Where should we focus our efforts on Corn (Yield per county)
Percent of total national production

United States: Corn

Yellow numbers indicate the percent each state contributed to the total national production. States not numbered contributed less than 1% to the national total.

- Major areas combined account for approximately 75% of the total national production.
- Major and minor areas combined account for approximately 99% of the total national production.
- Major and minor areas and state production percentages are derived from NASS county- and state-level production data from 2006-2018.

Note: The agricultural data used to create this map and crop calendar were obtained from the National Agricultural Statistics Service at: http://www.nass.usda.gov/

Major Crop Area
Minor Crop Area

Agricultural Weather Assessments
World Agricultural Outlook Board

Crop calendar for most of the United States

USDA
How can AgroLiquid perform better than the rest?

• The Right Balance
• The Right Timing
• The Right Placement
• The Right Amount
• The Right Product (and science)
The Right Balance

- **NUTRIENT BALANCE** is a major factor in a proper fertility program.
- A crop’s yield potential is determined by the “most limiting nutrient”.
The Right Time

Nitrogen—Corn

Phosphorus—Corn

Potassium—Corn

For The Soil | For The Plant | For the Future
The Right Placement

Effect Of Fertilizer Application Method on Soil N & P

<table>
<thead>
<tr>
<th>Method</th>
<th>N ppm</th>
<th>P ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcast &amp; Disked</td>
<td>11</td>
<td>19</td>
</tr>
<tr>
<td>Surface Banded</td>
<td>750</td>
<td>128</td>
</tr>
<tr>
<td>Root Zone Banding</td>
<td>6,200</td>
<td>1,200</td>
</tr>
</tbody>
</table>

Application Rate: 100 lbs. N & 40 lbs. P₂O₅ per acre
The Right Amount

- Soil and Tissue Testing
- 30+ years of research across multiple cropping conditions and geographies
- AgroLiquid provides a talented staff of agronomists, researchers, salesmen, and retailers to help bring together all components of your fertility program!
The Right Products: What to Look For

- Consistent manufacturing
- Quality raw materials
- Clean, easy to use, and less corrosive
- Low potential for plant injury
- Research proven technology

- With many products hitting the market with these qualities, what separates AgroLiquid?
Flavonol Polymer Technology
The Right Products!

ProGerminator®
Sure-K®
Kalibrate™ Precision Potassium

FERTRAIN
FASE 1 FASE 2 FASE 3

High NRG-N
eNhance
NResponse

accesS™
Micro 500™
Boron Copper
Micro 600
Moly
NUTRIRAIN
PRIMAGRO TECHNOLOGY

GROWRIGHT
Iron
NUTRIRAIN
S-Calate™

LIBERATECa™
Magnesium

Zinc
Corn Nitrogen Uptake

Figure 1. Seasonal nitrogen uptake in corn. Graph courtesy of Bender, R. et al. University of Illinois Crop Physiology Lab.
Corn Phosphorus Uptake
Corn Potassium Uptake
Corn Sulfur Uptake

Foliar Nitrogen Application Options

Broadcast Application

360 Yield Center: Undercover
Foliar Fertilizer Applications Method Comparison in Corn

North Central Research Station - 2015 and 2016

<table>
<thead>
<tr>
<th>Application</th>
<th>Yield - bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Foliar</td>
<td>178.1</td>
</tr>
<tr>
<td>2 gal ferti-Rain (BC@ VT)</td>
<td>183.2</td>
</tr>
<tr>
<td>2 gal ferti-Rain (UC@ VT)</td>
<td>190.2</td>
</tr>
<tr>
<td>2 gal ferti-Rain + 10 oz Headline® SC (BC@ VT)</td>
<td>191.2</td>
</tr>
<tr>
<td>2 gal ferti-Rain + 10 oz Headline® SC (UC@ VT)</td>
<td>194.9</td>
</tr>
</tbody>
</table>

All treatments included: 4 gal Pro-Germ. + 6 Sure-K + 2 qt Micro 500 (in-furrow); 45 High NRG-N (sidedress)

Average of 4 Replications
Foliar Fertilizer Applications on V8 Corn
North Central Research Station - 2017

Applications applied at V8 at a total of 10 gpa using 360 UnderCover
All treatments included: 4 gal Pro-Germ. + 6 gal Sure-K + 2 qt Micro 500 (IF); 44 gal High NRG-N (YD)
## Nitrogen Methods of Application

<table>
<thead>
<tr>
<th>Product</th>
<th>2015 Corn – bu/A</th>
<th>2016 Corn – bu/A</th>
<th>2017 Corn – bu/A</th>
<th>Average Corn – bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Foliar</td>
<td>194.7</td>
<td>161.4</td>
<td>167.2</td>
<td>174.4</td>
</tr>
<tr>
<td>2 gal ferti-Rain (BC)</td>
<td>201.2</td>
<td>165.3</td>
<td>164.9</td>
<td>177.1</td>
</tr>
<tr>
<td>2 gal ferti-Rain (UC)</td>
<td>212.9</td>
<td>167.5</td>
<td>160.0</td>
<td>180.1</td>
</tr>
<tr>
<td>2 gal fR + Headline (BC)</td>
<td>210.5</td>
<td>171.9</td>
<td>169.9</td>
<td>184.4</td>
</tr>
<tr>
<td>2 gal fR + Headline (UC)</td>
<td>218.7</td>
<td>171.1</td>
<td>168.5</td>
<td>186.1</td>
</tr>
</tbody>
</table>
Nitrogen Application Method Options

360 Yield Center Y-Drop

Coulter Inject
## Nitrogen Methods of Application

<table>
<thead>
<tr>
<th>N Method of Application</th>
<th>2015 Corn – bu/A</th>
<th>2016 Corn – bu/A</th>
<th>2017 Corn – bu/A</th>
<th>Average Corn – bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Emergence</td>
<td>125.3</td>
<td>136.0</td>
<td>192.4</td>
<td>151.2</td>
</tr>
<tr>
<td>Coulter Inject at V5</td>
<td>133.7</td>
<td>148.2</td>
<td>198.2</td>
<td>160.0</td>
</tr>
<tr>
<td>Y-Drop at V5</td>
<td>-</td>
<td>156.2</td>
<td>194.4</td>
<td></td>
</tr>
<tr>
<td>1/3 PRE; 2/3 SD V5</td>
<td>128.5</td>
<td>141.4</td>
<td>190.5</td>
<td>153.5</td>
</tr>
<tr>
<td>1/3 PRE; 2/3 YD V5</td>
<td>141.4</td>
<td>154.9</td>
<td>181.9</td>
<td>159.4</td>
</tr>
<tr>
<td>1/3: PRE; SD V5; SD V10</td>
<td>128.8</td>
<td>148.7</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1/3: PRE; SD V5; YD V10</td>
<td>130.7</td>
<td>133.8</td>
<td>184.0*</td>
<td>149.5</td>
</tr>
</tbody>
</table>

*2017 3rd application applied at R2

15-1102 and 16-702
Nitrogen Methods of Application Comparison in Corn
North Central Research Station - 2017

- Pre- emerge Broadcast: 192.4
- Coulter Inject @V5: 198.2
- Y-DROP @V5: 194.4
- 1/3 PRE; 2/3 Coulter Inject @V5: 190.5
- 1/3 PRE; 2/3 Y-DROP @V5: 181.9
- 1/3 PRE; 1/3 Y-DROP @V5; 1/3 Y-DROP @R2: 184.0

Average of 4 Replications

Yield - bu/A

All treatments included: 6 gal/A Pro-Germ. + 3 gal/A Sure-K + 2 qt/A Micro 500 (IF)
Nitrogen Source and Placement Comparison in Corn
North Central Research Station - 2017

All treatments included: 6 gal/A Pro-Germ. + 3 gal/A Sure-K + 2 qt/A Micro 500 (IF)
Planter Placement Options
2 x 2
Furrow Jet

(1) single stream over top of the seed

(2) two streams to the side of the seed trench

(3) three streams for all placements
Planter Fertilizer Method of Application Comparison in Corn

North Central Research Station - 2017

<table>
<thead>
<tr>
<th>Method</th>
<th>Yield - bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>2x2</td>
<td>161.0</td>
</tr>
<tr>
<td>Keeton</td>
<td>164.7</td>
</tr>
<tr>
<td>Furrow Jet: 1 stream</td>
<td>160.8</td>
</tr>
<tr>
<td>Furrow Jet: 2 stream</td>
<td>164.9</td>
</tr>
<tr>
<td>Furrow Jet: 3 stream</td>
<td>171.0</td>
</tr>
</tbody>
</table>

Average of 4 Replications

All treatments included: 4 gal Pro-Germ. + 3 gal Kalibrate + 2 qt Micro 500; 45 gal/A High NRG-N (V5 YDrop)
Effect of Fertilizer Placement through Furrow-Jet on Corn Yield

Cooperative Project with Precision Planting, IL

- 7 gal/A in-furrow, 7 gal/a furrow-jet: 276 bu/a
- 10 gal/A in-furrow, 4 gal/A furrow-jet: 267 bu/a
- 14 gal/A in-furrow: 267 bu/a

All treatments included: 7 gal Pro-Germinator, 6 gal Kalibrate, 0.75 gal Micro 500, 0.25 gal eNhance
260 lb/a Nitrogen was split applied at planting and side-dress.
Long-Term Fertilizer Program Comparison - 7 Year Yield Average

North Central Research Station: 2011-2017

<table>
<thead>
<tr>
<th>Fertilizer Type</th>
<th>Average (u/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen Only</td>
<td>184.7</td>
</tr>
<tr>
<td>AgroLiquid</td>
<td>204.6</td>
</tr>
<tr>
<td>Low Rate Conventional liquid/dry</td>
<td>190.7</td>
</tr>
<tr>
<td>Conventional liquid/dry</td>
<td>200.2</td>
</tr>
<tr>
<td>Conventional Dry</td>
<td>198.9</td>
</tr>
</tbody>
</table>

Average of 4 Replications per year
Planter Fertilizer Comparisons in Corn
North Central Research Station - 2013/2014 Average

Average of 4 Replications

- 2.5 gal Pro-Germ. + 2.5 gal Sure-K: 182.7
- 5 gal Season Pass (6-18-6 w/Avail): 179.4
- 5 gal Nachurs G24 (6-24-6): 179.4
- 5 gal P&L (3-20-15): 179.3

Notes: All planter fertilizer applied in-furrow with tubes. All treatments were sidedressed with 45 gal High NRG-N.
AgroLiquid Sulfur Fertilizer Options for Corn
North Central Research Station - 2016

Average of 4 Replications

- AgroLiquid (2x2): 174.5
- AgroLiquid + 2 gal accesS (2x2): 176.1
- AgroLiquid (2x2); 2 gal accesS (SD): 178.1
- AgroLiquid (IF): 173.3
- AgroLiquid + 2 qt eNhance (IF): 176.5

Yield - bu/A

AgroLiquid: 7 gal/A Pro-Germ. + 3 gal/A Sure-K + 2 qt/A Micro 500
All treatments included: 45 gal/A High NRG-N + 6 gal/A Kalibrate
Sidedress Nitrogen Source Comparison on Corn
North Central Research Station - 2016

All treatments included the same planter application based on soil test by field.
Nitrogen Method of Application Comparison
North Central Research Station - 2016

All Treatments Provide 165 lbs N/A

- PRE Coulter Band: 114.0
- PRE Spray Band: 133.9
- PRE Broadcast: 143.8
- Coulter Inject at V5: 145.4
- Y-Drop at V5: 145.9
- PRE Broadcast/Y-Drop at V10: 148.3
- Anhydrous Ammonia: 135.6

Average of 3 Replications

Yield - bu/A

All treatment included: 5 gal Pro-Germ. + 5 gal Sure-K + 2 qt Micro 500 (IF)
Except Anhydrous Ammonia treatment, all treatments received 55 gal/A 28% + eNhance
All rates of Sure-K were applied in combination with 3 gal Pro-Germinator + 2 qt Micro 500 (in-furrow);
All treatments received 43 gal High NRG-N. at sidedress.
Effect of Planter-Applied Micro 500 on Corn Yield

North Central Research Station - 2010

Sidedressed with 44 gal/A 28% + eNhance (165 lb-equivalent N/A)

Average of 4 Replications

Soil Test Levels
Zn: 1.5 ppm (M)
Mn: 10 ppm (M)
Fe: 57 ppm (VH)
Cu: 1 ppm (M)
B: 0.5 ppm (L)

Yield - Bu/A

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield - Bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen only</td>
<td>151.1</td>
</tr>
<tr>
<td>In-furrow: Pro-Germ. + Sure-K 6 gal + 4 gal/A</td>
<td>161.6</td>
</tr>
<tr>
<td>+ 1 qt/A Micro 500</td>
<td>168.5</td>
</tr>
<tr>
<td>+ 2 qt/A Micro 500</td>
<td>173.2</td>
</tr>
<tr>
<td>+ 1 gal/A Micro 500</td>
<td>176.3</td>
</tr>
</tbody>
</table>
Effect of Boron on Soybean Yield
Brownsburg, IN, 2017

- Boron 1 pt/A (In-Furrow) - 60
- Boron 1 pt/A (Foliar @R-3) - 54
- No Boron - 56

Average of 3 - 4 Replications

All treatments included: 2 gal/a Pro-Germinator, 2 gal/a Kalibrate, 1 qt/a Micro 500, 1 pt/a Manganese. Foliar applications included 1 gal/a ferti-Rain and 2 gal/a Sure-K.
Boron Toxicity

- Pale yellow to white corn shortly after emergence.
- Poor emergence may occur.
- Plants may die.

- Use caution with in-furrow:
  - Low CEC
  - Cool soils
  - Slow emergence conditions
Yield Benefit of eNhance Applied In-Furrow on Corn

*Average of 7 Locations 2013 - 2017*

- **AgroLiquid**: 184.4
- **+ 2 qt/A eNhance**: 189.8

All treatments included the same planter and sidedress fertilizer program within site.
Yield Benefit of Planter Applied LiberateCa on Corn

Average of 6 Locations 2013 - 2017

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield (bu/A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgroLiquid</td>
<td>172.0</td>
</tr>
<tr>
<td>+ 2 qt/A LiberateCa</td>
<td>178.2</td>
</tr>
</tbody>
</table>

All treatments included the same planter and sidedress fertilizer program within site.
Yield Benefit of Planter Applied C-TECH on Corn

Average of 9 Locations 2015 - 2017

- AgroLiquid: 182.1
- + 2 qt/A C-TECH: 187.3

All treatments included the same planter and sidedress fertilizer program within site.
Corn Fertility Program Effects on Yield and Soil Health
North Central Research Station - 2017

Planted: May 15th
Harvest: October 13th

Average of 4 Replications

Yield - bu/A

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AgroLiquid’s Core Products</td>
<td>4.1</td>
<td>9.0</td>
<td>7.7</td>
<td>7.7</td>
<td>8.2</td>
<td>9.6</td>
</tr>
<tr>
<td>Core Products + CTECH</td>
<td>5.6</td>
<td>6.5</td>
<td>5.3</td>
<td>10.0</td>
<td>7.7</td>
<td>9.9</td>
</tr>
<tr>
<td>PRIMAGRO</td>
<td>8.6</td>
<td>8.6</td>
<td>8.6</td>
<td>8.6</td>
<td>8.6</td>
<td>8.6</td>
</tr>
<tr>
<td>Potash; Core Products</td>
<td>6.5</td>
<td>6.5</td>
<td>12.5</td>
<td>10.0</td>
<td>5.6</td>
<td>4.2</td>
</tr>
<tr>
<td>Conventional</td>
<td>4.2</td>
<td>8.9</td>
<td>6.2</td>
<td>8.0</td>
<td>6.8</td>
<td>8.3</td>
</tr>
</tbody>
</table>

Planted: May 15th
Harvest: October 13th

Average of 4 Replications
PRIMAGRO Components in a Corn Fertilizer Program
North Central Research Station - 2017

AgroLiquid's Core Products
- PRIMAGRO: 809
- PRIMAGRO P + Sure-K: 188.6
- PRIMAGRO P + Kalibrate: 187.8
- Pro-Germ. + PRIMAGRO K: 193.8
- PRIMAGRO N: 191.8

Average of 4 Replications

Yield - bu/A

503 rates: 4 + 6 + 2 qt; 217 lbs N/A
706 rates: 6 + 4 + 2 qt; 217 lb N/A

17-503 and 706
<table>
<thead>
<tr>
<th>Strip Till</th>
<th>Planter</th>
<th>Yield - Bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard IRF</td>
<td>Standard IRF</td>
<td>153.1</td>
</tr>
<tr>
<td>Standard IRF</td>
<td>AgroLiquid Planter</td>
<td>159.7</td>
</tr>
<tr>
<td>15 gal High NRG-N</td>
<td>AgroLiquid Planter</td>
<td>161.2</td>
</tr>
<tr>
<td>15 gal High NRG-N</td>
<td>Standard IRF</td>
<td>147.4</td>
</tr>
<tr>
<td>Full AgroLiquid</td>
<td>No planter fertilizer</td>
<td>156.6</td>
</tr>
<tr>
<td>Full AgroLiquid</td>
<td>Starter AgroLiquid</td>
<td>160.4</td>
</tr>
</tbody>
</table>

**Strip Till fertilizers:**

- **Standard IRF:**
  - 17-8-1-4.8S
  - 10 gal/A at 4" and 18 gal/A 2x2
  - 13 gal/A at 10"

- **Full AgroLiquid:**
  - 15 gal/A High NRG-N + 5 gal/A Pro-Germ. +
  - 5 gal/A Pro-Germ. + 2 qt/A Micro 500 +
  - 2 qt/A Micro 500 + 2 qt/A eNhance In-Furrow
  - 2 qt/A accesS 2 qt/A eNhance In-Furrow
  - 21 total gal/A:
  - 10 gal/A at 4" and 1 qt/A Micro 500 +
  - 11 gal/A at 10" 1 qt/A eNhance In-Furrow

**Planter fertilizers:**

- **Standard IRF:**
  - 15.7-8.9-2.6-2.6S-0.1Zn

**Standard IRF strip till fertilizer:**

- Blend of water, potash, 10-34-0, ammonium thio-sulfate, 32% UAN
- **Standard IRF planter fertilizer:**
  - Blend of water, 32% UAN, zinc, KTS, ATS, 10-34-0
  - (fertilizers prepared by local dealer)

Applied to all plots: 40 gal/A 28-0-0-5 in 6 apps, 5/15 thru 7/28. 10.46" irrigation plus 14.44" rainfall during season.

**Hail storm on 8/20** caused severe leaf stripping and reduced yield potential. But hopefully yields reflect relative performance.
Fertilizer Program Comparisons in Corn

Security Seed & Chemical Research Farm. Hopkinsville, KY - 2013

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield - Bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>no planter fert; 47 gal</td>
<td>167.6</td>
</tr>
<tr>
<td>6-24-6; 10-34-0; 4 gal; 47 gal</td>
<td>186.6</td>
</tr>
<tr>
<td>Agro; 32% UAN; 4.625 gal; 47 gal</td>
<td>191.9</td>
</tr>
<tr>
<td>Agro; 32% eN; 4.625 gal; 47 gal</td>
<td>196</td>
</tr>
<tr>
<td>Agro + eN; 32% eN; 2 qt; 47 gal</td>
<td>203.8</td>
</tr>
<tr>
<td>Agro; 32% eN + accessS; 4.625 gal; 47 gal + 4 gal</td>
<td>198.1</td>
</tr>
<tr>
<td>Agro + SK + eN; 32% eN; 5 gal + 2 qt; 47 gal</td>
<td>206.4</td>
</tr>
</tbody>
</table>

Average of 2 Replications

Yield - Bu/A

Planter fertilizer: "Agro": 4 gal/A Pro-Germinator + 2 qt/A Micro 500 + 1 pt/A MicroLink Boron applied in-furrow.
Sidedress application was surface dribbled between the rows.
Effect of accesS and eNhance Applied Sidedress on Corn Yield

**Georgetown, IL - 2017**

- 45 gal 28%: 182
- 35.5 gal 28% + 1.5 qt eNhance: 198
- 44.5 gal 28% + 2 qt eNhance: 197
- 44.5 gal 28% + 2 qt eNhance + 3 gal accesS: 199

All treatments included: 9 gal 28% + 3 gal ATS + 2 qt Micro 500 (2x2)
**Fertilizer Source Comparison in Corn**

*Agrospary Research Farm: Canada - 2017*

Average of 3 Replications

<table>
<thead>
<tr>
<th>Fertilizer Source</th>
<th>Yield (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgroLiquid*</td>
<td>155.6</td>
</tr>
<tr>
<td>150 lbs MESZ (2x2)</td>
<td>147.3</td>
</tr>
<tr>
<td>150 lbs 19-19-19 (2x2)</td>
<td>148.5</td>
</tr>
</tbody>
</table>

*AgroLiquid: 3.5 gal Pro-Germ. + 4 gal Sure-K + 1 L LiberateCa + 1 L Micro 500 + 1 L eNhance + 0.5 L Boron (In-furrow)*
Fertilizer Program Comparison in Corn
Poplar Farms: WI - 2015

Yield – bu/A

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield</th>
<th>Average of 2 Replications</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 gal Pro-Germ.</td>
<td>207.5</td>
<td></td>
</tr>
<tr>
<td>3 gal Pro-Germ. + 2 qt Sure-K + 2 qt Micro 500</td>
<td>215.2</td>
<td></td>
</tr>
<tr>
<td>2 gal Pro-Germ. + 2 gal Kalibrate + 2 qt Micro 500</td>
<td>209.4</td>
<td></td>
</tr>
<tr>
<td>3 gal Season Pass</td>
<td>199.8</td>
<td></td>
</tr>
<tr>
<td>3 gal 10-34-0 (IF)</td>
<td>198.7</td>
<td></td>
</tr>
<tr>
<td>200 lbs 9-23-30 (PPI)</td>
<td>204.5</td>
<td></td>
</tr>
</tbody>
</table>
Corn Comparison: Tennessee (2017)

1. Grower Standard
2. Check N + K Only
3. 4 gal. ProGerm, 2 qt. Micro 500
   2 qt. Enhance
4. 4 gal. ProGerm, 2 qt. Micro 500
   2 qt. Enhance
   2 qt. C-TECH
5. 4 gal. Primagro P
   2 qt. Micro 500
   2 qt. Enhance

Planted 6-2-17.
Plants pulled 6-13-17.
Mid-season Corn: Ohio (2017)

Right: Primagro starter/acre
3.5 gal Primagro P
5.5 gal Primagro K
0.5 gal eNhance
2.4 pt LiberatCa
1.2 pt Micro 500
1.2 pt Boron

Left: Non primagro starter/acre
4.9 gallons sure k
4 gallons progerm
0.5 gallon eNhance
0.5 gallon micro 500
12 oz boron
5 oz zinc

Both sides:
Pre: 25 Gallons High N with Lexar herbicide
Side Dress 20 gallon 28%UAN with eNhance