

# Cover Crops for Modern Cropping Systems



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URL: <http://www.ag.purdue.edu/agry/extension/Documents/CoverCropsOverview.pdf>

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 and pesticides, and better machinery, the need to maintain and improve the underlying soil resource base was often overlooked. Today cover crops are getting a fresh look as part of modern sustainable agricultural systems. This publication provides an introduction to cover crops, including their benefits, selection of appropriate cover crops, and seeding and termination of cover crops. Other publications in this series will provide greater detail into various aspects of cover crops and how they fit into cropping systems.

## Benefits of Cover Crops

Different cover crops provide different benefits, and no individual cover crop will provide all benefits. Producers need to decide what their primary objective(s) is when selecting the appropriate cover crop(s) for their fields. Cover crops are planted for their benefit to soil or environmental quality and not for harvest. Some cover crops may also be suitable for grazing or haying, but then they are a forage crop and should be managed as such.

- Scavenge N – cover crops can scavenge or “trap” residual soil nitrate to prevent it from leaching into drainage water. This protects water quality, and some of the scavenged N will be available to succeeding cash crops while the rest helps build soil organic matter.
- Produce N – Legumes “fix” atmospheric nitrogen for their own use. After the legume cover crop is terminated, much of this N will be released as the residues decompose, providing available N to succeeding crops.
- Prevent 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 Quality – 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 tap-rooted crops help break up compacted layers, improving 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. Unfortunately, some cover crops can also become weeds in subsequent cash crops if not carefully managed.
- Recycle Nutrients – Although N is the usual focus, cover crops may also help recycle other nutrients by reducing erosion, building soil organic matter, and increasing soil biological activity.

- Protect Water Quality – cover crops scavenge residual soil N, thereby reducing N losses to drainage water. They also reduce erosion and the losses of phosphorus and pesticides bound to the sediments.
- Enhance Wildlife Habitat – cover crops can provide water, cover and food for birds and other wildlife and increase landscape diversity.

### Selection of Cover Crops

In addition to deciding the particular benefits or objectives for the cover crop, producers need to consider the following when choosing cover crops:

- Cropping/tillage system – what are the available time windows for cover crops in each system; what are the crop types and how compatible are different cover crop types during each window.
- Climate – this affects the length of growing season available for the cover crop.
- Soil types/natural drainage class/tile drainage – some cover crops tolerate wet or droughty conditions while others do not.
- Simple species vs. mixture – simple species are often easier to manage, but a mix of species can provide multiple benefits and improve soil biological activity more quickly.

### Seeding Methods

- Drilling or Split-row Planting – These are generally the most reliable seeding methods due to good seed-to-soil contact. The disadvantage is that seeding is delayed until after harvest of the cash crop. Consider earlier maturing cash crop hybrids and varieties to allow more time for cover crop growth in the fall.
- Broadcast seeding with or without shallow incorporation – Seed may be broadcast on harvested cropland and shallowly incorporated with harrows or vertical tillage tools that provide fluffing or cutting of crop residues to improve seed-to-soil contact. Broadcast seeding after harvest without incorporation is also possible but will generally be less reliable. Some cover crops such as peas cannot be broadcast as they have very poor establishment with this method.

Aerial seeding/overseeding – Seed may be flown into a standing corn or soybean crop, or broadcast with ground-based high clearance equipment. This allows for earlier seeding and the opportunity for the cover crop to become established before cash crop harvest. The earlier seeding window gives more options of cover crops to choose from. Timing of seeding needs to allow adequate light penetration to the soil surface. The disadvantage of the method is poorer seed-to-soil contact and greater unpredictability due to highly variable moisture conditions in late summer/early fall.

### Termination of Cover Crops

Producers should plan in advance for how they will control and terminate the cover crop. Some cover crops have the potential to become weeds and therefore careful planning and management is required.

- Winter-kill – some cover crops do not overwinter in our climate, and so the producer generally does not need to plan for termination in the spring. Oats and oilseed radish are two of the more common examples. If the radish is planted too early and goes to seed, or if planted too late and some seed does not germinate before cold temperatures, then some seed may germinate in the spring, but these are readily terminated with herbicides.
- Herbicide – Producers should always consult herbicide labels and your state weed control guide for current recommendations on specific chemicals and crops. In general, a non-selective 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 producers should be prepared and have a back-up plan.
- Tillage – tillage can effectively terminate some cover crops. Incorporating large amounts of above-ground growth can be challenging, however. 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. [the roller-crimper needs to snap the cover crop stem rather than bend them, in order to control the cover crop.]

#### Other Considerations

Producers should check with their crop insurance agents to understand the termination requirements in spring for any cover crops that overwinter. Producers should also consider the potential effects of any residual herbicides (used in the cash crops) on the establishment of crop crops.

#### Additional Resources

- Midwest Cover Crops Council (MCCC) website: [www.mccc.msu.edu](http://www.mccc.msu.edu) this website includes the Cover Crop Decision Tool, to help producers select cover crops for their location.
- MCCC Cover Crop Pocket Field Guide – target availability date for Dec. 2011. Available through Purdue Extension
- Cover crops for prevented planting acres:  
<http://www.ag.purdue.edu/agry/extension/Documents/PreventedPlantingCovers.pdf>
- Cover crops for nitrogen management: :  
<http://www.ag.purdue.edu/agry/extension/Documents/CoverCropsNitrogen.pdf>
- Cover crops and the corn and soybean herbicide rotational restrictions:  
<http://www.btny.purdue.edu/WeedScience/2011/CoverCrops11.pdf>
- *Managing Cover Crops Profitably*, third edition  
Sustainable Agriculture Network. 2007. Sustainable Agriculture Network and the Sustainable Agriculture Research and Education Program of USDA-CSREES. Order this 244-page manual or download a PDF version at [www.sare.org/Learning-Center](http://www.sare.org/Learning-Center)

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