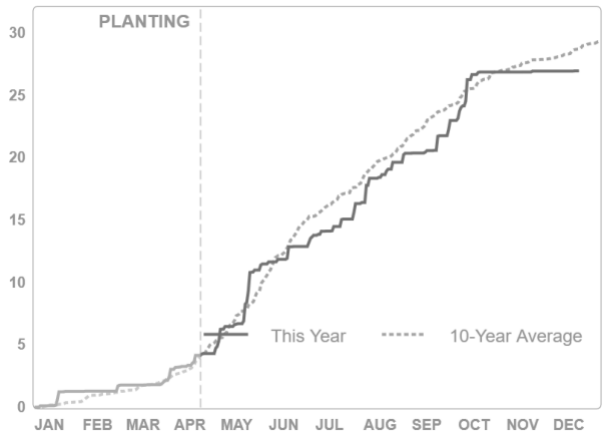
Project SENSE (Sensor-based In-season N Management)

Study ID: 620059201701
County: Fillmore
Soil Type: Crete silt loam 1-3% slope; Butler silt loam 0-1% slope; Fillmore silt loam drained, 0-1% slopes; Crete silt loam 0-1% slope; Crete silty clay loam 3-7% slopes, eroded; Fillmore silt loam frequently ponded
Planting Date: 4/18/17
Harvest Date: 10/17/17
Population: 35,300
Hybrid: CRM (days) 112
Reps: 6
Previous Crop: Soybean
Tillage: Reduced Tillage

Irrigation: Pivot; 5 N lb/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	5.8	6.7	0.51	NONE	2.8	50.5	121	21	14	1.31	264	3070	602	45	23.9	11	3	64	21	1
2	5.8	6.5	0.43	NONE	3.6	54.9	132	40	15	2.68	312	2335	295	37	20.4	26	4	57	12	1
3	6.2	6.8	0.21	NONE	3.3	6.4	15	13	16	2.08	261	2532	404	46	18.9	11	4	66	18	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 82 lb N/acre applied on March 10, 2017. An additional 3 lb N/acre was applied at planting. On June 8, 2017, 70 lb N/acre was applied as an in-season application. Total N applied was 155 lb N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 82 lb N/acre was applied on March 10, 2017 and an additional 3 lb N/acre was applied at planting. Crop canopy sensing and application occurred on June 6, 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 56 lb N/acre. Nitrogen application for the Project SENSE treatment strips is shown in *Figure 2*. The total N rate was 141 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	155	256 A*	92 B	0.61 A	741.33 A
Project SENSE N Management	141	251 B	100 A	0.56 B	733.36 A
P-Value	N/A	0.039	0.008	0.008	0.181

*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.

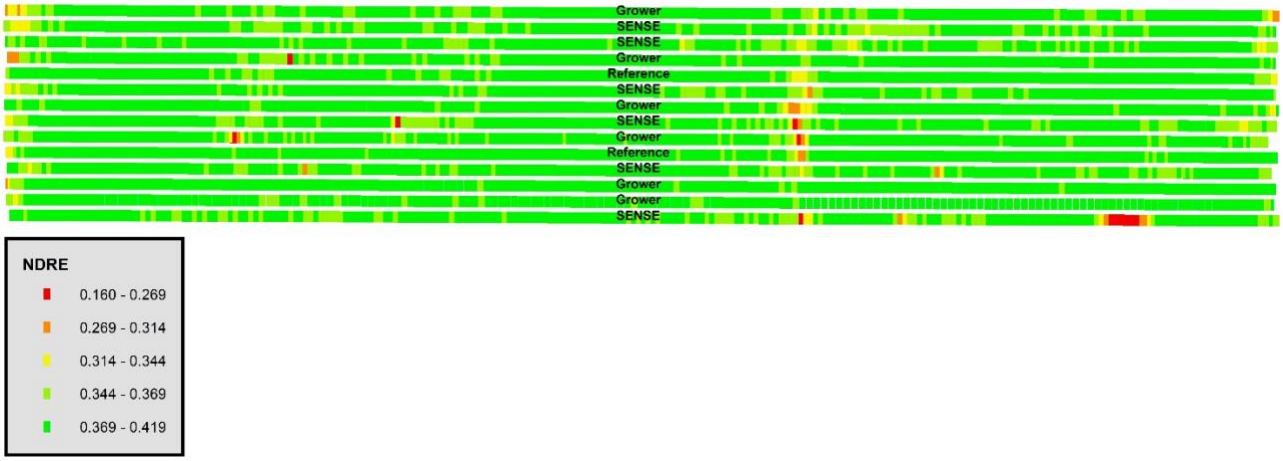


Figure 1. NDRE (normalized difference red edge) index obtained using crop canopy sensors mounted on a high clearance applicator for the plot area on June 6, 2017.

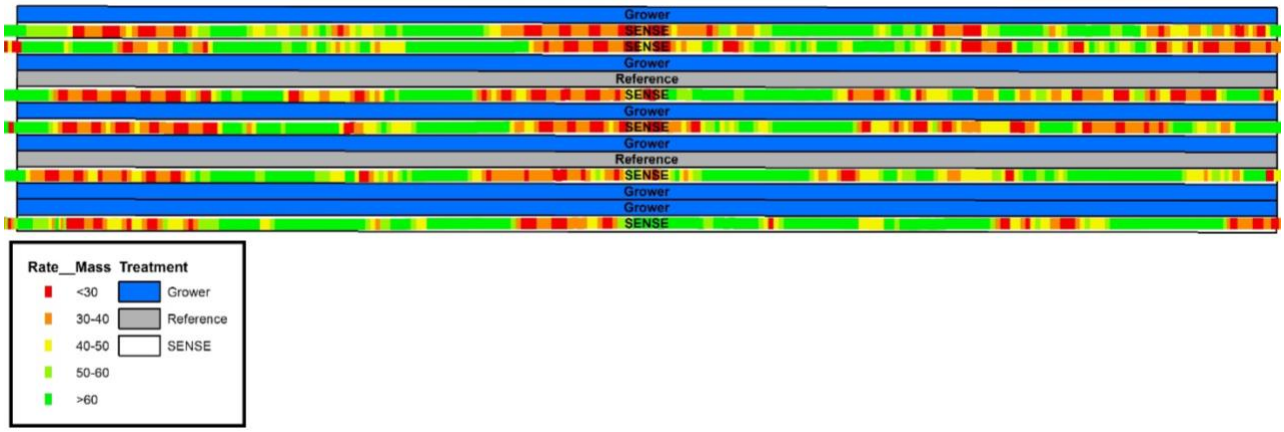


Figure 2. Nitrogen rate applied to Project SENSE N Management treatments based on NDRE captured with the crop canopy sensors and displayed in *Figure 1*.

Summary:

- Project SENSE N application was 14 lb N/acre lower than the grower's N application.
- The grower's N management resulted in a 4 bu/acre yield increase compared with the Project SENSE N management.
- Project SENSE N management resulted in higher N use efficiency than the grower's N application.
- There was no difference in marginal net return between the Project SENSE N management and the grower's N management.

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