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Nitrogen Fertilization Rates for Corn Production

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Nitrogen Fertilization Rates for Corn Production

Abstract

October 13, 2014 – There has been a large change in corn grain prices this fall. How might that affect recommended nitrogen (N) fertilizer or manure-N application rates, and planning for the 2015 crop? The answer depends on more than just the price of corn, but also the price of nitrogen. It is the ratio of these prices (price ratio, where the \$/lb actual N is divided by the \$/bu corn; example, \$0.50/lb N and \$3.50/bu corn is a 0.14 price ratio). Both prices are important and influence recommended N rates as the ratio reflects the last unit of N that can be paid for by the yield increase from that N application. In Iowa, recommended rates (Maximum Return to N, MRTN) come from the **Corn Nitrogen Rate Calculator (CNRC)**, which is the online tool providing rate recommendations for corn following corn and corn following soybean. The rates derived from the CNRC are adjusted for user specified N and grain prices. While a significant change in grain price may be troublesome, it may or may not affect recommended rates because of current N price.

Keywords

Agronomy

Disciplines

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Nitrogen Fertilization Rates for Corn Production

ICM News

October 14, 2014

by John Sawyer, Department of Agronomy

October 13, 2014 – There has been a large change in corn grain prices this fall. How might that affect recommended nitrogen (N) fertilizer or manure-N application rates, and planning for the 2015 crop? The answer depends on more than just the price of corn, but also the price of nitrogen. It is the ratio of these prices (price ratio, where the \$/lb actual N is divided by the \$/bu corn; example, \$0.50/lb N and \$3.50/bu corn is a 0.14 price ratio). Both prices are important and influence recommended N rates as the ratio reflects the last unit of N that can be paid for by the yield increase from that N application. In Iowa, recommended rates (Maximum Return to N, MRTN) come from the **Corn Nitrogen Rate Calculator** (CNRC), which is the online tool providing rate recommendations for corn following corn and corn following soybean. The rates derived from the CNRC are adjusted for user specified N and grain prices. While a significant change in grain price

may be troublesome, it may or may not affect recommended rates because of current N price.

Nitrogen rates determined from the online CNRC are directly the total fertilization amounts for each rotation, with no need to further adjust rate for previous crop. That is, for the soybean-corn rotation, there is no need to subtract a "soybean credit" as the rotation effect is already accounted for by the N rate trials that the database is derived from.

Tables 1 and 2 give example N rates for two different corn grain prices, along with four N prices. The N prices were kept constant between tables, but the corn price used in Table 1 was \$5.00/bu and was \$3.50/bu in Table 2. Therefore, the price ratios are not the same in both tables. For corn following soybean, the reduction in the MRTN rate with the lower priced corn ranged from 10 to 17 lb N/acre. For corn following corn, the reduction was from 12 to 23 lb N/acre. These are not large N rate changes, but sizeable enough to be considered for determining N rates as corn prices change. Of course potential N rate changes depend on specific N and corn prices.

The CNRC allows users to input whatever corn and N prices are applicable to their situation. In addition, besides the MRTN rate, a range of rates is provided that gives flexibility in decision making about N applications and allows for rate adjustments based on factors such as uncertainty in corn selling price and issues such as water quality impacts from N application.

The MRTN rates provided by the CNRC are based on many sites and years of N rate trials conducted across Iowa, and provide a reasonable estimate of N rate required for optimal corn production. Actual need in any given year, of course, can be influenced by many factors, most uncontrollable. However, across time the MRTN rates provide adequate N in the majority of trials that have been conducted. When MRTN rates tend to be too low, that typically occurs with above normal springtime rainfall, which is not predictable either.

Nitrogen Rate Guidelines in Iowa for Different N and Corn Grain Prices					
Price Ratio ¹	N Price	Corn Following Soybean		Corn Following Corn	
		Rate ²	Range ³	Rate ²	Range ³
\$/lb:\$/bu	\$/lb N	----- lb N/acre -----			
0.05	0.25	157	143 - 173	217	198 - 240
0.10	0.50	137	126 - 149	190	178 - 201
0.15	0.75	122	113 - 133	175	162 - 185
0.20	1.00	111	101 - 120	156	145 - 167

¹ Price per lb N divided by the expected corn price. For example, N at \$0.50/lb N and corn at \$5.00/bu is a 0.10 price ratio. Corn held at \$5.00/bu for all price ratios.

² Rate is the lb N/acre that provides the Maximum Return To N (MRTN). All rates are based on results from the Corn N Rate Calculator as of July 21, 2014 (<http://extension.agron.iastate.edu/soilfertility/nrate.aspx>).

³ Range is the range of profitable N rates that provides a similar economic return to N (within \$1.00/acre of the MRTN).

Table 1. Nitrogen rates derived for different N prices with corn grain set at \$5.00/bu.

Nitrogen Rate Guidelines in Iowa for Different N and Corn Grain Prices					
Price Ratio ¹	N Price	Corn Following Soybean		Corn Following Corn	
		Rate ²	Range ³	Rate ²	Range ³
		----- lb N/acre -----			
\$/lb:\$/bu	\$/lb N				
0.07	0.25	147	133 - 163	199	185 - 221
0.14	0.50	124	113 - 138	178	163 - 190
0.21	0.75	108	97 - 120	152	140 - 165
0.29	1.00	94	83 - 104	133	121 - 146

¹ Price per lb N divided by the expected corn price. For example, N at \$0.35/lb N and corn at \$3.50/bu is a 0.10 price ratio. Corn held at \$3.50/bu for all price ratios.

² Rate is the lb N/acre that provides the Maximum Return To N (MRTN). All rates are based on results from the Corn N Rate Calculator as of July 21, 2014 (<http://extension.agron.iastate.edu/soilfertility/nrate.aspx>).

³ Range is the range of profitable N rates that provides a similar economic return to N (within \$1.00/acre of the MRTN).

Table 2. Nitrogen rates derived for different N prices with corn grain set at \$3.50/bu.

Resources for Nitrogen Rate Decisions

The Corn Nitrogen Rate Calculator Web tool is located at:
<http://extension.agron.iastate.edu/soilfertility/nrate.aspx>

Click here to download Regional Nitrogen Rate Guidelines for Corn (PM 2015) or for printed copies, contact ISU Extension Online Store or (515) 294-5247.

The ISU Agronomy Extension Soil Fertility website is located at:
<http://www.agronext.iastate.edu/soilfertility/>

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