High Yielding Corn: Nitrogen and Best Management Practices

Fluid Fertilizer Technology Workshop
December 8, 2015

4R Plant Nutrition:
• Right Source
• Right Rate
• Right Time
• Right Place

Russell French, CCA
Account Manager
Amarillo, TX
DuPont Pioneer
Farmers ask:
Do I need more/less fertilizer?

When do I need to apply?

Is Product A better than B?

Is Method A better than B?

Will it pay?

What would you do if you were me?
Plot Locations (2010-2013)
Spatial and Temporal Analyses
### 2010 Plot Averages by Nitrogen Timing

<table>
<thead>
<tr>
<th>Nitrogen Timing</th>
<th>No post tassel nitrogen</th>
<th>Nitrogen applied brown silk</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 Plots</td>
<td>21 plots</td>
<td></td>
</tr>
<tr>
<td>Avg Yield 217 bu/acre</td>
<td>Avg Yield 248 bu/acre</td>
<td></td>
</tr>
<tr>
<td>Low yield: 170 bu/acre</td>
<td>Low yield: 183 bu/acre</td>
<td></td>
</tr>
<tr>
<td>High yield: 269 bu/acre</td>
<td>High yield: 302 bu/acre</td>
<td></td>
</tr>
<tr>
<td>3 plots over 240+ bu/acre</td>
<td>14 plots over 240+ bu/acre</td>
<td></td>
</tr>
</tbody>
</table>
## Nitrogen Effectiveness by Timing

1998 – 2007 TX & OK Hi-Plains

<table>
<thead>
<tr>
<th>N Application Timing</th>
<th>75%+ Total N as Pre-Plant</th>
<th>75%+ Total N as In-Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg Yield</td>
<td>207.7</td>
<td>215.9</td>
</tr>
<tr>
<td>Avg #N Used/A</td>
<td>247</td>
<td>192</td>
</tr>
<tr>
<td>N Use/Bushel</td>
<td>1.19</td>
<td>0.86</td>
</tr>
</tbody>
</table>

In-Season N 28% more efficient than preplant

Source: Better Harvest Inc., Dumas, TX
Table 1. Nitrogen uptake timing and quantities for old and new hybrids.

<table>
<thead>
<tr>
<th>Era of hybrid release</th>
<th>N at R1</th>
<th>N at R6</th>
<th>Post-flowering N uptake</th>
<th>Increase in post-flowering N uptake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old (1940 to 1990)†</td>
<td>102</td>
<td>145</td>
<td>43</td>
<td>28%</td>
</tr>
<tr>
<td>New (1991 - 2011)</td>
<td>97</td>
<td>152</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Old (1970)‡</td>
<td>125</td>
<td>162</td>
<td>37</td>
<td>40%</td>
</tr>
<tr>
<td>New (2000)</td>
<td>125</td>
<td>177</td>
<td>52</td>
<td></td>
</tr>
</tbody>
</table>

† Ciampitti and Vyn, 2012 ‡ Haegele et al., 2013
Research conducted over the last five years has shown that nitrogen needed for grain development originates from both remobilized N and continued N uptake from the soil; and newer hybrids take up additional N post-flowering compared to older hybrids.

Newer hybrids take up additional N post-flowering compared to older hybrids.
Center Pivot applied UAN post tassel

late N | no late N

Photo by Alyssa Abbott, DuPont/Pioneer Account Manager; NE Illinois
Pivot Applied UAN Post Tassel

Photo by Alyssa Abbott, DuPont/Pioneer Account Manager; NE Illinois
2014 Fertigation Trial
Post-Tassel 28-0-0

0# | 30# | 60# | 90#

Photo by Alyssa Abbot, DuPont/Pioneer Account Manager; NE IL
Photo by Alyssa Abbott, DuPont/Pioneer Account Manager; NE IL
Power of Proactive N Management
Momence 2015

P1417AMX | 268# Total N
Fertigation: 60# @ V6 | 60# @ V12 | 40# @ R1

P1417AMX | 168# N
Fertigation: 60# @ V6

Minimal Saturation

P1197AM | 268# Total N
Fertigation: 60# @ V6 | 60# @ V12 | 40# @ R1
Photo by Alyssa Abbott; DuPont Pioneer Account Manager

Heavy Saturation

P1197AM | 168# N
Fertigation: 60# @ V6
2015 Pivot Trial
Momence, IL

Summary

Yield (dry): 1,946.49 bu
Yield Area: 18.10 acre
Moisture: 18.96 %
Net Yield: 107.56 bu/acre
Date: Oct 23, 2015

203 bu/a
60 bu/a
<table>
<thead>
<tr>
<th>Location</th>
<th>Avg Yield</th>
<th>Plant Date</th>
<th>GPM/acre</th>
<th>Tillage</th>
<th>Starter</th>
<th>Miticide Pre-Tassel</th>
<th>Post Tassel Nitrogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sherman Co</td>
<td>285.2</td>
<td>5-17-13</td>
<td>5.5</td>
<td>ST</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Hansford Co</td>
<td>284.5</td>
<td>5-4-13</td>
<td>6.0</td>
<td>ST</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Hansford Co</td>
<td>282.2</td>
<td>5-10-13</td>
<td>5.3</td>
<td>ST</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Moore Co</td>
<td>281.4</td>
<td>4-30-13</td>
<td>6.0</td>
<td>ST</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Texas Co</td>
<td>280.9</td>
<td>5-17-13</td>
<td>5.6</td>
<td>ST</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Ochiltree Co</td>
<td>275.0</td>
<td>5-17-13</td>
<td>6.0</td>
<td>ST</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Sherman Co</td>
<td>267.2</td>
<td>5-13-13</td>
<td>5.4</td>
<td>ST</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Moore Co</td>
<td>265.4</td>
<td>4-29-13</td>
<td>5.0</td>
<td>ST</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Texas Co</td>
<td>263.4</td>
<td>5-13-13</td>
<td>6.0</td>
<td>NT</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Hansford Co</td>
<td>262.7</td>
<td>5-22-13</td>
<td>4.5</td>
<td>ST</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>
Strip-Tilled & Fertilized
## Starter Effects on Corn Yield (bu/a) 3-Year Avg

<table>
<thead>
<tr>
<th>Starter</th>
<th>In-furrow</th>
<th>2x2</th>
<th>Surface Band 2X0</th>
<th>Row Band Broadcast</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-15-5</td>
<td>172</td>
<td>194</td>
<td>190</td>
<td>179</td>
</tr>
<tr>
<td>15-15-5</td>
<td>177</td>
<td>197</td>
<td>198</td>
<td>180</td>
</tr>
<tr>
<td>30-15-5</td>
<td>174</td>
<td>216</td>
<td>212</td>
<td>192</td>
</tr>
<tr>
<td>45-15-5</td>
<td>171</td>
<td>215</td>
<td>213</td>
<td>195</td>
</tr>
<tr>
<td>60-15-5</td>
<td>163</td>
<td>214</td>
<td>213</td>
<td>201</td>
</tr>
<tr>
<td>Average</td>
<td>171</td>
<td>207</td>
<td>205</td>
<td>189</td>
</tr>
</tbody>
</table>

Dr. Barney Gordon, Kansas State University
Positional Availability

Pop-up allows In-Furrow Technology

BMP for Fertility

Pre-Plant 6” to 10” below seed

Side-Dress

Dribble

2X2
Girth (rows around) is determined by 8-leaf stage so ear girth can be affected by early moisture stress & nutrient deficiency
Starter Fertilizer @ V6
Dual Starter Placement
Utilize best of In-Furrow Technology
Dual Starter Placement
Utilize best of In-Furrow Technology
2x0 Surface Band
12 row coulter rig for side dressing 32-0-0 UAN in strip-till
Sidedress UAN with coulter rig in heavy residue with wet soil. No pre herbicide movement, no fertilizer burn.

Sidedress anhy burn due to wet soil. Pre herbicide barrier disturbed by shank.
Adjusting N Rate in Season

- Ear size estimate @ R1
- Plant Pop in 1/1000 acre

- Use Factor to Estimate Yield (girth x length x pop) x Specific Hybrid Factor

- Evaluate Plant Health, Subsoil Moisture, Extended Forecast

- + or – N amount post tassel based on new goal
Adjusting N Rate in Season

- Ear size estimate (2014)
  \[(17\times40\times36)\times0.0118=288\]

- Potential yield was 285 to 290. 150 lbs on 7-25

- Post-tassel N application increased from 50 to 90 units of N/acre
• Final ear size was 17-by-40 average
• 288 estimate
• 285 bu/a was final yield 2014
• .84 lbs applied N/bu
FOUR KEY INPUTS HELP ADVANTAGE THE ENCIRCA SERVICES NITROGEN MODEL

Weather
- Precipitation
- Solar radiation
- Temperature

Crop
- Leaf
- Stalk
- Grain
- Root
- Photosynthesis
- Partitioning
- Developmental stages

Soil
- Soil water
- Soil properties
- Organic matter
- NO₃
- NH₄
- Planting date
- Planting rate
- Leaching
- Fertilization
- Irrigation
- Tillage

Management
- Manure

ENCIRCA services provide estimates and management suggestions based on statistical and agronomic models. Encirca services are not a substitute for sound agronomic and management practices. Individual results may vary and are subject to a variety of factors, including weather, disease and pest pressure, soil type, and management practices.
P1625CHR
preplantbandNandP
fungicide
17x42x35K
miticide
popupstarter
300bu
100lbsNposttassel
standingperfect
Oct202014
150# N + 0# P
preplant band
Soil test 96 ppm
on P₂O₅ (manure)

10 gal starter
per acre 2x0
(APP + 28-0-0-5)

3) 50# N 32-0-0 at V6

4) 100# N 32-0-0
beginning R2

3 pints Comite
per acre by air
at V14

6.8 oz Aproach
Prima at R3

July Yield Estimate
(19x40x34K) (.0118)
= 305 bu/acre

2015 yield: 300 bu
A Special “Thank You” to my Colleague

Alyssa Abbott - *DuPont Pioneer*