Project SENSE (Sensor-based In-season N Management) on Irrigated Corn

Study ID: 0078155202001
County: Saunders
Soil Type: Yutan silty clay loam; Filbert silty clay loam; Fillmore silt loam; Scott silt loam
Planting Date: 4/25/20
Harvest Date: 10/6/20
Seeding Rate: 33,000
Row Spacing (in): 30
Hybrid: Pioneer® P1082
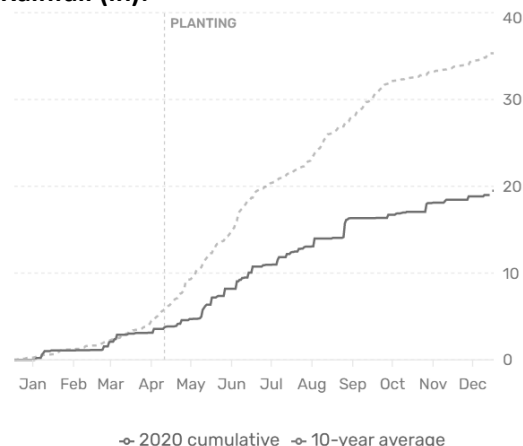**Reps:** 6
Previous Crop: Soybean
Tillage: No-Till
Herbicides: *Pre:* 80 oz/ac Acuron®
Foliar Insecticides: 2.19 oz/ac Baythroid®

Irrigation: Pivot, Total: 6.5"
Rainfall (in):

↝ 2020 cumulative ↝ 10-year average

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. This site was unique; in other Project SENSE study sites, a high N reference strip is established. This strip of the field receives N fertilizer levels that are non-limiting to plant growth. The strip is scanned with the sensors to calibrate the sensor algorithm prior to sensing and fertilizing the Project SENSE treatments. At this particular site, this strip was not established. Some sensor-based management protocols recommend this approach (not using a high N reference strip) and instead simply scan a portion of the field without a high N reference strip to calibrate the sensors; this site allowed us to test this approach. Without a high N reference to calibrate the sensors, the sensors operated at their set minimum application rate of 30 lbs/ac a majority of the time.

Grower Nitrogen Treatment: The grower rate totaled 154 lb N/ac. This consisted of a preplant application of 17.6 gal/ac 32% UAN (contributing 62 lb/ac N) and 3 gal/ac 12-0-0-26S thiosulfate (contributing 4 lb/ac N). A sidedress application was made on July 9 at VT growth stage and consisted of 23 gal/ac 32% UAN (contributing 80 lb/ac N) and 5.7 gal/ac thiosulfate (contributing 7 lb/ac N).

Project SENSE Nitrogen Treatment: For the SENSE treatment strips, the base rate (prior to in-season sensing) was established with 17.6 gal/ac 32% UAN and 3 gal/ac 12-0-0-26S thiosulfate, for a total base rate of 66 lb/ac N. Crop canopy sensing and application occurred on June 30, 2020, at the V12 growth stage. Across all Project SENSE treatments, the average N rate applied based on the in-season sensing was 32 lb N/ac. The field received 0.77" of rain on July 1, 2020. The average total N rate was 98 lb N/ac.

Results:

	Total N rate (lb/ac)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/bu grain	Marginal Net Return‡ ($/ac)
Grower	154 A*	211 A	77 B	0.73 A	679.04 A
Project SENSE	98 B	180 B	103 A	0.55 B	592.47 B
P-Value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

*Values with the same letter are not significantly different at a 90% confidence level.
†Yield values are from cleaned yield monitor data. Bushels per acre corrected to 15.5% moisture.
‡Marginal net return based on $3.51/bu corn and $0.41/lb N.

Summary:

- The Project SENSE management N rate was 56 lb/ac lower than the grower's N management.
- Yield for the Project SENSE management was 31 bu/ac lower than the grower's N management.
- Project SENSE had better nitrogen use efficiency; Project SENSE N management used 0.19 lb/ac less N to produce a bushel of grain than the grower's method.
- Marginal net return was $86.57/ac lower for the Project SENSE N management than the grower's N management.
- The use of a high N reference strip is recommended for sensor calibration.