

Sensor-Based Nitrogen Fertigation Management

Study ID: 1171155202201

County: Saunders

Soil Type: Yutan silty clay loam terrace, 2-6% slopes, eroded; Filbert silt loam 0-1% slope; Tomek silt loam 0-2% slope; Fillmore silt loam terrace, occasionally ponded

Planting Date: 5/11/22

Harvest Date: 10/17/22

Seeding Rate: 33,000

Row Spacing (in): 30

Hybrid: DEKALB® DKC63-91

Reps: 4

Previous Crop: Soybean

Tillage: No-till

Herbicides: Pre: 15.4 oz/ac atrazine 4L, 7.7 oz/ac DiFlexx®, 17.3 oz/ac Verdict®, 15.4 oz/ac Roundup PowerMAX® 3, 1.4 lb/ac AMS, and 18.7 MSO on 6/7/22 **Post:** 3 oz/ac Laudis®, 15.7 oz/ac atrazine 4L, 9.5 oz/ac Superb® HC and 1.4 lb/ac AMS

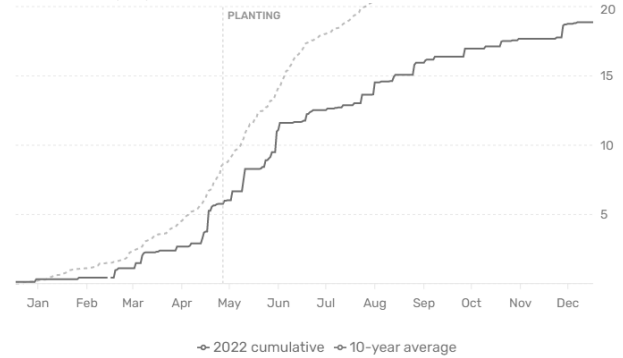
Seed Treatment: None

Foliar Insecticides: None

Foliar Fungicides: None

Irrigation: Pivot, Total: 13.25"

Rainfall (in):



Introduction: Corn nitrogen management may be improved by using sensors or imagery to detect and respond to corn nitrogen needs during the growing season. This study used weekly aerial imagery obtained with a multispectral sensor on a fixed-wing drone to monitor indicator plots that had lower N rates. If indicator plots demonstrated nitrogen deficiency, a fertigation application of 30 lb/ac or 60 lb/ac was triggered. This study compared the two reactive, sensor-based fertigation approaches as follows:

Risk-Averse Post-Establishment (RAP): Fertigation application decisions were made based on decision logic and analytics applied to aerial imagery from the V6 growth stage to the R3 growth stage.

Risk-Averse Post-Establishment Increased-Rate (RAP-IR): Fertigation application decisions were made based on decision logic and analytics applied to aerial imagery from the V6 growth stage to the R3 growth stage with application rate increased from 30 lb N/ac to 60 lb N/ac for any fertigation applications recommended between V9 and V14.

Application Table: Unless otherwise noted, N was applied using 32% UAN. Gray shaded area to the right of the striped line indicates where sensor-based management dictated N rates. The applied values are averages across all four 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.

	6/2	7/1	7/8	7/12	7/26	Total N Applied
Treatment	-----lb N/ac applied-----					
RAP	33 ^a	30	-	22.5	22.5	108
RAP-IR	33 ^a	45	15	7.5	-	101

^a Product used was 32-0-0 via high-clearance applicator

Results:

	Total N rate (lb/ac)	Moisture (%)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lb N/ bu grain	Marginal Net Return‡ (\$/ac)
RAP	108 A*	15.0 A	258 B	146 A	0.42 A	1,670 B
RAP-IR	101 A	16.1 A	274 A	155 A	0.37 A	1,784 A
P-Value	0.638	0.155	0.004	0.761	0.426	0.015

*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 \$6.80/bu corn and \$0.80/lb N.

Summary:

- Total N rate applied was very similar (within 7 lb N/ac) between the two sensor-based approaches evaluated. Rates during the V9 to V14 growth stages are doubled for the RAP-IR approach compared to the RAP approach, resulting in the RAP-IR having more N fertilizer applied earlier in the season compared to the RAP treatment.
- The RAP-IR approach resulted in an increase of 16 bu/ac compared to the RAP approach, which may be due to the earlier timing of N fertilizer application.
- There were no differences in nitrogen efficiency between the treatments.
- The RAP-IR treatment resulted in an increase in net return of \$114/ac compared to the RAP treatment.