Don't Double Dip Soybean

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Don't Be Tempted

The approach for determining nitrogen (N) application rates for producing corn has changed, so don't be tempted to subtract a "soybean credit." Current N rate guidelines for corn in Iowa and many nearby states now give suggestions based on specific rotations instead of "crediting" from rates for continuous corn. This means that suggested N rates are those that should be applied for the specific rotation and should not be further modified to account for having a legume in the rotation. In Iowa State University Extension publication *Nitrogen Fertilizer Recommendations for Corn in Iowa*, PM 1714, for example, a range of 100 to 150 lb N/acre for corn after soybean is recommended. Rates within that range can be adjusted for various site-specific conditions but not for any "soybean credit." In the newer regional N publication (*Regional Nitrogen Rate Guidelines for Corn*, PM 2015) and the *Corn Nitrogen Rate Calculator* (see below), using a 0.10 price ratio ($0.50/lb N and $5.00/bu corn grain) for the Iowa database gives a suggested N rate of 124 lb N/acre when corn follows soybean and 181 lb N/acre when corn follows corn (Table 1). These are the N rates to apply and do not need any subtraction of a "soybean credit" for corn following soybean as the soybean crop influence is already built into the recommendation.

Table 1. Nitrogen rate guidelines in Iowa for different N and corn grain prices.

Price	Corn Following Soybean		Corn Following Corn	
Ratio[1]	Rate[2]	Range[3]	Rate	Range
$/lb:$/bu	- - - - - - - - - - - - - - - - - lb N/acre - - - - - - - - - - - - - - - - -			
0.05	145	133 - 161	205	191 - 221
0.10	124	113 - 137	181	168 - 193
0.15	110	100 - 121	158	147 - 172
0.20	97	88 - 107	145	134 - 154

[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. In this table, corn grain was held constant at $5.00/bu.

[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 March 1, 2008 (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).

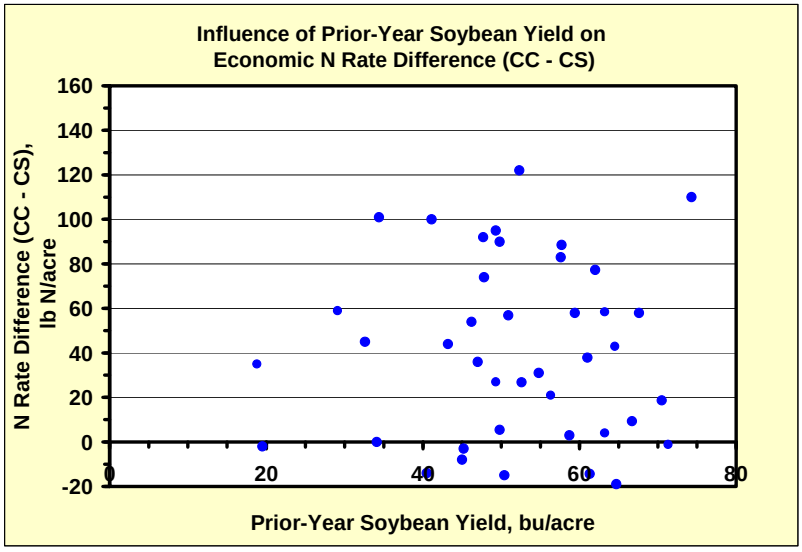
Why is that the case? The current method for determining N rates for corn is based on N response trials conducted for each specific corn rotation. Hence, any difference due to soil N supply as influenced by a crop such as soybean is already reflected in those research trials and therefore reflected in the calculated rate. Note that the rates suggested are for the actual pounds of N per acre, so the N analysis of a particular fertilizer product has to be used to calculate the rate of product per acre. This also is provided in the *Corn Nitrogen Rate Calculator*. For

example, to supply 124 lb N/acre in corn following soybean, 151 lb of anhydrous ammonia (82% N) would need to be applied.

The Old Way

For many years in Iowa and across the Corn Belt, N rate recommendations for corn were derived by taking a "yield goal" or "realistic yield potential" and multiplying times an N factor, such as 1.2 lb N/bu. That factor was used to calculate the N fertilization rate suggested for continuous corn, and then a "legume credit" was subtracted for corn grown following soybean or alfalfa. For several important reasons (including having corn following soybean as the main corn rotation instead of continuous corn, too high of an N rate suggested with the yield times N per bushel factor system, and a lack of relationship between yield and economic optimum N rate), the yield-based system was discontinued in Iowa with release of publication of PM 1714 in 1997. At the same time, N rate suggestions were based on specific rotations, rather than using a "legume credit." This approach continues today with the current regional guideline approach and the *Corn Nitrogen Rate Calculator*. In addition, research data show that the reduction in needed N fertilization rate for corn grown after soybean compared to corn grown after corn is not consistent with the prior-year yield of the soybean crop (Figure 1). What matters is that soybean is in the rotation, not the specific soybean yield.

Figure 1. Difference in economic optimum N rate for continuous corn (CC) compared to corn rotated after soybean (CS) for seven sites in Iowa, 2000-2007 (J.E. Sawyer and D.W. Barker, Department of Agronomy, Iowa State Univ.).



Using the *Corn Nitrogen Rate Calculator*

The *Corn Nitrogen Rate Calculator* Web tool (see below) is a resource that can aid in N rate decisions for corn production and is helpful in determining the effect of varying N fertilizer and corn prices on application rate. In the calculator, the suggested N rate is determined directly for corn following soybean and corn following corn. No adjustment is needed to the rate calculated for corn following soybean as the effect of soybean is already taken into account since the

calculations directly use the database of corn N response trials in that rotation. Table 1 provides a summary of suggested N rates derived from the calculator, with the rates being those that should be applied and with no adjustment needed for the soybean-corn rotation.

Resources for N Rate Decisions

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

The publication *Regional Nitrogen Rate Guidelines for Corn* (PM 2015) can be ordered through any ISU county office, on the Web through the ISU Extension Distribution Center at https://www.extension.iastate.edu/store, or by calling (515) 294-5247. An electronic copy of the publication is available at www.extension.iastate.edu/Publications/2015.pdf.

The publication *Nitrogen Fertilizer Recommendations for Corn in Iowa* (PM 1714) can be ordered through any ISU county office, on the Web through the ISU Extension Distribution Center at https://www.extension.iastate.edu/store, or by calling (515) 294-5247. An electronic copy of the publication is available at http://www.extension.iastate.edu/Publications/PM1714.pdf.

The ISU Agronomy Extension Soil Fertility Web site is located at http://www.agronext.iastate.edu/soilfertility/.