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EXPERT REVIEWED

MANAGING COVER CROPS

# Cover Crops for Modern Cropping Systems

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Interest in cover crops has skyrocketed over the past few years in the eastern Corn Belt. Although cover crops are an age-old practice for maintaining soil productivity, their use in modern corn-soybean systems over the past four decades has been minimal. With improved genetics, synthetic fertilizer, pesticides, and better machinery, the need to maintain and improve the underlying soil resource base was often overlooked.

Today, producers are giving cover crops a fresh look as part of modern sustainable agricultural systems. This publication is an introduction to cover crops — it describes cover crop benefits, how to select appropriate covers, common seeding methods, and how to terminate them.

Other publications in this series provide greater detail about various aspects of cover crops and how they fit into cropping systems. More publications in the *Managing Cover Crops* series are available from the Purdue Extension Education Store, www.edustore.purdue.edu.

## Cover Crop Benefits

Different cover crops provide different benefits to your cropping system. It is important to remember that no individual cover crop will provide all benefits, so you need to decide on your primary objectives before you select a cover.

It is also important to remember that you plant a cover crop to provide some benefit to the soil or environmental quality, not for its harvest value. Some cover crops are suitable for grazing or haying, but if you plant them for such purposes, then they are forage crops and you should manage them as such.

When it comes to benefits, cover crops can:

- **Scavenge N.** Cover crops can scavenge or "trap" residual soil nitrate to prevent it from leaching into drainage water. This protects water quality. Some of the scavenged nitrogen (N) will be available to succeeding cash crops while the rest helps build soil organic matter.
- **Produce N.** Legumes "fix" atmospheric N for their own use. After you terminate the legume cover crop, it will release much of this N into the soil as the residues decompose, providing available N to succeeding crops.
- **Reduce erosion.** The classic use of cover crops is to cover the soil surface to protect against both water and wind erosion, thus conserving the soil resource base.
- **Build soil health.** Cover crops improve soil physical properties, increase soil organic matter, and increase soil biological activity. Fibrous roots build soil aggregation, and deep-rooted crops improve permeability. Some taprooted crops help break up compacted layers, which improves water flow, aeration, and cash-crop rooting. Cover crops stimulate soil biological activity by providing additional food in the cover crop shoot and root residues. Cover crops left as a mulch at the soil surface can also conserve soil moisture for later use by the cash crop.

- **Suppress weeds.** Some cover crops can suppress weeds by competition, shading, or allelopathy (which is when a plant produces an organic compound that negatively affects other plants). Unfortunately, some cover crops can also become weeds in subsequent cash crops if you do not carefully manage them.
- **Recycle nutrients.** Although most growers focus on nitrogen, cover crops may also help recycle other nutrients by reducing erosion, building soil organic matter, and increasing soil biological activity.
- **Protect water quality.** When cover crops scavenge residual soil N, they can reduce N losses to drainage water. Covers also reduce erosion and the losses of both phosphorus and pesticides that are bound to the sediments.
- **Enhance wildlife habitat.** Cover crops can provide water, cover, and food for birds and other wildlife and increase landscape diversity. They may also provide habitat for pollinators and other beneficial insects.

## How to Select Appropriate Covers

In addition to deciding the particular benefits or objectives you want from a cover crop, you need to:

- **Consider your cropping/tillage system.** You will need to understand the time windows that are available for cover crops in each system. You also need to know how compatible the different crop types (both cover and cash) will be during each window.
- **Decide if you want the cold to terminate the cover.** Cold winters will kill certain cover crops. You must weigh whether you prefer one of these winter-kill covers, or one that will grow again in spring.
- **Understand your climate.** The climate in your region affects how long the growing season will be for the cover crop you plant.
- **Consider your soil types/natural drainage class/tile drainage.** Some cover crops tolerate wet or droughty conditions while others do not.
- **Decide if you want a single species or mixture.** It is often easier to manage a single, simple cover crop species; however, a mix of species can provide multiple benefits and improve soil biological activity more quickly.
- **Consider potential herbicide carryover.** The herbicide program in your current system may affect suitable cover crops that you can plant.

## Common Seeding Methods

Another important cover crop consideration is the seeding method. Common seeding methods include:

- **Drilling or split-row planting.** These are generally the most reliable seeding methods because they provide good seed-to-soil contact. The disadvantage to these methods is that seeding is delayed until after you harvest the cash crop. Consider earlier maturing cash crop hybrids and varieties to allow more time for cover crop growth in the fall.

Figure 1. Using a drill to seed a cover crop.

- **Broadcast seeding with or without shallow incorporation.** With these methods, you may broadcast seed on harvested cropland and incorporate it shallowly with harrows or vertical tillage tools. This provides fluffing or cutting of crop residues to improve seed-to-soil contact. Broadcast seeding after harvest without incorporation is also possible, but it will generally be less reliable. Some cover crops (such as peas) cannot be broadcast as they establish very poorly with this method.
- **Aerial seeding/overseeding.** With these methods, an aircraft can fly over and broadcast seed into a standing corn or soybean crop, or you can use ground-based, high-clearance equipment to broadcast seed. The advantages to these methods are that they allow for earlier seeding and the opportunity

for the cover crop to establish before cash crop harvest. The earlier seeding window also gives you more cover crop options to choose from. The timing of seeding needs to allow adequate light penetration to the soil surface. The disadvantages of these methods are that they have poorer seed-to-soil contact and are more unpredictable because of highly variable moisture conditions in late summer/early fall.

## How to Terminate Cover Crops

Plan in advance how you will control and terminate the cover crop. Some cover crops have the potential to become weeds, so careful planning and management are required.

Cover crop termination methods include:

- **Winter-kill.** Some cover crops do not survive the winter in our region, so you generally do not need to plan for spring termination. Oats and oilseed radish are two of the more common winter-kill covers. However, if you plant radish too early and it goes to seed, or if you plant it too late and some seed does not germinate before cold temperatures hit, then some seed may germinate in the spring. You can readily terminate these with herbicides.
- **Herbicide applications.** Always consult herbicide labels and your state weed control guide for current recommendations about specific chemicals and crops — for example, see *Weed Control Guide for Ohio, Indiana, and Illinois* (Purdue Extension publication WS-16-W), available from the Education Store, www.edustore.purdue.edu. In general, a nonselective contact or translocated herbicide will effectively terminate cover crops. Some cover crops may need a second herbicide application a few weeks later for improved control. The timing of application is very important for some tough-to-control cover crops, and you should be prepared and have a back-up plan.
- **Tillage.** Tillage can effectively terminate some cover crops. However, it can be a challenge to incorporate large amounts of aboveground growth. Tillage also reduces some of the benefits of the cover crops such as erosion control and building of soil organic matter.
- **Mowing or roller-crimping.** Mowing or using a roller-crimper can successfully terminate some cover crops at the flowering or heading stage, but that is often later than desired for typical row-crop systems. If you use a roller-crimper it must snap the cover crop stems rather than bend them, or you will not control the cover crop.

## Other Considerations

Before you integrate covers into your cropping system, there are other things you should consider. First, check with your crop insurance agent to understand the termination requirements in spring for any cover crops that overwinter. Second, consider the potential effects that any residual herbicides (used in the cash crops) will have on the establishment of cover crops.

## Additional Resources

Before including 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.

### *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.

### *Managing Cover Crops: An Introduction to Integrating Cover Crops Into a Corn-Soybean Rotation*

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

This publication (Purdue Extension publication AY-353-W) outlines an introductory approach to integrating cover crops into a corn-soybean cropping system.

### *Managing Cover Crops: Checklist for Integrating Covers Into Your Cropping System*

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

This publication (Purdue Extension publication AY-354-W) is a checklist of things growers should do as they plan for using cover crops in their operation.

### *Managing Cover Crops: Cover Crops for Prevented Planting Acres*

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

This publication (Purdue Extension publication AY-355-W) describes the particular benefits cover crops can have on prevented planting acres — that is, acres that can't be planted to a cash crop because of excessive spring rains, prolonged ponding, or other environmental issues.

### "Cover Crops for Nitrogen Management"

ag.purdue.edu/agry/extension/Documents/CoverCropsNitrogen.pdf

This article describes the various ways cover crops can help manage nitrogen in the soil.

### *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-carryover-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*

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.

**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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