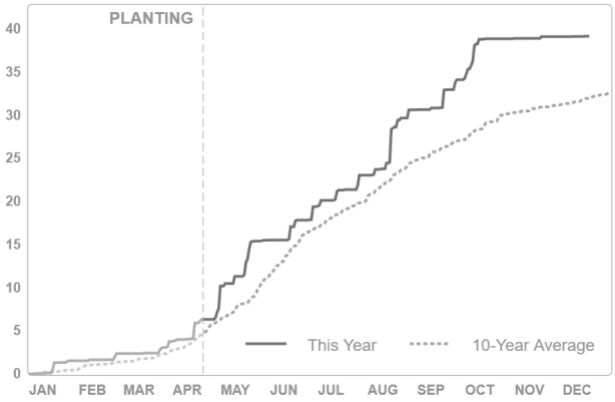
Project SENSE (Sensor-based In-season N Management)

Study ID: 211023201701
County: Butler
Soil Type: Ovina-Thurman complex 0-6% slopes; Muir silt loam rarely flooded
Planting Date: 4/20/17
Harvest Date: 10/26/17
Population: 32,000
Hybrid: CRM (days) 110
Reps: 6
Previous Crop: Corn
Tillage: Reduced Tillage

Irrigation: Pivot; 10 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	6.5	6.9	0.16	NONE	2.8	7.7	18	27	11	2.42	214	2120	257	20	14.5	8	4	72	15	1
2	5.9	6.7	0.09	NONE	1.7	5.8	14	18	12	1.57	216	1211	150	11	10.8	27	5	56	12	0
3	6	6.8	0.1	NONE	1.8	8.2	20	10	14	1.76	142	1432	178	14	11.3	20	3	63	13	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 70 lb N/acre applied on April 20, 2017. An additional application of 115 lb N/acre was made on June 1, 2017. Total N applied was 185 lb N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 70 lb N/acre was applied on April 20, 2017. Crop canopy sensing and application occurred on June 21, 2017, at V10 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 115 lb N/acre. Nitrogen application for the Project SENSE treatment strips is shown in *Figure 2*. The total N rate was 185 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	185	202 B*	61 A	0.92 A	561.67 B
Project SENSE N Management	185	205 A	62 A	0.91 A	569.22 A
P-Value	N/A	0.011	0.584	0.701	0.035

*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.

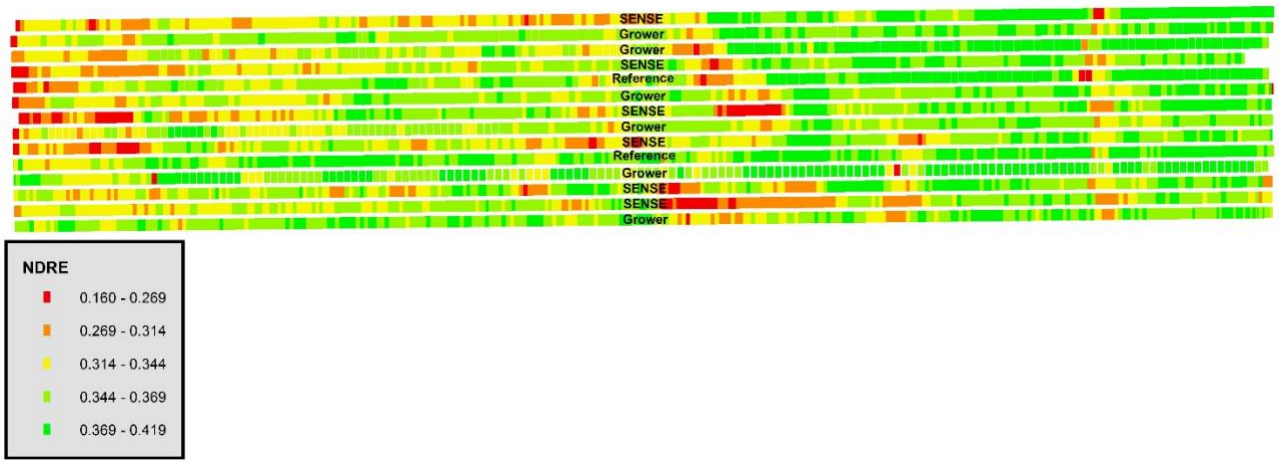


Figure 1. NDRE (normalized difference red edge) index obtained using crop canopy sensors mounted on a high clearance applicator for the plot area on June 21, 2017.

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:

- The total N application was the same for both the grower's N management and the Project SENSE N management.
- The Project SENSE N management had a 2.4 bu/acre yield increase compared with the grower's N management despite identical N rates. Different in-season application timing for the Project SENSE N management and grower N management is likely the cause of the yield difference. At the time of in-season application for the Project SENSE strips, some N deficiency was visually observed.
- There were no differences in N use efficiency between the grower's N management and the Project SENSE N management.
- The Project SENSE N management resulted in an $8/acre increase in marginal net return compared with the grower's N management.

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