

Data-Intensive Farm Management: Nitrogen Application Rates on Corn

Study ID: 0817081201901

County: Hamilton

Soil Type: Hastings silt loam 0-1% slope; Hastings silty clay loam 3-7% slopes, eroded

Planting Date: 4/20/19

Harvest Date: 10/20-26/19

Seeding Rate: 34,200

Row Spacing (in): 30

Variety: Pioneer® P1306WHR

Reps: 10

Previous Crop: Soybean

Tillage: Ridge-Till

Herbicides: *Pre:* 12 oz/ac Verdict®, 32 oz/ac glyphosate, and 1 qt/ac atrazine on 4/26/19 *Post:* 16 oz/ac Armezon® PRO, 32 oz/ac glyphosate, and 1 qt/ac atrazine on 6/11/19

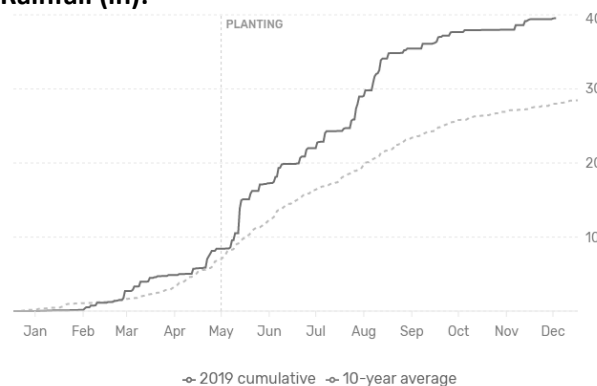
Seed Treatment: insecticide and fungicide

Foliar Insecticides: 5 oz/ac Hero® aerially applied at tassel on 7/18/19

Foliar Fungicides: 10 oz/ac Headline AMP® aerially applied at tassel on 7/18/19

Irrigation: Pivot, Total: 3"

Rainfall (in):



Introduction: This project is part of the Data-Intensive Farm Management Project, a multi-university collaboration led by the University of Illinois at Urbana-Champaign. The goal of these research studies is to utilize precision agriculture technology for conducting on-farm research. This study tested four nitrogen rates applied with anhydrous ammonia on April 13, 2019. Treatments were randomized and replicated in 40' wide by 280' long blocks across the entire field (Figure 1). Variable-rate prescription maps for the nitrogen study were developed and uploaded to the in-cab monitor. Geospatial yield monitor data were collected at the end of the growing season and post-processed to remove errors with Yield Editor software from the USDA. The as-applied fertilizer data were evaluated, and only areas that achieved application rates within 10% of the target application rate were included for yield analysis. The entire field received 5.8 lb N/ac as 5 gal/ac of 10-34-0 starter fertilizer at planting; therefore, values in the results table reflect the total N applications of 106 lb N/ac, 146 lb N/ac, 186 lb N/ac, and 226 lb N/ac.

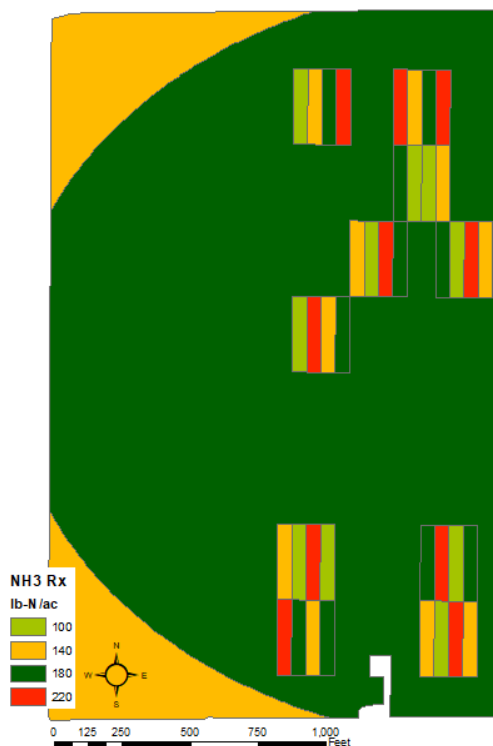


Figure 1. Nitrogen prescription map for anhydrous ammonia application.

Results:

	Moisture (%)	Yield (bu/ac)†	lbs N/bu grain	Marginal Net Return‡ (\$/ac)
106 lb N/ac	16.5 B*	238 C	0.42 D	877.31 B
146 lb N/ac	16.6 AB	246 B	0.57 C	896.71 A
186 lb N/ac	16.8 A	249 AB	0.72 B	894.23 A
226 lb N/ac	16.6 AB	251 A	0.88 A	888.73 AB
P-Value	0.023	<0.0001	<0.0001	0.042

*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 \$0.32/lb N.

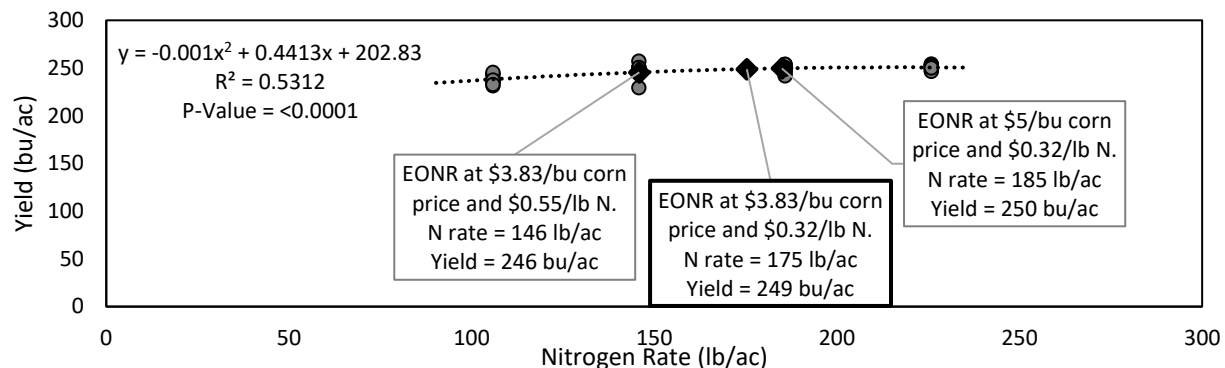


Figure 2. Yield versus nitrogen rate with economic optimum nitrogen rates (EONR) indicated at three price points.

Summary: At this year's corn price of \$3.83/bu and an N price of \$0.32/lb N, the economic optimum N rate was 175 lb N/ac yielded 249 bu/ac (Figure 2). Nitrogen use efficiency was highest for the 100 lb N/ac treatment, utilizing only 0.4 lb N to produce a bushel of corn.

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