Organic Row Cropping Systems, Cover Crops, and Soil Health

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Servi-Tech, Inc. Aurora, NE
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Objectives

- Certified organic crop production
- Cover crop experiences
- Soil organic matter changes
Organic Crop Production

- Is it a philosophy or good science?
- “Take what you can get” vs highly managed
- Must be out of “chemical” crop production for 3 years.
- Organic does not mean natural. Tillage is not natural
Organic Crop Production

- Must be approved by OCIA certifying organization
- Marketing is a key component
Crop Rotation Compliance

- 6 year- alfalfa, corn, soybeans, popcorn, soybeans, wheat, fall seeded alfalfa
- 4 year- alfalfa, corn/popcorn, soybeans, wheat, fall seeded alfalfa
Challenges in Organic Production

- Getting adequate N on corn
- Weed control in soybeans in wet springs.
- Western bean cutworm and corn borer in popcorn, bean leaf beetle in soybeans. Army cutworm, leafhoppers in alfalfa.
- Must use seed with no chemical treatments, limits corn hybrids
Certified Organic Crop Challenges

- Adequate weed control
- Nitrogen for corn, phosphate supply
- Corn borer control
- Good corn/soybean stand establishment
- Can’t use conventional seed treatments
Certified Organic Crop Prices

- $25 per bu clear hila soybeans
- $0.42 per pound popcorn
- $13 per bu white corn
- $13 per bu wheat
Flaming Organic Popcorn, before Emergence
Flaming Organic Popcorn
Cultivating Flamed Organic Popcorn
Flaming/Cultivating Organic Popcorn
Flaming Organic Popcorn
Flamed Organic Popcorn
Flamed Organic Popcorn

Non Flamed Skip
Flamed Organic Soybeans
Flamed Organic Soybeans
Flamed Organic Soybeans 2015
Flamed Organic Soybeans, New Grass Growth
Flamed Organic Soybeans, later in Year
Flamed Organic Soybeans, later in Year
Turning compost for organic fields
Compost for organic fields
Typical Compost Test

- Total N  15-23# per ton
- Total P  15-25# per ton
- Total K  25-35# per ton
- Moisture 25-40%
- C:N ratio  9:1-11:1
- pH  8.8
Vetch Cover Crop for Nitrogen
Nodules on Vetch
Organic Popcorn, Corn Borer Damage
Organic Popcorn, No Corn Borer Control
Organic Popcorn, Heavy Earworm Pressure, 2012
Corn Borer Control with Spinosad, 2011
Corn Borer Control with Spinosad, 2009
Organic White Corn 2014, 2015
Fall Planted Oats before Spring Planted Organic Soybeans
Turnip/Radish Cover Crop in Seed Corn
Turnip/Radish Cover Crop in Seed Corn
Turnip/Radish Cover Crop in Seed Corn after Harvest
Flown on turnips/canola fall 2015 on field corn
Flown on Turnips/Canola Fall 2015, Soybeans vs Field Corn
Turnips and “Digger” Radishes
Nov 22, 2011
It’s dry
Grazed Turnips/Radishes Fall 2015
June 2012
Cover Crop?? Late Nightshade
Oct 12, 2010  Aurora, NE
Planted Aug 31, 2010
Oats, peas, radish mix 45# per acre
No Cover Crop

Cover Crop, Volunteer Wheat Remaining April 2011
Snoberger Dryland Cover Crop Trial, Aurora, NE, April 2011

<table>
<thead>
<tr>
<th>Sample Depth Check</th>
<th>Inches Water Available @ 2.0 inches/ft Field Capacity</th>
<th>Nitrogen Lbs/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 12&quot;</td>
<td>1.91</td>
<td>76</td>
</tr>
<tr>
<td>12 - 24&quot;</td>
<td>1.76</td>
<td>25</td>
</tr>
<tr>
<td>24 - 36&quot;</td>
<td>1.32</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>4.99</td>
<td>112</td>
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</table>

<table>
<thead>
<tr>
<th>Cover Crop</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>0 - 12&quot;</td>
<td>1.85</td>
<td>18</td>
</tr>
<tr>
<td>12 - 24&quot;</td>
<td>0.88</td>
<td>2</td>
</tr>
<tr>
<td>24 - 36&quot;</td>
<td>0.67</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>3.40</td>
<td>22</td>
</tr>
</tbody>
</table>
75# N as NH3, 3 Reps
Pioneer 33D47    5.10.2011
26,000 per acre planting rate

201.1 bu/acre    190.2 bu/acre
### Cover Crops, Seed Corn after Soybeans

<table>
<thead>
<tr>
<th>Year</th>
<th>Cover Crops</th>
<th>No Cover Crop</th>
<th>#Samples</th>
<th>#Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>19.5</td>
<td>37.9</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>2012</td>
<td>23.3</td>
<td>56.0</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>2013</td>
<td>17.1</td>
<td>40.1</td>
<td>22</td>
<td>8</td>
</tr>
</tbody>
</table>

# Nitrogen/acre 10” sample

**Note:** The table above shows the nitrogen content in samples taken from cover crops and no cover crops after soybeans for the years 2011, 2012, and 2013. The nitrogen values are given in pounds per acre, and the number of samples and fields tested are also provided.
## Cover Crops, Seed Corn after Soybeans

### Nitrogen/acre 10” sample

<table>
<thead>
<tr>
<th>Year</th>
<th>Cover Crops</th>
<th>No Cover Crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>17.2</td>
<td>26.5</td>
</tr>
<tr>
<td></td>
<td>#Samples: 15</td>
<td>#Samples: 13</td>
</tr>
<tr>
<td></td>
<td>#Fields: 5</td>
<td>#Fields: 6</td>
</tr>
<tr>
<td>2015</td>
<td>14.1</td>
<td>24.4</td>
</tr>
<tr>
<td></td>
<td>#Samples: 20</td>
<td>#Samples: 21</td>
</tr>
<tr>
<td></td>
<td>#Fields: 8</td>
<td>#Fields: 11</td>
</tr>
</tbody>
</table>
Cover Crops, Seed Corn after Soybeans

#Nitrogen/acre

<table>
<thead>
<tr>
<th></th>
<th>Cover Crops</th>
<th>No Cover Crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Yr Average</td>
<td>18.3</td>
<td>37.0</td>
</tr>
</tbody>
</table>

#Samples

<table>
<thead>
<tr>
<th></th>
<th>Samples</th>
<th>Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover Crops</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>No Cover Crop</td>
<td>130</td>
<td></td>
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</tbody>
</table>
Cover Crops

- Useful in seed corn production
- Nutrient leaching and runoff, conservatively 18-20# N/ac from loss
- Good on erodible soils
- Timely control in spring imperative
Cover Crops

- Excellent fall and winter grazing, but compaction will enhance SDS in soybeans the next year.
- Will use significant soil moisture, especially if ungrazed.
- Helps on wet soil conditions at seed corn harvest
In Nebraska cover crops best:
- after silage
- in seed corn fields with brassicas
- following wheat
- following high moisture corn, short season soybeans
Organic Matter Changes, Hamilton Co, NE, Conventional, No Cover Crops
Organic Matter Changes, Hamilton Co, NE, Conventional, late Cover Crops
Organic Matter Changes, Hamilton Co, NE, Conventional, late Cover Crops
Organic Matter Changes, Hamilton Co, NE, Certified Organic Fields

![Graph showing changes in organic matter over time for different circles in Hamilton Co, NE.](image-url)
If OM below steady state levels, like in eroded areas, it may be increased.

Eventually get to a steady state of organic matter. Can't get back to pre cultivation OM with annual crops. Eroded soils can increase back to the steady state. Get reduction in soil erosion. But how long do the effects exist?
Kansas State Dryland Cover Crop Study

Effects of cover crops on soil organic C concentration at two soil depths. 2002 to 2008, Hesston, KS
Organic Matter Changes, Hamilton Co, NE, Certified Organic Fields

PAUL HUENEFELD - SOUTH CIRCLE

![Graphs showing changes in organic matter, phosphorus, and soil pH over years for different quarters of the field.]

A: northeast 1/4  B: southeast 1/4  C: southwest 1/4  D: northwest 1/4
Organic Matter Changes, Hamilton Co, NE, Conventional, No Cover Crops

KAPACO - SOUTH CIRCLE

Organic Matter

Phosphorus

Soil pH

A: northeast 1/4  B: southeast 1/4  C: southwest 1/4  D: northwest 1/4
Role of Crop Consultant for Organic Crop Production

- Soil and compost testing
- Match soil low N and P areas with compost
- Timing of weed control with flaming, and mechanical methods
- Corn borer scouting, helping with other innovative insect control
Role of Crop Consultant

- Irrigation management
- Proper compost making
- Marketing network
- Crop rotations
- Best yielding hybrids/varieties from low inputs
- Become a certified organic farm inspector
Planted to corn for 2011

175 # N Applied

No Nitrogen Applied

Jim Schneider, Hamilton Co Extension

10/28/2010
2011 Corn Yields Over Cover Crops

With 175# N

(Machine Harvested)

Bu/A @ 15 %

Jim Schneider, Hamilton Co Extension
Organic Popcorn, Spinosad (Entrust) Treated