

## **Corn Nitrogen Recommendations**

**Optimal nitrogen rates are not closely related to grain yield.**

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Variable – the one word often used to describe corn response to nitrogen (N). Soil variability within a field influences the N supply due to changes in soil texture, organic matter content, and topography while environmentally both temperature and rainfall distribution are often key drivers of N variability across entire landscapes. Despite new application technologies and a plethora of products targeting improved plant growth and efficiency, three factors including rainfall frequency, crop heat units, and soil texture still appear to offer the greatest influence on corn response to N.

Resources are available to reduce grower uncertainty when selecting corn nitrogen (N) rates. Seven states through the Corn Belt, including Michigan, utilize the MRTN (Maximum Return to Nitrogen) corn N recommendation system. The MRTN model was adopted to further enhance farm profitability by maximizing the economic return of N fertilizer invested while simultaneously addressing some of the negative environmental consequences that occur when applying excessive N rates.

The model provides a range of N rate recommendations based on corn yield response to N over many years and across a range of Michigan soils. What the MRTN model also recognizes and accounts for is that the most economically optimum nitrogen rate will never be constant as both corn and fertilizer prices fluctuate over time. The model provides a profitable range of N rates that allows for user input to adjust rate based on crop rotation, soil productivity potential, and current price of N fertilizer and corn grain. The MRTN recommendation table is a summary of results from the Michigan database within the Corn Nitrogen Rate Calculator. Both tools may be accessed via the Soil Fertility and Nutrient Management Program website [soil.msu.edu](http://soil.msu.edu) at Michigan State University.

### **Important notes to remember when using the MRTN recommendations:**

- 1) The MRTN model is a pre-season general N recommendation model that provides corn N response data that have proven profitable over many years and accounts for both optimal and sub-optimal growing seasons. The model does not account for individual site variability or variable in-season weather events (e.g., individual large rainfall events or excessive rainfall after early N applications) which may affect corn N response and require adjustments to in-season N applications.
- 2) Corn yield for the N rates listed at the 0.05 price ratio will be near maximum levels but N rates for greater price ratios may result in a greater economic return to the grower.

3) When the previous crop is soybean, the N credit is built into the recommendation system. Do not take any additional N credit as the rotational effect of soybean is already accounted for under the “previous crop” heading.

4) If the previous crop was a small grain that was interseeded with a leguminous cover crop species, growers should follow the recommendation category for previous crop soybean and small grain. If no leguminous cover crop was used with the small grain, growers should default to the recommendation category for previous crop corn.

5) Nitrogen credits for previously applied manure are not accounted for in the MRTN table. Manure N credits need to be subtracted from the recommendations listed in the table.

6) The profitable range listed beneath suggested N rates can be used to adjust N rates based on an individual grower’s familiarity with a specific field (i.e., tendency to yield greater or less than expected), the amount of risk a grower wishes to assume, or locally important air, soil, and water concerns.

**Table 1. Suggested N rates for corn grain grown in Michigan, 2017.**

Soil Productivity Potential <sup>1</sup>	Previous Crop	N:Corn Price Ratio			
		0.05	0.10	0.15	0.20
		Suggested N Rate (lbs. N/acre)			
<b>High/Very High</b>	Corn	<b>185</b> 170-200 <sup>2</sup>	<b>170</b> 160-185	<b>155</b> 145-170	<b>145</b> 135-160
	Soybean <sup>3</sup> and small grains <sup>4</sup>	<b>160</b> 145-175	<b>145</b> 135-160	<b>130</b> 120-145	<b>120</b> 110-135
<b>Medium/Low</b>	Corn	<b>155</b> 140-170	<b>145</b> 135-160	<b>135</b> 125-150	<b>120</b> 110-135
	Soybean <sup>3</sup> and small grains <sup>4</sup>	<b>130</b> 115-145	<b>120</b> 110-135	<b>110</b> 100-125	<b>100</b> 90-115
<b>Loamy Sands and Sands (CEC &lt; 8.0)</b>	Irrigated – all crops	<b>215</b> 200-230	<b>195</b> 180-210	<b>180</b> 165-195	<b>170</b> 155-185

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<sup>1</sup> **Low:** average yield = < 135 bu/A; **Medium:** average yield = 136 to 165 bu/A; **High:** average yield = 166 to 195 bu/A; **Very High** = more than 196 bu/A; (average yield is the five-year running average disregarding unusual highs and lows).

<sup>2</sup> Range approximates ± \$1 of the maximum return to N (MRTN) rate.

<sup>3</sup> When the previous crop is soybean, the nitrogen credit is built into the recommendation. Do not take any additional nitrogen credit. Nitrogen credits for previously applied manure need to be subtracted from the N recommendations.

<sup>4</sup> Refers to small grains interseeded with leguminous cover crop species. Small grains not interseeded with leguminous cover crop species should default to previous crop corn.

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