Cover Cropping in Upper Midwestern Organic Farming Systems

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Unique Aspects of Cover Cropping In Organic Systems

- Required as part of organic regulation
- Essential component of fertility and weed management plans
- Management considerations differ from conventional systems
  - No efficacious and economic herbicides available – termination must be achieved through winterkill, senescence, or mechanical means
  - Without insecticide seed treatments, insect interactions may be weighed and managed differently
  - More severe consequences of intended interactions – exacerbation of disease, contamination from volunteer crops
Unique Challenges of the Upper Midwestern Organic Systems

- Short growing season – difficult to fit cover crops in after corn and soybean harvest
- Wet springs – risk of not being able to get into fields and due timely incorporation of cover crops
- Few legume species that will overwinter
Where are some successes and innovations?
Interseeding

Fitting cover crops into the rotation
Cover Crop-Based Rotational No-Till

- Using fall-planted cover crop for weed suppression
Crimping Rye
# Soybean Yields across Experiments

<table>
<thead>
<tr>
<th>Year</th>
<th>Till (bu/ac)</th>
<th>Cover Crop No-Till (bu/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>47</td>
<td>30</td>
</tr>
<tr>
<td>2008/2009 (Bernstein)</td>
<td>54</td>
<td>43</td>
</tr>
<tr>
<td>2011</td>
<td>52</td>
<td>53</td>
</tr>
<tr>
<td>2012</td>
<td></td>
<td>drought</td>
</tr>
<tr>
<td>2013</td>
<td>50</td>
<td>45</td>
</tr>
<tr>
<td>2014</td>
<td>47</td>
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</tr>
<tr>
<td>2015</td>
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<td>2016</td>
<td>57</td>
<td>61</td>
</tr>
<tr>
<td>2017</td>
<td>48</td>
<td>47</td>
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</table>
Benefits of organic cover crop-based reduced-till

- Increased soil microbial biomass
- Increased potentially mineralizable nitrogen
- Increased soil bulk density
- Increased water absorption/decreased run-off
- Increased soil moisture later in the production season
- Increased profitability due to decreased labor and fuel use (if yields are within 10-15%)
Cover Crops with Specialty Crops
Treatments

Winter Wheat

Cereal Rye
Weed Density and Time Required for Weed Management (July 1 and 2, 2013)
Letter groups represent a statistically significant difference between treatments.
Novel Intercropping Techniques

- Fitting cover crops into the rotation
- Weed management
- Reducing tillage
Where is more research needed?
Broad research needs

- Breeding
  - Overwintering
  - Optimizing services – weed suppression, N fixation
- Agronomics
  - Predicting intended and unintended consequences
  - Equipment optimization
- Quantifying ecosystem services
Legume Cover Crops

- Predicting N contribution to subsequent crops
- Breeding
Cover Crops and Mixtures

- Optimizing ecosystem services