

Project SENSE (Sensor-based In-season N Management)

Study ID: 715035201701

County: Clay

Soil Type: Crete silt loam 0-1% slope; Hastings silt loam 1-3% slope; Butler silt loam 0-1% slope

Planting Date: 4/22/17

Harvest Date: 10/27/17

Population: 31,000

Hybrid: CRM (days) 114

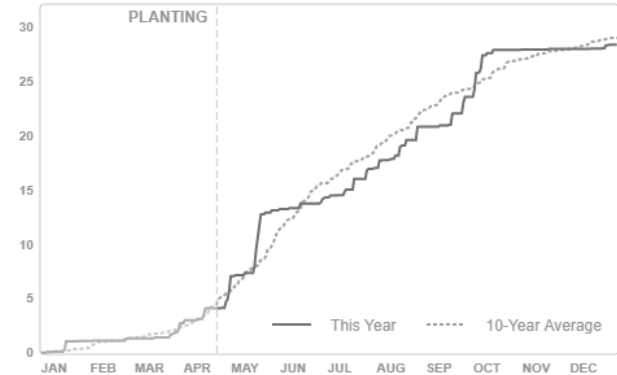
Reps: 6

Previous Crop: Corn

Tillage: Strip-Till

Irrigation: Pivot; 0 lb N/ac from irrigation

Rainfall (in):



Soil Sample Results: Soil samples were taken in three locations within the research study area and do not correspond to specific treatments or replications.

ID	Soil pH 1:1	WDRF Buffer pH	Soluble Salts 1:1 mmho/cm	Excess Lime Rating	Organic Matter LOI %	Nitrate -N ppm N	Nitrate lb N/A	Mehlich P-III ppm P	Sulfate-S ppm S	Zn (ppm)	Ammonium Acetate (ppm)				CEC me/100g	% Base Saturation				
											K	Ca	Mg	Na		H	K	Ca	Mg	Na
1	6.7	7.2	0.23	NONE	3.5	7.9	19	55	15	1.52	237	2029	284	45	13.3	0	5	76	18	1
2	6.5	6.8	0.17	NONE	3.6	8.5	20	79	15	1.85	246	2018	261	40	15.5	16	4	65	14	1
3	6.6	7.2	0.21	NONE	3.9	7.3	18	100	16	1.83	259	2250	392	60	15.4	0	4	73	21	2

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: 71 lb N/acre was applied as 32 percent UAN pre-plant with a strip-till applicator; 6 lb N/acre was applied as 10-34-0 at planting on April 22, 2017. On June 15, 2017, 106 lb N/acre was applied as an in-season application. Total N applied was 183 lb N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 6 lb N/ac was applied as 10-34-0 at planting on April 22, 2017, and an additional 71 lb N/acre was applied as 32 percent UAN shortly after planting. Crop canopy sensing and application occurred on June 27, 2017, at the V11 growth stage. The normalized difference red edge (NDRE) index values captured using the crop canopy sensors are shown in *Figure 1*. Across all Project SENSE treatments, the average N rate applied in-season was 162 lb N/acre. Nitrogen application for the Project SENSE treatment strips is shown in *Figure 2*. The total N rate was 239 lb N/acre.

Results: Data were analyzed using the GLIMMIX procedure in SAS 9.4 (SAS Institute Inc., Cary, NC). Mean separation was performed with Fisher's LSD.

	Total N rate (lb/ac)	Yield (bu/acre)†	Partial Factor Productivity of N (lb grain/lb N)	lb N/bu grain	Marginal Net Return‡ (\$/ac)
Grower N Management	183	241 A*	122 A	0.76 B	683.60 A
Project SENSE N Management	239	241 A	94 B	0.99 A	661.17 B
P-Value	N/A	0.924	<0.0001	<0.0001	0.018

*Values with the same letter are not significantly different at a 95% confidence level.

†Yield values are from cleaned yield monitor data. Bushels per acre corrected to 15.5% moisture.

‡Marginal net return based on \$3.15/bu corn and \$0.41/lb nitrogen fertilizer.

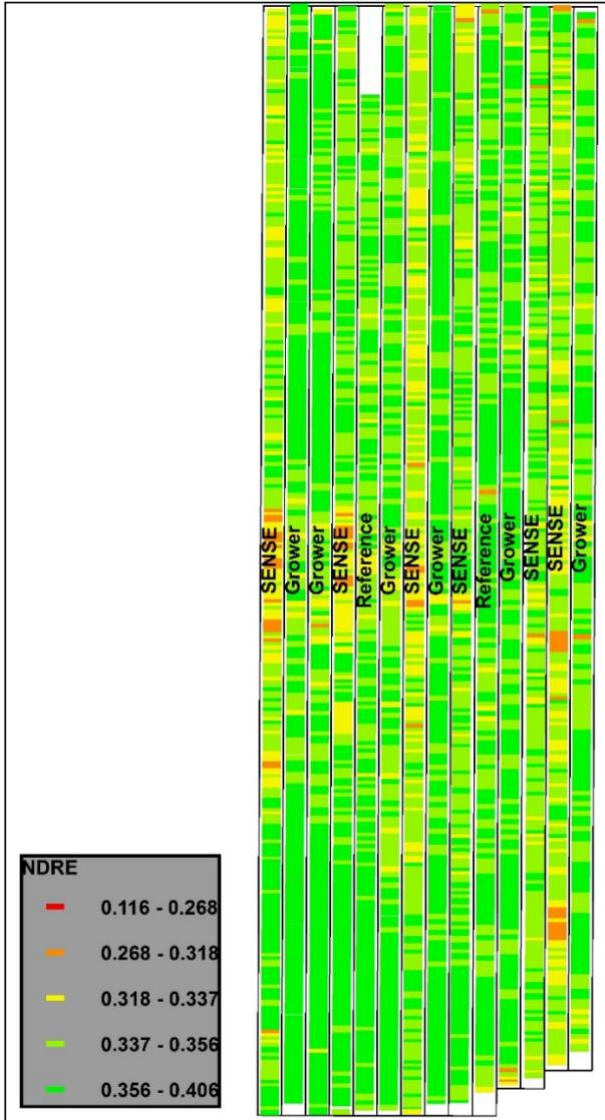


Figure 1. NDRE (normalized difference red edge) index obtained using crop canopy sensors mounted on a high clearance applicator for the plot area on June 27, 2017.

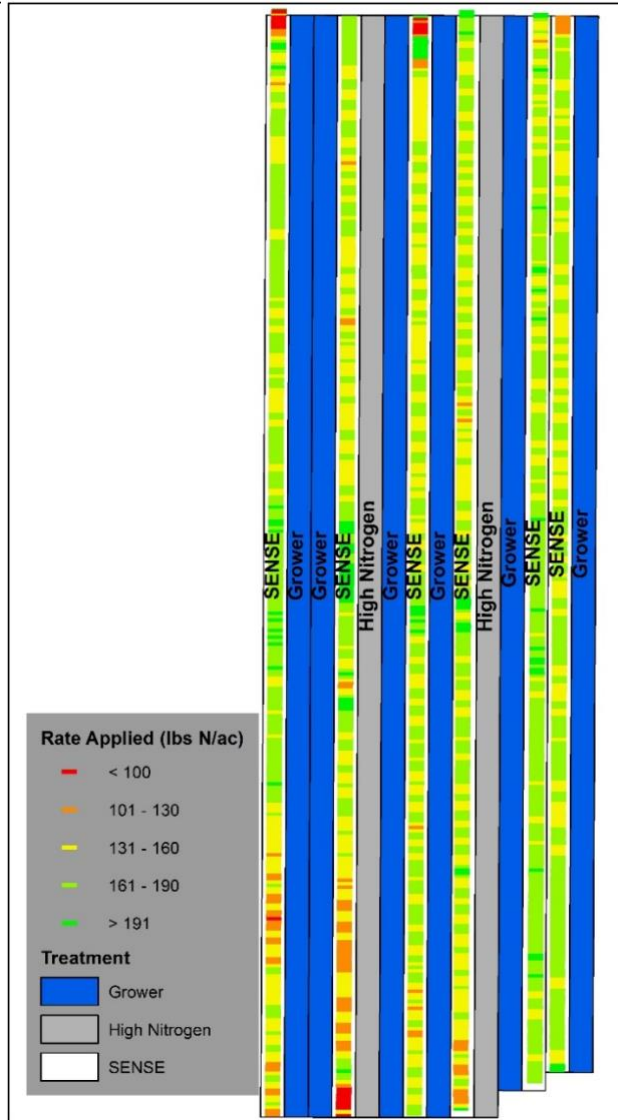


Figure 2. Nitrogen rate applied to Project SENSE N Management treatments based on NDRE captured with the crop canopy sensors and displayed in *Figure 1*.

Summary:

- Project SENSE N application was 56 lb N/acre higher than the grower's N application.
- There was no difference in yield between the Project SENSE N management and grower's N management.
- The grower's N management resulted in higher N use efficiency than the Project SENSE N management.
- The Project SENSE N management had a lower marginal net return than the grower's N management.
- Two additional N credits are not included in the figure above. Manure was applied in fall 2014 to the whole field, and N was applied to a cover crop in fall 2016. The soil test values should reflect these contributions.

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