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Nitrogen fertilization for corn following corn

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Nitrogen fertilization for corn following corn

Abstract
Increasing demand for corn grain to meet ethanol production in Iowa has spurred interest in growing more corn following corn. What is the nitrogen (N) fertilization rate for continuous corn (CC), how does it compare to rates with corn following soybean (SC), and what rates are needed for second- (CCS) or third-year corn (CCCS) in rotation with soybean?

Keywords
Agronomy

Disciplines
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Soils

Nitrogen fertilization for corn following corn
by John Sawyer, Department of Agronomy

Increasing demand for corn grain to meet ethanol production in Iowa has spurred interest in growing more corn following corn. What is the nitrogen (N) fertilization rate for continuous corn (CC), how does it compare to rates with corn following soybean (SC), and what rates are needed for second- (CCS) or third-year (CCCS) corn in rotation with soybean?

Nitrogen application rate

Soybean in the cropping rotation results in a soil system that supplies greater crop-available N. There are several reasons for this, but mainly it is due to the amount of crop residue, residue N content and time of return to soil, and soil microbial mineralization rate. Results of research in Iowa indicate that the N fertilizer rate requirement is on average approximately 50 to 60 lb N/acre higher with CC than SC (Figure 1). The emphasis today is not on determining a “soybean credit,” which is really a misnomer, and trying to equate an N rate for SC from CC, but instead the emphasis is on determining the N rate required for corn in a specific rotation.

Yield

Nitrogen fertilization rate should be based on expected maximum economic return to N application rather than trying to achieve maximum production. It is just not possible to pay for the relatively large N-rate increase required to grow the last small yield increase from an economic optimum rate to a maximum yield-producing rate. Current N and corn prices result in recommended rates that produce yields quite close to maximum production (average 96 to 99% of maximum yield). Unless N prices increase and/or corn prices decline dramatically, recommended rates will not hinder productivity and will allow expression of yield potential for the growing season. Using economically derived rates also helps reduce nitrate loss to water systems.

Summary

1. Based on current N fertilizer and corn prices (price ratio of about 0.10; example $0.30/lb N:$3.00/bu), recommended N application for corn following soybean is approximately 125 lb N/acre (range 105 to 145 lb N/acre) and for continuous corn is 175 lb N/acre (range 155 to 195 lb N/acre). See Table 1 for N rates at other price ratios. Because of variation in N fertilization requirement between locations and years, and uncertainty in an exact maximum economic return to N (MRTN) rate, a range in suggested N rates is provided that gives similar economic return and is usually ±20 to 25 lb N/acre within the MRTN rate.

2. Second- or third-year corn in rotation with soybean has an N fertilizer rate need similar to continuous corn.
Table 1. Nitrogen rate guidelines in Iowa for different N and corn grain prices.

<table>
<thead>
<tr>
<th>Price Ratio</th>
<th>Corn following Soybean Rate</th>
<th>Range</th>
<th>Corn following Corn Rate</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>$/lb/$bu</td>
<td>------------------------------</td>
<td>-------</td>
<td>--------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>0.05</td>
<td>145</td>
<td>126–169</td>
<td>205</td>
<td>184–237</td>
</tr>
<tr>
<td>0.10</td>
<td>123</td>
<td>108–144</td>
<td>179</td>
<td>158–201</td>
</tr>
<tr>
<td>0.15</td>
<td>110</td>
<td>94–126</td>
<td>155</td>
<td>140–176</td>
</tr>
<tr>
<td>0.20</td>
<td>96</td>
<td>83–112</td>
<td>143</td>
<td>126–158</td>
</tr>
</tbody>
</table>

1Price per lb N divided by the expected corn price. For example, N at $0.30/lb N and corn at $3.00/bu is a 0.10 price ratio.

2Rate 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 Sept. 1, 2006, which can be accessed at http://extension.agron.iastate.edu/soilfertility/nrate.aspx.

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

Resources for N application decisions

Concepts and Rationale for Regional Nitrogen Rate Guidelines for Corn (PM 2015) can be ordered through any ISU Extension county office, on the Web through the ISU Extension Distribution Center’s online store at www.extension.iastate.edu/store, or by calling (515) 294-5247. An electronic copy is available at www.extension.iastate.edu/Publications/2015.pdf.

The Soil Fertility Web site is located at http://extension.agron.iastate.edu/soilfertility.

John Sawyer is an associate professor with research and extension responsibilities in soil fertility and nutrient management.

Announcements
ISU Extension offers crop scout course
by Brent Pringnitz, Department of Agronomy

If you plan to work as a crop scout for the 2007 crop season, you will want to attend the upcoming Crop Scout School offered by Iowa State University Extension. Hands-on sessions will cover identification and scouting methods for weeds, insects, and diseases. Workshops on plant growth and development of corn, soybean, and alfalfa will be included along with discussion of common field crop problems.

Crop Scout School will be held Saturday, March 3, 2007, on the Iowa State University campus in Ames. Registration opens at 7:30 a.m. in Farm Bureau Pavilion with sessions beginning at 8:00 a.m. and ending at 5:00 p.m. Scout School is limited to 120 participants and preregistration is required. The program brochure and registration form are posted on the Web at www.aep.iastate.edu.

The cost is $70. Registration and fees must be received by February 27, 2007. Registrations will not be accepted at the door for this program. Registration includes a scouting notebook, crop management clip-board, and hand lens.

Scouts attending the March session also can participate in a follow-up session at the Field Extension Education Laboratory (FEEL) in Ames on June 7, 2007. This afternoon session will test your problem-solving skills in actual field conditions and is only open to those attending the 2007 IPM Crop Scout School. This session is included in registration fee.

Registration can be completed online with a credit card (MasterCard or VISA only) at www.aep.iastate.edu. Registrations also may be faxed with a credit card to (515) 294-1311 or be mailed along with a check or credit card information to ISU Agribusiness Education Program, 2104B Agronomy Hall, Ames, Iowa 50011-1010. For more information, contact the Agribusiness Education Program at (515) 294-6429 or e-mail aep@iastate.edu.

This program is sponsored by the ISU Integrated Pest Management Program and the Departments of Agronomy, Entomology, and Plant Pathology.

Brent Pringnitz is coordinator of the Agribusiness Education Program.