Cover Crops for Weed Management in Organic Production Systems

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Cover Crop Objectives

- Soil erosion
- Soil quality
- Nutrient loss
- Water quality
- Water use
- Weed suppression
- Beneficial insects
- Nitrogen from legumes
Weed Management System

• Prevention strategies
• Number of related practices:
  - cover crops,
  - living mulches,
  - intercropping,
  - relay cropping
Weed Management System

Cover cropping is part of the weed management system

System components:
- Cash crop rotation
- Cash crop health and vigor
- Timing and type of tillage
- Timing and amount of soil nutrients
- Habitat for seed predators
Cover Crops for Weed Suppression

- Importance Carbon: Nitrogen (C:N) ratio
- High C:N ratio cover crops >25:1 to 30:1
  - immobilize N and cause N deficiency in following cash crop
  - Mature cereal rye = 40:1 to 80:1
  - Crimson clover = 10:1 to 20:1
Weed Suppression by Cover Crops

- **Achieved by:**
  - **Competition** - more vigorous growth
  - **Mulch** - reducing light that triggers germination
  - **Allelopathic compounds** - chemicals that inhibit germination
Weed Suppression - Competition and Mulch

- Proper seeding rate
  - Often increase recommended rate for crop production
- Timely planting
- Proper conditions for rapid germination and canopy closure
  - May need fertilization
Planting Date

Bauer and Reeves, 1999
Weed Suppression - Allelopathic Compounds

- Cereal rye, black oats
- Brassicas such as rapeseed, oilseed or “tillage” radish
Soybeans After Black Oat

No Black Oat Cover Crop

Without herbicides  With herbicides

Black Oat Cover Crop
Weed Suppression in Winter

- Cereal rye and oats - workhorses
- Black oats
  - Useful in Coastal Plain for very late planting
  - May useful in Piedmont with winterkill
- Perennial ryegrass (*Lolium perenne*)
- Brassicas - canola and oilseed radish
  - Largely for fall weeds
- Berseem clover
  - managed as winter annual, dies below 20 °F
Weed Dry Matter - 96 days

Soybean No-tillage, no herbicide

LSD 5% = 1810 Kg/h

- Black oat: 0.093 t/ha
- Wheat: 0.498 t/ha
- White oat: 0.723 t/ha
- Rye: 0.760 t/ha
- Sunflower: 1.653 t/ha
- Triticale: 1.818 t/ha
- For. peas: 2.263 t/ha
- White lupins: 3.735 t/ha
- Oils. radish: 4.258 t/ha
- Fallow: 7.390 t/ha

(Klewer, et al, 1998)
Weed Suppression in Winter - Mixtures

• Early planted cash crops
  - Oats/ Austrian winter peas
  - Oats/ forage radish
    • drilled in 2 rows oats between each row of forage radish

• Late planted cash crops
  - Rye/ crimson clover
  - Rye/vetch
    • Caution - don’t let vetch go to seed!
Advantages of Mixtures

- Mixtures dual function
- Adds N and lower C:N ratio
  - Reduces risk of N deficiency
  - Help retain N over first month after termination
- Oats /forage radish mixture helps alleviate plow pans
Weed Suppression in Summer

- Sudan grass, Sorghum, Sudangrass/sorghum hybrids - workhorses
- Velvetbean - GA bush variety
- Sunnhemp (*Crotolaria juncea* L.)
  - seed availability and price
- Buckwheat
  - favorite for short intervals
Buckwheat to Manage Perennial Weeds

- Buckwheat quick canopy closure, out competes perennials and exhausts carbohydrate supply
  - Plant buckwheat as early as possible,
    - soil 50 °F
  - In about 6 weeks (full flower) till in
  - Replant
  - Repeat till frost
  - Turn in before seeds set!!
Weed Suppression in Summer - Mixtures

- Sudangrass sorghum hybrids/ cowpeas
- Sorghum/ velvetbean
- Millet/cowpeas - We’ll see !?
  - Hort Farm middles trial
Planting Cover Crops

Grain drills
Planting Cover Crops

Broadcast seeders

Model 1200C 3-pt. For Category 2 Tractors
1200 lbs. capacity-20 cubic ft. - 16 bushels
Planting Cover Crops

- **Seeding rate**
  - Drilling takes less seed than broadcasting.

- **Seeding depth**
  - Grasses and large seeded legumes should be planted 1 to 1.5 inches deep.
  - Plant smaller seed 0.25 to 0.5 inches deep.

<table>
<thead>
<tr>
<th>Cover</th>
<th>Drilling (7.5”)</th>
<th>Broadcasting</th>
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</thead>
<tbody>
<tr>
<td><strong>Small grains</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>15 to 18</td>
<td>40 to 45</td>
</tr>
<tr>
<td>Oats</td>
<td>12 to 15</td>
<td>25 to 30</td>
</tr>
<tr>
<td>Triticale</td>
<td>15 to 18</td>
<td>40 to 45</td>
</tr>
<tr>
<td>Rye</td>
<td>18 to 22</td>
<td>45 to 50</td>
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<tr>
<td><strong>Legumes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crimson clover</td>
<td>12 to 15</td>
<td>20 to 30</td>
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<tr>
<td>Hairy vetch</td>
<td>15 to 20</td>
<td>25 to 35</td>
</tr>
<tr>
<td><strong>Grasses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millet</td>
<td>8-10</td>
<td>20</td>
</tr>
<tr>
<td>Sorghum-Sudan</td>
<td>15-20</td>
<td>30</td>
</tr>
<tr>
<td><strong>Legumes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Velvet beans</td>
<td>60</td>
<td>120</td>
</tr>
<tr>
<td>Cowpeas</td>
<td>30 to 40</td>
<td>60 to 70</td>
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Managing Cover Crops Profitably – Great Resource
Killing Cover Crops

- When to kill?
  - At least 2 to 3 wks before planting

- How to kill?
  - Tillage
  - Mowing
  - Rolling

- Living mulch
Killing Cover Crops

Low biomass, quick decomposition
High biomass, slow decomposition
Killing Legumes

- Minimize time between cover crop termination and planting to maximize N recovery (2 weeks)
- Manage to allow reseeding
  - Strip termination
- Difficult to kill with rollers

Note reseeded crimson clover
Living Mulches

- Not recommended with high weed pressure
- Nordell example:
  - Single row of vetch between rows of onions of garlic
  - Vetch becomes living mat
  - When it starts to move into crop rows
  - Disk hiller or coulter used to cut next to row
- In southeast may be problems with seed production
Intercropping
What to avoid:

- Seed production - particularly by cover crops with hard seed.

- Avoid using the same cover crop every year, particularly a single species.
  - Risk build up of populations of competitive weeds, as well as pests and disease organisms.
Challenge!

One of the biggest challenges to using cover crops is finding the right cover crop that fits your rotation and accomplishes your specific purposes.
**Cover Crop Resources**

- *Cover crops at UGA* -  
  http://www.caes.uga.edu/commodities/sustainag/contillage/index.html

- Managing Cover Crops Profitably, 2nd ed. Sustainable Agriculture Network.  
  www.sare.org/publications/covercrops/covercrops.pdf

- Sustainable Practices for Vegetable Production in the South  
  www.cals.ncsu.edu/sustainable/peet/index.html

- National Sustainable Agriculture Information Service (ATTRA)  
  www.attra.org
Success With Cover Crops

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Information in this presentation was developed through a cooperative effort between:

- The University of Georgia College of Agricultural & Environmental Sciences
- USDA Agricultural Research Service
- Natural Resources Conservation Service
- Auburn University