Save nitrogen dollars after manure

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Save nitrogen dollars after manure

Abstract
Precision farming trials last year confirmed the old idea that manure can be a valuable source of nitrogen (N) for corn production. The results deserve special attention when both fertilizer N prices and environmental concerns are high. The trials were made possible by funding from the Iowa Corn Promotion Board and were conducted at 11 sites having an average size of 20 acres.

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Disciplines
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Save nitrogen dollars after manure

Precision farming trials last year confirmed the old idea that manure can be a valuable source of nitrogen (N) for corn production. The results deserve special attention when both fertilizer N prices and environmental concerns are high.

The trials were made possible by funding from the Iowa Corn Promotion Board and were conducted at 11 sites having an average size of 20 acres. All trials were within fields managed by producers using their normal practices. All fields received liquid swine manure that was injected into the soil at rates selected by the producer (Table 1).

An extra 100 lb N/acre of fertilizer N was applied in replicated strips going the lengths of the fields. The strips were at least two combine swaths wide and separated by at least two combine swaths. Soils were sampled for nitrate at five points per trial in nonfertilized strips when plants were 6 to 12 inches tall. The fields were harvested with combines having yield monitors and global positioning system (GPS) receivers. Yield responses to the fertilizer N were calculated.

Pooled data from all sites showed that the addition of 100 lb of fertilizer N resulted in an average yield increase of 1.9 bu/acre. This increase is not enough to pay for the fertilizer material and application costs, so the participating farmers as a group would have reduced their profits by adding fertilizer.

The yield increase at the most responsive site was just about enough to pay for the fertilization. Whether the farmer actually made a profit or suffered a loss depended on the exact cost of fertilization at that site and the price received for the grain. It should be noted that the fertilizer N was applied at all sites because our objective was to evaluate and improve N recommendations.

Information released last winter (see February 28, 2000, ICM article Hold nitrogen on manured cornfields [1]) indicates that it is usually not profitable to apply fertilizer N to manured cornfields unless soil nitrate N concentrations are less than 10 ppm if grain and fertilizer prices are unfavorable for the farmer. If these guidelines were followed, fertilizer N would have been applied only at the most responsive site in this study. It is noteworthy that the current guidelines using this test on manured cornfields indicate that optimal

Yield monitors and GPS can improve N recommendations.
concentrations of nitrate-N are substantially less than 25 ppm.

The results of this study should not be extrapolated to all times, placements, and rates of manure application or to other types of manure. Research during the past decade has shown that manure often is an unreliable source of N for crop production. The critical problem for improving N management is to learn which practices provide reliable sources of N and which do not. General rules of thumb do not provide this information.

Perhaps the most important finding during the past decade of N research is that precision farming technologies empower farmers to evaluate their N management practices on their fields. Trials can be simple and inexpensive. Coordinated groups of farmers working with researchers can rapidly distinguish manure management practices that provide reliable sources of N from those that do not. Such information could be especially valuable to farmers where phosphorus-based guidelines force decreases in rate of manure application.

We are looking for groups of farmers who have combines equipped with yield monitors and GPS receivers and would like to work with us to improve N management on manured cornfields this year. If you are interested in coordinating a localized group of interested farmers, please contact Brad Van De Woestyne at vandewoe@iastate.edu [2] or call (515) 294-9726 as soon as possible.

Table 1. Yields of grain measured in 11 manured cornfields with (+FN) and without (-FN) fertilizer that was sidedressed in strips at a rate of 100 lb N/acre.

<table>
<thead>
<tr>
<th>County</th>
<th>Rate of manure N applied&lt;sup&gt;a&lt;/sup&gt; (lb/acre)</th>
<th>Soil nitrate-N concentration&lt;sup&gt;b&lt;/sup&gt; (ppm)</th>
<th>Yield (bu/acre)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greene</td>
<td>170</td>
<td>25.5</td>
<td>180.4 179.0</td>
<td>1.4</td>
</tr>
<tr>
<td>Buchanan</td>
<td>300</td>
<td>14.7</td>
<td>150.4 150.4</td>
<td>0</td>
</tr>
<tr>
<td>Cherokee</td>
<td>235</td>
<td>65.1</td>
<td>138.1 137.9</td>
<td>0.2</td>
</tr>
<tr>
<td>Cherokee</td>
<td>300</td>
<td>57.2</td>
<td>151.1 151.5</td>
<td>–0.4</td>
</tr>
<tr>
<td>Franklin</td>
<td>250</td>
<td>10.9</td>
<td>159.8 158.7</td>
<td>1.1</td>
</tr>
<tr>
<td>Hancock</td>
<td>190</td>
<td>17.2</td>
<td>150.7 148.2</td>
<td>2.5</td>
</tr>
<tr>
<td>Hancock</td>
<td>190</td>
<td>14.7</td>
<td>161.4 160.5</td>
<td>0.9</td>
</tr>
<tr>
<td>Hancock</td>
<td>190</td>
<td>13.0</td>
<td>162.4 159.0</td>
<td>3.4</td>
</tr>
<tr>
<td>Floyd</td>
<td>85</td>
<td>27.0</td>
<td>174.6 171.4</td>
<td>3.2</td>
</tr>
<tr>
<td>Kossuth</td>
<td>150</td>
<td>8.7</td>
<td>165.9 158.7</td>
<td>7.2</td>
</tr>
<tr>
<td>Chickasaw</td>
<td>125</td>
<td>22.0</td>
<td>147.3 145.9</td>
<td>1.4</td>
</tr>
</tbody>
</table>
aAmount of N applied as manure was calculated from manure samples taken at the time of application.

bConcentrations of nitrate in the surface foot of soil in –FN strips when corn plants were 6–12 inches tall.

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