Cover Crops with Direct Seed Rotation in North Central Idaho

UNIVERSITY OF IDAHO EXTENSION

RESEARCH AND DEMONSTRATION PROJECT

FUNDED THROUGH AWARD #2011-68002-30191 FROM USDA NATIONAL INSTITUTE OF FOOD AND AGRICULTURE
Personnel

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- Doug Finkelnburg, University of Idaho Extension Educator, Nez Perce County
- Kevin Seitz, NRCS Soil Conservationist, Lewis County
- Drew Leitch, Cooperator
- Mart Thompson, Cooperator
- Vern McMaster, Lewis Soil Conservation District
Soil Health What is It?

The continued capacity of the soil to function as a vital living ecosystem that sustains plants, animals, and humans.
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- Nutrient cycling
- Water (infiltration & availability)
- Filtering and Buffering
- Physical Stability and Support
- Habitat for Biodiversity
Soil Health Planning Principles

Manage more by Disturbing Soil Less
Use Diversity of Plants to add diversity to Soil Micro-organisms
Grow Living Roots Throughout the year
Keep the Soil Covered as Much as Possible

Goal: To create the most favorable habitat possible for the soil food web
Goals

Demonstrate cover crop benefits including enhanced soil biology, improved crop rotation diversity, improved soil structure, nutrient cycling, forage production, and reduced erosion.

Demonstrate cover crops seeded in the fall and sprayed out for spring seeded cereal crop production.

Demonstrate cover crops seeded in the late spring, grazed in late summer, and sprayed out in fall for fall seeded cereal crop production.

Increased knowledge by livestock producers on the potential to extend their grazing season using unconventional forages seeded as cover crops.

Study the effect of cover crops on the following cereal crop productivity.

Producers will be more willing to try cover crops due to the availability of current, local research information.
On Farm Test Design
Small Plot Demonstration Site

Cover Crop Individual Species Plots
Location: 700 block of Willow Street, West side of the street, Nezperce Idaho
Planting date: May 20 and 21, 2013

<table>
<thead>
<tr>
<th>Species</th>
<th>Drill setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundhog radish (North end)</td>
<td>10</td>
</tr>
<tr>
<td>Purple top turnip</td>
<td>12</td>
</tr>
<tr>
<td>Flax</td>
<td>13</td>
</tr>
<tr>
<td>Graza forage brassica</td>
<td>15</td>
</tr>
<tr>
<td>Coron Ethiopian cabbage</td>
<td>10</td>
</tr>
<tr>
<td>Hunter forage brassica</td>
<td>13</td>
</tr>
<tr>
<td>Winfred forage brassica</td>
<td>13</td>
</tr>
<tr>
<td>Sunflower</td>
<td>35</td>
</tr>
<tr>
<td>Buckwheat</td>
<td>20</td>
</tr>
<tr>
<td>Safflower</td>
<td>20</td>
</tr>
<tr>
<td>Sorghum Sudan grass</td>
<td>18</td>
</tr>
<tr>
<td>Pearl millet</td>
<td>10</td>
</tr>
<tr>
<td>Red clover</td>
<td>8</td>
</tr>
<tr>
<td>Crimson clover</td>
<td>13</td>
</tr>
<tr>
<td>Hairy vetch</td>
<td>18</td>
</tr>
<tr>
<td>Lentil</td>
<td>18</td>
</tr>
<tr>
<td>Soybean</td>
<td>35</td>
</tr>
<tr>
<td>Austrian winter pea</td>
<td>31</td>
</tr>
<tr>
<td>Nutragreen forage pea</td>
<td>33</td>
</tr>
<tr>
<td>Flax spring forage pea</td>
<td>31</td>
</tr>
<tr>
<td>Winter triticale (102, T1261)</td>
<td>23</td>
</tr>
<tr>
<td>Oversead oat</td>
<td>23</td>
</tr>
<tr>
<td>Spring forage barley (South end)</td>
<td>23</td>
</tr>
</tbody>
</table>

Single species plots run east and west. Plots are 10 feet wide, 200 feet long.

Seeded with University of Idaho plot drill, 5 feet wide, double disk drill 8-inch spacing.

Plots seeded by Ken Hart, Lewis County Extension, Kevin Seltz, Natural Resources Conservation Service, and Vern McMaster, Lewis Soil Conservation District
Fall Seeded Cover Crops

Cover Crop Planting – Fall Seeded

Cover crops were direct seeded on 10-12-12. Plots were planted in 45’ x 800’ strips.

Treatments included:

1) No cover crop (control)
2) Nitrogen mix (winter peas, winter oats, common vetch, red clover, and winter lentil)
3) Soil enhancement mix (Crimson clover, red clover, winter pea, hairy vetch, winter lentil, winter triticale, spring barley, winter oats, purple top turnip, nitro radish, winter canola)

Cover crops were sprayed out in March and spring canola was direct seeded. Strips were harvested in the fall of 2013. Winter wheat was seeded fall 2013. Winter wheat yields will be evaluated fall 2014.

**Canola Yields**—Treatment 1 = 1473.3 lbs. (SD = 63.5), 1782.7 lb/ac
Treatment 2 = 1483.3 lbs. (SD = 120.1), 1794.8 lb/ac
Treatment 3 = 1373.3 lbs. (SD = 100.2), 1661.7 lb/ac

(No significant difference at the 5% significance level.)
Fall Seeded Cover Crops

March 15, 2013
Spring Seeded Cover Crops

Cover crops were direct seeded in 45’ x 1200’ strips in winter wheat stubble on May 20, 2013. Crop development was monitored throughout the growing season.

Treatments included:

1) No cover crop (chemical fallow, control)

2) Nitrogen mix (Lentils, common vetch, spring forage peas, rapeseed, flax)

3) Grazing mix (Common vetch, spring forage peas, crimson clover, spring oats, spring barley, rapeseed, forage turnips, forage radish, pearl millet)

4) Soil enhancement mix (Crimson clover, soybean, winter pea, hairy vetch, spring forage peas, spring triticale, spring barley, pearl millet, oats, purple top turnip, rapeseed, nitro rapeseed, forage brassicas, sunflower, buckwheat)

Plots were grazed three times with target dates of August 1, August 15 and September 1. Each time a 200’ plot length was exposed to grazing. The final 600’ of plot length was not be grazed.
Spring Seeded Cover Crops
Spring Seeded Cover Crops

June 25, 2013

July 30, 2013
Earthfort Soil Foodweb Tests

### Biological Analysis

#### Soil

**Report prepared for:** University of Idaho  
**Sample Received:** 11/15/2013  
**Sample #:** 01-117500  
**Submission #:** 01-023544  
**Sample #:** Not Indicated  
**Plants:**  
**Plant:** Not Indicated  
**Invoice Number:** 0

<table>
<thead>
<tr>
<th>Organism Biomass Data</th>
<th>Dry Weight (mg/g)</th>
<th>Active Bacteria (g/g)</th>
<th>Total Bacteria (g/g)</th>
<th>Active Fungi (g/g)</th>
<th>Total Fungi (g/g)</th>
<th>Hyphal Diameter (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Results</strong></td>
<td>0.85</td>
<td>50.7</td>
<td>1105</td>
<td>32.9</td>
<td>322</td>
<td>2.85</td>
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<tr>
<td><strong>Comments</strong></td>
<td>In Good Range</td>
<td>In range</td>
<td>Above range</td>
<td>Below range</td>
<td>In range</td>
<td></td>
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<tr>
<td><strong>Expected Low Range</strong></td>
<td>0.45</td>
<td>45</td>
<td>300</td>
<td>45</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td><strong>Expected High Range</strong></td>
<td>0.85</td>
<td>90</td>
<td>600</td>
<td>90</td>
<td>600</td>
<td></td>
</tr>
</tbody>
</table>

**Protoplasms (Numbers/g):**

- Flagellates
- Anabaena
- Oleate

**Total Nematodes (#/g):**

- Endo
- Ecto

**Microbial Colonization (%):**

- 0%

**Fungi/Fungus Feeding:**

- Total nematode
- Parasitic
- Apothecial
- Dactylosis
- Root feeder
- Nematode

**Nitrogen Cycling Potential (Tes/wa):**

- 100-150

**For interpretation of this report please contact:**

Earthfort Labs  
info@earthfort.com  
(541) 297-2812

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**Earthfort Labs**  
635 SW Western Blvd  
Camas, OR 97013  
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www.earthfort.com
Forage Tests

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Moisture %</th>
<th>Protein %</th>
<th>Fiber %</th>
<th>aNDF %</th>
<th>Ash % (ppm)</th>
<th>NE/LACT</th>
<th>TDN Est.</th>
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</thead>
<tbody>
<tr>
<td>Average 2</td>
<td>6.6</td>
<td>13.6</td>
<td>30.5</td>
<td>35.7</td>
<td>9.5</td>
<td>550</td>
<td>0.67</td>
</tr>
<tr>
<td>Average 3</td>
<td>6.5</td>
<td>9.0</td>
<td>32.5</td>
<td>45.4</td>
<td>8.7</td>
<td>544</td>
<td>0.64</td>
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<tr>
<td>Average 4</td>
<td>5.0</td>
<td>8.2</td>
<td>30.6</td>
<td>45.3</td>
<td>8.2</td>
<td>538</td>
<td>0.67</td>
</tr>
</tbody>
</table>

Forage by Treatment (lbs/ac)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Production</th>
<th>Post Graze</th>
<th>Consumed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 - Nitrogen</td>
<td>5569.93</td>
<td>896.31</td>
<td>4673.62</td>
</tr>
<tr>
<td>3 - Grazing</td>
<td>6668.98</td>
<td>1920.67</td>
<td>4748.32</td>
</tr>
<tr>
<td>4 - Soil</td>
<td>5175.13</td>
<td>1931.34</td>
<td>3243.79</td>
</tr>
</tbody>
</table>
Grazing

24 head stocked at a rate of 1.4 AUM's per acre.

Turned the cattle in on the cover crop trial on August 13th.

They were removed the third week of September.

The cattle were moved to a new paddock every other day. They had access to the paddocks previously grazed.

The rate of gain was 1.5 pounds per day per head.
Winter Wheat (bu/acre) after Spring-Sown Cover Crops

TREATMENTS:
1. No cover crop (chemical fallow)
2. Nitrogen mix (Lentils, common vetch, spring forage peas, rapeseed, flax)
3. Grazing mix (Common vetch, spring forage peas, crimson clover, oats, spring barley, rapeseed, Appine forage turnips, GroundHog forage radish)
4. Soil enhancement mix (Crimson clover, soybean, winter pea, hairy vetch, spring forage peas, winter triticale, spring barley, pearl millet, oats, purple top turnip, rapeseed, nitro radish, Pacific Gold mustard, sunflower, buckwheat)
Herbicide Carryover

Callisto: “Inhibits plant pigment biosynthesis and photosynthesis.”

Bioassay for Herbicide Residues
http://www.ianrpubs.unl.edu/pages/publicationD.jsp?publicationId=1052
Cover Crop Seeding Date

Oats, 2- (oats, forage pea), 5- (add radish, sorghum sudan grass, soybean), 8- (add buckwheat, turnip, flax), and 12- way (add proso millet, crimson clover, sunflower, lentil)

Seeded May 15 and June 6-9

Harvested August 1 and August 26

Yield and Protein
Five Year Rotation Study

Fallow, 2- (oats, forage pea), 5- (add radish, sorghum sudan grass, soybean), 8- (add buckwheat, turnip, flax), and 12-way (add proso millet, crimson clover, sunflower, lentil)

Two management levels

Full and 50% fertility

Cover crops, winter wheat, cc, spring barley, cc, spring peas, ww
New Option: Cover Crop Grazing

Leitch Farms
Cover Crop Mix

- Ever Leaf Oats
- Turnips
- Radishes
- Forage Peas
- Triticale
- Crimson Clover
- Canola
Cover Crop Grazing

2014 Drew Leitch Field

46 acres planted early May 12th

46 cow/calf pairs turned out late June

Estimated pounds of forage needed per day = 2000 pounds. 50 pounds as fed per pair per day.
Leitch Farm Cover Crop Grazing

Estimated production per acre = 4 tons
At 50% utilization = 2 tons of forage available per acre – conservative
Recommended paddock size = 2 acres
Duration = 4 days per paddock
Leitch Farm Cover Crops

23 paddocks
Grazing time 92 days
Approx. 1/3 of field swathed and windrow grazed.
Approx. 1/3 of field swathed and bale grazed.
Paddock Fence
Fence Installation
Shade and Water
• Part of the field was swathed and baled.
  Test = 16.3% CP
  56.8% TDN
• Cattle gained over 2 pounds per day.
• Fresh Quality test = 19.2% CP
  58.5% TDN
Farm Cover Crops

Estimated net return from grazing cover crops = $300 per acre

Baled forage fed later tested high in nitrates. Not at a toxic level but high.
2 Weeks of Grazing
A great deal of potential for this management practice.

Will have to determine if advantages out weigh disadvantages – ie. Yield of next wheat crop.
Contact:

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