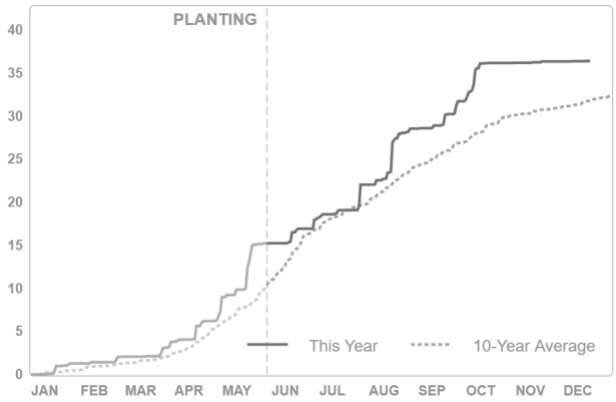
Project SENSE (Sensor-based In-season N Management)

Study ID: 574037201701
County: Colfax
Soil Type: Lawet silt loam rarely flooded
Planting Date: 5/29/17
Harvest Date: 11/7/17
Population: 31,000
Hybrid: CRM (days) 107
Reps: 6
Previous Crop: Corn
Tillage: Reduced Tillage

Irrigation: Pivot; 24 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	8.1	7.2	0.31	HIGH	5	6.3	15	45	7	2.21	341	5135	789	9	33.2	0	3	77	20	0
14	8.1	7.2	0.3	HIGH	4.5	6.4	15	42	6	2.16	279	5128	773	9	32.8	0	2	78	20	0
22	8.2	7.2	0.33	HIGH	5.3	8.1	19	50	7	2.14	326	5250	913	15	34.8	0	2	76	22	0

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 54 lb N/acre applied on May 29, 2017. An additional application of 173 lb N/acre was made during the growing season. Total N applied was 227 lb N/acre.

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, 54 lb N/acre was applied on May 29, 2017. Crop canopy sensing and application occurred on July 10, 2017, at the V13 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 31 lb N/acre. Nitrogen application for the Project SENSE treatment strips is shown in *Figure 2*. The total N rate was 85 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	227	233 A*	58 B	0.97 A	641.95 A
Project SENSE N Management	85	213 B	141 A	0.40 B	634.76 B
P-Value	N/A	<0.0001	<0.0001	<0.0001	0.038

*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.

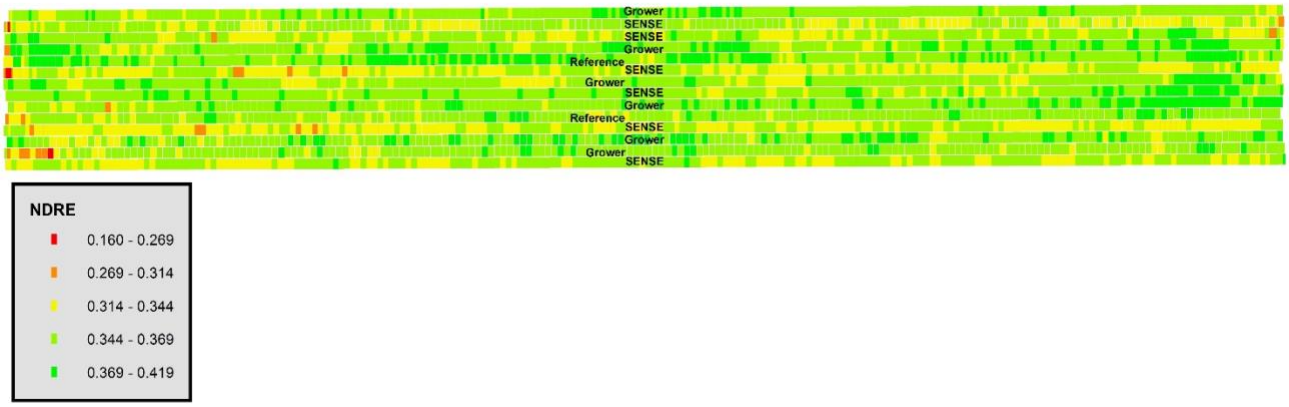


Figure 1. NDRE (normalized difference red edge) index obtained using crop canopy sensors mounted on a high clearance applicator for the plot area on July 10, 2017.

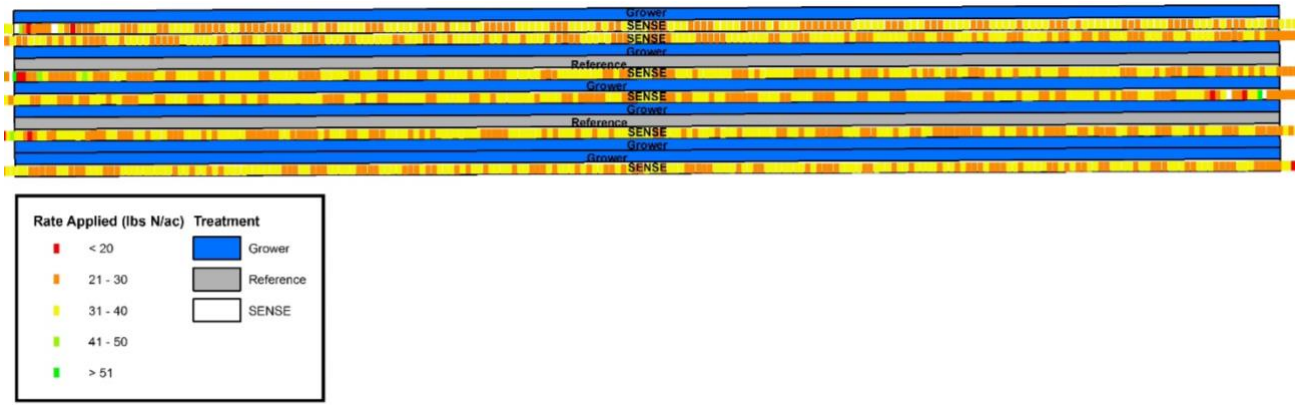


Figure 2. Nitrogen rate applied to Project SENSE N Management treatments based on NDRE captured with the crop canopy sensors and displayed in *Figure 1*.

Summary:

- Project SENSE N application was 143 lb N/acre lower than the grower's N application.
- The grower's N management had 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 had a $7/acre higher marginal net return.

Sponsored by: University of Nebraska Lincoln; Nebraska Corn Board

In Partnership with: Nebraska Soybean Checkoff; Nebraska Corn Growers Association; Nebraska Dry Bean Commission