



Cover Crops for Field Crop Systems

Introduction

A well-managed cover crop can conserve and protect the soil, boost productivity, capture nitrogen and phosphorus leftover from a main crop or from fall applied manure, and if harvested in the spring, provide additional forage for dairy cattle and other livestock. For field crop rotations on dairy farms in the Northeast, cereal rye, triticale, wheat, and annual ryegrass are good options in rotation with corn silage or small grains as they are winter hardy. Oats are a good option for their quick emergence and abundant biomass in the fall but oats winter-kill. For any cover crop, an establishment and termination plan should be in place before planting. This factsheet describes general establishment and termination methods, and planting timing of winter cereal cover crops for field crop systems in the Northeast.

Establishment

Cover crops can be established with broadcast seeders, drills, or aerial application.

Broadcast seeding

- Equipment: Use a broadcast seeder or high clearance machinery for planting into standing crop. Plant as the canopy is closing to avoid competition with the main crop.
- Seeding rate: Generally, 10-20% higher than needed for drilling. See table 1.
- Pro: It is faster and therefore less expensive than drilling.
- Con: Emergence is typically lower due to poor soil to seed contact as compared to drilling.

Drill seeding

- Equipment: Drill seeder.
- Seeding rate: See table 1.
- Pro: High germination rates because of good seed to soil contact.
- Con: Typically done after harvest of the main crop, limiting time for fall growth of the cover crop. Due to equipment limitations, narrow widths require more time and energy to interseed an acre with a drill than to broadcast seed on the surface.

Aerial seeding

- Equipment: Airplane or helicopter with seed dispersal attachment. Rotary or fixed wing. See fig. 1.
- Seeding rate: Generally, 25-50% higher than needed with drilling to compensate for lower emergence.
- Pro: Planting into a standing crop is possible, allowing for earlier planting. Minimizes compaction in fields because of decreased traffic, and is the fastest planting method of the three.
- Con: Emergence rate is often low due to poor seed to soil contact, requiring higher seeding rates. Limited number of operators.



Figure 1. Typical equipment for aerial seeding (left, photo credit: USDA), drill seeding (top; photo credit: Matt Ryan) and broadcast seeding (bottom; photo credit: University of Vermont).

Termination

A cover crop can winter-kill, or be terminated chemically or mechanically.

Winter kill

- Pro: No field operation required. No early burndown necessary in spring, and the vegetation mat after winter may reduce dominance of spring weeds.
- Con: Lack of a live root system can increase erosion risk in the spring. Mat of dead forage keeps soil cooler and wetter which may delay planting. Nutrient leakage from dead foliage may be more prone to winter losses.

Table 1: Quick guide to establishment and termination of cover crops.

Covercrop	Benefits	Establishment	Termination Options
Oats	- Quick to emerge - Good weed competition	- August-early September - Broadcast or over-seed, disc to incorporate - Drill 80-110 lbs/acre; higher seeding rate needed for later planting	- Winter-kill
Wheat and Triticale	- Good spring weed competition	- Drill, or broadcast - Drill at 75 lbs/acre - Mid to late September	Termination for wheat, triticale and rye: - Glyphosate common termination method especially when soil is too wet for tillage.
Cereal rye	- Tolerates later seeding than oats or wheat - Best cool season crop to absorb unused nitrogen in soil	- Early August through mid-October - Drill, broadcast or by air. - Drill 60 lbs/acre mid-September; higher seeding rate for later planting	- Plow, disc or mow wheat and triticale before seed matures - Plow or till rye to incorporate before the plants reach 8 inches - 2-3 weeks before following crop - Roll crimp wheat and triticale at soft-dough
Annual ryegrass	- Quick to emerge - Erosion control - Tolerates wet soils - Good weed competition	- July 20- September 15 - Interseed - Drill at 10-20 lbs/acre	- Will not winter-kill - Will re-seed if not terminated in time - Terminate before 6 inches - Plow or till to incorporate, or use glyphosate

Tillage

- Pro: Incorporates cover crop into soil, allowing soils to warm up quicker and cover crop biomass to breakdown more rapidly. Tillage can be combined with manure application. For faster decomposition, till when the cover crop is young and green (carbon to nitrogen ratio is less than 20).
- Con: Tillage may require more than one pass, disturbs soil (nutrient loss, organic matter loss, and risk of compaction), and is not suitable for no-till systems. Terminating a young cover crop can cause weeds to grow before seeding the main crop.

Chemical

- Pro: A burndown program is most effective on crops that are not yet flowering, and this timing fits well with an early planted main crop. Compatible with no-till.
- Con: Weather will determine effectiveness of herbicides. Cool, cloudy conditions slow rate of herbicide uptake and may limit field access due to wet soils. Herbicide selection depends on the crop rotation.

Summary

Cover crops can be established by drill, broadcast, or aerial seeding. Seeding rate should be adjusted to the planting method and date. Common methods for termination including winter kill, tillage, and chemical. The method should be chosen based on the timing of the following crop, the winter hardiness of the cover crop, and the rate of spring maturation of the cover crop. Having a plan for establishment and spring management is an important part of

managing cover crops. The overall benefits include spring weed control, erosion reduction, nutrient cycling, and improved soil health.

Additional Resources

- SARE Managing Cover Crops Profitably 3rd Edition. <http://www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rd-Edition/Text-Version>.
- Under Cover: Integrating Cover Crops into Corn Silage Corn Systems. University of Vermont. <http://www.uvm.edu/extension/cropsoil/wp-content/uploads/UnderCoverGuide.pdf>.
- University of Illinois Extension IPM Bulletin about Termination: <http://bulletin.ipm.illinois.edu/?p=3552>
- A Comprehensive Guide to Cover Crop Species Used in the Northeast United States: NRCS. http://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIA/LS/publications/nypmcpu10645.pdf

Disclaimer

This fact sheet reflects the current (and past) authors' best effort to interpret a complex body of scientific research, and to translate this into practical management options. Following the guidance provided in this fact sheet does not assure compliance with any applicable law, rule, regulation or standard, or the achievement of particular discharge levels from agricultural land.

For more information



Cornell University
Cooperative Extension

Nutrient Management Spear Program
<http://nmisp.cals.cornell.edu>

Nicole Smaranda, Quirine Ketterings, Karl Czymmek,
Thomas Björkman, Janice Degni, Joe Lawrence, Mike Stanyard

2016