Manure and Commercial Fertilizer Comparison

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Objective
To evaluate the response of corn from a sidedress application of manure compared to commercial fertilizer.

Background

Cooperator: Paul Herringshaw, Walter Manders
County: Wood
Nearest Town: Weston
Drainage: Tile, well-drained
Soil type: Hoytville, clay loam
Tillage: conventional
Previous Crop: soybean

Soil test: CEC 12.8, pH 7.5, OM 3.4, P 64 ppm, K 242ppm
Fertilizer: 35 gal/ac 28%
Planting Date: 5-8-09
Planting Rate: 32,000
Row Width: 30 in.
Herbicides:
Harvest Date: 11-2-09

Methods
The entries were replicated four times in a completely randomized design. Plot size- 30 x 300 feet each entry. Harvest data was collected from the entire area of each plot. All treatments received the same tillage, herbicide, and pre-season fertilizer applications. Compaction from manure application versus sidedress fertilizer application were not visually different due to dry soil at that time.

Manure treatments had a drag-line applicator inject liquid dairy manure between each corn row on June 10, 2009 at corn growth stage V6. Manure application was 7,000 gallons/acre with a total nitrogen content of 21 lbs/1,000 gallon. The total nitrogen value estimated in animal manure is not fully available during the growing season. With direct incorporation with a growing crop, we expect 95% of the NH4-N and 33 % of the organic nitrogen to be available in the first year. This would be 15.5 lb N /1,000 gal which equals 108 lb/acre of plant available nitrogen (PAN) applied at side-dress from dairy manure. This also includes some 7.75 and 15.0 lb/1,000 gal of P2O5 and K2O respectively or 54 lb P2O5 and 105 lb K2O per acre.

Commercial fertilizer treatments had an application of 35 gal/ac liquid 28% UAN which equals 105 lb/ac nitrogen. No additional P2O5 or K2O was supplied from this nutrient resource.

Results
Soil nitrate levels that supply adequate amounts of nitrogen range from 25 – 30 ppm. Stalk nitrate levels that are sufficient range from 750 – 2,000 ppm.
<table>
<thead>
<tr>
<th>Treatment</th>
<th>Soil Nitrate ppm 6-10-09</th>
<th>Soil Nitrate ppm 6-25-09</th>
<th>Soil Nitrate ppm 7-15-09</th>
<th>Soil Nitrate ppm 7-29-09</th>
<th>Stalk Nitrate ppm 9-18-09</th>
<th>Yield bu/ac</th>
</tr>
</thead>
<tbody>
<tr>
<td>manure</td>
<td>12</td>
<td>10</td>
<td>13</td>
<td>17</td>
<td>98</td>
<td>146.7 A</td>
</tr>
<tr>
<td>28%</td>
<td>13</td>
<td>11</td>
<td>11</td>
<td>24</td>
<td>1560</td>
<td>151.9 B</td>
</tr>
</tbody>
</table>

**Economic Analysis**

All calculations on a per acre basis

<table>
<thead>
<tr>
<th>Nutrient Resource</th>
<th>PAN</th>
<th>P2O5</th>
<th>K2O</th>
</tr>
</thead>
<tbody>
<tr>
<td>UAN 28% (lb/acre)</td>
<td>105</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dairy manure-7,000 gal (lb/ac)</td>
<td>108</td>
<td>54</td>
<td>105</td>
</tr>
<tr>
<td>Nutrient value ($/lb)</td>
<td>$0.66</td>
<td>$0.37</td>
<td>$0.65</td>
</tr>
<tr>
<td>UAN ($/ac)</td>
<td>$69.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dairy manure ($/ac)</td>
<td>$71.28</td>
<td>19.98</td>
<td>$68.25</td>
</tr>
</tbody>
</table>

PAN 28% commercial fertilizer = $0.66 / lb N

105 lb PAN applied as UAN 28% x .66 = $ 69.30 / acre PAN

($69.30/ac) / 151.9 bu/ac = $ 0.46 (N cost per unit of production)

Nutrient value of manure/ac applied:

N, P2O5, K2O = $159.51 / acre

108 lb PAN applied x $0.66 = $71.28

$71.28/acre / 146.7 bu/ac = $0.48 (N cost per unit of production)

UAN 28% grain yield: 151.9 bu/ac

Dairy manure grain yield: - 146.7

Yield difference: 5.2 bu/ac x $3.50/bu = $18.20 less income with manure

Application cost (published custom rates):

- UAN 28% $12-$13 /ac
- Dairy manure ($0.02/gal) $140/ac

**Summary**

In 2009 grain yield from UAN 28% applied at side-dress was significantly higher than from dairy manure applied at the same time. There are a number of factors that may be contributing to this and include under estimating PAN available from dairy manure. This is highly probably given PSNT levels during the growing season and end of year stalk nitrate nitrogen levels reported. Other factors include environmental conditions that limited mineralization of the organic nitrogen fraction.

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