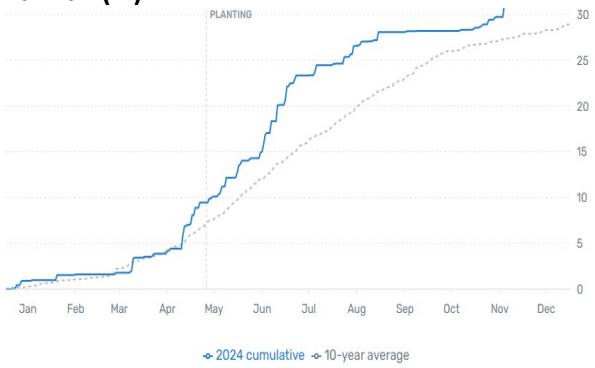
Imagery-Based Nitrogen Fertilization with Sentinel Fertigation N-Time®

Study ID: 1541-011-2024-02
County: Nance
Soil Type: Nora silt loam, Nora-Crofton complex, Belfore silty clay loam
Planting Date: 5/18/24
Harvest Date: 10/22/24
Seeding Rate: 32,000-36,000
Row Spacing (in): 30
Reps: 6
Previous Crop: Soybeans
Tillage: No-Till
Herbicides: ***Pre:*** 16 oz/ac Aatrex® 4L + 40 oz/ac Resicore® + 32 oz/ac Glyplex®+ 12 oz/ac 2-4D + LV6 on 5/9 ***Post:*** 16 oz/ac Aatrex® 4L + 40 oz/ac Resicore® + 32 oz/ac Glyplex® on 6/7/24
Seed Treatment: Pivot Bio Proven® 40 OS, ipconazole, ethaboxam, L-2012R, Lumivia®, Lumisure®, Lumialza®
Foliar Insecticides: 1.6 oz/ac Bifenture® 2EC on 5/29, 6.8 oz/ac Bifenture® on 8/10/24
Foliar Fungicides: 8 oz/ac Xyway® on 5/18 , 6 oz/ac Aproach® Prima on 8/10/24
Fertilizer: Pell lime, 11-52-0, 0-0-60 , 5 oz/ac Utrisha® N on 6/25/24
Irrigation: Pivot, Total: 7.5"
Rainfall (in):

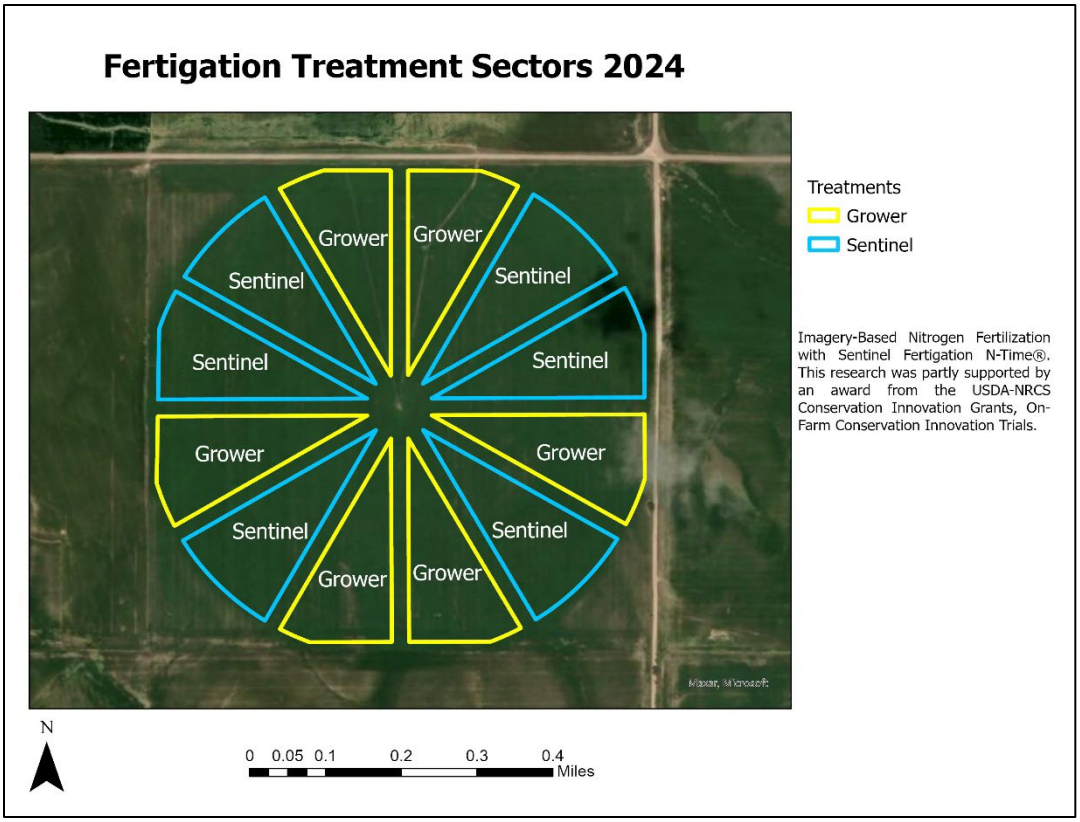


Soil Samples (November 2024):

pH	OM LOI %	M3–P ppm P	Sulfur ppm S	K ppm	Ca ppm	Mg ppm	Na ppm	CEC me/100g
6.0	3.9	83	10	276	2565	381	6	19.6
5.6	3.2	259	12	254	2066	259	13	17.3
6.8	3.5	39	14	297	3011	395	14	19.8
6.3	3.4	59	12	314	2821	485	21	21.2
7.0	2.6	73	14	343	2545	339	14	16.6
6.7	3.0	37	9	254	2607	414	15	18.0

Introduction: Corn nitrogen management may be improved by using sensors or imagery to detect and respond to corn N needs during the growing season. Sentinel Fertigation's N-Time® application analyzes multispectral images to deliver fertigation scheduling recommendations. Indicator blocks (small blocks established during the base N applications) with higher (+60 lb-N/ac) and lower (-30 lb-N/ac) nitrogen rates were applied in the field on June 13, 2024, to monitor and determine when fertigation was needed.

If an N application was recommended by N-Time®, the N (lb-N/ac) applied via fertigation (typically 30 or 60 lb-N/ac) is noted in the application table below. Note that different Sentinel sectors of the pivot may receive different recommendations throughout the growing season. This study compared the grower's standard N management to the Sentinel Fertigation N-Time® N management, with six paired sectors of each treatment (each sector was about 7.5 acres, buffered 60 feet internally to reduce sprinkler package overlap between sectors); the field trial layout is shown below.



Application Table: Nitrogen applied throughout the 2024 growing season is included in the table below. N applications (in lb-N/ac) are noted by date, along with products applied at those instances. Sentinel N-Time® began monitoring and directing N fertigation applications following the June 13, 2024, N application. N-Time® directed N applications are shaded in gray to the right of the double vertical lines in the table below.

N was applied using 32% UAN unless otherwise noted. Gray-shaded area to the right of the striped line indicates where Sentinel Fertigation N-Time® dictated N rates. The applied values were averaged across all reps; therefore, if only one out of six replications triggered an application of 30 lb N/ac, a value of 5 lb N/ac is reported as the average treatment N application across reps. *Note: late season southern rust impacted yield 10-15%.*

		6/13		7/5	7/23	8/12	Total N Applied
Treatment							
Grower N Management	21.2[a]	38.4[b]	34[c]	17.1[b]	34[c]	11.4[c]	**156.1**
Sentinel Fertigation N-Time®	21.1[a]	38.5[b]	34[c]	27.5[b]	-	19[c]	**140.1**

[a] Product used was MAP
[b] Product used was 95% 32-0-0 + 5% ATS via Indicator block establishment
[c] Product used was applied with post-emerge herbicide
[d] Product used was 95% 32-0-0 + 5% ATS via fertigation

Results:

	Total N rate (lb/ac)	Moisture (%)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/bu grain	Marginal Net Return‡ ($/ac)
Grower N Management	156.1	16.4 A*	224 A	80.3 A	0.697 A	896 A
Sentinel Fertigation N-Time®	140.1	16.4 A	228 A	91.0 A	0.615 A	920 A
P-Value	N/A	0.917	0.423	0.0878	0.107	0.141

*Values with the same letter are not significantly different at a 90% confidence level.
†Yield values are from cleaned yield monitor data. Bushels per acre were corrected to 15.5% moisture.
‡Marginal net return based on $4.35/bu corn and $0.5 lb/N.

Summary:

- There were no significant differences in moisture, yield, partial factor productivity, lbs N/bu grain, or marginal net return between treatments.
- The Sentinel Fertigation N-Time® management system called for 16 lb N/ac reduction in N applications during the growing season.
- Late season Southern Rust impacted the yield for the entire field by 10-15%.

This research was partly supported by an award from the USDA-NRCS Conservation Innovation Grants, On-Farm Conservation Innovation Trials, award number NR203A750013G014.