Fertilizer Distribution

- Liquid applicators are able to deliver the same rate of fertilizer from the first to the last foot of each pass.
- Due to differences in granular fertilizer shape and mass, spinner disc spreaders cannot uniformly distribute dry granular fertilizers.
- Corn yield losses of 3% on average have been reported in University studies comparing uniformly and non-uniformly distributed P & K fertilizer (Virk et al., 2013).

Maintaining Fertilizer Blends

- Granular sources of dry fertilizer often have different sizes and shapes—denser smaller granules shift toward the bottom of the transport vehicle or the fertilizer spreader, while larger less dense granules stay toward the top.

Fluid sources of fertilizer however—
- Dissolve in solution
- Are held in suspension by clay
- Agitated to keep in suspension
- The failure to maintain fertilizer blends causes some fertilizer sources to be spread at higher or lower rates than intended—reducing fertilizer efficiency & yield potentials

**Table 1.** Avg variability (standard deviation) of 5 samples from a blended liquid and dry fertilizer.

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Liquid K$_2$O Blend %</th>
<th>Dry K$_2$O Blend %</th>
<th>Liquid Zinc Blend %</th>
<th>Dry Zinc Blend %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7.55</td>
<td>28.4</td>
<td>0.056</td>
<td>1.4</td>
</tr>
<tr>
<td>2</td>
<td>7.54</td>
<td>31.5</td>
<td>0.059</td>
<td>3.4</td>
</tr>
<tr>
<td>3</td>
<td>7.43</td>
<td>30.8</td>
<td>0.056</td>
<td>0.8</td>
</tr>
<tr>
<td>4</td>
<td>7.62</td>
<td>28.3</td>
<td>0.057</td>
<td>2.2</td>
</tr>
<tr>
<td>5</td>
<td>7.51</td>
<td>33</td>
<td>0.055</td>
<td>1.1</td>
</tr>
<tr>
<td>Avg Variability</td>
<td>0.07</td>
<td>2.03</td>
<td>0.002</td>
<td>1.04</td>
</tr>
</tbody>
</table>

**Fig 1 & 2** Distribution of potassium and sulfur fertilizer sources applied with a dry spinner disc spreader or a liquid fertilizer applicator across a 30 ft swath width.

**Fig 3** Distribution of zinc fertilizer sources applied with a dry spinner spreader or a liquid fertilizer applicator across a 30 ft swath width.
Reducing Phosphorus Soil Tie Up – Banding

- Phosphorus fertilizers are highly reactive with other mineral components of the soil.
- At low pH’s (> 5.5) phosphorus fertilizers are tied up with iron and aluminum oxides, causing plant available phosphorus to decrease.
- At high pH’s (< 7) phosphorus fertilizers transforms to calcium phosphates, which are not plant available forms of phosphorus.

**Fig 4** The availability of phosphorus as effected by soil pH. Figure appears in University of Missouri extension publication G9180.

- Banding phosphorus reduces fertilizer surface area - thus reducing the amount fixed by the soil.
  - Banding reduces fixation of fertilizer phosphorus.
  - Making more phosphorus fertilizer available for plant uptake.

**Fig 5** Soil test phosphorus (resin –extractable P) as a % of total soil phosphorus. Adapted from Khatiwada et al., 2012.

Summing Up The Liquid Advantage

- Liquid fertilizers allow for accurate in-field placement.
  - Via a precise fertilizer distribution from the first to the last foot of each pass.
  - By maintaining the integrity of the fertilizer blend.
- Liquid fertilizers can easily be “dribble banded” on top the soil surface, coulter banded just below the soil surface, or deep banded with strip-till machines.
  - Banding reduces phosphorus from being fixed into calcium, iron, and aluminum phosphates.
  - Reducing phosphorus fixation into unavailable plant forms results in greater plant phosphorus uptake.
- Due to accurate in-field placement and reduced phosphorus fertilizer tie up, it is common for Liqui-Grow’s P & K fertilizer program to yield 3 to 8 bu/ac more at fertilizer responsive sites when compared to similar dry fertilizer programs.

**Table 2** Liquid and Dry fertilizers were applied at the same rates each year. Plots were randomized and replicated each year 3 or 4 times.

<table>
<thead>
<tr>
<th>Fert Source</th>
<th>Yield (bu/ac)</th>
<th>Fert Cost (per/ac)</th>
<th>Net Return (per/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry</td>
<td>199.2</td>
<td>52.6</td>
<td></td>
</tr>
<tr>
<td>Liquid</td>
<td>204.5</td>
<td>55.1</td>
<td>+16.05</td>
</tr>
</tbody>
</table>

References
