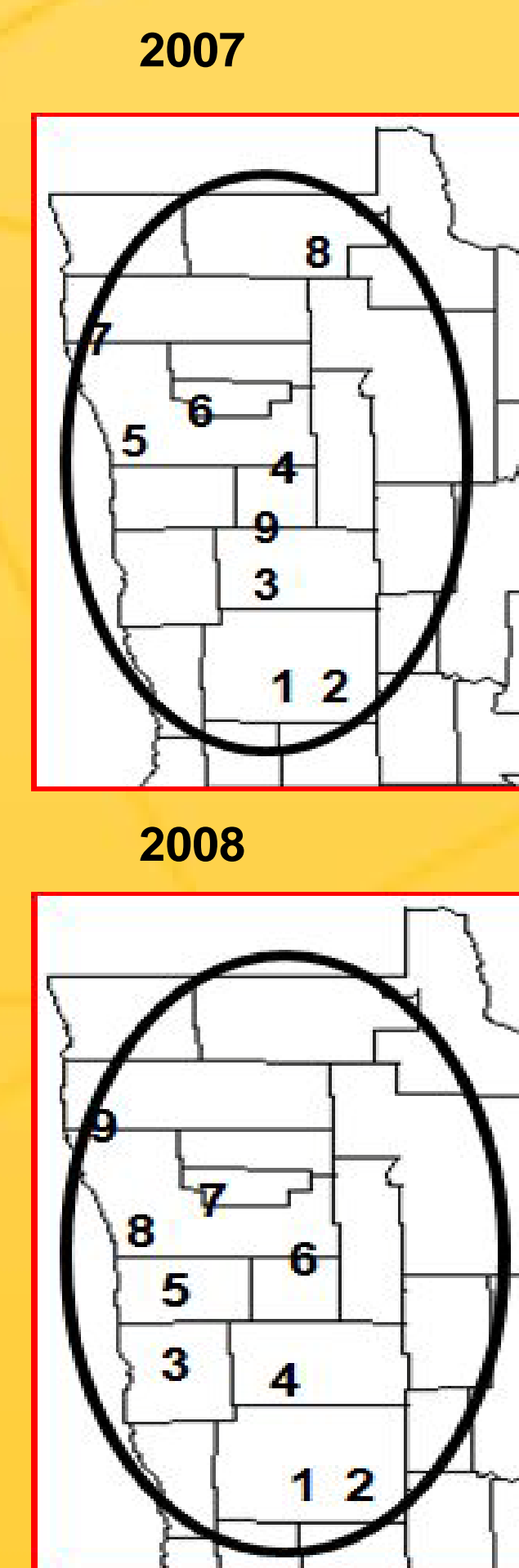


Objectives

- ✓ Validate the applicability of the new Corn N guidelines for NW and WC Minnesota
- ✓ Determine if corn yields are differentially affected when grown after previous crops of Corn, Wheat, Dry bean, Sugarbeet or Soybean.
- ✓ Determine if corn yield response to fertilizer N rates (and optimum N rate) varies with the previous crop.
- ✓ Determine if residual basal stalk nitrate test can predict appropriate nitrogen rate for corn
- ✓ Determine the most profitable fertilizer N rate for corn production in NW and WC Minnesota

Research Site Farmer Cooperators

- ❖ Wayne & Jay Leaderbrand – New York Mills
- ❖ Phil & Dan Jennen – Fergus Falls
- ❖ Tim Thompson – Moorhead
- ❖ Bill, Eric & Nick Zurn – Callaway
- ❖ Dan & Glen Brandt – Ada
- ❖ Charles & Scott Balstad – Fosston
- ❖ Ken & Chris Hove – Fosston
- ❖ Gary Purath – Red Lake Falls
- ❖ Elliot & Eric Solheim – Crookston
- ❖ Don & Mark Yutrzenka – Warren
- ❖ Diesen Farms - Skime



Materials and Methods

Experimental Design: RCBD with 4 Replications (Blocks)

- Nine research sites were established in 2007 from Fergus Falls to Skime, nine sites in 2008 from Fergus Falls to Warren and six sites in 2009 from Fergus Falls to Fosston to collect data to be included in the New N Guidelines and validate the applicability of the N guidelines to this region of the state.
- Two-foot soil samples were collected and analyzed from each site to determine the initial fertility of each location.
- Each site used the same research protocol each year and nitrogen was applied to replicated plots at rates from 0 to 210 pounds of nitrogen per acre at 30 pound increments as spring applied broadcast urea.
- Phosphorus, potassium and zinc were blanket applied to all plots to remove any variability from these nutrients.
- Basal stalk nitrate samples were harvested from twelve plants at physiological maturity in each plot at each location
- Grain yield data was collected from 15 linear feet of two adjacent rows from each plot at each location at harvest
- Previous Crops ranged from Corn, Soybean, Hard Red Spring Wheat, Dry bean and Sugarbeet

Results

2007

Table 1. Statistical significance, Economic Optimum Nitrogen Rate (EONR), Soil Test Value and previous crop at each location.

Location	Argyle	Crookston	Callaway	Mahnomen	Red Lake Falls	Skime	Winger	Fergus Falls
Significance	0.01	0.0001	0.0001	NS	0.019	NS	0.002	0.0001
EONR * (0.10)	100.0	108.0	80.8	39.2	106	63.4	142.9	128.7
Soil Test N Lb/A, 0-24"	127	69	23	---	45	121	67	---
Previous Crop	Dry bean	Wheat	Sugar beet	Soybean	Soybean	Soybean	Wheat	Soybean

*(0.35 N/\$3.50 Corn)

2008

Table 2. Statistical significance, Economic Optimum Nitrogen Rate (EONR), Soil Test Value and previous crop at each location.

Location	Warren	Crookston	Ogema	Underwood	Red Lake Falls	Fergus Falls	Moorhead	Ada	Fosston
Significance	NS	0.0026	0.006	0.0001	0.0001	0.0576	0.0001	NS	0.1303
EONR * (0.10)	50.6	108.5	69.3	98.2	90.6	90.3	108.7	145.6	87.8
Soil Test N Lb/A, 0-24"	79	47	43	105	40	60	42	84	38
Previous Crop	Wheat	Wheat	Sugar beet	Soybean	Soybean	Soybean	Soybean	Corn	Soybean

*(0.50 N / \$5.10 Corn)

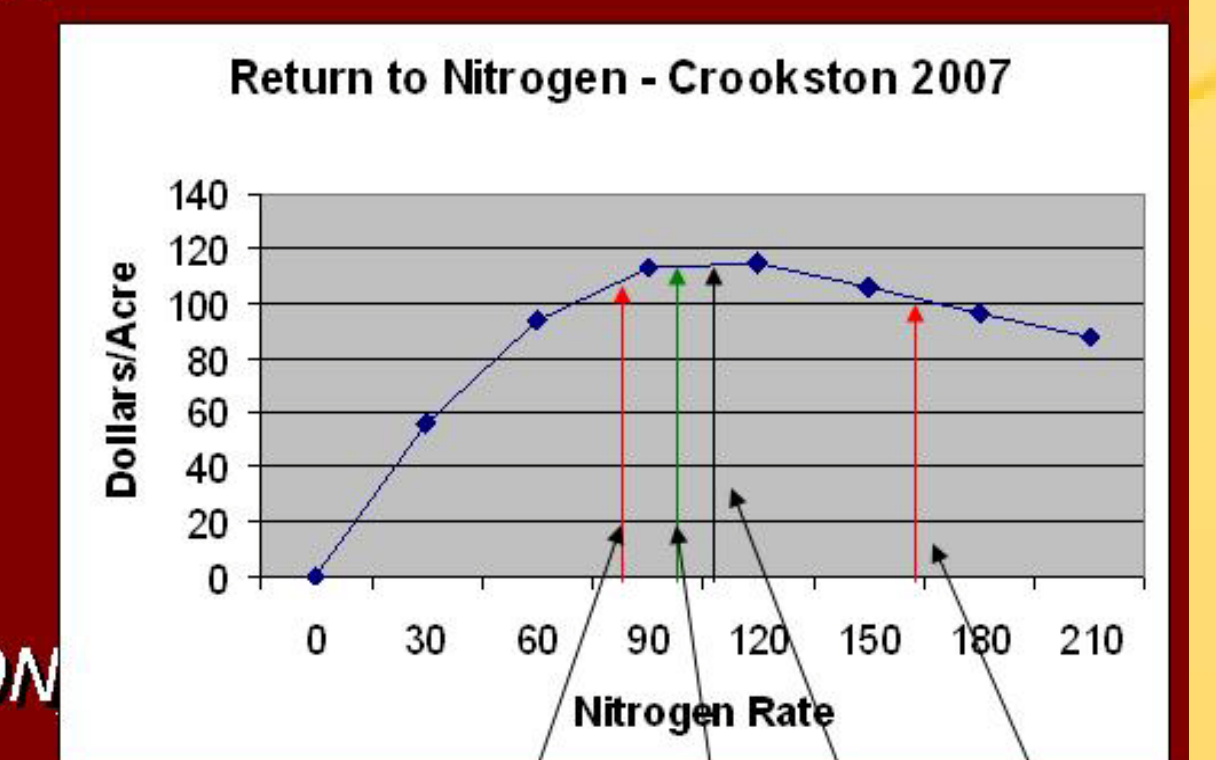
N Guidelines (high productivity)

N price/Crop value ratio	Corn/corn		Corn/soybean	
	MRTN*	Flexible range	MRTN	Flexible range
unitless	pounds N per acre			
0.05	155	130 to 180	120	100 to 140
0.10	140	120 to 165	110	90 to 125
0.15	130	110 to 150	100	80 to 115
0.20	120	100 to 140	85	70 to 100

MRTN = maximum return to nitrogen.

Old N Recs. CROX

- 130bu X 1.2 N/bu = 156N – ST (69)
- = 87 N
- **20lb. N under EONR**
- Actual 190bu/ac (159N)
- **51N Over EONR**



130 YG, New EONR Guideline, 190 YG

Conclusions

- ❖ The newest corn genetics appear to be much more efficient at utilizing fertilizer nitrogen requiring approximately 0.7 pounds of nitrogen per bushel of yield compared to 1.2 pounds with older hybrids.
- ❖ The soil test nitrogen credit appears to work well when using the new guidelines for both a non-legume and legume previous crop.
- ❖ Northern corn growers could realize as much as a 55 pound decrease in nitrogen usage following the new guidelines.
- ❖ West central corn growers could realize as much as an 80 pound decrease in nitrogen usage following the new guidelines.
- ❖ Corn growers will be able to apply the most profitable fertilizer nitrogen rate to their crop based on the price of fertilizer nitrogen and the price of corn rather than choosing a yield goal.
- ❖ Corn growers will be able to adjust their nitrogen rates based on their soil productivity, early or lateness of the growing season and their attitude toward environmental stewardship.