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EXPERT REVIEWED

MANAGING COVER CROPS

An Introduction to Integrating Cover Crops Into a Corn-Soybean Rotation

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Interest in cover crops has increased among farmers in the eastern Corn Belt. Cover crops have many potential benefits, but farmers need to manage them carefully to avoid or reduce the risks to crop production.

This publication outlines an introductory approach to integrating cover crops into a corn-soybean cropping system and is intended to help farmers who are new to growing cover crops. As farmers and advisers gain more experience with the management of cover crops and how they work on their particular soils, they can implement more complex systems.

General Considerations

Before you start using cover crops in your corn-soybean rotation, it's important to keep these principles in mind:

- **Take a long-term view.** The benefits of cover crops accrue over a number of years, and most soil health benefits will not be evident in the first year or two. Cover crops have their greatest potential when you consider them as a practice that will increase the resiliency and long-term sustainability of your soils resource.
- **Do your homework and start slowly.** This publication provides basic recommendations for a two-year cover crop sequence for a corn-soybean rotation. Still, there are many details to learn and consider as you integrate cover crops into your system. Attend workshops; talk with other growers who have successfully implemented cover crops; and consult resources from Purdue and other land-grant universities, state and federal conservation agencies, and the Midwest Cover Crops Council (www.mccc.msu.edu).

  Plan ahead, start with a small part of your farm, and expect to fine-tune your management over the first few years. If you use an ag retailer to apply your herbicides, have a discussion with them about your cover crops, how they will affect the timing and choice of herbicides, and then formulate a plan together.
- **Adjust your planter and practices.** Many cover crop considerations are similar to those for no-till, but cover crops result in additional surface residue cover on the soil. Be sure to adjust the planter so that it operates properly and effectively for conditions in the field. Also, be prepared for greater than expected cover crop growth in the spring.

  Consider equipping your planter/drill with coulters, row cleaners, and/or heavy-duty furrow closers. Avoid trapping or "pinning" surface residue into the seed furrow, planting seed at an uneven depth, and leaving the furrow open. Strongly consider equipping your corn planter with 2x2 starter fertilizer applicators, and aim for a starter fertilizer rate that provides no less than 30 pounds of actual N per acre and up to 50 pounds of actual N per acre.

These starter fertilizer rates will help minimize the effects of N immobilization by the decomposing cover crops during the first 30 to 45 days after planting corn. Adjust the remainder of your corn N fertilizer program to account for the N applied as starter fertilizer.

- **Scout for insects.** Living green material (cover crops, weeds) can attract both beneficial and pest insects in the spring. Successfully integrating cover crops into a cropping system *must* include a commitment to scouting for insect pests on a timely basis and treating if and when it is needed.

  The effects of many insect pests, especially those that migrate from the South (black cutworms, armyworms), can be lessened by terminating the cover crop early or at least two weeks before planting the following crop, or by using cover crops that do not overwinter.

- **Be timely.** It is important to seed cover crops, terminate them, and scout at the proper times. If you plant a cover significantly after its recommended seeding period, it is not likely to produce enough benefit to be worth the cost.

  The Midwest Cover Crops Council website (www.mccc.msu.edu) features selector tools for choosing cover crops. In these tools, the "Reliable establishment dates" are based on 30-year normal frost date values for your county. "Reliable establishment" means that there is generally enough time for the cover crop to establish and grow to provide benefits to the soil and the following cash crop. Of course, in some years winter will come earlier while in others winter weather will start later, giving either less or more time for cover crop growth than indicated by the charts.

- **Use good quality seed.** Be sure to work with reputable seed dealers who know your area and who provide strong technical support for cover crop management and not just seed sales. For cover crops other than cereal grains, be cautious of using VNS ("variety not stated").

  Avoid cheap deals from unknown sources. It is important to know where your seed comes from and to know if the dealer took any measures during the cleaning process to keep out unwanted weeds like johnsongrass, Canada thistle, waterhemp, and Palmer amaranth. These weeds are particularly difficult to control and have been known to appear in seed used in different types of conservation plantings. Planting reliable seed is good advice in general, not just for cover crops.

A Two-year Plan for Corn-Soybean Rotation

There are many different cover crop options that can be tailored to work in very specific soils, climates, or management styles. The plan described below is considered a basic, relatively low-risk option.

Step 1: Plant Cereal Rye into Corn Stalks

No-till plant winter cereal rye into corn stalks as your first cover crop. Cereal rye is a versatile cover crop, because it is winter-hardy and can still provide benefits if you plant it late in the fall. Seeding cereal rye with a no-till drill is timely and effective, but cereal rye can also be broadcast seeded and incorporated with a vertical tillage tool, or aerially seeded into the senescing corn crop.

For suggested seeding rates, and dates for your county, see Resources, page 5.

Figure 1. Cereal rye planted into corn stalks.

Step 2: Terminate in Spring

Terminate the cereal rye in spring when the plants are 6 to 12 inches tall and actively growing or about two weeks before planting soybean, whichever comes first.

Note that in some years or locations, the cereal rye will grow this tall long before planting. Even when that's the case, we still recommend that you terminate the cover at this small stage for easier management.

You may have heard of some growers who are successfully terminating the cereal rye later, but this is not recommended for those just starting with cover crops, due to increased management risk and crop establishment challenges.

For a suggested herbicide program, see Resources, page 5.

You need to watch the weather and be ready to modify your termination plans. In a dry spring, the cereal rye has the potential to use moisture that the cash crop will need, so terminate covers as early as possible.

In a very wet spring, when it has been very difficult to get into the fields to spray and the cereal rye has gotten very tall, then it often works better to spray within a day or two of planting. The key to success is to not plant into large cereal rye plants that have fallen on the soil surface and formed a wet mat. This matted material can attract pest insects, such as seedcorn maggot, which will feed on any rotting organic material and readily move to corn and soybean seeds and young plants.

There is debate about whether it is better to terminate a cover crop with herbicides before or after planting at this late stage. Table 1 summarizes the risks and advantages to both approaches. For Indiana and the eastern Corn Belt, crop insurance now allows growers to plant into the green cover crop and terminate the cover crop within five days and before the cash crop emerges.

Table 1. A comparison of the advantages and risks of three methods of terminating a cereal rye cover crop.

Preferred Option Spray 2 weeks before planting or when cereal rye is 6-12 inches tall	Alternative Termination Options Under Very Wet Conditions Only	
	Option 1 Spray 1-2 days BEFORE planting	Option 2 Spray AFTER planting (same day or within 1-2 days)
Advantages		
Herbicide works effectively on undamaged cereal rye plants. Cereal rye is dead before cash crop is planted. Relatively small amount of residue to plant through.	Herbicide works effectively on undamaged cereal rye plants. Cereal rye plants start dying before cash crop is planted.	Planter/drill performance is better in the standing cereal rye.
Risks		
	If it rains after spraying but before planting, planting may be further delayed and the cereal rye may form a wet mat that interferes with planter/drill performance.	Herbicide may not work as well on plants damaged by planter/drill operation. If it rains after planting but before herbicide application, there is a risk the cash crop will emerge before the application. If that happens, there are fewer options for killing the cover crop and there is a potential for yield loss due to early-season competition.

Step 3: No-till Plant Soybean into Cereal Rye

No-till plant soybean into the dying or dead cereal rye cover crop. Consider using an early maturity group soybean and try to plant those soybeans early in the planting season. These soybeans could then accumulate more heat units to grow vegetatively (that is, undergo additional leaf node development and branching) before reaching the critical photoperiods or reproductive triggers for the soybean varieties.

Potential benefits include more pod/seed production via nodal positions, branches, and reproduction duration for the early maturity soybean. The combination of planting an early maturity group soybean early will provide earlier maturity in the season, which would give you more calendar days to seed your cover crop next fall.

There may be a tradeoff between soybean yield and cover crop benefits if you choose a maturity group that is too early for your area. However, most growers already purchase several different maturity groups for their farms. Take the earliest maturity soybean group for your farm, and plant it first on the fields that will go to cover crops in the fall. Also, remember that planting soybeans early comes with a higher risk for soilborne diseases, so careful variety selection is essential and seed treatment may be warranted.

Figure 2. Soybeans planted into dead cereal rye.

Step 4: Plant Cover Crops that Winter-kill

Plant a low carbon:nitrogen (C:N) cover crop mix after soybean and before corn. The cover crops you plant before corn should scavenge N in the fall but not tie up N the following season when the corn needs it.

One viable choice is to use a mixture of oats and daikon radish. Both are excellent N scavengers, and both die over the winter (winter-kill). Thus, you do not need to terminate the cover crop in the spring. The radish scavenges soil N and leaves the soil surface friable in spring, but do not plant radish alone because it has very little residue in spring and leaves the soil susceptible to erosion.

Figure 3. A cover crop mix of oats and daikon radish.

The disadvantage of the oats/radish mixture is that you need to plant it by mid-September in much of Indiana in order to have enough fall growth to be of benefit. Oats or another spring cereal, like spring wheat or spring barley may be planted a bit later, but the earlier the better.

Aerial seeding has been effective as an alternative to seeding after soybean harvest, but aerial seeding is more risky because of the uncertainty of rainfall timing in the fall. You may hear of growers who seed more elaborate species mixtures in their fields; however, we do not recommend these mixes when you are first learning how to grow cover crops because they are more challenging to manage — particularly terminating plants with different growth characteristics.

For more information, see seeding dates and rates in Resources, page 5.

Step 5: No-till Plant Corn into Dead Cover

No-till plant corn into the dead oats/radish mix in the spring. If a few cover crop plants are present in spring, a normal burndown herbicide program will easily kill them. If you do not want to no-till plant the corn, then a fall strip-till or a shallow tillage pass with a vertical tillage tool in the spring, is possible.

Resources

Before integrating cover crops into your cropping system, it pays to do your homework. These resources provide tools and advice for those interested in using covers.

Midwest Cover Crops Council

www.mccc.msu.edu

The Midwest Cover Crops Council (MCCC) is a consortium of land-grant universities, conservation agencies, USDA researchers, extension staff, crop advisers, seed companies, farmers, and NGOs. Their goal is to facilitate the widespread adoption of cover crops across the Midwest for their benefits to water quality and agricultural sustainability.

The MCCC website includes cover crops selector tools that allow you to choose your county and get seeding dates for each cover crop. There is a tool for agronomic crops for many states, plus for a tool for vegetable crops for Michigan. You can also get seeding rates by reading the information sheet about your cover crop of choice. The website includes a wealth of other information about cover crops from around the Midwest.

Indiana Conservation Cropping Systems Initiative (CCSI)

ccsin.iaswcd.org

The CCSI is an initiative within the Indiana Conservation Partnership. The website contains information and links for more details about cover crops, no-till, and other conservation cropping systems practices.

Midwest Cover Crops Field Guide

Available from the Purdue Extension Education Store, www.edustore.purdue.edu.

This pocket guide (Purdue Extension publication ID-433) was produced by the MCCC and the Purdue Crop Diagnostic Training and Research Center. The guide contains more detailed information about selecting and managing cover crops and describes common cover crops for our region. The descriptions also include ranges of cover crop seeding rates. The insect section includes specific information about scouting for both pests and beneficials.

Terminating Cover Crops: Successful Cover Crop Termination with Herbicides

Available from the Purdue Extension Education Store, www.edustore.purdue.edu.

As the title suggests, this publication (Purdue Extension publication WS-50-W) describes how producers can effectively terminate cover crops with herbicides to prevent them from becoming weeds in the cash crop.

Herbicide Carryover Table

Available from Penn State University Extension, extension.psu.edu/plants/crops/soil-management/cover-crops/herbicide-persistence/herbicide-carry-over-table.

Although published by Penn State, this table includes information that would fit Indiana.

Agronomy Technical Note: Recommended Cover Crop Seeding Methods and Tools

Available from the USDA-Natural Resources Conservation Service, efotg.sc.egov.usda.gov/references/public/IN/Technical_Note_Agronomy_Cover_Crop_Seeding.pdf.

This excellent publication describes cover crop seeding methods that can be used in Indiana and similar Midwest states.

Managing Cover Crops Profitably, second edition

Available the Sustainable Agriculture Research and Education Learning Center, www.sare.org/Learning-Center.

This 244-page manual is part of a USDA-CSREES program.

Managing Cover Crops: Cover Crops for Modern Cropping Systems

Available from the Purdue Extension Education Store, www.edustore.purdue.edu.

This publication (Purdue Extension publication AY-352-W) describes the benefits and considerations of using cover crops in today's agricultural rotations.

Find Out More

Find more publications in the *Managing Cover Crops* series by visiting the Purdue Extension Education Store, www.edustore.purdue.edu.

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