USING THE PSNT AND NITROGEN CREDITING TO IMPROVE CORN NITROGEN RECOMMENDATIONS

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Introduction and Rationale

• Excess N can lead to reduced economic returns and environmental problems.
• The PSNT and N crediting can improve accuracy of N recommendations.
• These practices are often not used due to concerns about reliability and profitability.
Objectives

• Compare the PSNT and N crediting for predicting optimum N rates for corn.
• Determine economic benefits of using the PSNT and N crediting in corn production.
Procedure for N Crediting/PSNT Evaluation

- 101 corn N response trials on research and private farms, 1989-1999
- High (56%) and medium (44%) yield potential soils
- Sites included N fertilizer, manure, legume N, and rotation variables
- Book value N credits (BVNC) calculated
### Corn Nitrogen Recommendations Based on Presidedress Soil Nitrate Test (PSNT)

<table>
<thead>
<tr>
<th>PSNT Result — ppm N —</th>
<th>Very High/High — N Application Rate, lb/a —</th>
<th>Medium/Low — N Application Rate, lb/a —</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 21</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>20-18</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>17-15</td>
<td>100</td>
<td>40</td>
</tr>
<tr>
<td>14-13</td>
<td>125</td>
<td>80</td>
</tr>
<tr>
<td>12-11</td>
<td>150</td>
<td>80</td>
</tr>
<tr>
<td>&lt; 10</td>
<td>160 **</td>
<td>120 **</td>
</tr>
</tbody>
</table>

** Unadjusted nitrogen application rate.
Procedure for N Crediting/PSNT Evaluation

• Three N rate recommendations compared at each site for accuracy vs. EONR and for economic return
  ▪ PSNT
  ▪ Book value credits (BVNC)
  ▪ Base N rate (no credits)
Site-specific factors affecting PSNT performance

- Years since manure or legume N input
  - >3, 1-3, <1
- Soil yield potential
  - Medium, High or very high
- Air temperature vs. ave.
- Precipitation vs. ave.
Accuracy Criteria for N Recommendations

- Correct = +/- 34 kg N/ha of EONR
- Over-applied = > 34 kg N/ha above EONR
- Under-applied = > 34 kg N/ha below EONR
Temperature effects on accuracy of PSNT-based N recommendations

Below (n=46) Average or above (n=55)

May-June average temperature

Correct | Over-applied | Under-applied

Below (n=46)

Correct: 37
Over-applied: 59
Under-applied: 4

Average or above (n=55)

Correct: 76
Over-applied: 16
Under-applied: 7
Soil yield potential effects on accuracy of PSNT-based N recommendations

Ave. or higher May-June temps.
May-June temperature effects on PSNT-based N recommendations
## Economic gains from PSNT- and BVNC-based N recommendations

<table>
<thead>
<tr>
<th>Management System</th>
<th>Increase in return</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PSNT N credits</td>
</tr>
<tr>
<td>&lt; 1 year</td>
<td>36</td>
</tr>
<tr>
<td>1-3 years</td>
<td>40</td>
</tr>
<tr>
<td>&gt; 3 years</td>
<td>0</td>
</tr>
</tbody>
</table>

1/ High yield potential soils, Ave. or above May-June air temps.
2/ Years since manure or legume N inputs
Conclusions

• Accuracy of PSNT rate recommendations is lower if May-June temps. are below normal.
• PSNT is more accurate on high than on medium yield potential soils.
Conclusions

• Economic returns are higher with PSNT where manure or legume N inputs occurred within 1-3 yr.

• Economic returns are higher with BVNC for 1st yr manure or legume N inputs and on medium yield potential soils.
Conclusions

• Using PSNT or BVNC lowered N rates by 90 to 102 kg N/ha where manure or legume N inputs occurred within 3 yr.

• Adjusting N rate recommendations using BVNC or PSNT is more profitable (ave. $19/ha) than not making these adjustments.