



AGRONOMIC SPOTLIGHT



COVER CROPS IN VEGETABLE PRODUCTION

- » Cover crops can provide many benefits to vegetable production systems.
- » Cover crops are usually grown during periods between cash crops.
- » Cover crop types, planting times, and termination times are chosen based on the cash crops and the desired benefits.

With the high value of vegetable crops, it is important to manage and protect the health of the soils in which they are produced. Unfortunately, some of the practices used in high intensity vegetable crop production can be detrimental to soil health if proper attention is not paid to soil management.^{1,2} Problems with soil erosion and nitrate contamination of ground water can arise in vegetable production systems if issues associated with tillage, soil organic matter levels, and off-season leaching of nutrients are not addressed.^{1,3} The use of cover crops has been steadily increasing in agronomic cropping systems, and they can be used to manage soil health issues in vegetable systems as well.⁴

Cover crops are crops that are not planted with the intention of harvesting them. They are often planted between successive cash crops to help improve soil fertility, increase soil organic matter levels, scavenge nutrients, and to help manage weeds, pests, and diseases.¹ The presence of cover crops and their residues help prevent soil erosion from wind and water in the off-season, and the increased soil organic matter levels help

increase the water holding capacity and water infiltration rates of the soil. Over time, cover crops can improve the aggregate stability, porosity, and tilth of the soil. Increased microbial diversity and activity associated with cover crops can improve nutrient cycling and pest management, and legume cover crops can add nitrogen to the soil through the process of nitrogen fixation.

INTEGRATION WITH VEGETABLE SYSTEMS

Integrating cover crops into a vegetable production system is somewhat different than with row crops. Vegetable production is seasonally more diverse than most row crop production, with both short and long season crops and more intense management throughout the season. Vegetables are often produced on smaller land areas with higher levels of crop diversity. These differences do present more challenges but also provide more opportunities when using cover crops in vegetable systems.^{4,5}

Cover crops can be chosen to fit within existing vegetable

Table 1. Examples of cover crop selection and timing in vegetable production systems.^{1,6}

	Example 1	Example 2	Example 3	Example 4	Example 5	Example 6
September	Oats + Field Peas	Oilseed Radish	Annual Clover	Oats + Radish	Cereal Rye + Legume	Oats + Field Peas
October						
November						
December						
January	winter kill	winter kill	winter kill	winter kill	winter kill legume	winter kill
February						
March						
April	ONION	LETTUCE	BROCCOLI	TOMATO/ PEPPER	terminate rye	CUCUMBER
May						
June						
July						
August	Crimson Clover	Buckwheat	Buckwheat	Rye + Vetch	Sorghum-Sudangrass	Oilseed Radish
September		PEAS	CAULIFLOWER			
October		Cereal Rye				
November						

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COVER CROPS IN VEGETABLE PRODUCTION

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rotation sequences, or new rotations can be designed with cover crops in mind to revamp production systems.⁵ In either case, cover crop types and practices should be carefully selected to match the desired outcomes for the crop as well as the integration with the timing of the cash crop management practices.⁴ Is the primary purpose of the cover crop to add organic matter, suppress weeds, fix nitrogen, or prevent soil erosion? In some cases, mixtures or “cocktails” of cover crop species can be used to address multiple objectives.⁵ When will the cover crop be planted, terminated, incorporated into the soil, and how will these events integrate with the field preparation, planting, and harvesting activities of the cash crops planted before and after the cover crops?² What specialized equipment will be needed to plant, terminate, and incorporate the cover crops?

Cover crops can be used in several ways. Using cover crops as rotational crops during the main production season allows for optimal growth of the crop and helps to maximize the impact for biomass accumulation or nitrogen fixation, but it also eliminates the use of that land for the production of the cash crop during that period. Companion crops can be planted between the rows of the cash crops as living mulches. This is usually more feasible in areas that receive adequate moisture from rainfall so that irrigation will not be needed to maintain the companion crop. Catch crops can be planted just before or just after the cash crop to scavenge nutrients and provide some protection against soil erosion. The most common way that cover crops are used is as off-season crops, established after the main growing season. The crops are left in place during the off-season to scavenge nutrients, prevent erosion, and to break up soil compaction.⁴

Short- and long-term cover crops can be chosen to fit between various vegetable cropping sequences. Fast-growing, warm season cover crops (buckwheat, cowpea, oats, and sorghum-sudangrass) can be planted between early spring and fall planted cash crops.^{1,6,7} Cover crops planted in the early fall that will winterkill (tillage radish, oats, annual clover, sorghum-sudangrass) tend to decompose in time for the planting of early spring vegetables such as lettuce and spring Brassica crops. Cover crops planted in mid- to late-fall that will overwinter and resume growth in the spring (cereal rye, annual rye, winter wheat, hairy vetch) can be used before later planted spring crops, such as tomatoes, peppers, and cucurbits.^{4,6,7} Example rotations are provided in Table 1.

COVER CROP MANAGEMENT

Successful establishment of a cover crop depends on good seed to soil contact. A seed drill usually results in the best stands. Broadcasting seed followed by harrowing to cover the seed or applying a layer of compost can also be effective. Consult seed bag labels for recommended seeding rates and depths.² Control weeds prior to planting to minimize

competition during stand establishment. Inoculants may be needed when planting legume species, but the correct strain of inoculant needs to be used depending on the legume species. In the absence of rain, irrigation may be needed to promote germination and emergence of the cover crop.

The termination of cover crops, methods and timing, require careful planning to allow sufficient time for the crop residue to decompose prior to planting of the following cash crop. Young, vegetative residue decomposes relatively quickly, and as few as two weeks may be needed between termination of the cover crop and planting of the cash crop. With more mature plant material, longer periods (three to four weeks) may be needed between termination and planting. In most situations the cover crop needs to be completely killed to prevent competition with the following cash crop. This can be done with chopping, tillage, or herbicides, depending on the crops involved and the operation (conventional/organic).⁴ Specialized equipment may be needed in some situations.

Cover crops should be viewed as a long-term investment rather than a quick fix. To get the most benefit out of using a cover crop it is important to put as much attention into the planning and management of the cover crops as is put into the cash crops in the rotation. Some of the benefits from cover crops, such as management of herbicide resistant weeds, can be realized in a relatively short timeframe (one or two cycles). Other benefits, such as increasing organic matter content, breaking up soil compaction, or improving water and nutrient management, will develop over a period of years of repeated cover crop use.⁵

Sources:

¹ Nair, A., Kaspar, T., and Nonnecke, G. 2015. Cover crops in vegetable production systems. Iowa State University Extension and Outreach. HORT 3026.

² Keay, J. 2021. Cover crops for vegetable production. Integrated Pest Management, University of Missouri.

³ Brennan, E. Can we grow organic or conventional vegetables sustainably without cover crops? HortTechnology 27:151-161.

⁴ Marr, C., Janke, R., and Conway, P. 1998. Cover crops for vegetable growers. Commercial Vegetable Production. Kansas State University. MF2343.

⁵ Clark, A. Cover crops for sustainable crop rotation. <https://www.SARE.org/Cover-Crops>.

⁶ Tucker, T. 2012. Cover crops for vegetable growers. 2012 Illiana Vegetable Growers' School.

⁷ Hoidal, N., Fernandez, A., and Candelaria, N. 2021. Cover crop selection for vegetable growers. University of Minnesota Extension. <https://extension.umn.edu/cover-crops-and-soil-health/cover-crop-selection-vegetable-growers#cover-crop-timing-options-for-vegetable-growers-transcript-2785610>.

Websites verified 4-18-2022

For additional agronomic information, please contact your local seed representative.

Performance may vary from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields. The recommendations in this article are based upon information obtained from the cited sources and should be used as a quick reference for information about vegetable production. The content of this article should not be substituted for the professional opinion of a producer, grower, agronomist, pathologist and similar professional dealing with vegetable crops.

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