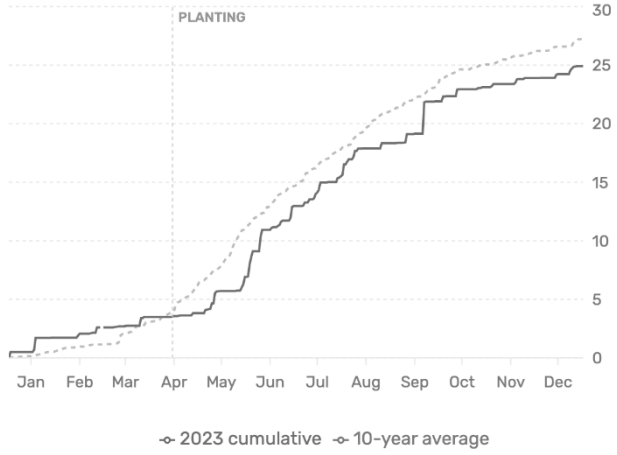
Imagery- and Model-Based Nitrogen Fertilization with Sentinel Fertigation N-Time® and Adapt-N

Study ID: 0195019202302
County: Buffalo
Soil Type: Wood River silt loam; Hall silt loam; Hord silt loam
Planting Date: 4/14/23 & 4/17/23
Harvest Date: 10/3/23-10/6/23
Seeding Rate: 34,000
Row Spacing (in): 30
Hybrid: Channel® 211-11VT2PRIB
Reps: 4
Previous Crop: Corn
Tillage: Strip-till
Herbicides: ***Pre:*** 2 qt/ac Degree Xtra®, 3 oz mesotrione, and 1% COC ***Post:*** 1.25 qt/ac Harness® Max, 1 pt/ac atrazine, 8 oz/ac Tough®, 20 oz/ac Roundup PowerMAX® 3, and 8.5 lb AMS/100 gal
Seed Treatment: Standard Channel® seed treatments

Foliar Insecticides: None
Foliar Fungicides: 10.5 oz/ac azoxystrobin and propiconazole package mix applied at R1
Irrigation: Pivot
Rainfall (in):



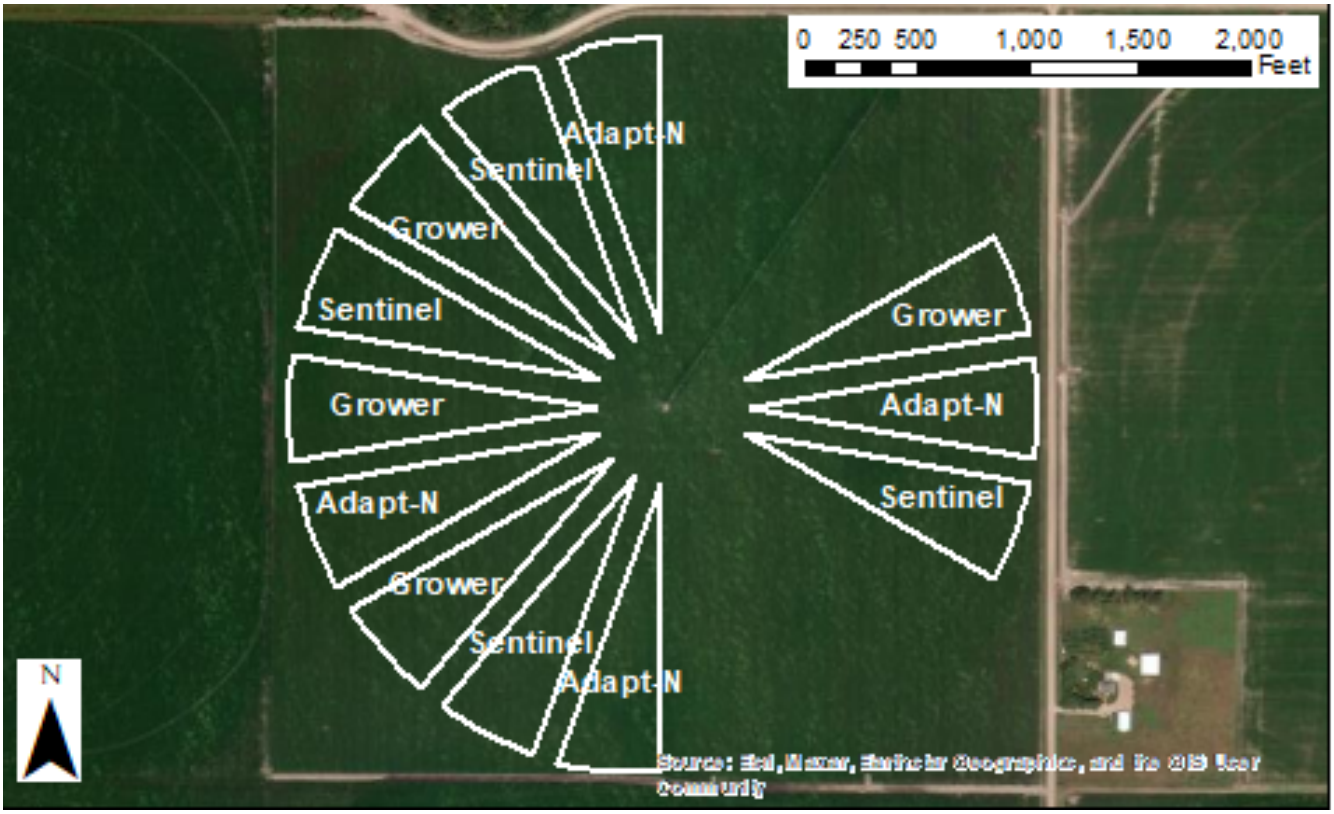
Baseline Soil Samples 0-6" (May 2023):

pH	OM LOI %	Nitrate–N ppm N	M3–P ppm P	Sulfate–S ppm S	K ppm	Ca ppm	Mg ppm	Na ppm	CEC me/100g
7.6	3.3	41.9	73	22	567	2031	305	125	14.7
7.6	3	29.1	69	25.5	500	1691	277	111	12.5
8.1	2.8	20.1	58	30.6	554	1741	274	124	12.9

Introduction: Corn nitrogen management may be improved by using dynamic tools such as sensors, imagery, and crop models to respond to corn N needs during the growing season.

- Adapt-N is a dynamic crop modeling software that simulates crop growth and N requirements. Previously, Adapt-N has been utilized to direct single N applications. In this study, Adapt-N was instead used as a tool to monitor N throughout the season and direct N application(s) through fertigation.
- 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) rates were applied in the field on May 26, 2023 to monitor and determine when fertigation was needed. If an N application was recommended by N-Time® the N 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.

Evaluating Adapt-N and Sentinel Fertigation's N-Time® with the grower's current fertigation management evaluates the potential benefits of dynamic crop model N management and imagery-based management. Different sectors of the pivot may receive different recommendations. Four replicate sectors (each about 8 acres shown below) were included in the study for each of the three treatments (grower, Adapt-N and Sentinel). Note that two replicate blocks were removed due to issues with the harvest data and the lack of yield data points in those sectors.



Application Table: Nitrogen applied throughout the 2023 growing season is included in the table below. N applications (lb N/ac) are noted by date, along with products applied at those instances. Sentinel N-Time® or Adapt-N began monitoring and directing N fertigation applications following the May 26, 2023 N application. Applications directed by N-Time® or Adapt-N are shaded in gray to the right of the double vertical lines in the table below. Applied values were averaged across all reps; therefore, if only one out of four replications triggered an application of 30 lb N/ac, a value of 7.5 lb N/ac is reported as the average treatment N application across replications.

	3/23	4/14	5/26	7/6	7/13	7/21	7/26	Total N rate (lb/ac)
Treatment	*lb N/ac applied*							
Grower N Management	8.7[a]	51[b]	35[c]	21[c]	-	42.5[c]	28[c]	**186**
Sentinel Fertigation N-Time®	8.7[a]	51[b]	35[c]	-	-	-	7.5[c]	**102**
Adapt-N	8.7[a]	51[b]	35[c]	30[c]	30[c]	40[c]	-	**195**

[a] Product used was 10-34-0 applied with strip till
[b] Product used was 32-0-0 applied with planter
[c] Product used was 32-0-0

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	186 A	17.5 A*	268 A	81 B	0.70 A	1,221 B
Sentinel Fertigation N-Time®	102 B	17.3 A	266 A	148 A	0.38 B	1,266 A
Adapt-N	195 A	17.1 A	266 A	77 B	0.73 A	1,209 B
P-Value	N/A	0.696	0.881	<0.0001	<0.0001	0.0416

*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 corrected to 15.5% moisture.
‡Marginal net return based on $5/bu corn and $0.63/lb N.

Summary:

- Compared to the grower's traditional management, the Adapt-N management resulted in a 9 lb N/ac increase in N while the Sentinel Fertigation N-Time® management resulted in an 84 lb N/ac reduction in N, both with no statistical difference in yield.
- Compared to the grower's traditional management, N efficiency was 5% lower when using the Adapt-N management and 83% greater when using the Sentinel Fertigation N-Time® management.
- Net return for the Sentinel Fertigation N-Time® management was $45/ac greater than the grower's traditional management. There was no difference in net return between the Adapt-N management and the grower's traditional management. Subscription and technology costs to implement the Sentinel Fertigation N-Time® or Adapt-N management were not included in this calculation.

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