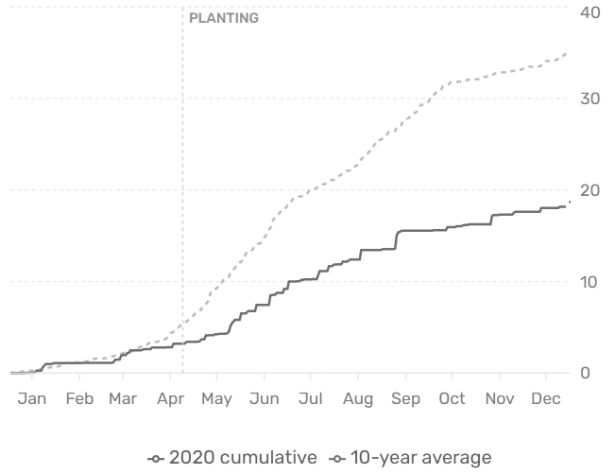
Project SENSE (Sensor-based In-season N Management) on Non-irrigated Corn

Study ID: 0108155202001
County: Saunders
Soil Type: Yutan silty clay loam; Tomek silt loam; Filbert silt loam
Planting Date: 4/23/20
Harvest Date: 10/9/20
Seeding Rate: 28,000
Row Spacing (in): 30
Hybrid: DEKALB® DKC63-57 VTP2 RIB
Reps: 5
Previous Crop: Soybean
Tillage: No-Till
Herbicides: ***Pre:*** 40 oz/ac Roundup PowerMAX®, 4 oz/ac Corvus®, 19.4 oz/ac MSO, 2 pt/ac atrazine 4L, and 2.3 lb/ac AMS with 15 gal/ac water on 4/23/20
Post: 40 oz/ac Roundup PowerMAX®, 3 oz/ac Laudis®, 6 oz/ac InterLock®, 1 pt/ac atrazine 4L, 2.31 lb/ac AMS, and 19.2 oz/ac MSO with 15 gal/ac water on 6/4/20
Irrigation: None
Rainfall (in):



Soil Samples (June 2020, minimum, maximum, and average values from zone sample):

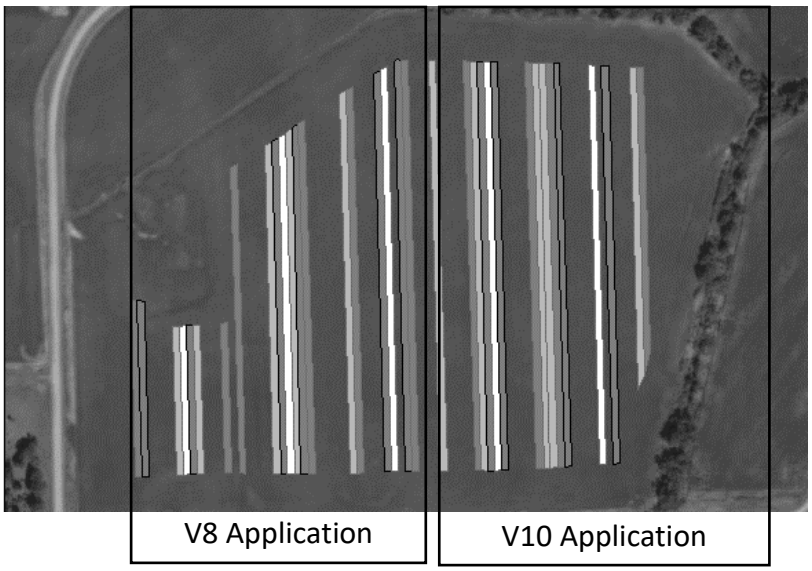
	Soil pH			Nitrate – N ppm N		Mehlich P-	Sulfate-S	Ammonium Acetate (ppm)				CEC	% Base Saturation				
	1:1	BpH	OM LOI %	75 lb Base | 35 lb Base		III ppm P	ppm S	K	Ca	Mg	Na	me/100g	H	K	Ca	Mg	Na
Min	4.7	5.9	3.5	10.9*	7.9*	13	6.7	156	1611	192	12	18	27	2	39	8	0
Max	5.6	6.4	4.6	72.7*	49.2*	157	15.4	496	2461	462	20	24.7	50	6	51	17	0
Avg	5.2	6.1	4.0	31.9*	19.1*	40.8	11.6	257	1974	303	15	21.8	39	3	45	11	0

*All samples are 0-8" depth except nitrate-N ppm N sampled at 0-24" depth

Introduction: A high-clearance applicator was equipped with Ag Leader® OptRx® sensors. UAN fertilizer was applied with drop nozzles as the crop canopy was sensed. This study compares crop canopy sensor-based in-season N application with the grower's standard N management.

Grower Nitrogen Treatment: The grower rate was 137 lb N/ac, applied as anhydrous ammonia on March 26, 2020.

Project SENSE Nitrogen Treatment: The SENSE approach evaluated two in-season application timings: V8 on June 17, 2020, and V11 on June 26, 2020. The SENSE treatments also evaluated two base rates: 35 lb/ac N and 70 lb/ac N, applied on March 26, 2020. In-season N was applied as 28% UAN with Nitrain Bullet™ pronitridine stabilizer. Following the V8 application, the field received 0.92" of rain on June 18, 2020, and following the V10 application, the field received 0.53" of rain on June 28, 2020.



Results:

Grower and Project SENSE results with V8 Project SENSE application and two base rates.

	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/ bu grain	Marginal Net Return‡ ($/ac)
Grower	138 A*	220 A	89 B	0.63 A	727.70 A
Project SENSE 35 lb/ac base	120 B	212 A	100 A	0.57 B	698.13 A
Project SENSE 70 lb/ac base	120 B	217 A	101 A	0.56 B	717.92 A
P-Value	<0.0001	0.123	0.009	0.006	0.115

*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 $3.51/bu corn, $0.41/lb N UAN, and $0.32/lb N anhydrous ammonia.

Grower and Project SENSE with V11 Project SENSE application and two base rates.

	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/ bu grain	Marginal Net Return‡ ($/ac)
Grower	137 A	220 A	90 B	0.62 A	727.38 A
Project SENSE 35 lb/ac base	103 C	206 B	112 A	0.50 B	684.68 B
Project SENSE 70 lb/ac base	107 B	210 B	110 A	0.51 B	698.05 B
P-Value	<0.0001	0.012	<0.0001	0.0001	0.022

*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 $3.51/bu corn and $0.41/lb N.

Summary:

At the V8 in-season application timing, the Project SENSE treatments applied 18 lb/ac less N than the grower. There was no difference in Project SENSE total application rate based on the initial base rate. For the 35 lb/ac base rate, the sensors directed that 85 lb/ac N should be applied in-season to bring the total to 120 lb/ac. For the 70 lb/ac base rate, the sensors directed that 50 lb/ac N was applied in-season to bring the total to 120 lb/ac. There was no difference in yield or marginal net return between the grower and Project SENSE treatments with V8 timing. The Project SENSE treatments had greater nitrogen use efficiency. This indicates that with a planned in-season application at the V8 growth stage, a range of initial base rates (35-70 lb/ac N) may be acceptable.

At the V11 in-season application timing, the Project SENSE treatments applied 30-34 lb/ac less N than the grow. The Project SENSE total application rate varied slightly based on the initial base rate. For the 35 lb/ac base rate, the sensors directed that 68 lb/ac N should be applied in-season to bring the total to 103 lb/ac. For the 70 lb/ac base rate, the sensors directed that 37 lb/ac N should be applied in-season to bring the total to 107 lb/ac. Yield was 10-14 bu/ac lower for the V11 Project SENSE treatments compared to the grower treatments. Nitrogen use efficiency was greater for the Project SENSE treatments than the grower treatments. Marginal net return was lower for the Project SENSE treatments compared to the grower treatments.

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