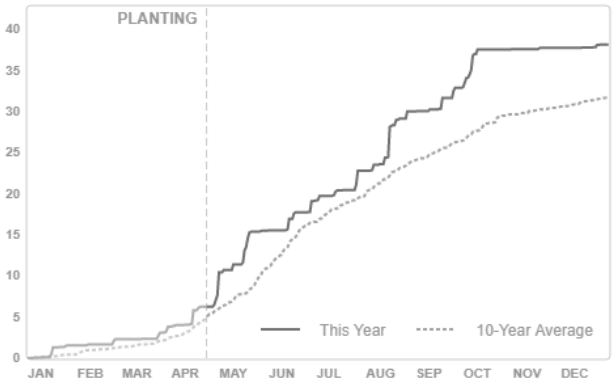
Project SENSE (Sensor-based In-season N Management)

Study ID: 621023201701
County: Butler
Soil Type: Thurman loamy fine sand 2-6% slopes; Brocksburg loam 0-2% slope; Simeon loamy sand 0-3% slope
Planting Date: 4/23/17
Harvest Date: 10/18/17
Population: 30,300
Hybrid: Pioneer 1498
Reps: 6
Previous Crop: Soybean
Tillage: No-Till

Irrigation: Pivot; 22.8 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
3	6.8	7.2	0.07	NONE	1.8	4.5	11	29	7	4.93	181	1464	142	9	9	0	5	81	13	0
14	6.3	6.8	0.03	NONE	0.7	2	5	26	4	2.5	64	734	72	6	6.5	31	3	57	9	0
22	6.9	7.2	0.03	NONE	0.7	2.1	5	12	4	2.63	48	618	66	6	3.8	0	3	81	15	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 initial grower N rate was 13 lb N/acre applied on April 23, 2017. An additional 74 lb N/acre was applied on April 29, 2017, 21 lb N/acre was applied on June 2, 2017, and 110 lb N/acre was applied on June 11, 2017. Total N applied was 218 lb N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 13 lb N/acre was applied on April 23, 2017, 74 lb N/acre was applied on April 29, 2017, and 21 lb N/acre was applied on June 2, 2017. Crop canopy sensing and application occurred on June 29, 2017, at 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 42 lb N/acre. Nitrogen application for the Project SENSE treatment strips is shown in *Figure 2*. The total N rate was 150 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	218	220 A*	57 B	0.99 A	663.09 A
Project SENSE N Management	150	199 B	75 A	0.76 B	605.88 B
P-Value	N/A	0.002	0.0003	<0.0001	0.004

*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 nitrogen fertilizer.

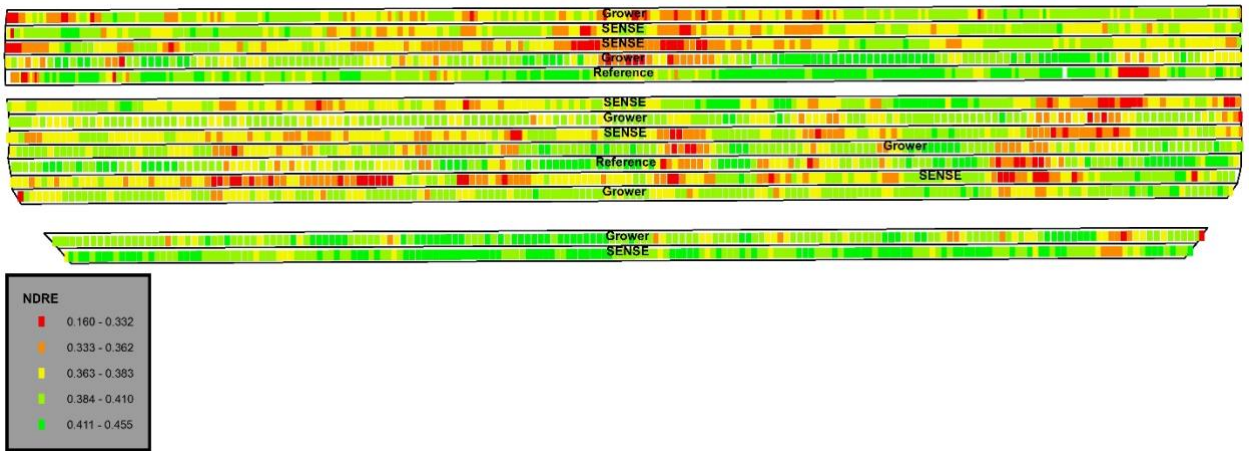


Figure 1. NDRE (normalized difference red edge) index obtained using crop canopy sensors mounted on a high clearance applicator for the plot area on June 29, 2017.

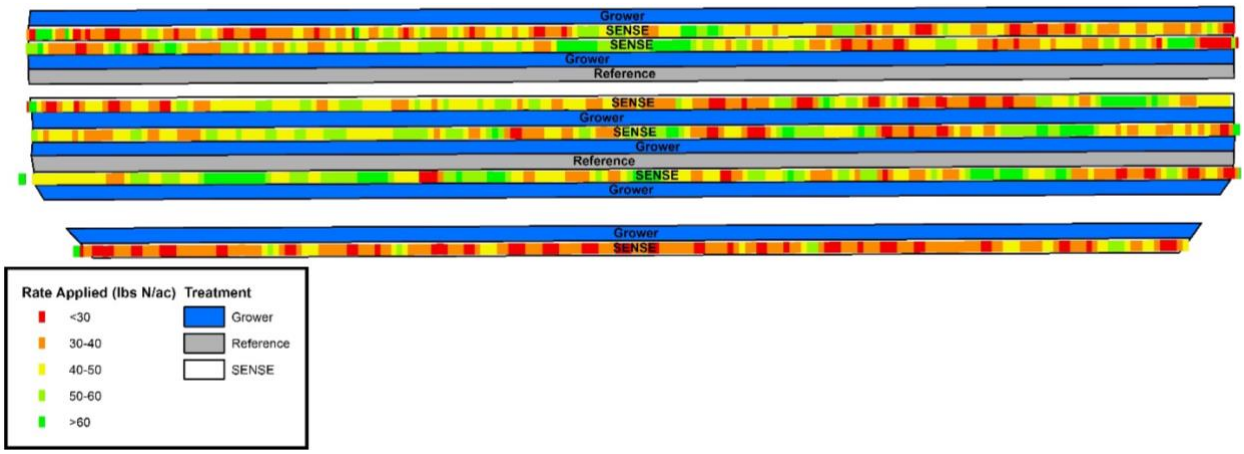


Figure 2. Nitrogen rate applied to Project SENSE N Management treatments based on NDRE captured with the crop canopy sensors and displayed in *Figure 1*.

Summary:

- Project SENSE N application was 68 lb N/acre lower than the grower's N application.
- The grower's N management resulted in a 21 bu/acre yield increase compared with the Project SENSE N management.
- The Project SENSE N management resulted in higher N use efficiency than the grower's N management.
- The grower's N management resulted in a $57/acre higher marginal net return.

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