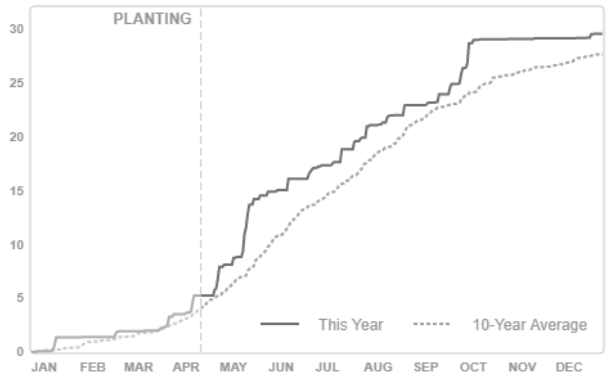
Project SENSE (Sensor-based In-season N Management)

Study ID: 617035201701
County: Clay
Soil Type: Hastings silt loam 0-1% slope; Butler silt loam 0-1% slope
Planting Date: 4/24/17
Harvest Date: 10/28/17
Population: 34,000
Hybrid: Channel 209-51VT2P
Reps: 6
Previous Crop: Soybean
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	6.6	0.31	NONE	2.9	27.4	66	18	13	2.44	371	2111	275	26	17.6	21	5	60	13	1
2	6.4	6.8	0.22	NONE	3.3	6.9	16	6	10	3.43	427	2354	294	34	17.5	11	6	67	14	1
3	6.8	7.2	0.19	NONE	3.3	6	14	14	10	4.57	483	1956	219	32	13	0	10	75	14	1

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 applied all of his N fertilizer on March 17, 2017 in a variable rate application averaging 163 lb N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 90 lb N/acre was applied on March 17, 2017. Crop canopy sensing and application occurred on July 5, 2017, at the V16 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 119 lb N/acre. Nitrogen application for the Project SENSE treatment strips is shown in *Figure 2*. The total N rate was 209 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	163	245 A*	84 A	0.67 B	705.17 A
Project SENSE N Management	209	237 B	64 B	0.88 A	659.63 B
P-Value	N/A	<0.0001	<0.0001	<0.0001	<0.0001

*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.

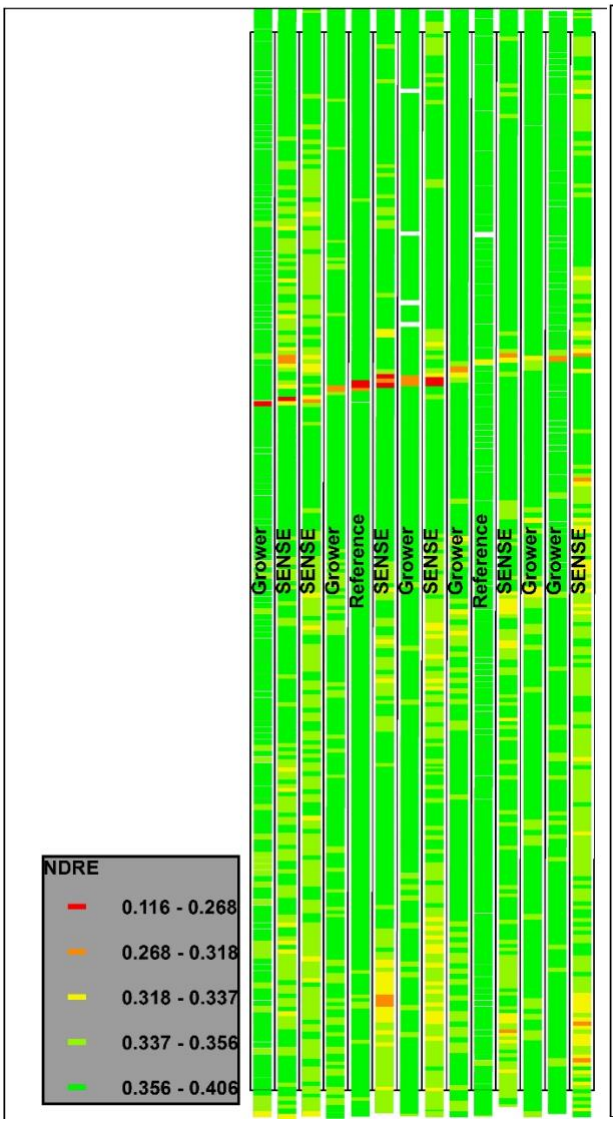


Figure 1. NDRE (normalized difference red edge) index obtained using crop canopy sensors mounted on a high clearance applicator for the plot area on July 5, 2017.

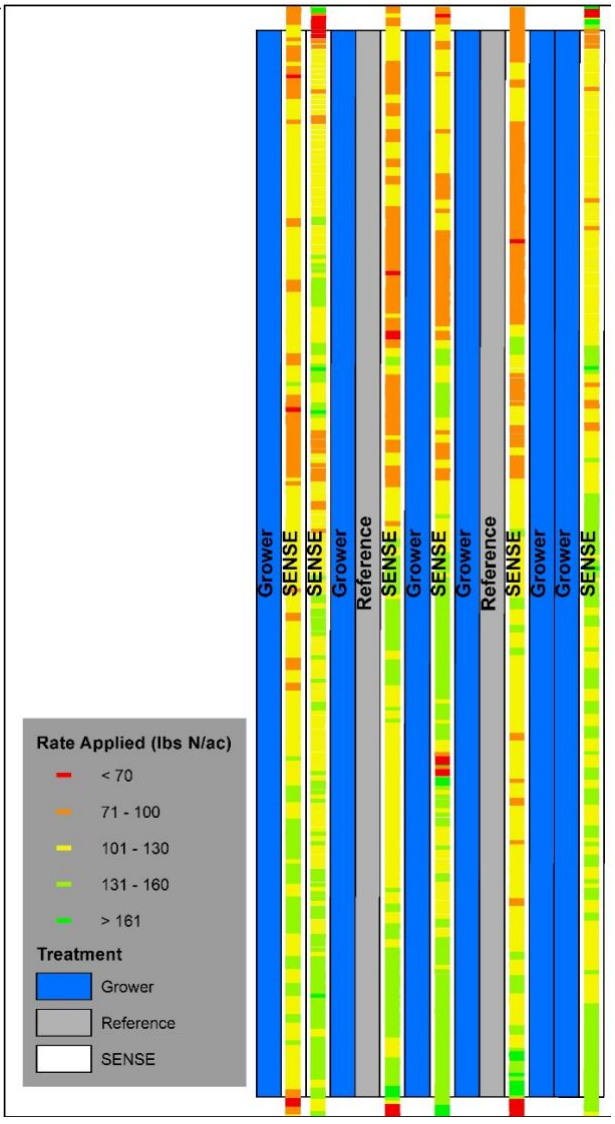


Figure 2. Nitrogen rate applied to Project SENSE N Management treatments based on NDRE captured with the crop canopy sensors and displayed in *Figure 1*.

Summary:

- Project SENSE N application was 46 lb N/acre higher than the grower's N application.
- The grower's N management resulted in a 9 bu/acre yield increase compared with the Project SENSE N management.
- At the time of in-season application, deficiencies were not visually evident. Lack of incorporation of the in-season N application is a possible explanation for the lower yields despite higher N rates.
- The grower's N management resulted in higher N use efficiency than the Project SENSE N management.
- The grower's N management resulted in a $46/acre higher marginal net return.

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