Economics of Cover Crops

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Cost of Tillage Operations/Acre

- Chisel Plow $14/A
- Disk Tandem $13/A
- Field Cultivate $11/A
- Plow $17/A
- Soil Finishing Tools $11/A
- Subsoil $18/A

Ohio Farm Custom Rates 2010
Barry Ward, OSU Economist
# Legume Cover Crop Seed Cost

<table>
<thead>
<tr>
<th>Cover Crop</th>
<th>Seed Price/lb</th>
<th>Pound</th>
<th>Planting</th>
<th>Kill</th>
<th>Total Cost/A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cowpeas</td>
<td>$.80</td>
<td>40-50</td>
<td>$14</td>
<td>$0</td>
<td>$46-54</td>
</tr>
<tr>
<td>Winter peas</td>
<td>$1.00</td>
<td>30-40</td>
<td>$14</td>
<td>$0-15</td>
<td>$34-$69</td>
</tr>
<tr>
<td>Red Clover</td>
<td>$2.00</td>
<td>10-12</td>
<td>$6</td>
<td>$15</td>
<td>$41-$45</td>
</tr>
<tr>
<td>Chickling vetch</td>
<td>$1.00</td>
<td>30-70</td>
<td>$14</td>
<td>$15</td>
<td>$59-$99</td>
</tr>
<tr>
<td>Sweet Clover</td>
<td>$1.50</td>
<td>10-20</td>
<td>$6</td>
<td>$10</td>
<td>$31-$46</td>
</tr>
<tr>
<td>Hairy Vetch</td>
<td>$1.25</td>
<td>15-20</td>
<td>$14</td>
<td>$15</td>
<td>$49-$54</td>
</tr>
</tbody>
</table>
## Grass Cover Crop Seed Cost

<table>
<thead>
<tr>
<th>Cover Crop</th>
<th>Seed Price/lb</th>
<th>Pound</th>
<th>Planting</th>
<th>Kill</th>
<th>Total Cost/A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereal Rye</td>
<td>$.20</td>
<td>60</td>
<td>$14</td>
<td>$15</td>
<td>$41</td>
</tr>
<tr>
<td></td>
<td>$12/bu</td>
<td>1 bu</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual rye</td>
<td>$.80</td>
<td>15-25</td>
<td>$14</td>
<td>$15</td>
<td>$41-$49</td>
</tr>
<tr>
<td>Wheat</td>
<td>$.10</td>
<td>60</td>
<td>$14</td>
<td>$15</td>
<td>$35</td>
</tr>
<tr>
<td></td>
<td>$6/bu</td>
<td>1 bu</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oats</td>
<td>$.15</td>
<td>42-63</td>
<td>$14</td>
<td>$0</td>
<td>$20-$23</td>
</tr>
<tr>
<td></td>
<td>$6/Bu</td>
<td>1-1.5 bu</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brassicas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oilseed Radish</td>
<td>$3.00</td>
<td>1-10</td>
<td>$14</td>
<td>$0</td>
<td>$17-$44</td>
</tr>
</tbody>
</table>

*Note: Prices and amounts assume 1 acre.*
Value of Soil Organic Matter

Assumptions: 2,000,000 pounds soil in top 6 inches
    1% organic matter = 20,000#

Nutrients:
Nitrogen: 1000# * $0.50/#N = $500
Phosphorous: 100# * $0.70/#P = $70
Potassium: 100# * $0.50/#K = $50
Sulfur: 100# * $0.50/#S = $50
Carbon: 10,000# or 5 ton * $?/Ton = $0

Value of 1% SOM Nutrients/Acre = $670
Soil Organic Matter Accumulation

• Takes 10 tons of Decomposed Organic Matter to equal 1% SOM
• If start with 40 tons Organic Matter and lose 75% to get 10 tons decomposed SOM
• Accumulate 4-6 tons and lose 75% equals 1-1.5 tons Decomposed SOM or .1-.15% SOM * $670/Acre or $67 to $100/Acre

You are Building Your Soil Fertility with SOM!
Crop Residue along Ditch from Bare Cropland, Chiseled Wheat Stubble
Value of Ton of Topsoil

- Most Biological activity occurs in top 3 inches.
- One million pounds or 500 ton of topsoil in top 3 inches.
- Average Value of Cropland = $10,000/Acre
- Soil Lost at T value = 4-5 ton/acre
- Soil Productivity Value: $5,000/500 = $10/Ton
- Lost value per acre = $10/ton soil loss * 4-5 tons
  Losing $40 to $50 per acre.
Productivity of SOM

- Michigan study: Every 1% SOM = 12% increase in crop yields.
- Baseline Yields: 170 bu corn, 50 bu soybeans
Starting SOM = 2.5% and add 1% SOM

Soybeans 50 bu * 12% = 6 bu * $10 = $60/A
.1 to .15% SOM increase/year = $6-$9/yr.

Corn 170 bu * 12% = 20.4 bu * $4 = $81/A
.1 to .15% SOM increase/year = $8.10-$12.30/yr.
Lime Costs/acre

- 1 to 2 tons of lime per acre * $15/Ton
- Plus spreading cost $6/Acre
- Total lime cost: $36/Acre over 3-5 years
- Cost /Acre/Year: $7-$12
- No-till and Cover Crops need less lime because they keep Ca\(^{2+}\) circulating
## Legume Cover Crop N Economics

<table>
<thead>
<tr>
<th>Cover Crop</th>
<th>Total Cost/A.</th>
<th>Pound Of N</th>
<th>Value of N</th>
<th>Total N $</th>
<th>Net Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cowpeas</td>
<td>$46-54</td>
<td>120-150</td>
<td>$.50</td>
<td>$60-75</td>
<td>$6-$29</td>
</tr>
<tr>
<td>Winter peas</td>
<td>$34-$69</td>
<td>120-150</td>
<td>$.50</td>
<td>$60-75</td>
<td>($9) - $41</td>
</tr>
<tr>
<td>Red Clover</td>
<td>$41-$45</td>
<td>100-120</td>
<td>$.50</td>
<td>$50-60</td>
<td>$5-$19</td>
</tr>
<tr>
<td>Chickling Vetch</td>
<td>$59-$99</td>
<td>50-120</td>
<td>$.50</td>
<td>$25-$60</td>
<td>($74)-$1</td>
</tr>
<tr>
<td>Crimson Clover</td>
<td>$18-25</td>
<td>100-150</td>
<td>$.50</td>
<td>$50-$75</td>
<td>$25-$50</td>
</tr>
<tr>
<td>Hairy Vetch</td>
<td>$49-$54</td>
<td>100-200</td>
<td>$.50</td>
<td>$50-$100</td>
<td>($4)-$51</td>
</tr>
</tbody>
</table>
Drainage

- $800 to $1000/acre for subsurface drainage.
- Farmers say you pay for drainage every 20 years whether you pay for it or not. Poor drainage costs you in reduced yields.

Keep $1000 in Bank, Collect 2-3% interest
Spend Interest on Cover Crops: $20-30/A.
Still have principal at end of 20 years.
Annual Ryegrass Cover Crop
No-till Cropland No cover
Annual Ryegrass Cover Crop
Soil Temperature Differences

Conventional / No-till??

No-till + Cover Crops & Live Plants
## SOM and Available Water Capacity

Inches of Water/Per one foot of Soil

Berman Hudson  Journal of Soil & Water Conservation 49(2) 189-194 March-April 1994

<table>
<thead>
<tr>
<th>Percent SOM</th>
<th>Sand</th>
<th>Silt Loam</th>
<th>Silt Clay Loam</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.0</td>
<td>1.9</td>
<td>1.4</td>
</tr>
<tr>
<td>2</td>
<td>1.4</td>
<td>2.4</td>
<td>1.8</td>
</tr>
<tr>
<td>3</td>
<td>1.7</td>
<td>2.9</td>
<td>2.2</td>
</tr>
<tr>
<td>4</td>
<td>2.1</td>
<td>3.5</td>
<td>2.6</td>
</tr>
<tr>
<td>5</td>
<td>2.5</td>
<td>4.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>
For Hot Dry Summers

For Corn Production:
75 degrees Fahrenheit – 1 Inch water/week
85 degrees Fahrenheit – 2 inch water/week
95 degrees Fahrenheit – 4 inch water/week

2X Water requirements for every 10F increase
1” Rain = 8 bu. corn, 22” needed for 200 bu. Corn Rain = 19-23 inch/year in growing season
1” Rain fully used = 8 bu/A * $4 = $32/A

Heat and drought quickly increase yield losses!

By Elwynn Taylor, Iowa Ag. Climatologist
SOM Buffers Soil Temperatures

- Early frost 1/20 years
- Value to replant soybeans $120/acre
- Value of frost protection over 20 years = $6/acre/year
Soil Compaction costs

Conventional tillage vs No-till and Cover Crops
Corn 3% yield gain
170 bushel corn * 3% = 5.1 bu * $4 = $20.40/A

Soybeans 10% yield gain
50 bushels soybeans * 10% = 5 bu * $10 = $50/A

Cover crops improve soil structure, water infiltration, and decrease runoff.
Cover Crop Effects

6 years CC (annual ryegrass)
160+/- bu/ac

No Cover Crop
80+/- bu/ac

Mike Plumer’s long-term no till with ryegrass cover crops on heavy clay soil.
2005 Illinois Demonstration Results

<table>
<thead>
<tr>
<th>Tillage/cover crop</th>
<th>Yield (bu./A.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional tillage</td>
<td>82</td>
</tr>
<tr>
<td>No cover crop no-till</td>
<td>124</td>
</tr>
<tr>
<td>Ryegrass 1 year no-till</td>
<td>137</td>
</tr>
<tr>
<td>Ryegrass 6 years –claypan</td>
<td>165</td>
</tr>
<tr>
<td>Ryegrass 6 years no claypan</td>
<td>215</td>
</tr>
</tbody>
</table>

Rain fall …. May- Sept. 2.3”
Cover Crop Benefits in Drought

2005 Illinois Corn Data (2.3 inches rain)
Conventional tillage 82bu.
No-till 124-82=42 bushels * $4.00/Bu = $168
No-till + Annual Rye 137-82=55*$4.00 = $220
$220/20 years = $11/Acre/Year

Negative Effects:
Cover crops may excessively dry the soil through respiration in a dry spring. Solution is to kill the cover crop early if the soil is getting too dry.
In 2012 (Drought)
Corn plus cover crops yielded 11 bushels more than conventional @ $7/bu. Or $77/Acre.
Soybean plus cover crops yielded 5 bushels more than conventional @ 15/bu. Or $75/Acre.

In 2013 (Good Moisture)
Corn plus cover crops yielded 5 bushels more than conventional @ $4/bu. Or $20/Acre.
Soybean plus cover crops yielded 2 bushels more than conventional @ 10/bu. Or $20/Acre.
<table>
<thead>
<tr>
<th>Plot</th>
<th>Corn Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>check (no cover crop on No-till, replicated 3 times)</td>
<td>105.24</td>
</tr>
<tr>
<td>Annual Ryegrass + Crimson Clover + Radish</td>
<td>120.31</td>
</tr>
<tr>
<td>Winter Cereal Rye</td>
<td>126.86</td>
</tr>
<tr>
<td>Oats + Radish</td>
<td>138.79</td>
</tr>
<tr>
<td>Annual Ryegrass Blend</td>
<td>134.27</td>
</tr>
<tr>
<td>Annual Ryegrass + Crimson Clover</td>
<td>136.41</td>
</tr>
<tr>
<td>Crimson Clover + Radish</td>
<td>153.99</td>
</tr>
<tr>
<td>Oats + Rye + Appin Turnips</td>
<td>164.37</td>
</tr>
<tr>
<td>Austrian Winter Peas + Radish</td>
<td>164.82</td>
</tr>
</tbody>
</table>
## The NET PROFIT from Cover Crops 2012

<table>
<thead>
<tr>
<th>Robison Farms Cover Crop Research Plot</th>
<th>Revenue</th>
<th>(Revenue less Seed and application cost)</th>
<th>Net Advantage (extra profit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>check (no cover crop)</td>
<td>$ 605.13</td>
<td>$605.13</td>
<td>$0.00</td>
</tr>
<tr>
<td>Annual Ryegrass + Crimson Clover + Radish</td>
<td>$ 691.78</td>
<td>$646.91</td>
<td>$41.78</td>
</tr>
<tr>
<td>Winter Cereal Rye</td>
<td>$ 729.45</td>
<td>$696.97</td>
<td>$91.84</td>
</tr>
<tr>
<td>Oats + Radish</td>
<td>$ 798.04</td>
<td>$733.29</td>
<td>$128.16</td>
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<tr>
<td>Annual Ryegrass Blend</td>
<td>$ 772.05</td>
<td>$743.05</td>
<td>$137.92</td>
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<tr>
<td>Annual Ryegrass + Crimson Clover</td>
<td>$ 784.36</td>
<td>$750.76</td>
<td>$145.63</td>
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<tr>
<td>Crimson Clover + Radish</td>
<td>$ 885.44</td>
<td>$829.44</td>
<td>$224.31</td>
</tr>
<tr>
<td>Oats + Rye + Appin Turnips</td>
<td>$ 945.13</td>
<td>$870.23</td>
<td>$265.10</td>
</tr>
<tr>
<td>Austrian Winter Peas + Radish</td>
<td>$ 947.72</td>
<td>$892.07</td>
<td>$286.94</td>
</tr>
</tbody>
</table>
Dave Brandt Farm 2012

30 Years No-Till and 15 years Cover Crops
Corn: 149.9 Bu/A  Soybeans: 49.5 Bu/A

Neighbors: Conventional Tillage
Corn: 80-95 Bu/A Soybeans: 32-35 Bu/A

Corn = $7.50/Bu.  Soybeans = $15/Bu.
$7.50 * 55-70 = $412-$525/A  $15 * 15-18 = $225-$270/A.

Rain makes Grain! Increased moisture equals higher yields.
2012 Putnam County Soybeans Replicated 4 times

Conventional Soybeans: 55 Bu/A ---
Cereal Rye/Soybeans: 60 Bu/A $75
Daikon Radish/Soybeans: 68 Bu/A $195
Soybeans = $15/Bu

Weeds
Conventional: Highest Level = Moderate
Cereal Rye: Medium Level = Few
Oilseed Radish: Lowest Level = Scattered
Ecological Concepts

• Weeds, Insects and Diseases Cost Farmers 30% of their Crop every year since 1940’s.
• Native undisturbed soils have diverse species (predators, prey, parasites). Keep pests in check.
• 100% Pest Control not Achievable!
• New ECO Goal: Keep pests at acceptable levels using all Ecological strategies: Safe, durable, $$$
• Keep Insecticides, Fungicides, Herbicides around for major outbreaks.
Natural Succession of Plants & Soil

Weeds
High Disturbance
Low Diversity

Bacterial
Natural Flow of Energy

Balanced

Low Disturbance
High Diversity
Fungal
Human Inputs

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES
What does your plant need?

Bare Parent Material
100% bacterial

Cyanobacteria
True Bacteria
Protozoa
Fungi
Nematodes
Microarthurs
F:B = 0.01

“Weeds”
- high NO3
- lack of oxygen
F:B = 0.1

Early Grasses
Bromus, Bermuda
F:B = 0.3

Mid-grasses, vegetables
F:B = 0.75

Late successional grasses, row crops
F:B = 1:1

Conifer, old-growth forests
F:B = 100:1 to 1000:1

Deciduous Trees
F:B = 5:1 to 100:1

Shrubs, vines, bushes
F:B = 2:1 to 5:1

Soil Foodweb Structure Through Succession, Increasing Productivity
Weeds

• Farmers promote weed seed by tilling the soil.
• Ways to fight weeds
  1) Hoe or pull them out
  2) Kill with herbicides
  3) Compete for sunlight and nutrients by growing cover crops and reduce weed seed production.
• Farmers with No-till and Cover Crops reduce herbicide cost by 1/3 = $7-$12/A.
• Early weeds reduce crop yields 10% * 50 bu soybeans * $10/Acre = $50
• Reduced weeds: cereal rye, oilseed radish, etc.
Insects

Positive: Soybean Cysts Nematodes (SCN)
1) 80-90% Reduction using cereal rye/annual rye
   50 bu * 30% =15 bu * $10 =$150/A

Natural Pollinators:$5 Billion/350 million =$14/A

Negative: Slugs, Cutworm, Armyworm

1) *Carabidae* beetles/ground beetles and lightning bugs are natural predators of soft body insects.
2) Cover crops may be an alternative food source for slugs and may protect corn from damage.
Five Steps to Fighting Insect Pests

- Small Fields surrounded by natural vegetation. These areas offer refuge and extra food.
- Diverse crops with diverse flowers. Small flowers with open flowers promote predators.
- Minimize use of insecticides and fungicides.
- Keep soils high in SOM (mulch) and biological activity. Winter refuge and food for predators.
- Use multiple natural tactics. Plant cover crops and mow every other row or raise mowing height.
Promote Predator Friendly Plants

• Promote nectar early spring, mid-summer, and late fall.
• Early spring: Dandelions, Henbit
• Mid summer: Buckwheat, Sunflower, Flowering Legumes: crimson clover, sweet clover, hairy vetch, red clover
• Late Fall: Wild carrot (Queen Ann’s Lace), Goldenrod
• Ecosystems with more diversity are more stable and Resistant to change and are more Resilient!
Diseases that thrive under excess water

- Phytophthora: 20% loss * 50 bu = 10 bu * $10 = $100/A
- Phythium: 5-10% * 50 bu = 2.5-5 bu * $10 = $25-$50/A
- Fusarium: 10% * 50 bu = 5 bu * $10 = $50
- Rhizoctonia: 2-5% * 50 bu = 1-2.5 bu * $10 = $10-$25/A

Thrive with less biological activity (tillage)

- Sclerotina/White Mold (Bury seed with tillage)
  2 to 4 bushel per acre * $10 = $20-40/A
The Soil Food Web

Plants
- Shoots and roots
- Mycorrhizal fungi
- Saprophytic fungi
Organic Matter
- Waste, residue and metabolites from plants, animals and microbes

Fungi
- Fungal- and bacterial-feeders

Nematodes
- Root-feeders

Arthropods
- Shredders
- Predators

Protozoa
- Amoebae, flagellates, and ciliates

Bacteria

First trophic level:
- Photosynthesizers

Second trophic level:
- Decomposers
- Mutualists
- Pathogens, parasites
- Root-feeders

Third trophic level:
- Shredders
- Predators
- Grazers

Fourth trophic level:
- Higher level predators

Fifth and higher trophic levels:
- Higher level predators

Birds

Animals
Seed Production

Cereal rye:
30-60 bushels * $12 = $360-$720/A minus $49 seed, plant, kill it plus $30 for harvesting = $280 - $640

Cowpeas: 30-35 bushels per acre or 1500 to 1750 pounds times $.80/lb = $1200 -$1400/A minus seed, planting, harvesting costs
Forage Value of Cover Crops

- Oats, cereal rye, annual ryegrass
- 4 tons cereal rye at $100/ton = $400 Income
- Costs $60 (2 bu/Acre for seed) per acre for seed, plant, kill it.
- Harvest Costs: $40
- Net Income: $300
Mimic Mother Nature

60 Million Bison in USA in early 1800’s

Did they stop eating or pooping in winter?

Water Quality?
Holding Nitrogen from Manure...

Effects from Annual Ryegrass

Manure w/o cover crop

Manure w/ cover crop
Holding Nutrients from Manure

3 kernels = 1 bushel corn on 30,000 corn pop.
18 rows * 4-5 kernels = 75-90 kernels more per ear
25-30 bushel yield difference * $7 = $175-$210/A.

Manure w/o cover crop
Ave. 5 ½ -6”

Manure w/ cover crop
Ave. 7 ½”
Manure Value of Cover Crops

Swine Manure: 95% Water 5% solids
Manure Nutrient Analysis: 18-16-14/1000 gallons
Uptake: At 5,000 gallons/A = 90-80-70 $80
At 10,000 gallons/A = 180-160-140 $147

Dairy Manure: 98% water 2% solids
Manure Nutrient Analysis: 20-15-15
Uptake: At 5,000 gallons/A = 100-75-75 $87
At 10,000 gallons/A = 200-150-150 $122

*Absorb 70% N, maximum 20# P
Crops absorb about 0.5% N Maximum and 0.2% P
## Cost Effectiveness of BMP’S

*JEQ 2002 Forster & Rausch*

<table>
<thead>
<tr>
<th>BMP</th>
<th>$/Ton of Sediment</th>
<th>BMP</th>
<th>$/Ton of Sediment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover Crops</td>
<td>$1.99</td>
<td>Diversions</td>
<td>$18.10</td>
</tr>
<tr>
<td>No-till</td>
<td>$2.99</td>
<td>Sediment Retention</td>
<td>$50.21</td>
</tr>
<tr>
<td>Permanent Cover</td>
<td>$6.95</td>
<td>Average Cost</td>
<td>$8.71</td>
</tr>
<tr>
<td>Wind break</td>
<td>$12.10</td>
<td>CRP Program</td>
<td>$22.95</td>
</tr>
<tr>
<td>Sod water way</td>
<td>$13.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Water Quality Benefits from Winter Cover Crops

• Reduces nutrient and pesticide runoff by 50% or more.
• Decreases Soil Erosion by 90%
• Reduces Sediment Loading by 75%
• Reduces Pathogen Loading by 60%
• May decrease flooding potential by increasing water infiltration
GLCCI Cover Crop Resources – MCCC Decision Tool

The MCCC Decision Tool is available on the MCCC website

www.mccc.msu.edu
Cover Crop Resources - Websites

MCCC Website is a source for cover crop information. The Cover Crops Program at Michigan State University focuses on integrating new and expanded research on cover crops on their farms. Important contacts include Sieg Snapp of the Michigan State University website at http://www.covercrops.msu.edu.

Activities and research

The Cover Crops Program at Michigan State University focuses on integrating new and expanded research on cover crops on their farms. Important contacts include Sieg Snapp of the Michigan State University website at http://www.covercrops.msu.edu.

Other important contacts include:

Sieg Snapp
Associate Professor, Soils and Crop Sciences
Michigan State University
P.O. Box 3184
East Lansing, MI 48824
Phone: 517-353-5644
E-mail: snapp@msu.edu

Since Dr. Snapp joined MSU, he has been using the biological principles to improve their cover crops and personal gardens. He best for different soil types and rainfall patterns that promote phosphorus and nitrogen. He also coordinates a website at MSU http://www.caf.msu.edu/covercrops

MCCC Report

- 2008 Michigan Report
- Selection of cover crops
- Cereal Rye:
  - Cereal Rye: Management
- Clovers and Medics:
  - Red Clover Overview
  - Crimson Clover Overview
  - Annual medics Overview
  - Collection: Cover Crop Management
- Olsgeed Radish:
  - Olsgeed Radish Overview
  - Olsgeed Radish: A New Cover Crop?

Rich Leep, Dept. of Crop and Soil Sciences, MSU

Links

- Michigan State University cover crops website:
  - http://www.covercrops.msu.edu

- NRCS
  - Michigan electronic Field Office Technical Guide (eFOTG): Cover Crops

MICHIGAN STATE UNIVERSITY

Michigan State University Extension (bulletins)

- Cover Crop Choices for Michigan
- Cover Crop Choices for Michigan - Vegetables
- No-till drilling cover crops after wheat harvest and their influence on next season's corn
- Olsgeed radish: A new cover crop for Michigan
- Mustards - A Brassica cover crop for Michigan

Presentations

- From Soil Problems to Progress: Advanced Cover Crops Systems Planning presentation by Vicki Moreone and Sieglinde Snapp (MSU)
- Cover Crops - Their Challenges and Benefits presentation by Vicki Moreone (MSU)
- Mixtures of legume and grass summer cover crops for integrated weed and soil management presentation by Daniel Bronson (MSU), and Vinender Kane, Robin Bellinder, Laurie Drinkwater (Cornell University)
# Cash Crop Growing Period: Requires Aerial Seeding or Interseeding of Cover Crop

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(C) Common Use – Considerable State Knowledge about species/use
(E) Emerging Use – Limited State Knowledge about species/use
Attribute Ratings: 0 – Poor, 1 – Fair, 2 – Good, 3 – Very Good, 4 - Excellent

Cash Crop Growing Period: Requires Aerial Seeding or Interseeding of Cover Crop

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| Radish, Oilseed     |       |       |       |       |       |       |       |       |       |       |       | 4 3 1  |
| Rapeseseed/Canola   | 3     | 2     | 2     |       |       |       |       |       |       |       |       |        |
| Turnip, Forage type | 3     | 3     | 3     |       |       |       |       |       |       |       |       | 3 3 1  |

| Legumes             |       |       |       |       |       |       |       |       |       |       |       |        |
| Alfalfa - Non-dormant | 1 | 2 | 1 |       |       |       |       |       |       |       |       |        |
| Clover, Berseem     | 1     | 3     | 3     |       |       |       |       |       |       |       |       | 3 3 1  |
| Clover, Crimson     | 2     | 3     | 2     |       |       |       |       |       |       |       |       |        |
**Cover Crop Information Sheet**

**Considerations for using Rye, Winter Cereal in Indiana**

There are no special considerations.

Web links to information on using Cover Crops in Indiana can be found at [http://ncsc.msue.msu.edu/states/Indiana.html](http://ncsc.msue.msu.edu/states/Indiana.html)

### Location Information

- **Location:** Indiana - De Kalb County
- **Cash Crop:** Corn - Grain
- **Plant Date:** April 14
- **Harvest Date:** October 19
- **Soil Drainage Class:** Poorly Drained
- **Artificial Drainage:** Yes
- **Flooding:** No

### Cultural Traits

- **Scientific Name:** Secale cereale
- **Life Cycle:** Cool Season Annual
- **Growth Habit:** Upright
- **Preferred Soil pH:** 5.0-7.0
- **Min. Germination Temp.:** 34F
- **Heat Tolerance:** Fair
- **Drought Tolerance:** Very Good
- ** Shade Tolerance:** Fair
- **Flood Tolerance:** Good
- **Low Fertility Tolerance:** Excellent
- **Winter Survival:** Expected

### Cover Crop Selection Information

- **Cover Crop Selected:** Rye, Winter Cereal
- **Cover Crop Attribute #1:** Nitrogen Scavenger
- **Cover Crop Attribute #2:** Weed Fighter
- **Cover Crop Attribute #3:** Lasting Residue
- **Use within the State:** Common

### Planting Information

- **Drilled Seeding Depth:** 1%-1½ inches
- **Drilled Seeding Rate:** 50-90 lb/A PLS
- **Broadcast Seeding Rate:** 55-99 lb/A PLS
- **Aerial Seeding Rate:** 60-100 lb/A PLS
- **Seed Count:** 18,160 Seeds/lb.
- **Frost Seed:** No
- **Fly-Free Date:** No
- **Inoculation Type:** Comments:

### Potential Advantages

- **Soil Impact - Subsoiler:** Very Good
- **Soil Impact - Frees P and K:** Very Good
- **Soil Impact - Loosens Topsoil:** Excellent
- **Soil Ecology - Nematodes:** Good
- **Soil Ecology - Disease:** Good
- **Soil Ecology - Allelopathic:** Excellent
- **Soil Ecology - Choke Woods:** Excellent
- **Other - Attract Beneficials:** Fair
- **Other - Bears Traffic:** Very Good
- **Other - Short Windows:** Excellent

Comments:
Summary

• No-till is an important first step in keeping soils healthy. Cover crops or live plants is the second step.

• Farmers can reduce their input costs by planting cover crops.

• How we manage the soil impacts soil temperature, water storage, & crop yields.

• Soil health also impacts weeds, insects, diseases, weather and climate.
Economics of Cover Crops
James J. Hoorman
Ohio State University
hoorman.1@osu.edu
www.mccc.msu.edu