MCCC Cover Crop Decision Tool: Guidance for Cover Crop Selection

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Background

- Cover crops provide a variety of ecosystem services, including:
  - Erosion protection
  - Soil building
  - Nitrogen sourcing and scavenging
  - Weed, disease and pest management

- Widespread cover crop adoption in the Midwest has been hampered by:
  - Lack of knowledge and understanding of:
    - Cover crop alternatives
    - Agronomic and environmental benefits
    - Economic risks
  - Accessibility to specific cover crop application information
Background

- Project is a collaborative effort of the Midwest Cover Crops Council (MCCC)
  - Formed in 2006
  - Diverse group
    - Academia
    - Production agriculture
    - NGOs
    - Commodity interests
    - Private sector
    - Federal and state agencies

- Representatives from:
  - Illinois
  - Indiana
  - Iowa
  - Michigan
  - Minnesota
  - North Dakota
  - Ohio
  - Ontario
  - Wisconsin
Problem Statement

- Considerable local cover crop information has been generated by universities, agricultural organizations and farmers, however this information:
  - Resides within multiple organizations and systems
  - Varies in form and format
  - Is often difficult to locate
  - Does not lend itself to making cover crop decisions

- A regional system is required that:
  - Consolidates local information
  - Provides a common format
  - Implements a database
  - Is web-based
  - Supports cover crop decision-making
Cover Crop Decision Tool

- Development of the MCCC Cover Crop Decision Tool
  - Funded by a NRCS Conservation Innovation Grant
  - Through Conservation Technology Information Center
  - For Indiana and Ohio

- Currently seeking funding to include other states/provinces that are part of the MCCC
Cover Crop Decision Tool

- Start with Information from the SARE/SAN book *Managing Cover Crops Profitably*
- Adapt to each state in the MCCC
Midwest Cover Crops Council - Cover Crop Decision Tool

Select Your State/Province

Location Information
State/Province
None
Indiana
Iowa
Ohio

Cash Crop Information
Crop
None or Prevented Planting

Plant Date
Month
Day

Harvest Date
Month
Day

Field Information
Soil Drainage Class
None

Floodling/Ponding
No

Cover Crop Attributes
#1
None

#2
None

#3
None

Select Cover Crop to Create Information Sheet

Go to Information Sheet Tab to View Cover Crop Information
# Ohio: All Counties Average Seeding Dates

<table>
<thead>
<tr>
<th>Crop Type</th>
<th>Reliable Establishment</th>
<th>Freeze Risk to Establishment</th>
<th>Frost Seeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millet, Pearl</td>
<td>15-Mar</td>
<td>15-Jun</td>
<td>15-Oct</td>
</tr>
</tbody>
</table>

**60% Oats/40% OSR**
# Midwest Cover Crops Council - Cover Crop Decision Tool

## Ohio: All Counties Average Seeding Dates

### Reliable Establishment
- 15-Mar
- 15-Apr
- 1-May
- 1-Jun
- 1-Jul
- 1-Aug
- 1-Sep
- 1-Oct
- 1-Nov
- 1-Dec
- 1-Jan
- 1-Feb

### Freeze Risk to Establishment
- 15-Mar
- 15-Apr
- 1-May
- 1-Jun
- 1-Jul
- 1-Aug
- 1-Sep
- 1-Oct
- 1-Nov
- 1-Dec
- 1-Jan
- 1-Feb

### Frost Seeding
- 1-Mar
- 1-Apr
- 1-May
- 1-Jun
- 1-Jul
- 1-Aug
- 1-Sep
- 1-Oct
- 1-Nov
- 1-Dec
- 1-Jan
- 1-Feb

### Plant Date
- Barley, Winter
- Buckwheat
- Millet, Japanese
- Millet, Pearl
- Oats
- Ryegrass, Annual
- Rye, Winter Cereal
- Sorghum-sudangrass

### Field Information
- Soil Drainage Class: None
- Flooding/Ponding: No

### Cover Crop Attributes
- #1: None
- #2: None
- #3: None

### Select Cover Crop to Create Information Sheet
- Geauga
- Greene
- Guernsey
- Hamilton
- Hancock
- Hardin
- Harrison
- Henry
- Pea, Field/Winter
- Pea, Cow
- Vetch, Hairy
- 60% A Ryegrass/40% OSR
- 60% Cr Cl/40% A Ryegrass
- 60% Cr Cl/40% Oats
- 50% HV/50% WC Ryegrass
- 60% Oats/40% OSR

### Go to Information Sheet Tab to View Cover Crop Information
## Ohio: All Counties Average Seeding Dates

### Reliable Establishment

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### Freeze Risk to Establishment

- Nonlegumes
  - Barley, Winter
  - Buckwheat
  - Millet, Japanese
  - Millet, Pearl
  - Oats
  - Ryegrass, Annual
  - Rye, Winter Cereal
  - Sorghum-sudangrass
  - Sudangrass
  - Triticale, Winter
  - Wheat, Winter

### Fly-Free Dates
### Ohio: Hamilton County Seeding Dates

#### Reliable Establishment

- 15 - 15 Sept
- 15 - 15 Oct

#### Freeze Risk to Establishment

- 15 - 15 Nov
- 15 - 15 Dec
- 15 - 15 Jan
- 15 - 15 Feb

#### Frost Seeding

- 1 - Mar

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**Nonlegumes**
- Barley, Winter
- Buckwheat
- Millet, Japanese
- Millet, Pearl
- Oats
- Ryegrass, Annual
- Rye, Winter Cereal
- Sorghum-sudangrass

**Legumes**
- Clover, Crimson
- Clover, Red
- Clover, Sweet
- Pea, Field/Winter
- Pea, Cow
- Vetch, Hairy
- Vetch, Hairy
- Vetch, Hairy
- 60% A Ryegr/40% OSR
- 60% Cr Cl/40% A Ryegr
- 60% Cr Cl/40% Oats
- 50% HV/50% WC Rye
- 60% Oats/40% OSR

---

Select Cover Crop to Create Information Sheet

Go to Information Sheet Tab to View Cover Crop Information
### Soil Survey Drainage Classifications:

**Excessively drained.** Water is removed very rapidly. The occurrence of internal free water commonly is very rare or very deep. The soils are commonly coarse-textured and have very high hydraulic conductivity or are very shallow.

**Somewhat excessively drained.** Water is removed from the soil rapidly. Internal free water occurrence commonly is very rare or very deep. The soils are commonly coarse-textured and have high saturated hydraulic conductivity or are very shallow.

**Well drained.** Water is removed from the soil readily but not rapidly. Internal free water occurrence commonly is deep or very deep; annual duration is not specified. Water is available to plants throughout most of the growing season in humid regions. Wetness does not inhibit growth of roots for significant periods during most growing seasons. The soils are mainly free of the deep to redoximorphic features that are related to wetness.

**Moderately well drained.** Water is removed from the soil somewhat slowly during some periods of the year. Internal free water occurrence commonly is moderately deep and transitory through permanent. The soils are wet for only a short time within the rooting depth during the growing season, but long enough that most mesophytic crops are affected. They commonly have a moderately low or lower saturated hydraulic conductivity in a layer within the upper 1 m, periodically receive high rainfall, or both.

**Somewhat poorly drained.** Water is removed slowly so that the soil is wet at a shallow depth for significant periods during the growing season. The occurrence of internal free water commonly is shallow to moderately deep and transitory to permanent. Wetness markedly restricts the growth of mesophytic crops, unless artificial drainage is provided. The soils commonly have one or more of the following characteristics: low or very low saturated hydraulic conductivity, a high water table, additional water from seepage, or nearly continuous rainfall.

**Poorly drained.** Water is removed so slowly that the soil is wet at shallow depths periodically during the growing season or remains wet for long periods. The occurrence of internal free water is shallow or very shallow and common or persistent. Free water is common at or near the surface long enough during the growing season so that most mesophytic crops cannot be grown, unless the soil is artificially drained. The soil, however, is not continuously wet directly below plow-depth. Free water at shallow depth is usually present. This water table is commonly the result of low or very low saturated hydraulic conductivity of nearly continuous rainfall, or of a combination of these.

**Very poorly drained.** Water is removed from the soil so slowly that free water remains at or very near the ground surface during much of the growing season. The occurrence of internal free water is very shallow and persistent or permanent. Unless the soil is artificially drained, most mesophytic crops cannot be grown. The soils are commonly level or depressed and frequently ponded. If rainfall is high or nearly continuous, slope gradients may be greater.
### Midwest Cover Crops Council - Cover Crop Decision Tool

#### Ohio: Hamilton County Seeding Dates

<table>
<thead>
<tr>
<th>Reliable Establishment</th>
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<th>Frost Seeding</th>
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</thead>
<tbody>
<tr>
<td>1-15 Nov</td>
<td>1-15 Nov</td>
<td>1-15 Nov</td>
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<td>15 Nov - 15 Dec</td>
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<td>15 Jan - 15 Feb</td>
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</tbody>
</table>

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

### Field Information

<table>
<thead>
<tr>
<th>Soil Drainage Class</th>
<th>Poorly Drained</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Artificial Drainage</th>
<th>Yes or No</th>
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<tr>
<th>Crop</th>
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<tbody>
<tr>
<td>Barley, Winter</td>
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<tr>
<td>Buckwheat</td>
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<td>Millet, Japanese</td>
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<tr>
<td>Oats</td>
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<tr>
<td>Ryegrass, Annual</td>
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<tr>
<td>Rye, Winter Cereal</td>
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<tr>
<td>Sorghum - sudangrass</td>
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<tr>
<td>Sudangrass</td>
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<tr>
<td>Triticale, Winter</td>
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<tr>
<td>Wheat, Winter</td>
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<tr>
<td>Kale</td>
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<tr>
<td>Radish, Olsseed</td>
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<tr>
<td>Rapeseed/Canola</td>
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<tr>
<td>Turnip, Forage type</td>
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</tbody>
</table>

### Cover Crop Attributes

| #1 | None |
|    |      |
| #2 | None |
| #3 | None |

### Select Cover Crop to Create Information Sheet

Go to Information Sheet Tab to View Cover Crop Information
### Ohio: Hamilton County Seeding Dates

#### Reliable Establishment

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

<table>
<thead>
<tr>
<th>Plant Date</th>
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#### Freeze Risk to Establishment

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

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<th>Plant Date</th>
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</table>

#### Frost Seeding

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

<table>
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<th>Plant Date</th>
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### Field Information

#### Soil Drainage Class

- Poorly Drained

#### Artificial Drainage

- Yes

#### Flooding/Ponding

- Brief (up to 7 days)
- Long (7 days+)

#### Covers/Crop Attributes

- Clover, Red
- Clover, Sweet
**Cover Crop Attribute Descriptions:**

**Nitrogen Source:** Rates legume cover crops for their relative ability to supply fixed N. *(Nonlegumes have not been rated for their biomass nitrogen content, so nonlegumes will not be displayed.)*

**Nitrogen Scavenger:** Rates a cover crop’s ability to take up and store excess nitrogen. Bear in mind that the sooner you plant a cover after main crop harvest—or overseed a cover into the standing crop—the more N it will be able to absorb.

**Soil Builder:** Rates a cover crop’s ability to produce organic matter and improve soil structure. The ratings assume that you plan to use cover crops regularly in your cropping system to provide ongoing additions to soil organic matter.

**Erosion Fighter:** Rates how extensive and how quickly a root system develops, how well it holds soil against sheet and wind erosion and the influence the growth habit may have on fighting wind erosion.

**Weed Fighter:** Rates how well the cover crop out-competes weeds by any means through its life cycle, including killed residue. Note that rates for the legumes assume they are established with a small-grain nurse crop.

**Good Grazing:** Rates relative production, nutritional quality and palatability of the cover as forage.

**Quick Growth:** Rates the speed of establishment and growth.

**Lasting Residue:** Rates the effectiveness of the cover crop in providing a long-lasting mulch.

**Duration of Vegetation:** Rates how well the stand can provide long-season growth.

**Forage Value:** Rates the cover crop’s economic value as forage, bearing in mind the relative market value and probable yields.

**Seed/Grain Value:** Rates the cover crop’s economic value as a seed or grain crop, bearing in mind the relative market value and probable yields.

**Nurse/Companion Crop:** Rates whether the cover crop would hinder or help while serving as a companion crop.
# Cover Crop Attribute Ratings

<table>
<thead>
<tr>
<th>Cover Crop</th>
<th>Lasting Residue</th>
<th>Weed Fighter</th>
<th>Nitrogen Scavenger</th>
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<tbody>
<tr>
<td>Barley, Winter</td>
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<td>Ryegrass, Annual</td>
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<tr>
<td>Sorghum-sudangrass</td>
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</tbody>
</table>

**Reliable Establishment**

Cash Crop Growing Period: Required

- 15-Mar
- 1-Apr
- 1-May
- 1-Jun
- 1-Jul

**50% HV/50% WC Rye**

<table>
<thead>
<tr>
<th>Nonlegumes</th>
<th>1-Mar</th>
<th>15-Mar</th>
<th>1-Apr</th>
<th>1-May</th>
<th>1-Jun</th>
<th>1-Jul</th>
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<tr>
<td>Barley, Winter</td>
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### Ohio: Hamilton County Seeding Dates

#### Reliable Establishment
- Barley, Winter
- Millet, Japanese
- Millet, Pearl
- Oats
- Ryegrass, Annual
- Rye, Winter Cereal
- Sorghum-sudangrass
- Sudangrass
- Triticale, Winter
- Wheat, Winter

#### Freeze Risk to Establishment
- Barley, Winter
- Millet, Japanese
- Millet, Pearl
- Oats
- Ryegrass, Annual
- Rye, Winter Cereal
- Sorghum-sudangrass
- Sudangrass
- Triticale, Winter
- Wheat, Winter

#### Frost Seeding
- Barley, Winter
- Millet, Japanese
- Millet, Pearl
- Oats
- Ryegrass, Annual
- Rye, Winter Cereal
- Sorghum-sudangrass
- Sudangrass
- Triticale, Winter
- Wheat, Winter

#### Select Cover Crop to Create Information Sheet

Select from the following:
- Millet, Pearl
- Oats
- Ryegrass, Annual
- Rye, Winter Cereal
- Sorghum-sudangrass
- Sudangrass
- Triticale, Winter
- Wheat, Winter

### Field Information
- Soil Drainage Class: Somewhat Poorly Drained
- Artificial Drainage: Yes
- Flooding/Ponding: No

### Cover Crop Attributes
- #1: Nitrogen Scavenger
- #2: Weed Fighter
- #3: Lasting Residue

### Cash Crop Information
- Crop: Corn Grain
- Plant Date: April
- Harvest Date: October

### Location Information
- State/Province: Ohio
- County: Hamilton

Note: F1 Removes/Restores Command Ribbon to Lengthen/Shorten Display.
### Planting Information

- **Planting Depth**: ¾-2 inches
- **Seeding Rate - Drilled**: 60-120 lb./A PLS
- **Seeding Rate - Broadcast**: 75-150 lb./A PLS
- **Seed Count**: 18,000 Seeds/lb.
- **Frost Seed**: No
- **Fly-Free Date**: No
- **Inoculation Type**:

#### Potential Advantages

<table>
<thead>
<tr>
<th><strong>Soil Impact</strong></th>
<th>Very Good</th>
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<tbody>
<tr>
<td><strong>Subsoiler</strong></td>
<td>Good</td>
</tr>
<tr>
<td><strong>Frees P and K</strong></td>
<td>Good</td>
</tr>
<tr>
<td><strong>Loosens Topsoil</strong></td>
<td>Very Good</td>
</tr>
</tbody>
</table>

#### Potential Disadvantages

<table>
<thead>
<tr>
<th><strong>Increase Pest Risk</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weed Potential</strong></td>
</tr>
<tr>
<td><strong>Insects/Nematodes</strong></td>
</tr>
<tr>
<td><strong>Crop Diseases</strong></td>
</tr>
</tbody>
</table>

#### Management Challenges

- **Hinders Crops**: Could be a moderate problem
- **Establishment**: Rarely a problem
- **Till Kill**: Occasionally a minor problem
- **Mow Kill**: Could be a minor problem
- **Mature Incorporation**: Could be major problem

#### Additional Information

Additional Information from Managing Cover Crops Profitably, 3rd Edition, Edited by Andy Clark, Sustainable Agriculture Network

**Rye, Winter Cereal**
RYE

Secale cereale

Also called: cereal rye, winter rye, grain rye

Type: cool season annual cereal grain

Roles: scavenge excess N, prevent erosion, add organic matter, suppress weeds

Mix with: legumes, grasses or other cereal grains

See charts, pp. 66 to 72, for ranking and management summary.

The hardiest of cereals, rye can be seeded later in fall than other cover crops and still provide considerable dry matter, an extensive soil-holding root system, significant reduction of nitrate leaching and exceptional weed suppression. Inexpensive and easy to establish, rye outperforms all other cover crops on infertile, sandy or acidic soil or on poorly prepared land. It is widely adapted, but grows best in cool, temperate zones. Taller and quicker-growing than wheat, rye can serve as a windbreak and trap snow or hold rain.

- A Maryland study credited rye with holding 60 percent of the residual N that could have leached from a silt loam soil following intentionally over-fertilized corn (372).
- A Georgia study estimated rye captured from 69 to 100 percent of the residual N after a corn crop (220).
- In an Iowa study, overseeding rye or a rye/oats mix into soybeans in August limited leaching loss from September to May to less than 5 lb. N/A (313).
**Cover Crop Information Sheet**

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

There are no special considerations.

Web links to information on using Cover Crops in Ohio can be found at: [http://mcc.cornell.edu/states/Ohio.html](http://mcc.cornell.edu/states/Ohio.html)

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<table>
<thead>
<tr>
<th>Location: Ohio - Hamilton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash Crop: Corn - Grain</td>
</tr>
<tr>
<td>Plant Date: April 27</td>
</tr>
<tr>
<td>Harvest Date: October 15</td>
</tr>
<tr>
<td>Cover Crop Selected: Rye, Winter Cereal</td>
</tr>
<tr>
<td>Cover Crop Attribute #1: Nitrogen Scavenger</td>
</tr>
<tr>
<td>Cover Crop Attribute #2: Weed Fighting</td>
</tr>
<tr>
<td>Cover Crop Attribute #3: Lasting Residue</td>
</tr>
<tr>
<td>Soil Drainage Class: Somewhat Poor</td>
</tr>
<tr>
<td>Artificial Drainage: Yes</td>
</tr>
<tr>
<td>Flooding: No</td>
</tr>
</tbody>
</table>

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**Planting Information**

- **Planting Depth**: 3-4" In
- **Seeding Rate - Drilled**: 60-120 lb
- **Seeding Rate - Broadcast**: 75-150 lb
- **Seed Count**: 16,000 /28,000
- **Frost Seed**: No
- **Fly-Free Date**: No
- **Inoculation Type**:

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**Performance and Roles**

- **Legume Nitrogen Source**: No
- **Total Nitrogen**: 0-5000 (lbs/acre)
- **Nitrogen Scavenger**: Excellent
- **Soil Builder**: Excellent
- **Erosion Fighter**: Excellent
- **Weed Fighter**: Excellent
- **Good Grazing**: Excellent
- **Quick Growth**: Excellent
- **Lasting Residue**: Very Good
- **Duration**: Very Good
- **Harvest Value - Forage**: Good
- **Harvest Value - Seed/Grain**: Very Good
- **Cash Crop Interseed**: Very Good
- **Comments**: Tolerates trials one of the last cover crops

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**Ohio State University Fact Sheets**

- **Using Cover Crops to Convert to No-till** (Hoorman, Islam, Sundermeier, and Reeder)
- **The Biology of Soil Compaction** (Hoorman, Carlos de Moraes Sá, and Reeder)
- **Sustainable Crop Rotations with Cover Crops** (Hoorman, Islam, and Sundermeier)
- **Utilizing Cover Crops in Vegetable Production Systems** by Alan Sundermeier
- **Cover Crop Fundamentals** by Alan Sundermeier
- **Oilseed Radish Cover Crop**
- **Value of Legumes for Plowdown Nitrogen**
- **Forage Legumes for Temporary Soil Cover**
- **Soil Quality Test Kit** - A simple test for active organic matter as a measure of soil quality by Rafiq Islam, Ph.D. and Alan Sundermeier
- **Value of Legumes for Plowdown Nitrogen** (Extension Fact Sheet) by W. H. Schmidt, D. K. Myers and R. W. Van Keuren

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**On-farm Research Reports**

- **Tillage System plus Soybean Cover Crop Effect on Corn Following Wheat**
- **Effects of Cover Crops and Tillage on Corn Production in Wheat Stubble**
- **Cover Crop Contribution to Ground Cover, Soil Nitrate, and Corn Production**
- **Cover Crop Comparisons**
Next Steps

- Continue development and validation with Indiana, Ohio and Iowa teams:
  - University Extension Educators
  - University Researchers
  - NRCS State Agronomist
  - Crop Advisors
  - Seed Suppliers
  - Farmers

- Identify development and validation teams for other states/provinces

- Schedule development meetings
MCCC Cover Crop Decision Tool: Guidance for Cover Crop Selection

Contact Information:
Dean Baas email: baasdean@msu.edu

Questions?