Make Cover Crops & Manure Pay: coach farmers to success

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ALL TOO COMMON....
WHO IS PRACTICAL FARMERS OF IOWA?
Equipping farmers to build resilient farms and communities.

Member-led, non-profit organization
~3,400 members
Farmer-Led Research

**Outputs**
- 51 farmers conducted
- 71 projects

*Equipping farmers to build resilient farms and communities.*
Farmer-Led Learning

**Outputs**
- 54 PFI farmer members and staff
- 99 learning opportunities
- 6980 attendance

Equipping farmers to build resilient farms and communities.
Barriers
to reaching
goals
WHY ARE COVER CROPS A MUST?
Iowa Nutrient Reduction Strategy: Nitrogen reduction practices

Average nitrate-nitrogen concentration or load reduction as a percentage. Error bars represent one standard deviation above and below the mean.

* Based on the land retirement (CRP) value. There were no observations to develop a standard deviation.
† Based on one report looking at multiple wetlands in Iowa (Helmers et al., 2008).
‡ Based on one study with three years of corn and two years of soybeans.
§ Reduction calculated based on initial estimated application rate for each Major Land Resource Area in Iowa.

Data from the Iowa Nutrient Reduction Strategy (IDALS, IDNR, and ISU CALS, 2014).
In the shaded areas, the soil produces nitrate, but there is no crop to use it. As a result, some nitrate is lost to waterways.
Regional Research Projects (*SI)

Recent Projects
- Mapping Cover Crops ‘15 – ’16
- Economics of Cover Crops
- ASA Cover Crops for CCAs

Equipping farmers to build resilient farms and communities.
Benefits of livestock manure

- Less need for purchased fertilizers
- Add micronutrients to soil
- Improve soil health
  - Increase soil organic matter
  - Improve porosity & aggregate stability
  - Reduce soil bulk density
  - Increase microbial activity & nutrient cycling

The Impact of Manure Management and Cover Crops on Drainage Water Quality and Yields

Matt Helmers, Brian Dougherty, Carl Pederson, Michelle Soupir, and Dan Andersen - Dept. of Agricultural & Biosystems Engineering
Antonio Mallarino and John Sawyer - Dept. of Agronomy

IOWA STATE UNIVERSITY
## Management systems for 2016 - 2018 study

<table>
<thead>
<tr>
<th>System</th>
<th>Application timing and N source</th>
<th>Crop</th>
<th>Tillage</th>
<th>N rate (lb/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spring UAN</td>
<td>Corn Soybean</td>
<td>Chisel plow Field cultivate</td>
<td>150 -</td>
</tr>
<tr>
<td>2</td>
<td>Early fall manure</td>
<td>Corn Soybean</td>
<td>No-till No-till</td>
<td>150 -</td>
</tr>
<tr>
<td>3a</td>
<td>Late fall manure + Instinct</td>
<td>Continuous corn</td>
<td>Chisel plow</td>
<td>200</td>
</tr>
<tr>
<td>3b</td>
<td>Spring manure</td>
<td>Continuous corn</td>
<td>Chisel plow</td>
<td>200</td>
</tr>
<tr>
<td>4a</td>
<td>Late fall manure</td>
<td>Continuous corn</td>
<td>Chisel plow</td>
<td>200</td>
</tr>
<tr>
<td>4b</td>
<td>Late fall manure + 1 ton/ac gypsum</td>
<td>Continuous corn</td>
<td>Chisel plow</td>
<td>200</td>
</tr>
<tr>
<td>5</td>
<td>Early fall manure</td>
<td>Corn + Rye cover Soybean + Rye cover</td>
<td>No-till No-till</td>
<td>150 -</td>
</tr>
<tr>
<td>6</td>
<td>Late fall manure</td>
<td>Corn Soybean</td>
<td>No-till No-till</td>
<td>150 -</td>
</tr>
</tbody>
</table>
Monthly nitrate-N levels in corn
2016-2017

Flow-weighted nitrate-N concentration (mg/L)

Research funded by Iowa Pork Producers Association and Calcium Products Inc.

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Monthly nitrate-N levels in soybeans
2016-2017

Flow-weighted nitrate-N concentration (mg/L)

Research funded by Iowa Pork Producers Association and Calcium Products Inc.
Manure injection bands

Manure injected on 30” spacing with Houle 3350 gal. manure tank
High disturbance vs. Low disturbance

Rye cover crop spring 2013(?) Van Horne

Rye cover crop growth at NERF April 6, 2016
Corn phase yields

<table>
<thead>
<tr>
<th>Treatment</th>
<th>2016 Yield (bu/acre)</th>
<th>2017 Yield (bu/acre)</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Spring UAN chisel plow</td>
<td>243</td>
<td>243</td>
<td>0</td>
</tr>
<tr>
<td>2 Early fall manure no-till</td>
<td>222</td>
<td>222</td>
<td>0</td>
</tr>
<tr>
<td>5 Early fall manure no-till + cover crop</td>
<td>-26</td>
<td>-26</td>
<td>-52</td>
</tr>
<tr>
<td>6 Late fall manure no-till</td>
<td>216</td>
<td>216</td>
<td>0</td>
</tr>
<tr>
<td>1 Spring UAN chisel plow</td>
<td>243</td>
<td>243</td>
<td>0</td>
</tr>
<tr>
<td>2 Early fall manure no-till</td>
<td>222</td>
<td>222</td>
<td>0</td>
</tr>
<tr>
<td>5 Early fall manure no-till + cover crop</td>
<td>27</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>6 Late fall manure no-till</td>
<td>216</td>
<td>216</td>
<td>0</td>
</tr>
</tbody>
</table>

Research funded by Iowa Pork Producers Association and Calcium Products Inc.
COACH COVER CROP
RECOMMENDATIONS TO SUCCESS
Make Cover Crops Pay

1. Control Seed Costs
2. Control Herbicide Costs
3. Avoid Cover Crop Establishment Failures
4. Avoid Redundant Expenses
5. Avoid Corn Yield Drag
6. Realize Soybean Yield Gains
7. Feed Cover Crops
1. Control Seed Costs

- Oats: $8/A
- Mix: $32/A
- Rye: $10/A
- Mix: $14.25/A
Cover Crop Variety Trial

- 49 cover crop entries
- 10-16 locations
- 5 years

GRASS: Cereal Rye
BRASSICAS: Rapeseed
LEGUMES: Hairy Vetch
Choosing a Cover Crop Species

**Early Harvest (by Sept. 10)**
- Grass
- Brassica
- Legume

**Late Harvest (after Sept. 30)**
- Aerial Seeding
  - Grass
  - Brassica

**Late Harvest (by Sept. 30)**
- Drill Seeding
  - Grass
2. Control Herbicide Costs
Early ~10 days prior to planting soybeans

Late within 1 day of planting soybeans
Mid-season “mulch” at Jeremy Gustafson’s on Aug. 6, 2016. Jeremy was able to eliminate two weed control passes in the late termination treatment.
Soybean yields for the early and late cover crop termination treatments at Jeremy Gustafson’s and Jack Boyer’s in 2016 and 2015. The least significant difference (LSD) at the $P \leq 0.05$ level is indicated above each pair of mean columns for both years. By year and farm, if the difference between the treatment means is equal to or greater than the LSD, the treatments are considered significantly different.
<table>
<thead>
<tr>
<th>Early termination</th>
<th>$/ac</th>
<th>Late termination</th>
<th>$/ac</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate (40 oz/ac)</td>
<td>5.16</td>
<td>Glyphosate (32 oz/ac)</td>
<td>4.13</td>
</tr>
<tr>
<td>Class Act adjuvant</td>
<td>3.76</td>
<td>Class Act</td>
<td>3.76</td>
</tr>
<tr>
<td>Application</td>
<td>7.35</td>
<td>Application</td>
<td>7.35</td>
</tr>
<tr>
<td>Glyphosate (32 oz/ac)</td>
<td>4.13</td>
<td>Flexstar GT (3.5 pt/ac)</td>
<td>13.76</td>
</tr>
<tr>
<td>Class Act</td>
<td>3.76</td>
<td>AMS</td>
<td>0.60</td>
</tr>
<tr>
<td>Application</td>
<td>7.35</td>
<td>Destiny</td>
<td>0.80</td>
</tr>
<tr>
<td>Flexstar GT (3.5 pt/ac)</td>
<td>13.76</td>
<td>Application</td>
<td>7.35</td>
</tr>
<tr>
<td>AMS</td>
<td>0.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Destiny adjuvant</td>
<td>0.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application</td>
<td>7.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mech. cultivation</td>
<td>13.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>67.52</td>
<td>TOTAL</td>
<td>37.75</td>
</tr>
</tbody>
</table>

**Diff. = $29.77**
3. Avoid Cover Crop Failure

**Herbicide carryover into fall**

- Cereal rye only affected by 2x Dual II Magnum (Halex GT, anecdotally)
- Vetch, lentil, and radish affected by:
  - Balance Flexx, Corvus, & Hornet
- Atrazine, Callisto, & Laudis caused no injury
4. Avoid Redundant Expenses

Cover Crop Impact on Water Quality

- Fall+cc - 70% fall DAP & anhydrous + 30% sidedress anhydrous
- Fall-70% fall DAP & anhydrous + 30% sidedress anhydrous
- Spring + cc-20% fall DAP + 80% anhydrous
- Spring-20% fall DAP + 80% anhydrous
- Zero control: no N & no cc

Precipitation
Total = 63 inches
Annual Average = 25

N Loading Trends
Fall N vs. Spring N = Equal
Fall N vs. Spring N + CC = 42% ▼
Spring N vs. Fall N + CC = 50% ▼
Spring N + CC vs. Fall N + CC = Equal
5. Avoid Corn Yield Drag

Figure 1. Trends with respect to cover crop effect on corn yields at 10 site-years from 2009 to 2010 and 25 site-years from 2011 to 2017.
12 participating farmers from 2008 – 2017
(5 remaining)
Corn yields, Cover vs. No cover

Yield advantage

Yield drag

P < 0.10
Cover crops and seedling disease

Winter rye hosts corn pathogens
Bakker et al. 2017 Phytopathology 106:591

Pythium populations increased as rye roots senesced
Bakker et al. 2017 Phytopathology 106:591

Green bridge effect

IOWA STATE UNIVERSITY
Extension and Outreach
### Cover crop termination & corn seedling disease

<table>
<thead>
<tr>
<th>Treatment 2015</th>
<th>Root rot incidence (%)</th>
<th><em>Pythium</em> incidence (%)</th>
<th><em>Fusarium</em> incidence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No rye, check</td>
<td>8.3 b</td>
<td>2.8 c</td>
<td>61.1</td>
</tr>
<tr>
<td>Rye, spray 21 DBP</td>
<td>25.0 b</td>
<td>19.4 b</td>
<td>69.4</td>
</tr>
<tr>
<td>Rye, spray 14 DBP</td>
<td>25.0 b</td>
<td>13.9 bc</td>
<td>47.2</td>
</tr>
<tr>
<td>Rye, spray 10 DBP</td>
<td>80.6 a</td>
<td>38.9 a</td>
<td>75.0</td>
</tr>
<tr>
<td>Rye, spray 3 DBP</td>
<td>80.6 a</td>
<td>19.4 b</td>
<td>77.8</td>
</tr>
<tr>
<td>Rye, spray 1 DAP</td>
<td>83.3 a</td>
<td>25.0 b</td>
<td>50.0</td>
</tr>
<tr>
<td><strong>Pr &gt; F</strong></td>
<td><strong>&lt;0.01</strong></td>
<td><strong>&lt;0.01</strong></td>
<td><strong>0.25</strong></td>
</tr>
</tbody>
</table>

Camelina showed no increased *Pythium* incidence.
QUESTION: When should I terminate cereal rye cover crop before planting soybeans?
Figure 2. Corn yields for the early and late cover crop termination treatments from each Rep at Dick Sloan’s in 2016. Mean yields and the least significant difference (LSD) at the $P \leq 0.05$ level are indicated in the inset table. If the difference between the two treatment means is greater than the LSD, the treatments are considered significantly different.
**TABLE 1**

**Cover crops, N rates and corn yields as affected by cover crop termination at Dick Sloan’s and Tim Sieren’s in 2017.**

<table>
<thead>
<tr>
<th>Cooperator</th>
<th>Cover crop</th>
<th>N rate (lb N/ac)</th>
<th>Cover crop terminated three weeks before planting</th>
<th>Cover crop terminated at planting</th>
<th>LSD (P ≤ 0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sloan</td>
<td>Wheat+oats+barley+rapeseed</td>
<td>180</td>
<td>230 ab</td>
<td>222 b</td>
<td>11</td>
</tr>
<tr>
<td>Sloan</td>
<td>Wheat+oats+barley+rapeseed</td>
<td>200</td>
<td>240 a</td>
<td>235 a</td>
<td>11</td>
</tr>
<tr>
<td>Sloan</td>
<td>Wheat+rye+barley</td>
<td>150</td>
<td>242 a</td>
<td>226 b</td>
<td>9</td>
</tr>
<tr>
<td>Sloan</td>
<td>Wheat+rye+barley</td>
<td>170</td>
<td>247 a</td>
<td>233 b</td>
<td>9</td>
</tr>
<tr>
<td>Sieren</td>
<td>Rye</td>
<td>140</td>
<td>228 a</td>
<td>200 b</td>
<td>9</td>
</tr>
</tbody>
</table>

CC herbicide terminated 21 & 3 days before planting 5/8/2017
6. Realize Soybean Yield Gain

Figure 2. Trends with respect to cover crop effect on soybean yields at 6 site-years from 2009 to 2010 and 22 site-years from 2011 to 2017.
### Feedlot Economics

<table>
<thead>
<tr>
<th>Cattle</th>
<th>Acres</th>
<th>Cover Crops Seeded</th>
<th>Avg. Weight In (lbs)</th>
<th>Avg. Weight Out (lbs)</th>
<th>Total Gain (lbs)</th>
<th>Value per head</th>
<th>Value per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>180</td>
<td>11</td>
<td>Cereal Rye + Oats</td>
<td>850</td>
<td>1479</td>
<td>629</td>
<td>$31.45</td>
<td>$514.64</td>
</tr>
<tr>
<td>330</td>
<td>50</td>
<td>Cereal Rye + Oats</td>
<td>923</td>
<td>1459</td>
<td>536</td>
<td>$26.80</td>
<td>$176.88</td>
</tr>
<tr>
<td>240</td>
<td>79</td>
<td>Cereal Rye + Oats</td>
<td>898</td>
<td>1462</td>
<td>564</td>
<td>$28.20</td>
<td>$85.67</td>
</tr>
</tbody>
</table>

#### 2017

<table>
<thead>
<tr>
<th>Cattle</th>
<th>Acres</th>
<th>Cover Crops Seeded</th>
<th>Avg. Weight In (lbs)</th>
<th>Avg. Weight Out (lbs)</th>
<th>Total Gain (lbs)</th>
<th>Value per head</th>
<th>Value per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>180</td>
<td>11</td>
<td>Cereal Rye + Oats</td>
<td>756</td>
<td>1371</td>
<td>615</td>
<td>$30.75</td>
<td>$503.18</td>
</tr>
<tr>
<td>230</td>
<td>71</td>
<td>Cereal Rye + Oats</td>
<td>789</td>
<td>1311</td>
<td>522</td>
<td>$26.10</td>
<td>$83.38</td>
</tr>
<tr>
<td>225</td>
<td>79</td>
<td>Cereal Rye + Oats</td>
<td>938</td>
<td>1416</td>
<td>478</td>
<td>$23.90</td>
<td>$68.07</td>
</tr>
</tbody>
</table>

Cattle grazed November to March
Cover crop valued at $0.05 per pound of gain
Cover Crop Decision Tree

**Cover Crop Decision Tree**

- Are you planting cover crops by Sept. 15?
  - Yes
  - No
- Are you overseeding cover crops into standing cash crops?
  - Yes
  - No
- Are you using full width fall tillage or double disk manure application?
  - Yes
  - No
- Consider strip tillage, spring tillage or low disturbance application to reduce cover crop damage.
  - It's unlikely a winterkill cover crop will survive high disturbance.
  - An alternative option: chase tillage equipment with cover crop planting equipment if fall tillage is planned.
  - Will the following crop be corn grain?
    - Yes
    - No
- Can you apply ~30 lbs of your total nitrogen program at planting or early side-dress?
  - Yes
  - No
  
  **Option 1:** Choose an overwintering species like cereal rye, winter wheat or winter triticate. Plan to apply 30-40 lbs of your total nitrogen program at planting to ensure good corn yields.
  
  **Option 2:** Overseed a diverse winterkill mix if by Sept. 15. See "Aerial or High Clearance Overseeded" column on back.

---

**Seeding Rate Recommendations**

Based on pure live seed (PLS)

<table>
<thead>
<tr>
<th>Small Grains</th>
<th>Drilled/Planted before Sept. 15</th>
<th>Aerial or High-Clearance Overseeded before Aug. 15 - Sept. 15</th>
<th>Drilled/Planted after Sept. 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter cereal rye*</td>
<td>~55 lb/acre</td>
<td>60-75 lb/acre</td>
<td>60-75 lb/acre*</td>
</tr>
<tr>
<td>Winter triticale**</td>
<td>~55 lb/acre</td>
<td>60-75 lb/acre</td>
<td>60-75 lb/acre*</td>
</tr>
<tr>
<td>Winter wheat**</td>
<td>~55 lb/acre</td>
<td>60-75 lb/acre</td>
<td>60-75 lb/acre*</td>
</tr>
<tr>
<td>Winter barley***</td>
<td>~55 lb/acre</td>
<td>60-75 lb/acre</td>
<td>60-75 lb/acre*</td>
</tr>
<tr>
<td>Oats***</td>
<td>~60 lb/acre</td>
<td>60-75 lb/acre</td>
<td>X</td>
</tr>
<tr>
<td>Cool-season grass</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual ryegrass*</td>
<td>~15 lb/acre</td>
<td>~20 lb/acre</td>
<td>X</td>
</tr>
<tr>
<td>Brassicas (must be planted with grasses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAPeseed**</td>
<td>3-4 lb/acre</td>
<td>4-6 lb/acre</td>
<td>X</td>
</tr>
<tr>
<td>Brown mustard***</td>
<td>3-4 lb/acre</td>
<td>4-6 lb/acre*</td>
<td>X</td>
</tr>
<tr>
<td>Oilseed radish***</td>
<td>3-4 lb/acre</td>
<td>4-6 lb/acre*</td>
<td>X</td>
</tr>
<tr>
<td>Turnips***</td>
<td>3-4 lb/acre</td>
<td>4-6 lb/acre*</td>
<td>X</td>
</tr>
<tr>
<td>Legumes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hairy vetch**</td>
<td>15-20 lb/acre</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Common vetch**</td>
<td>15-20 lb/acre</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Winter lentil***</td>
<td>50 lb/acre</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Winter pea***</td>
<td>60 lb/acre</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

* = should not winterkill | ** = could winterkill | *** = will winterkill | X = not recommended for this time and planting

When using a mixture be sure to check applicable seeding rates or talk to your retailer.

1. If receiving cost-share through government programs, please see USDA-NRCS Agromony Technical Note 18: Cover Crop Management at tinyurl.com/1AMKs3BCCRecs or NRCS recommended rates.
2. If growing cover crops for livestock forage, use upper range of seeding rates and see: tinyurl.com/PFICornHerb-CC-Grazing and tinyurl.com/PFICoverHerb-CC-Grazing

**Cover Crops and Heat Units**

Legumes and brassicas need more heat units than small grains to be effective.

The number of heat units (base 50°F) remaining in Iowa declines dramatically throughout the month of September:

- After Aug. 1: 2,185
- After Sept. 1: 707
- After Oct. 1: 246

Source: Iowa Environmental Mesonet

**Minimum Germination Soil Temperatures**

- Cereal rye: 34°F
- Other small grains: 38°F
- Annual ryegrass: 40°F
- Mustard/Rape: 40°F
- Turnip/Radish: 45°F
- Vetches: 60°F
- Lentils/Peas: 41°F

Source: Midwest Cover Crops Field Guide: 2nd Edition
If we want to turn this... into this
Make Cover Crops Pay

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5. Avoid Corn Yield Drag
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Take home messages

WHO is Practical Farmers of Iowa?

WHY are cover crops a must?

IMPROVE Cover Crops Recommendations

Sarah Carlson
Practical Farmers of Iowa
Strategic Initiatives Director

sarah@practicalfarmers.org  515-232-5661
“$30-$35/A cover crop cost protects a $5000-$10,000/A asset”

Iowa farmer new to cover crops
QUESTION: How does a cereal rye cover crop affect corn and soybean yields?

First strips established in Fall 2008 at six commercial farms.
Corn yields, Cover vs. No Cover

Yield advantage

Yield drag

Bushels per acre

Holstein | Jefferson | Plainfield | West Chester | New Market | Coon Rapids | Jefferson

2015 | 2016 | 2017

* P ≤ 0.05
QUESTION: When should I terminate cereal rye cover crop before planting soybeans?
Figure 2. Corn yields for the early and late cover crop termination treatments from each Rep at Dick Sloan’s in 2016. Mean yields and the least significant difference (LSD) at the $P \leq 0.05$ level are indicated in the inset table. If the difference between the two treatment means is greater than the LSD, the treatments are considered significantly different.
### Early vs. Late Killed Cereal Rye & Nitrogen Rate Effect on Corn

#### Corn-on-Corn

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>76#N Fall Manure</td>
<td>76#N Fall Manure</td>
<td></td>
</tr>
<tr>
<td>35#N @ planting</td>
<td>35#N @ planting</td>
<td></td>
</tr>
<tr>
<td>70#N @ side-dress</td>
<td>90#N @ side-dress</td>
<td></td>
</tr>
<tr>
<td>181#N Total</td>
<td>201#N Total</td>
<td></td>
</tr>
</tbody>
</table>

**CC herbicide terminated 21 & 3 days before planting 5/8/2017**

**Cover Crop:**
- 15 W. Barley,
- 50 W. Wheat;
- 20 Oats;
- 5 Rapeseed
Early vs. Late Killed Cereal Rye & Nitrogen Rate Effect on Corn following Soybean

<table>
<thead>
<tr>
<th>Nitrogen Rate</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before Planting</td>
<td>15#N</td>
<td>15#N</td>
</tr>
<tr>
<td>Planting</td>
<td>35#N</td>
<td>35#N</td>
</tr>
<tr>
<td>Side-dress</td>
<td>100#N</td>
<td>120#N</td>
</tr>
<tr>
<td>Total</td>
<td>150#N Total</td>
<td>170#N Total</td>
</tr>
</tbody>
</table>

CC herbicide terminated 21 & 3 days before planting 5/8/2017

Cover Crop:
20 W. Barley,
50 W. Wheat;
20 Cereal Rye
Early Termination (19DBP) | Late Termination (1DBP)
---|---
70#N as UAN @ planting | 70#N as NH3 @ strip-till | 35#N UAN as herbicide carrier | 70#N as NH3 @ strip-till |
70#N as UAN @ side-dress | 70#N as UAN @ side-dress | 105#N as UAN @ side-dress | 35#N UAN as herbicide carrier |
140#N Total | 140#N Total | 140#N Total | 140#N Total |

Cover Crop:
97#/A Cereal Rye
Cover crop biomass

- **Corn**:
  - Apr. 17 termination: 1,000 pounds per acre
  - May 5 termination: 3,000 pounds per acre

- **Soybean**:
  - Apr. 17 termination: 1,000 pounds per acre
  - May 5 termination: 5,000 pounds per acre

- **Soybean** (Sieren):
  - May 5 termination: 4,000 pounds per acre

Farm and Previous Crop:
- Sloan
- Sieren
# TABLE 1

**Cover crops, N rates and corn yields as affected by cover crop termination at Dick Sloan’s and Tim Sieren’s in 2017.**

<table>
<thead>
<tr>
<th>Cooperator</th>
<th>Cover crop</th>
<th>N rate (lb N/ac)</th>
<th>Cover crop terminated three weeks before planting</th>
<th>Cover crop terminated at planting</th>
<th>LSD (P ≤ 0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sloan</td>
<td>Wheat+oats+barley+rapeseed</td>
<td>180</td>
<td>230 ab</td>
<td>222 b</td>
<td>11</td>
</tr>
<tr>
<td>Sloan</td>
<td>Wheat+rye+barley</td>
<td>150</td>
<td>242 a</td>
<td>226 b</td>
<td>9</td>
</tr>
<tr>
<td>Sieren</td>
<td>Rye</td>
<td>140</td>
<td>228 a</td>
<td>200 b</td>
<td>9</td>
</tr>
</tbody>
</table>

1. CC 21 DBP = 1000 lbs/A  
2. CC 21 DBP = 1200 lbs/A  
3. CC 21 DBP = 2000 lbs/A  
CC 3 DBP = 3000 lbs/A  
CC 3 DBP = 5000 lbs/A  
CC 3 DBP = 4000 lbs/A
<table>
<thead>
<tr>
<th></th>
<th>Cover crop terminated three weeks before planting</th>
<th>Cover crop terminated at planting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>230 ab</td>
<td>222 b</td>
</tr>
<tr>
<td>1.</td>
<td>240 a</td>
<td>235 a</td>
</tr>
<tr>
<td>2.</td>
<td>242 a</td>
<td>226 b</td>
</tr>
<tr>
<td>2.</td>
<td>247 a</td>
<td>233 b</td>
</tr>
<tr>
<td>3.</td>
<td>228 a</td>
<td>200 b</td>
</tr>
<tr>
<td>Previous crop</td>
<td>Cover Crop Termination Date</td>
<td>N Fertilizer Rate</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Corn</td>
<td>21 DBP</td>
<td>76 lb N/ac fall manure + 35 lb N/ac as UAN at planting + 70 lb N/ac as UAN at side-dress</td>
</tr>
<tr>
<td></td>
<td>3 DBP</td>
<td>76 lb N/ac fall manure + 35 lb N/ac as UAN at planting + 90 lb N/ac as UAN at side-dress</td>
</tr>
<tr>
<td>Soybeans</td>
<td>21 DBP</td>
<td>15 lb N/ac as MAP in spring + 35 lb N/ac as UAN at planting + 100 lb N/ac as UAN at side-dress</td>
</tr>
<tr>
<td></td>
<td>3 DBP</td>
<td>15 lb N/ac as MAP in spring + 35 lb N/ac as UAN at planting + 120 lb N/ac as UAN at side-dress</td>
</tr>
</tbody>
</table>

DBP = days before planting corn.
“$30-$35/A cover crop cost protects a $5000-$10,000/A asset”

Iowa farmer new to cover crops