

COVER CROPPING ON VEGETABLE FARMS IN NORTHERN NEW ENGLAND

Cover cropping is a valuable practice that can increase yields, increase soil nutrient retention, and improve soil and water quality. This pamphlet provides a brief overview for vegetable farmers in the northeast.

Benefits of Cover Cropping

Cut fertilizer costs

Cover crops take up and store nitrogen so that it can be retained for the next crop. After a legume cover crop, the cash crop can utilize 30 to 60 percent of the nitrogen taken up by the cover crop.

Reduce the need for herbicides

Cover crops can suppress weeds by outcompeting weeds through direct competition for sunlight or nutrients, or by altering the soil surface temperature, making the environment less suitable for many weeds. Cover crops can also encourage the growth of microbes that protect against disease, encourage the growth of beneficial insects that can help reduce the damage of other insects, and decrease pest populations while encouraging beneficial populations of nematodes.

Conserve soil moisture

Killed cover crops contribute moisture to soils, increase infiltration, and reduce water lost to evaporation, which lessens water stress during droughts.

Improve soil health and water quality

Cover crops hold soil in place and increase soil aggregation and stability, which builds up soil over time and prevents loss to erosion. Better soil aggregation increases soil aeration and infiltration, which in turn prevents runoff and decreases compaction. Cover crop canopy cover also protects against raindrop impact. The addition of organic matter adds more nutrients to the soil, encourages beneficial soil microbial life, and increases infiltration and water hold capacity. Over time, nutrient cycling is enhanced and the increase in water infiltration and reduction in runoff prevents excess nutrients like nitrogen and phosphorus from entering waterways.



Winter Rye

Challenges in a Vegetable System

In a cold northern New England climate, establishing cover crop growth can be difficult as winter sets in. Cover crop planting is dependent on the seasonal weather patterns and limits of farm schedules.

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Many vegetable crops are grown on smaller tracts of land in comparison to large-scale corn silage production. This may make cover crop rotations and establishment more difficult. Smaller vegetable farms may not have access to or space for larger equipment for terminating, tilling, and planting cover crops.

Selecting the Right Cover Crop for You

When choosing cover crops or cover crop mixtures, consider what goals you want to achieve, and what planting dates are realistic to your seasonal work load. Some cover cropping goals can include:

- Soil building (adding organic matter and structure)
- Nitrogen scavenging (storing leftover nitrogen)
- Attracting beneficial insects, reducing nematodes
- Nitrogen fixation
- Reducing soil compaction
- Preventing erosion
- Weed control
- Use for grazing



Hairy Vetch

To achieve your specific cover cropping goals, it is important to choose the right cover crop. Different types of cover crops (grasses, legumes, and brassicas) provide different advantages:

Grasses increase soil organic matter and structure, scavenge nitrogen and release it for use in the next crop during decomposition, prevent erosion, and can be used as forage. Cool-season cereal grains are particularly hardy in cold climates. **Legumes** grow slower than grasses, fix nitrogen, increase soil organic matter and structure, prevent erosion, and can be used as forage. **Brassicas** suppress weeds and pests, reduce soil compaction, scavenge nutrients from previous cash crop, and prevent erosion. **Cover crop mixtures** can provide multiple benefits. For example, if you want increased nitrogen fixation and to suppress weeds, you may choose plant a mixture of red clover and radish.

Common Vermont Cover Crops

Legumes

- *Red clover, crimson clover, white clover, hairy vetch, chickling vetch, field pea, cowpea, alfalfa, soybean*

Grasses

- *Annual & perennial ryegrass, orchard grass, timothy*
- *Cool-season annual grains: winter rye, wheat, spelt, triticale, barley, oats*
- *Warm-season annual grains: buckwheat, millet, sorghum-Sudangrass*

Brassicas

- *Forage radish, mustard, canola, forage turnip*

Common Mixes

- *Winter rye or oats with hairy vetch, red clover or peas*
- *Annual ryegrass and clovers*
- *Sorghum-Sudangrass or millets with soybean or cowpea*



NRCS Mix 2: Annual Ryegrass, Crimson Clover, Arifi Radish

Many pre-mixed seed mixtures are available on the market. It is also important to set priorities based on planting dates and other limitations, such as your seasonal workload, cost, labor available, and local weather. Consider whether you are planting a winter killed versus winter surviving cover crop, and options for termination available to you (see *Termination Strategies*). A Cover Cropping Costs and Benefits table is available at the NWCS website (see *Resources*), which shows the financial costs by cover crop, seeding rate, application and termination methods, and the net financial benefits from increased yield, erosion reduction, and nutrient credits.

Seeding Options

Seeding rates will depend on the seeding method and cover crop species. Smaller seed will have higher seeding rates per acre, and broadcast seed will have higher rates per acre than drilled seed. Cover crops can be seeded by no-till drills, broadcast, aerial seeding, or interseeding. The chart to the right shows the minimum seeding rate in pounds per acre recommended for common cover crops, as specified by Vermont NRCS, 2014.

SPECIES	BROADCAST (INCLUDING AERIAL SEEDING)	DRILLED OR PLANTED
Winter rye	112	75
Winter triticale, wheat, spelt	112	75
Spring wheat, triticale, barley	100	75
Oats	112	75
Red clover	12	10
White or alsike clover	10	8
Berseem clover	18	10
Crimson clover	25	20
Hairy vetch	35	20
Winter pea	100	65
Forage brassica (radish, turnip, spring canola)	15	10
Mustard	10	6
Winter canola	10	6
Annual ryegrass	30	20

Adapted from "Vermont NRCS Cover Crop Specifications Guide Sheet (340)"

Planting Dates

Planting dates impact how well a cover crop establishes and/or overwinters. Planting dates vary by species and seeding method. The earlier the cover crop is planted, the more nitrogen can be taken up and stored before winter, and a greater amount of biomass can be produced. Interseeding allows for earlier planting dates, as cover crops can be planted before the cash crop harvest. Not only does this often provide better establishment, but you can choose from a greater variety of cover crops.

Termination Strategies

Termination strategies include winter kill, herbicide, harvest, plow down, or rolling with a roller crimper. Your chosen strategy will depend on your goals. For example, if you would like to collect the cover crop for forage, you may wait longer before termination to increase yield, then terminate it via harvest. All of these methods will increase soil health, but harvesting biomass or using herbicide decrease the amount of nitrogen that could have been transferred to the next crop. Cover crop species that are winter killed include oats, winter peas, tillage radish, hairy vetch, buckwheat, millet, and sorghum-sudangrass. Overwintering species include winter (cereal) rye, triticale, spelt, wheat, and red clover.



Interseeding Technologies "Penn State" Interseeder

Resources

For more information on cover cropping and interseeding: <https://www.uvm.edu/extension/nwcrops>

Managing Cover Crops Profitably, 3rd Edition, 2007. SARE. Available in print or free online: <https://www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rd-Edition>

For help choosing the best cover crop for you: <https://extension.psu.edu/what-cover-crop-should-i-plant>

Cover Crops for Vegetable Growers: The Cornell University Cover Crop Decision Tool, <http://covercrop.org/mobiledecisiontool>

VEGETABLE COVER CROPPING SUCCESS STORIES

River Berry Farm, Fairfax, Vermont – Jane Sorensen & David Marchant

When did you start cover cropping and why? 1991. For soil fertility, soil conservation, and nutrient management.

How do you cover crop on your farm? Our primary cover cropping is fall cover cropping, primarily rye and hairy vetch. We also do oats in the fall, sometimes with field peas. Spring cover cropping we will do oats and field peas and also yellow sweet clover. Yellow sweet clover in late summer, planted biennial, grows substantially then till in late summer. It was tough because a couple years it just died out.

What benefits have you seen from cover cropping at your farm? Great increase in fertility. I've been able to grow some crops just on cover crop fertility. Increase in organic matter, general airiness and sponginess to the soil. Improved tilth, better water drainage, less compaction.

What challenges do you face trying to cover crop? Time of seeding, and working in those windows.

What equipment are you using for your cover cropping? The grain drill is a John Deere Van Brunt single disc opener. The combine is an International 82 tow behind. For field prep, we use regular disc harrows, and field cultivators.



River Berry Farm

Cedar Circle Farm, East Thetford, Vermont – Luke Joanis, Farm Manager

When did you start cover cropping and why? Since 2001. Cover crops remained basic for several years, mostly limited to winter rye and rye/vetch. In the past ten years, we have been branching out to include more diverse crops. We cover crop for all the many ecological beneficial reasons any certified organic farm would, but our primary drive is to increase and/or maintain soil organic matter. As organic growers, we depend on the slow release of N through mineralization of organic matter.

How do you cover crop on your farm? We have used some monoculture including winter rye, winter wheat, sorghum sudangrass, Japanese millet, annual rye grass, oats, mustard, tillage radish and buckwheat. We have tried legumes including peas, cow peas, hairy vetch, chickling vetch, sweet clover, red and white clover, as well as various combinations of all of these. Timing varies according to crop needs.

What benefits have you seen from cover cropping at your farm? We have measured increased soil organic matter, a visibly coarser soil aggregate, and seen improved crop health, vigor, and yields.

VEGETABLE COVER CROPPING SUCCESS STORIES

What challenges do you face trying to cover crop? Over the years we have been challenged by establishing even stands, weed competition, irrigation demands, plant timing, terminating, and incorporating crop residues.

Have you developed different strategies to face those challenges? Yes, for example, we understand the importance of a clean seed-bed, seeding rate, soil moisture and temperature at establishment. Through trial and error mostly, we have been able to dial in methods over the years of what tools and species to use in a given situation.

Pomykala Farm, Grand Isle, Vermont – Bob Pomykala

When did you start cover cropping and why? I started in cover cropping as soon as we started the farm in 1980 because we don't have another way to add organic matter. We don't have access to animal manure, generally.

How do you cover crop on your farm? Predominately winter rye, because of the heavy soil it's not easy to do crops like buckwheat, because it will be killed by a heavy rain. Whenever I can get in the field, starting in late August, I start planting when I can, up until almost December.

What benefits have you seen from cover cropping at your farm? Weed control and increased organic matter and tilth of the soil.

What challenges do you face trying to cover crop? Timing. Having the time to plant them when I can get the most benefit. Because I have a crop growing there which is worth a lot of money so I hesitate to destroy the crop in order to get the cover crop in even though its good for the soil.

Have you developed different strategies to face those challenges? We're always trying to make our land better, everybody is, and I am no exception. I am trying to increase the productivity of our soil and increase the permeability of it and really, what I'd like, is to grow everything no-till. Weeds are the limitation to no-till and fertility.

What equipment are you using for your cover cropping? Two grain drills (all crop 60A Allis Chalmers 5 foot wide pick up, and an International 82 -7 foot, tow behinds), two combines (All Crop is 1949, International 82 1966-1974), and off set high residue harrows with 22 inch discs.



Tillage Radish at Pomykala Farm

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