

## Sensor-based Nitrogen Fertigation

**Study ID:** 0815093201902

**County:** Howard

**Soil Type:** Valentine-Thurman complex 0-17% slopes; Thurman loamy fine sand 2-6% slopes; Libory-Boelus loamy fine sand; Kenesaw silt loam 1-6% slopes; Kenesaw silt loam 0-1% slope; Thurman loamy fine sand 0-2% slope; Ortello loamy fine sand 1-6% slopes

**Planting Date:** 5/13/19

**Harvest Date:** 10/19/19

**Seeding Rate:** 35,000

**Row Spacing (in):** 30

**Variety:** Pioneer® P0339AMXT™

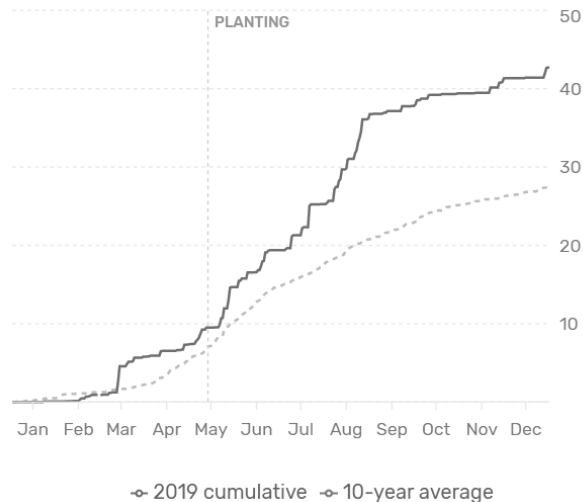
**Reps:** 4

**Previous Crop:** Corn

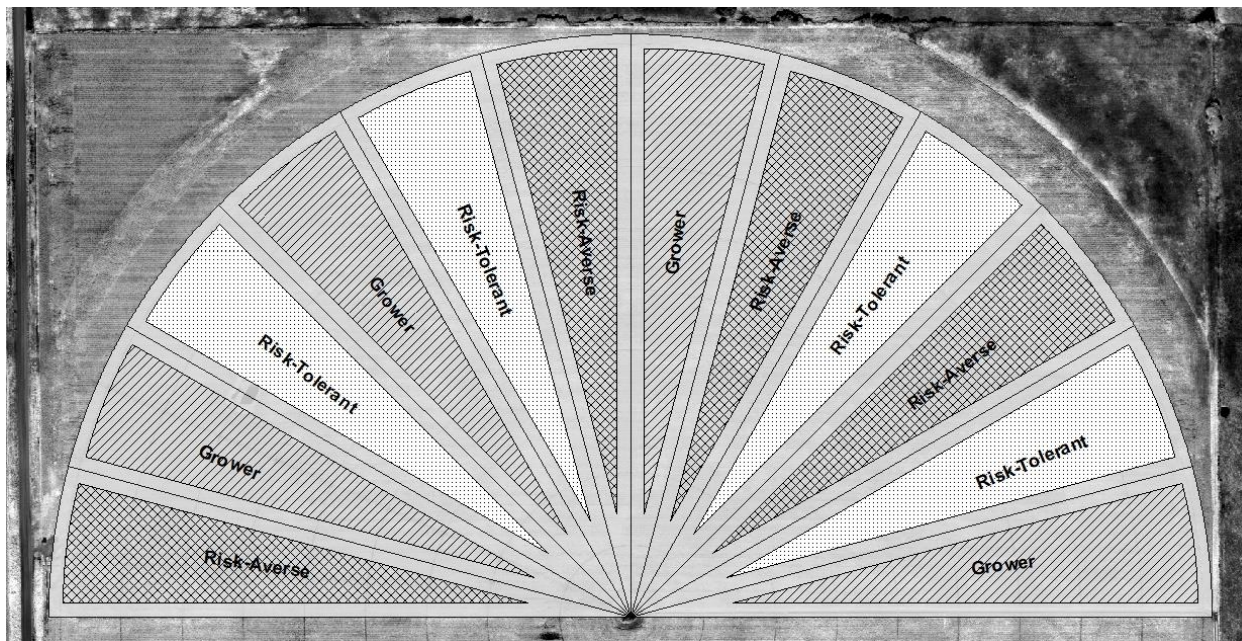
**Tillage:** No-Till

**Irrigation:** Pivot, Total: 6.9"

**Rainfall (in):**



**Introduction:** Corn nitrogen management may be improved by using sensors or imagery to detect and respond to corn nitrogen need during the growing season. This study used weekly aerial imagery to monitor indicator plots with lower N rates. Sensor-based fertigation management began once the cumulative N applied was 60 lb/ac less than the grower's total target N for the season. If indicator plots demonstrated nitrogen deficiency, a fertigation application of 30 lb/ac was triggered. This study compared the grower's standard N management with two reactive, sensor-based fertigation approaches as follows:



**Figure 1.** Experiment layout showing four replications of three treatments arranged in sectors.

**Grower Management:** The grower's standard N management plan involved applying 36 lb N/ac as starter at planting, 21 lb N/ac as fertigation on June 16, 30 lb N/ac as sidedress on June 20, 27 lb N/ac as

fertigation on July 14, 30 lb N/ac as fertigation on July 18, and 56 lb N/ac as fertigation on July 23. The total N applied was 200 lb N/ac.

**Risk-Averse Fertigation Treatment:** This approach triggered N fertigation when one indicator block showed N deficiency and therefore may better protect yield by applying N more frequently.

**Risk-Tolerant Fertigation Treatment:** This approach triggered N fertigation when three indicator blocks showed N deficiency and may better guard against excess N applications by only applying N when several indicator blocks agree that N is needed.

At this site, the risk-averse and risk-tolerant treatments resulted in the same N management. For both, 36 lb N/ac was applied as starter at planting. Standard grower management applied an additional 134 lb N/ac (21 lb N/ac as fertigation on June 16, 30 lb N/ac as sidedress on June 20, 27 lb/ac as fertigation on July 14, and 30 lb N/ac as fertigation July 18). The July 23 fertigation was applied at a rate of 30 lb N/ac, which was less than the grower’s rate of 56 lb N/ac, in order to bring the cumulative N applied to 174 lb/ac. This was 60 lb/ac less than the grower’s target total N rate. Though sensor-based fertigation management started at this point, an application wasn’t made the week of July 29 because fertigation events in sensor-based management sectors were not allowed in consecutive weeks. On the week of August 5, the crop was observed at the R2 growth stage, outside of the allowable interval for sensor-based applications. Therefore, no sensor-based applications were made on this site and the total N applied during the growing season was 174 lb N/ac.

**Results:**

N Management Strategy	Total N rate (lb/ac)	Moisture (%)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/ bu grain	Marginal Net Return‡ (\$/ac)
Grower	200 A	15.9 A	157 A	44 A	1.30 A	520.90 A
Risk-Averse Fertigation	174 B	15.0 A	171 A	55 A	1.08 A	586.55 A
Risk-Tolerant Fertigation	174 B	15.2 A	160 A	52 A	1.15 A	543.62 A
P-Value	<0.0001	0.111	0.828	0.383	0.440	0.781

\*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 adjusted to 15.5% moisture.

‡Marginal net return based on \$3.83/bu corn and \$0.40/lb N.

**Summary:**

- At this site, the risk adverse and risk tolerant fertigation approach applied 26 lb/ac less N than the grower's N management.
- There was no yield, N efficiency, or net return difference between the sensor-based fertigation approaches and the grower's N management.

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