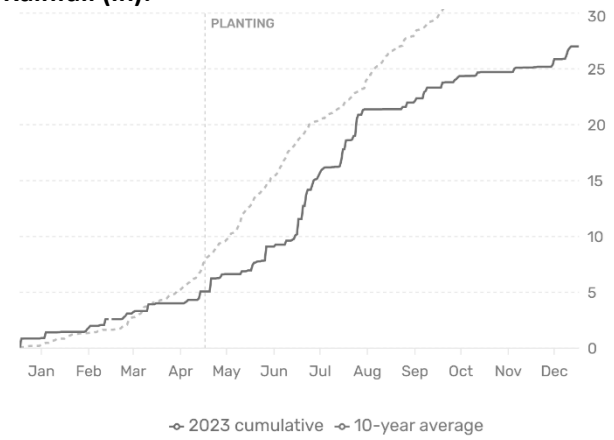
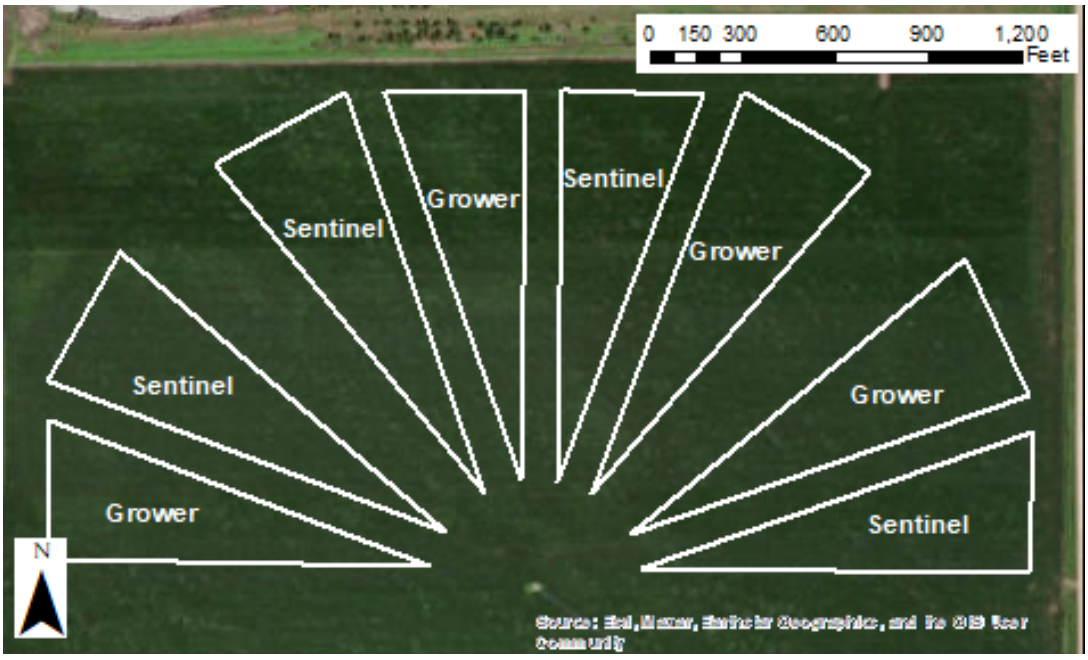
Imagery-Based Nitrogen Fertilization with Sentinel Fertigation N-Time®

Study ID: 0211023202301
County: Butler
Soil Type: Muir silt loam rarely flooded; Ovina-Thurman complex 0-6% slopes
Planting Date: 5/1/23
Harvest Date: 10/18/23
Seeding Rate: 34,000
Row Spacing (in): 30
Hybrid: Dekalb® DKC63-90
Reps: 4
Previous Crop: Corn
Tillage: Strip-till
Herbicides: ***Post:*** 3 oz/ac Balance® Flexx and 24 oz/ac Roundup® on 5/17/23
Foliar Fungicides: 13.7 oz/ac Trivapro® on 7/18/23

Irrigation: Pivot
Rainfall (in):



Introduction: Corn nitrogen (N) 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 sectors (small slices established during the first fertigation event) with higher (+30 lb N/ac) and lower (-30 lb N/ac) N rates were applied in the field using a variable-rate injection pump on June 29, 2023. These indicator sectors were used to determine when additional fertigation is needed throughout the season. 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 four paired sectors (each sector was about 7 acres) of each treatment as shown in the map below.



Application Table: Nitrogen applied throughout the 2023 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 29, 2023 N application. N applications directed by N-Time® are shaded in gray to the right of the double vertical lines in the table below.

	4/12	6/16	6/29	7/10	Total N rate (lb/ac)
Treatment	*lb N/ac applied*				
Grower N Management	77[a]	32.5[b]	30[b]	34[b]	**173.5**
Sentinel Fertigation N-Time®	77[a]	32.5[b]	30[b]	-	**139.5**

[a] Product used was 32-0-0-0 via strip till

[b] Product used was 32-0-0-0 applied 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	174	15.3 A*	255 A	82 B	0.68 A	1,168 A
Sentinel Fertigation N-Time®	140	15.1 A	256 A	103 A	0.55 B	1,190 A
P-Value	N/A	0.156	0.929	0.0003	0.0002	0.168

*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 $5/bu corn and $0.63/lb N.

Summary:

- The Sentinel Fertigation N-Time® management did not recommend additional N applications beyond the grower base rates, which resulted in a 34 lb N/ac reduction in N fertilizer with no impact on yield, resulting in a 26% increase in N use efficiency. There was no difference in marginal net return.
- Soil samples (24" depth) were collected in early December 2023 following harvest. Four grower and four Sentinel sectors were randomly selected for sampling and two composite samples were taken from each sector. Results indicated residual nitrate in the Sentinel sectors (average 9.2 ppm) was comparable to the grower sectors (average 9.7 ppm); the difference was not statistically significant.

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