



Corn Response to Nitrogen Rates

Trial Objective

- The optimum nitrogen (N) rate for corn can be difficult to determine for farmers. Inadequate N can cause a noticeable reduction in yield while excess N is unused by the crop. Also, unused N reduces the return on N investment.
- The objective of this study was to evaluate the response of corn products to six N rates.

Research Site Details

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Planting Rate (seeds/acre)
Gothenburg, NE	Hord silt loam	Corn	Strip tillage	5/15/19	10/25/19	220	34K

- The study was set up as a split-plot design with four replications.
- The previous crop was corn, which depleted the soil profile of N and other nutrients. The residual N in the top two feet was 26 lb N/acre.
- Nitrogen rate was the whole plot factor with six rates of N: 0, 60, 120, 180, 240, and 300 lb/acre, which was applied with 360 Y-DROP® fertilizer tube attachments at the V5 corn growth stage on June 26th, 2019. No additional nutrients were applied to the plots.
- Corn product was the subplot with the three products evaluated ranging in maturity from 100 to 117 relative maturity.
- Weeds were uniformly controlled; no other pests were controlled in the study.
- Shelled corn weight and grain moisture were collected, and bushels per acre calculated.

Understanding the Results

- There was no N rate by corn product interaction, so data were averaged across corn products.
- The amount of N to produce one bushel of grain increased as the applied N rate increased. Compared to the first increments of applied N, more N was needed to make one bushel of grain at the greater rates of applied N (Figure 2).
- Application of 180 lb N/acre calculated 1.08 lb of N to make one bushel. This result coincides with the application recommendation of 1.0 to 1.2 lb N/acre calculated from fertility formulas based on the yield goal of a field.^{1,2}
- Approximately 14 lb of N was needed to produce one bushel of grain with the greatest rate of applied N (300 lb/acre). In comparison, it took 1.6 lb of N to produce one bushel of grain with the lowest rate of applied N (60 lb/acre) (Figure 3).

Key Learnings

- The law of diminishing returns is illustrated in this research with more value observed from the first 60 lb N/acre applied than the last 60 lb N/acre increment.



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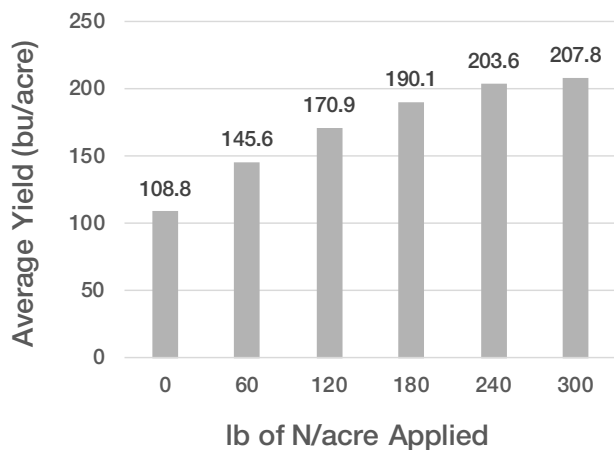


Figure 1. Yield response to N application rates. The positive yield response to additional N leveled off at the 240 lb N/acre rate with 91% of the yield potential achieved with the 180 lb N/acre rate.

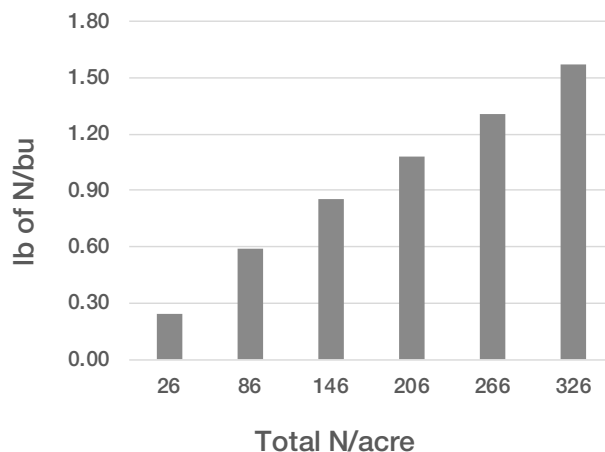


Figure 2. Pounds of N to make one bushel of grain based on total available N per acre (including soil residual N).

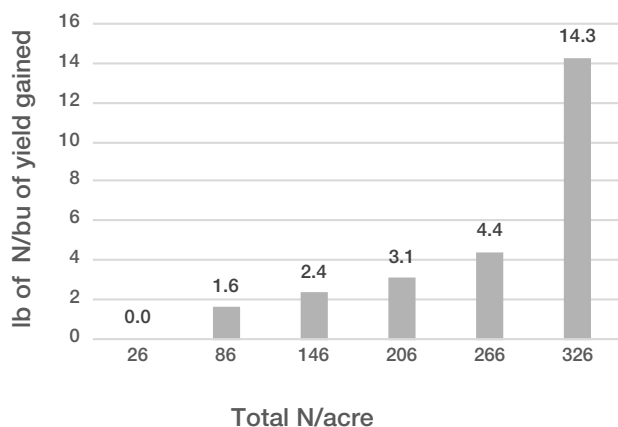


Figure 3. Total available N per bushel of yield gained over the previous treatment.

- Nitrogen application rates are a key factor in driving yield, but residual N should be considered to tailor the N rate for a specific field.
- While maximum yield potential is the goal of many operations, the value of the input in increasing crop yield needs to be carefully considered as farmers put together their fertility plans.

Sources: Web sources verified 11/9/19

¹ Nielsen, R.L. 2001. Optimizing fertilizer decisions. Corny News Network. Purdue University. https://www.agry.purdue.edu/ext/corn/news/articles.01/N_Use_Efficiency_0221.html.

² University of Maryland Cooperative Extension. 2009. Nutrient recommendations by crop. https://mda.state.md.us/resource_conservation/Documents/consultant_information/I-B1%20p1-15%20s6.pdf

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