Ag Technology & Nebraska On-Farm Research Network
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How It Works

1. Farmers or educators identify the research topics.
2. Research protocols are developed.
3. Trials are implemented using the farmer’s equipment.
4. Trials are replicated.
5. Results are summarized.
6. Farmers, Extension Educators and Specialists discuss the findings.
2017 On-Farm Research Studies

[Map showing various research studies across Nebraska]

- Cover Crop
- Crop Production - Multi-Hybrid Planter
- Crop Production - Plant Population
- Crop Production - Row Spacing
- Crop Production - Variety
- Equipment
- Foliar Fertilizer
- Growth Promoters
- In-Season Nitrogen Application
- Nitrogen
- Organic Fertilizer
- Other Fertility
- Project SENSE Nitrogen Management
- Seed Treatment
- Starter Fertilizer
Fungicide  Check
Advantages of On-Farm Research

- GPS guidance, aerial imagery, and yield monitor data have made it easier to conduct on-farm research
2017 Nitrogen Rate and Timing – Dodge County

- 210 lb N/ac Preplant
- 70 lb N/ac Preplant + 110 lb N/ac Sidedress
- 70 lb N/ac Preplant + 140 lb N/ac Sidedress
- 70 lb N/ac Preplant + 170 lb N/ac Sidedress
2017 Nitrogen Rate and Timing – Dodge County

Yield (bu/ac)
- 77.5 - 180.2
- 180.3 - 217.1
- 217.2 - 242.8
- 242.9 - 271.1
- 271.2 - 370.4

225.8
246.0
250.2
242.3
238.2
255.4
218.4
245.0
250.2
219.6
227.0
232.1
244.6
195.4
246.4
241.4
# 2017 Nitrogen Rate and Timing – Dodge County

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield (bu/ac)†</th>
<th>Marginal Net Return‡ ($/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>210 lb N/ac Preplant</td>
<td>216 B</td>
<td>610.98 B</td>
</tr>
<tr>
<td>70 lb N/ac Preplant + 110 lb N/ac Sidedress</td>
<td>239 A</td>
<td>691.72 A</td>
</tr>
<tr>
<td>70 lb N/ac Preplant + 140 lb N/ac Sidedress</td>
<td>243 A</td>
<td>696.25 A</td>
</tr>
<tr>
<td>70 lb N/ac Preplant + 170 lb N/ac Sidedress</td>
<td>251 A</td>
<td>710.89 A</td>
</tr>
<tr>
<td>P-Value</td>
<td>0.0007</td>
<td>0.0009</td>
</tr>
</tbody>
</table>

*Values with the same letter are not significantly different at a 90% confidence level.

†Bushels per acre corrected to 15.5% moisture.

‡Marginal net return based on $3.15/bu corn and $0.33/lb N.
2017 Nitrogen Rate and Timing – Dodge County

True color (red-green-blue) imagery (left) and NDVI (right) from June 1, 2017.
2017 Nitrogen Rate and Timing – Dodge County

True color (red-green-blue) imagery (left) and NDVI (right) from August 31, 2017.
2017 Nitrogen Rate and Timing – Dodge County

Fillmore silt loam, occasionally ponded

Moody silty clay loam, terrace, 0-2% slopes

Fillmore silt loam, occasionally ponded
2017 Nitrogen Rate and Timing – Dodge County

Yield (bu/ac)

- Moody
- Fillmore

20 lb/ac difference

210 lb/ac Preplant
70 lb/ac Preplant + 110 lb/ac Sidedress
70 lb/ac Preplant + 140 lb/ac Sidedress
70 lb/ac Preplant + 170 lb/ac Sidedress
Combining Research Across the State
On-Farm Research Summaries: Soybean Seeding Rates

Average of 16 planting population studies

2 Dryland Population Studies

14 Irrigated Population Studies

Yield (bu/ac) at 13% moisture

Seeding Rates

90000 120000 150000 180000
On-Farm Research Summaries: Soybean Seeding Rates

If you were using 150,000 planting rate (most popular) and switched to

- 90,000 seeds per acre, you would save $17.62/acre
  (assumes yield loss of 0.9 bu/ac, and save $25.71/ac on seed)

- 120,000 seeds per acre, you would save $10.69/acre
  (assumes yield loss of 0.6 bu/ac, and save $12.86/ac on seed)

Uses averages of 16 population studies and $60/140,000 seeds.

https://cropwatch.unl.edu/2017/10-years-research-show-benefit-reducing-soybean-seeding-rates
On-Farm Research Summaries: Starter Fertilizer

- 15 studies from 1997 to 2016
- Looking at 4-6 gal/ac of 10-34-0
On-Farm Research Summaries: Starter Fertilizer

- 4-9 ppm
- 10-17 ppm
- 22-35 ppm
On-Farm Research Summaries:
Starter fertilizer 10-34-0

https://cropwatch.unl.edu/2017/starter-fertilizer-when-it-recommended
Local On-Farm Research Studies
Commence on Soybean – Saline County

- Evaluating Commence® seed treatment applied to soybeans
- Applied at a rate of 4 oz/100 lb of seed

<table>
<thead>
<tr>
<th>GUARANTEED ANALYSIS</th>
<th>PLANT NUTRIENT DERIVED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobalt (Co)</td>
<td>Cobalt Carbonate, Cobalt Sulfate, Copper (II) Carbonate, Iron (III) Oxide, Manganese (II) Oxide, Manganese (II) Sulfate, Zinc Carbonate, Zinc Sulfate</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td></td>
</tr>
<tr>
<td>Iron (Fe)</td>
<td></td>
</tr>
<tr>
<td>Manganese (Mn)</td>
<td></td>
</tr>
<tr>
<td>Zinc (Zn)</td>
<td></td>
</tr>
</tbody>
</table>

1.90%                   0.45%                  0.94%                  0.61%                  0.38%

Product information from:
http://www.kellysolutions.com/erewals/documentsubmit/KellyData/ND%5CFertilizer%5CProduct%20Label%5CCommence_for_Soybeans_9_1_2015_10_52_24_AM.pdf
Commence on Soybean – Saline County

Study ID: 704151201701
County: Saline
Soil Type: Muir silt loam rarely flooded; Zook silt loam occasionally flooded
Planting Date: 5/6/17
Harvest Date: 10/20/17
Population: 140,000
Row Spacing (in) 30
Variety: Asgrow 3231
Reps: 7
Previous Crop: Corn
Tillage: No-Till
Herbicides: Pre: 0.5 lb/acre Sencor®, 1 qt/acre Dual®, 5 oz/acre Valor® XLT, 0.5 pt/acre 2,4D Post: 1 qt/acre Roundup®, 1 qt/acre Dual®

Seed Treatment: Fungicide, Cruiser®, and 1/2 rate of ILeVO®
Foliar Insecticides/Fungicides: None
Fertilizer: 100 lb/ac 11-52-0, 2 lb/ac Zn, 4 lb/ac S applied broadcast in the spring
Irrigation: Pivot, Total: 6"
Rainfall (in.):

<table>
<thead>
<tr>
<th>OM (%)</th>
<th>pH</th>
<th>Buffer pH</th>
<th>Bray P1 (ppm)</th>
<th>K (ppm)</th>
<th>Zinc (ppm)</th>
<th>Sulfate S (ppm)</th>
<th>NO3-N</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4</td>
<td>6.1</td>
<td>6.8</td>
<td>28</td>
<td>261</td>
<td>0.7</td>
<td>8</td>
<td>6.9</td>
</tr>
<tr>
<td>2.9</td>
<td>6.0</td>
<td>6.7</td>
<td>16</td>
<td>273</td>
<td>0.8</td>
<td>8</td>
<td>6.4</td>
</tr>
</tbody>
</table>
## Commence on Soybean – Saline County

<table>
<thead>
<tr>
<th></th>
<th>Harvest Stand Count (plants/ac)</th>
<th>Test Weight (lb/bu)</th>
<th>Moisture (%)</th>
<th>Yield (bu/acre)†</th>
<th>Marginal Net Return‡ ($/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Check</strong></td>
<td>110,571 A*</td>
<td>56 A</td>
<td>12.3 A</td>
<td>68.4 A</td>
<td>608.93 A</td>
</tr>
<tr>
<td><strong>Commence</strong></td>
<td>107,000 A</td>
<td>56 A</td>
<td>12.3 A</td>
<td>69.5 A</td>
<td>612.70 A</td>
</tr>
<tr>
<td><strong>P-Value</strong></td>
<td>0.317</td>
<td>0.362</td>
<td>0.778</td>
<td>0.162</td>
<td>0.561</td>
</tr>
</tbody>
</table>

*Values with the same letter are not significantly different at a 90% confidence level.

†Bushels per acre corrected to 13% moisture.

‡Marginal net return based on $8.90/bu soybean and $6/ac Commence product and application cost.
Commence on Corn – 3 Locations

- Evaluate Commence® seed treatment on corn
- Applied at a rate of 6 oz/100 lb of seed
- Non-irrigated

GUARANTEED ANALYSIS

<table>
<thead>
<tr>
<th>Element</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobalt (Co)</td>
<td>1.58%</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>0.33%</td>
</tr>
<tr>
<td>Iron (Fe)</td>
<td>0.85%</td>
</tr>
<tr>
<td>Manganese (Mn)</td>
<td>0.49%</td>
</tr>
<tr>
<td>Zinc (Zn)</td>
<td>0.27%</td>
</tr>
</tbody>
</table>
## Commence on Corn – 3 Locations

<table>
<thead>
<tr>
<th></th>
<th>Replications</th>
<th>Check Yield</th>
<th>Commence Yield</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saunders County</td>
<td>7</td>
<td>182 B</td>
<td>187 A</td>
<td>0.040</td>
</tr>
<tr>
<td>Colfax County</td>
<td>7</td>
<td>212 A</td>
<td>211 A</td>
<td>0.736</td>
</tr>
<tr>
<td>Clay County</td>
<td>5</td>
<td>148 A</td>
<td>149 A</td>
<td>0.906</td>
</tr>
<tr>
<td><strong>Summary</strong></td>
<td><strong>19</strong></td>
<td><strong>180.6 A</strong></td>
<td><strong>182.4 A</strong></td>
<td><strong>0.1255</strong></td>
</tr>
</tbody>
</table>
In-Season Nitrogen – Gage County

• Nitrogen requirements for corn following cover crop?
• Corn followed a grazed rye cover crop
• Corn planted 4/26/17 into standing rye
• Rye terminated on 5/6/17
In-Season Nitrogen – Gage County

- 155 lb/ac N pre-plant
- 3 rates of sidedress N were tested – 46-0-0 urea broadcast on May 24 at V5-V6
  - 0 lb/ac
  - 50 lb/ac
  - 100 lb/ac
# In-Season Nitrogen – Gage County

<table>
<thead>
<tr>
<th>Sidedress</th>
<th>Harvest Stand Count</th>
<th>Ears Count (ears/ac)</th>
<th>Moisture (%)</th>
<th>Yield (bu/ac) †</th>
<th>Marginal Net Return‡ ($)</th>
<th>P-Value</th>
<th>Ear Lily</th>
<th>Ear Berry</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 lb/ac Sidedress</td>
<td>23,513 A*</td>
<td>22,932 A</td>
<td>15.2 A</td>
<td>190 A</td>
<td>598.89 A</td>
<td>0.692</td>
<td>0.110</td>
<td>0.781</td>
</tr>
<tr>
<td>50 lb/ac Sidedress</td>
<td>23,803 A</td>
<td>24,819 A</td>
<td>15.6 A</td>
<td>194 A</td>
<td>586.13 A</td>
<td>0.110</td>
<td>0.110</td>
<td>0.781</td>
</tr>
<tr>
<td>100 lb/ac Sidedress</td>
<td>24,093 A</td>
<td>24,819 A</td>
<td>15.5 A</td>
<td>198 A</td>
<td>580.15 A</td>
<td>0.781</td>
<td>0.110</td>
<td>0.815</td>
</tr>
</tbody>
</table>

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†Bushels per acre corrected to 15.5% moisture.

‡Marginal net return based on $3.15/bu corn, $0.36/lb N, and $6.17/ac broadcast application cost.
Drones for Nitrogen Fertilizer Management – Richardson County

- Research funded by SARE (Sustainable Agriculture Research and Education Program)
- In-Season, Variable-Rate
Multispectral Sensor

Graph showing reflectance across different wavelengths for different nitrogen levels:
- 150 lb N/acre
- 50 lb N/acre
- 0 lb N/acre

Wavelength (nm - nanometer):

- Blue
- Green
- Red
- Red Edge
- NIR

% Reflectance:
- 0%
- 10%
- 20%
- 30%
- 40%
- 50%
Automated Drones Flights

Imagery collected on:
- June 5
- June 8
- June 15
- June 16
- June 20
- June 22
- June 24
- July 1
- July 8
- July 14
- July 23
Stitched Images
Research Plan – Base Nitrogen Fertilizer Applied

- **Red** = Farmer’s Traditional Management
- **Blue** and **Green** = Drone Management
Imagery from Drone (June 24)
Variable-Rate, In-Season Nitrogen Prescription

In-season N Prescription (lb/ac)

- 40
- 60
- 70
- 80
- 90
- 100
- 110
- 120

[Diagram showing variable-rate nitrogen prescription with colors indicating different rates based on field dimensions.]
## Year 1 Results

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Base N Rate</th>
<th>Avg In-season N Rate</th>
<th>Total N Rate</th>
<th>Yield (15.5%)</th>
<th>Nitrogen Use Efficiency</th>
<th>Partial Profit†</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 lb/ac base rate + in-season variable rate</td>
<td>75</td>
<td>102</td>
<td>177</td>
<td>247 A*</td>
<td>0.72 A</td>
<td>$692.51</td>
</tr>
<tr>
<td>100 lb/ac base rate + in-season variable rate</td>
<td>100</td>
<td>75</td>
<td>175</td>
<td>246 A</td>
<td>0.71 A</td>
<td>$692.64</td>
</tr>
<tr>
<td>Traditional Farmer Management</td>
<td>160</td>
<td>40</td>
<td>200</td>
<td>246 A</td>
<td>0.81 B</td>
<td>$689.86</td>
</tr>
</tbody>
</table>
Project SENSE
Access On-Farm Research Results
Welcome to the On-Farm Research Network Database

Watch this video to learn how to use this tool. The results finder is a database of 800+ on-farm research studies testing numerous products, practices, and new technologies. The research is conducted by Nebraska farmers in cooperation with Nebraska Extension. For questions and comments related to this database, please contact Laura Thompson.

- Online database of over 700 on-farm research studies dating back to 1990.
- The database allows users to search and filter to obtain on-farm research results of interest.
- Since the launch in Feb. 2017, there have been 2,288 page views of on-farm research data.

resultsfinder.unl.edu
Results Update Meetings

There is no cost to attend. Please pre-register at least 2 days in advance for meal planning purposes. For more info - onfarm@unl.edu or 402-624-8030.

Looking for ways to maximize profitability in 2018?

- Attendees from last year valued info at an $8/acre profit through expected management changes
What Farmers Like About On-Farm Research

“Transparency”

“Producers talking about their experiences”

“Trials in our area”

“Nice to have unbiased look at products/management methods”

“I appreciated the ability for interactions and dialog with educators”
Videos
Drone time lapse video of entire soybean growing season

https://www.youtube.com/watch?v=PbqQnC9gyII
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