

CROP ROTATION ON VEGETABLE FARMS

Vern Grubinger
Vegetable and Berry Specialist
University of Vermont Extension
11 University Way, Brattleboro VT 05301
vernon.grubinger@uvm.edu

Crop rotation is one of the most effective tools for managing pests and maintaining soil fertility, but there aren't many specific recommendations for how to go about it. A common approach on vegetable farms is to rotate crops by families. Another strategy is to alternate vegetable crops with field or forage crops, such as small grains, alfalfa or clovers. Some growers try to rotate fields so they are in cash crops one year and cover crops the next year. On farms with limited land for rotation out of cash crops, sweet corn is a good crop to rotate with since it hosts very few insects or diseases that affect other vegetables.

Too many growers rotate their crops using the 'seat of their pants' technique, relying on memory and making decisions day by day when planting. To make the most of crop rotation you need detailed records of where crops were grown in the past as well as a written plan for how crops will be arranged in the future.

Start by making a map of your farm and other fields you may use such as rented fields. Label the fields or sub-fields with names and acreage. Make photocopies of the map and at the end of each season fill one in and date it, noting any serious pest or soil problems in a field. Prior to the growing season, fill in a new map with your best guess as to where crops will go, depending on growing conditions, etc. Try to develop a plan that results in the most years possible between planting similar crops in a given location.

As you plan, remember that rotation helps prevent some pests but not others. For insects that over-winter near the crop they infested, such as Colorado potato beetle, European corn borer, or flea beetle, it helps to plant host crops as far away as possible the next year. Having a barrier such as a road or river between last year's crop and this year's can enhance the rotation effect. Rotation will not help prevent insect damage from pests that migrate into the area, such as potato leafhopper or corn earworm.

For diseases that are soil-borne or over-winter in crop residues, rotating out of susceptible crops is a key to preventing infection, as in the case of Phytophthora blight, early blight, and many other diseases. However, host crops must be rotated far enough away to avoid infection through blowing or washing soil.

Equipment that moves soil from field to field can also reduce the benefit of rotation. For some diseases, such as clubroot of crucifers, susceptible weed hosts must be controlled if rotation is to be effective. As with insects, rotation cannot prevent airborne diseases that move in from other areas, such as downy mildew, nor can it prevent seed-borne diseases.

In addition to minimizing some pest pressure, rotating crops is also good for soil health because it leads to changes in tillage, rooting depth and nutrient removal. Rotation is also a way to maintain soil organic matter if plans include soil-improving cover crops, a practice that is critical to sustaining productivity over time.

Always include winter cover crops in your rotation plans to minimize erosion and add some organic matter back to the soil. Whenever possible, also use summer cover crops for warm-season biomass production and weed suppression. In addition, to the extent possible, one should include one or two year-long green manure crops to ‘rest’ fields from tillage for substantial periods of time while allowing extensive cover crop root growth to occur.

A good resource for understanding the benefits and limitations of various cover crops, which species are suitable for your area, and how to manage them is the book Managing Cover Crops Profitably, available from the Sustainable Agriculture Network for \$19 plus shipping. Call (301) 374-9696. It is also available for free on the web at: www.sare.org/publications/covercrops/covercrops.pdf

Intercropping cover crops and cash crops can help maintain soil fertility and enhance biodiversity. However, this does not negate the need to rotate cash crops among fields.

A 70-minute DVD is available called Farmers and their Innovative Cover Cropping Techniques that shows a variety of cover cropping and intercropping systems used on 10 different vegetable farms in 5 northeastern states. The video costs \$15 postage-paid. It’s available from the UVM Center for Sustainable Agriculture, call (802) 656-5459 or go to www.uvm.edu/vtvegandberry/videos.

A publication called Crop Rotation on Organic Vegetable Farms: A Planning Manual will be available through NRAES (www.nraes.org) for \$24. The guide was developed using information from a dozen organic vegetable farmers, each with decades of experience. The farmers identified the following sequence of tasks for planning crop rotations:

- 1) Review overall farm goals, both long and short term
- 2) Review overall farm operation
- 3) Identify problems that can be addressed by rotation
- 4) Set rotation goals (e.g., insects, disease, weeds, soil, field logistics, profitability)
- 5) Review annual production plan (crop and cover crop species, varieties, quantities)
- 6) Balance farm acreage among cash crops, cover crops, livestock, sod/hay, etc.
- 7) Update records (farm plan and mission, annual production and sales, etc.)

While these expert farmers try to follow a rotation plan, they tend not to do so in a rigid manner. Instead, they use their knowledge of fields and crops, and their own ‘rules of thumb’ that are site specific. Many have contingency plans (based on changes in weather, markets, labor, etc.) and they are often focused on what NOT to do when implementing a rotation. They all have a clear sense of priorities for their rotations.

Here are three examples of crop rotations with cover crops on Northeast vegetable farms:

	<i>one year in cash crops / one year in cover crops</i>
Year 1	vegetables rye and hairy vetch in fall
Year 2	plow rye and hairy vetch in early summer bare summer fallow to control weeds oats and hairy vetch in late summer
Year 3	plow oats and hairy vetch in late spring vegetables rye and hairy vetch in fall

	<i>two years in cash crops / two years in cover crops</i>	
	<i>if perennial weeds <u>are</u> a problem</i>	<i>if perennial weeds <u>are not</u> a problem</i>
Year 1	vegetables fall oats that winter-kill	Vegetables fall oats that winter-kill
Year 2	buckwheat in early summer rye and hairy vetch in fall	red clover and oats in spring mow oats off at head formation
Year 3	plow rye/vetch in late spring summer bare fallow oats and field peas in fall	mow red clover 3 times
Year 4	disk winter-killed oats and peas vegetables	plow clover in early spring plant vegetables

	<i>alternating cover crops with warm and cool season vegetable crops</i>
Year 1	plow winter rye, followed by summer bare fallow oats and field peas in fall
Year 2	disk oats and peas in early spring cool-season vegetable crops winter rye
Year 3	plow rye in early summer summer bare fallow rye plus hairy vetch in late summer
Year 4	plow rye and hairy vetch in late spring warm-season vegetables winter rye