The Latest…

No Till Cover Crop Revelations

Steve Groff
Holtwood, PA
Remember this?
The reason why one farmer can make cover crops work and his neighbors can't is complex. Attention to details and timing! Management!
We need to focus more on Biological solutions than Chemical, Fertilizer, and Iron solutions
Cover Crop Influences: Yield - input costs = Profit
Cover Crops Planted Third Week August 2010

Species / Blend Planted in Separate Plots

- Crimson Clover
- Hairy Vetch
- Control (No cover crop)
- Hairy Vetch, Austrian Winter Pea, Crimson Clover
- Subterranean Clover, Hairy Vetch
- Austrian Winter Pea
- Yellow Blossom Sweet Clover, Hairy Vetch
100 degrees
No cover

88 degrees
Crimson Clover
3 days later!
Dr. Ray Weil July 6th
Measuring yields

Penn State University
Results: Corn Planted Behind Cover Crops

Cover Crops and Blends Tested

- Crimson Clover, Austrian Winter Peas, Hairy Vetch
- Subterranean Clover/Hairy Vetch
- Control (only plot with N added, 75 lb/a)
- Austrian Winter Pea
- Yellow Blossom Sweet Clover/Hairy Vetch
- Crimson Clover/Hairy Vetch

Corn, Bushels Per Acre (b/a) Yield

<table>
<thead>
<tr>
<th>Zero N Added 5-31-11</th>
<th>90</th>
<th>100</th>
<th>110</th>
<th>120</th>
<th>130</th>
<th>140</th>
<th>150</th>
<th>160</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crimson Clover, Aust</td>
<td></td>
<td>151.55</td>
<td>144.56</td>
<td>144.92</td>
<td>142.85</td>
<td>124.18</td>
<td>152.36</td>
<td></td>
</tr>
<tr>
<td>Control (only plot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austrian Winter Pea</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow Blossom Sweet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subterranean Clover/H</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cover Crops and Blends Tested</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Average Corn Yield From Cover Crop Plots

- 143.40
- 44.32 b/a

Increase Over Control
Cover Crops and Blends Tested

- Crimson Clover, Austrian Winter Peas, Hairy Vetch
- Subterranean Clover/Hairy Vetch
- Control (only plot with N added, 75 lb/a)
- Austrian Winter Pea
- Yellow Blossom Sweet Clover/Hairy Vetch
- Crimson Clover
- Hairy Vetch

Corn, Bushels Per Acre (b/a) Yield

- 90 lb/a N: 163.61 b/a
- 100 lb/a N: 145.87 b/a
- 110 lb/a N: 128.66 b/a
- 120 lb/a N: 147.94 b/a
- 130 lb/a N: 158.68 b/a
- 140 lb/a N: 136.22 b/a
- 150 lb/a N: 158.78 b/a
- 160 lb/a N: 151.85 b/a

Average Corn Yield From Cover Crop Plots:

- 151.85 b/a

Increase Over Control:

- 23.19 b/a
Another Slice of the Data

Study 1

<table>
<thead>
<tr>
<th>Description</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Cover Crop Plots</td>
<td>143.20 b/a</td>
</tr>
<tr>
<td>All Control Plots</td>
<td>110.28 b/a</td>
</tr>
<tr>
<td>Increase</td>
<td>32.92 b/a</td>
</tr>
</tbody>
</table>
# Cover Crop Economics

## Study 1

Gross value - seed costs @ $7.00/bu

<table>
<thead>
<tr>
<th>Species, Mix</th>
<th>Average Yield, All Plots</th>
<th>Seed Prices</th>
<th>Seeding Rate (lb/a)</th>
<th>Seed Cost Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crimson Clover</td>
<td>128.39</td>
<td>$1.45</td>
<td>12</td>
<td>$17.40</td>
</tr>
<tr>
<td>Hairy Vetch</td>
<td>151.43</td>
<td>$2.70</td>
<td>15</td>
<td>$40.50</td>
</tr>
<tr>
<td>Control, no cover crop grown</td>
<td>110.28</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Hairy Vetch, Austrian Winter Pea, Crimson Clover</td>
<td>151.31</td>
<td>$2.70 / $0.90 / $1.45</td>
<td>5 / 12 / 14</td>
<td>$30.10</td>
</tr>
<tr>
<td>Subterranean Clover, Hairy Vetch</td>
<td>138.70</td>
<td>$3.19 / $2.70</td>
<td>8 / 8</td>
<td>$47.12</td>
</tr>
<tr>
<td>Austrian Winter Pea</td>
<td>138.67</td>
<td>$0.90</td>
<td>40</td>
<td>$36.00</td>
</tr>
<tr>
<td>Yellow Blossom Sweet Clover, Hairy Vetch</td>
<td>150.73</td>
<td>$2.16 / $2.70</td>
<td>4 / 10</td>
<td>$35.64</td>
</tr>
</tbody>
</table>

Gross values:
- $881.33
- $1019.51
- $771.96
- $1029.07
- $923.78
- $934.69
- $1019.47
# Cover Crop Research

## Research on Timing of Tillage Radish Planting and Effect on Corn Yield

**Objective:**
Attempt to determine the latest practical planting date for Tillage Radish (TR) to have a positive effect on yield for corn planting following Tillage Radish grown as a cover crop.

<table>
<thead>
<tr>
<th>Tillage Radish Planted</th>
<th>Corn Yield b/a</th>
<th>Difference b/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (no TR)</td>
<td>136.75</td>
<td></td>
</tr>
<tr>
<td>September 20, 2010</td>
<td>149.21</td>
<td>+ 12.46</td>
</tr>
<tr>
<td>October 9, 2010</td>
<td>145.11</td>
<td>+ 8.36</td>
</tr>
</tbody>
</table>
Cover Crop Mixes

- Guards against failure of one species
- Provide opportunity for maximum benefits of any given species
- A smorgasbord or food for the critters
- Crop rotation on steroids!
- Can cut seeding rates due to synergistic effects
- Higher cash crop yields!
Cost Analysis of Cover Crop Use Compared to Nitrogen Input for Corn

Study 3

Our Cover Crop ‘Cocktail’ – Species Selected for Known Benefits and Synergies

- Tillage Radish®
- Sunflower
- Sweet Blue Lupin
- Austrian Winter Pea
- Phacelia
- Fava Bean
- Early Cover Hairy Vetch
- Common Vetch
- Sunn Hemp
- Fenugreek
- Calendula
- Oats
All Plots Harvested October 18, 2011

190 bu/ac corn grown with no synthetic N!
All Plots Harvested October 18, 2011

<table>
<thead>
<tr>
<th></th>
<th>N Cost</th>
<th>N Cost</th>
<th>N Cost</th>
<th>N Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cover Crop</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(No fertilizer; Seed +$17.60 drill cost)</td>
<td>$46.80</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>Urea</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Cost +$12.00 application cost)</td>
<td>–</td>
<td>$59.70</td>
<td>$83.55</td>
<td>$107.40</td>
</tr>
<tr>
<td><strong>Gross Profit / Acre</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>@ $7.00 / bu Corn</td>
<td>$1,288.80</td>
<td>$1,379.50</td>
<td>$1,303.15</td>
<td>$1,270.90</td>
</tr>
</tbody>
</table>
Tillage Radish®/Tillage RootMax® annual ryegrass
Tillage Radish®/Crimson Clover
Tillage Radish®/RootMax® Annual Ryegrass/Crimson Clover
Annual Ryegrass and Crimson Clover
Deeper roots
Certified seed
Later maturity in spring
More tillers-easier to kill
High grazing/forage potential

New Annual Ryegrass

Tillage RootMax®
But what about planting into green covers?
Patience and Wisdom!
Planting into cereal rye

Add N at planting!
Cover Crops that Pay

- **Precision Planted** cover crops
  - Can cut seeding rates in half!
  - Save Cover Crop $$$
  - Larger equipment=faster planting
  - Better seed placement
  - Custom cover crop planting service?
Profiles of Success

David Brandt, Ohio
Precision Planting

- 2lbs/A in 15” rows
- 15lbs/A
- With Peas

Less than $20/A!
Charlie Hammer- Wisconsin
Controlled spillage...
...in slow motion!
Enhanced Residue decomposition
Over 200 bu bt corn the past 2 seasons
Nice decomposition!
My Vertical tillage tool
• Plant shorter season hybrids/varieties on a portion of your acres
  – Modern short season varieties have improved yield potential
  – Possibly can plant covers 2 weeks earlier
  – Spreads out harvest
Shorter Season Corn -103 day-harvested Sept 20th
Planted Tillage Radish®, Crimson Clover, Tillage RootMax® Annual Ryegrass

September 20th
Harvesting long Season-111 day- Oct 18th
Using Shorter Season Varieties

103-day hybrid
194 bu/ac (dry)

111-day hybrid
163 bu/ac (dry)

31 bu difference this year!

Results based on 2011 weather conditions
• Aerial/broadcast seeding
  – Earlier planting window
  – Plant in standing crop
  – Faster/less cost?
  – With proper management has been effective on many acres
High Clearance Seeders

Matt Van Tillburg, Ohio
High Clearance Seeders
High Clearance Seeders
Aerial Seeding
Penn State University’s

Cover Crop Interseeder
Cover Crop Herbicide Research

Penn State University - 2nd year
Early “in crop” establishment
Sunn Hemp and Tillage Radish
Sunn Hemp and Tillage Radish
Sweet Blue Lupin
Sweet Blue Lupin=N production
Phacelia
Phacelia=soil conditioning
Look at them roots!
University of Maryland:
12 bushel corn yield increase and
8 bushel soybean yield increase
after planting Tillage Radish®
the previous fall. Never had a
yield decrease. 5 years- over 70
comparisons
• Break up compaction
• Control winter annuals
• Capture N in the Fall- release in the spring
• Increase yields!
Rye cover crop in December 2011 responds (strips of darker, taller plants) to June 2011 UAN-N side-dressing in 60 cm wide rows where Tillage Radish was grown in fall 2010 but *not* in the strips where no cover crop was grown in fall 2010.
Silage Yields

2 ton Increase
8 days after planting
8 days after planting

Look at that root already!
Steve Carruthere's farm in Ontario, Canada
Soil compaction decreased by >40%
Nitrogen Storage Tanks
Bulk storage units!
Is bigger always better?
Don’t forget about the little things-

The fine roots
Soil Quality Enhancement Activity – SQL05 – Use of Deep Rooted Crops to Break up Soil Compaction

Enhancement Description
This enhancement is for the use of deep rooted crops to break up compacted soils and improve soil quality. Deep rooted crops can be perennial plants like alfalfa or annual plants like forage radish.

Land Use Applicability
Cropland

Benefits
Soils can have naturally occurring compacted layers (hard pans) or those that have been created through tillage or other farming activities. Deep rooted crops with large taproots can alleviate the effects of soil compaction by penetrating the compacted layer, creating pore space that allows air, water and crop roots to penetrate deeper in the soil profile. Eliminating soil compaction through the use of deep rooted crops increases infiltration, reduces surface runoff, improves soil tilth and overall soil quality. It also eliminates the need for sub-soiling with a plow, thus saving fuel, reducing erosion and enhancing water quality.

Criteria for Use of Deep Rooted Crops to Break up Soil Compaction
• The selected crop must be one that has been identified as having the capability of alleviating soil compaction (state specific lists are available in NRCS Field Office Technical Guide).
• If perennial plants are used, once established, they must be maintained annually by proper fertilization and mowing/harvesting.
• Annual crops should be seeded early enough in the fall to allow for adequate growth to occur prior to winter (Follow NRCS 340 standard).
• No deep tillage is allowed to remove compacted layer.

Documentation Requirements for Use of Deep Rooted Crops to Break up Soil Compaction
1. Written documentation for each year of this enhancement describing the following items:
   • Deep rooted crops used and dated planted.
   • Cash crop planted and method used.
2. A map showing fields where the enhancement is applied.
3. Photographs of a representative number of fields showing deep rooted crops.
Tillage Radish® With Wheat

+18 bu
+12 bu
+11 bu
+11 bu
+5 bu
+2.5 bu
+1 bu
0 bu
Tillage Radish® With Wheat 2011

- OK - 9 and 11 bu + (very dry)
- OH - 7 bu +
- PA - 6.3 bu +
- PA - 3 bu +
- IL - 2.5 bu +
Pushing the envelope...
Other species with wheat
Yep, they can be grazed
What’s the ppm of nitrates...

...coming out of your tile lines or running off your fields??
N is free to leave...
N goes nowhere!
Jan 10th, 2012!

Forerunner Triticale
Tillage RootMax
annual ryegrass
Tillage Radish
Fava Bean
Frostmaster Peas
TREAT COVER CROPS LIKE YOUR CASH CROPS!
There’s still a lot to learn!