



Organization of American States
in cooperation with the Mayan Reserve Foundation,

FACT SHEET COVER CROPS

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Cover Crops and Living Mulches

Cover crops are grown to protect and improve the soil, not to harvest. Cover crops have the potential to improve soil tilt, control erosion and weeds, and maintain soil organic matter. They can reduce compaction and increase water infiltration which decreases leaching of nutrients. Cover crops retain and recycle plant nutrients (especially nitrogen) between crops, provide habitat for beneficial microorganisms, and increase plant diversity.

There are many ways to use cover crops in a production cycle:

1. As a main crop during the primary growing season. Used as a rotational crop, the cover will exclude production of a cash crop.
2. As a companion crop, or living mulch, the cover is planted between the rows of the cash crop.
3. As a 'catch' crop for nutrients, planted after harvest of the main crop or between the rows of the cash crop to reduce leaching of nutrients.
4. As an off-season crop grown to protect the soil, usually during the winter when there is no main crop. This is the most common practice.

Cover crops must be correctly selected and managed. There are many possible crops, each of which differs in potential benefits and in adaptability to particular climates and rotational schemes. The most commonly used cover crops are annual grasses and legumes, but some perennials and biennials can also be used.

Cover Crop Management

Growers who use cover crops only to increase soil organic matter are likely to be frustrated. The high temperatures, high rainfall and short, mild winters in the southern states cause such rapid decay of the cover crop that it is difficult to increase soil organic matter. To the extent that cover crops prevent erosion and improve plant growth, however, they contribute to maintenance and cycling of soil organic matter and stimulate biological activity in the soil. As discussed in greater detail in Soil Management, the actual contribution of the cover crop to soil organic matter will depend on many factors, including the amount of growth of the cover crop and whether the crop is removed from the field as hay, left on the surface, incorporated, or used as a living mulch. The C:N ratio of any residues plowed under is also important, as crops with a low C:N ratio break down more rapidly.

In most cases, it is necessary to make trade-offs between practices that maximize the growth of the cover crop and practices that maximize the marketable yield and profitability of the vegetable crop grown that season. Whether or not reseeding of the cover crop is desirable is also important.

Cover crops often consist of mixtures of legumes and grasses. Grass cover crops germinate quickly and put on enough growth in the fall to protect the soil over the winter. However, grass cover crops do not fix nitrogen and may actually tie up soil nitrogen temporarily when turned under. Legumes are slow to develop in the fall but grow rapidly the following spring, providing nitrogen and biomass for the summer vegetable crop. Fall-planted cover crops are more competitive with spring weeds than are spring-planted

cover crops. Cover crops, particularly grains, can be used as catch crops to keep nutrients from the previous crop from leaching. However, additions of fertilizer or other soil amendments may be necessary for optimum cover crop growth. An experiment in Louisiana found that phosphorus applications consistently and significantly increased yields of white and subterranean clovers. Higher nitrogen content was found in plants receiving phosphorus.

Establishing the Cover Crop

Soil pH and fertility levels must be adequate for growth of the cover crop. The soil should be disked, incorporating any needed fertilizer or liming materials, and then partially smoothed before planting the cover crop. Better stands are obtained and 20 to 50 percent less seed is used when the seed is drilled rather than broadcast. Cover crops can be established using a no-till grain drill. It is important to have good contact between the seed and the soil and to plant at the correct depth. See Conservation Tillage for more details on no-till practices. To increase biomass and nitrogen production (in legumes) and to suppress weed growth more effectively, cover crops should be seeded at rates higher than those recommended for seed or forage production.

Incorporating the Cover Crop

The amount of biomass and nitrogen provided by the cover crop, its rate of decomposition, and the ease of establishing the vegetable crop vary with the growth stage of the cover plant and the time of incorporation. The purpose of the cover crop and the needs of the vegetable crop determine the growth stage at which the cover crop is incorporated.

Incorporating before bloom when foliage is green and succulent results in rapid increase in soil biological activity, rapid decomposition of cover crop, and quick release of nutrients into the soil. Incorporating just before or at full bloom is usually recommended because it results in decomposition and nutrient release over longer period and accumulation of more biomass. Incorporating after bloom may result in better aeration of poorly drained soils, reseeding of cover crop, and high C:N ratios which slow decomposition and delay nutrient availability for following crop. Adding the main crop's fertilizer after the cover crop is killed may enhance residue decomposition. However, if this fertilizer is added while the cover crop is still growing and able to use it, it may not be available for the main crop, leading to reduced yields.

Fields planted with cover crops will have less soil moisture than bare or no-till fields. For this reason, cover crops are often not appropriate in dry regions such as the Great Plains. If soil moisture is limiting, the cover crop should be killed or turned under at least two weeks before the cash crop is planted. In more humid regions, however, incorporating residues improves water infiltration and surface residues reduce water evaporation, so cover crops can actually help crops withstand late-season droughts. Virginia cabbage planted into rye stubble with straw left on the field had yields 56 percent higher than cabbage planted on fields with the stubble left but the straw removed. Increased moisture in plots with the straw was the greatest factor in this increased yield.

For direct seeded beans, corn, melons, cabbage, and cucumbers, residues should be incorporated 30 days before planting to minimize carryover of seed corn maggots in decomposing.

REFERENCES

- Wagger, M.G. 1989. Winter annual cover crops. IN M.G. Cook and W.M. Lewis (ed.) Conservation Tillage for Crop Production in North Carolina. NC Cooperative Extension AG-407.
- Phatak, S.C., D.R. Sumner, L.D. Chandler, R.B. Chalfant, J.D. Gay and R.L. Bugg. 1992. Cover crops-vegetables relay cropping to reduce pesticide dependence. p. 387, Proc. 1st International Weed Control Congress, Vol. 2, 17-21 February, 1992. Monash Univ., Australia.
- Sarrantonio, M. 1991. How to choose a soil-building legume. The New Farm, July/August, pp. 23-25.
- Diver, S., and P. Sullivan. 1991. Cover crops and green manures. Appropriate Technology Transfer for Rural Areas, Fayetteville, AR.
- Kong, T., D.L. Robinson, and H.J. Savoy, Jr. 1993. Soil nitrogen and carbon status following clover production in Louisiana. Commun. Soil Sci. Plant Anal. 24:1345-1357.
- Wagger, M.G. and D.B. Mengel. 1988. The role of nonleguminous cover crops in the efficient use of water and nitrogen. p. 115-127. IN Cropping strategies for efficient use of water and nitrogen. ASA-CSSA-SSSA Special Publication No. 51, Madison, WI.
- Ranells, N.N. and M.G. Wagger. 1992. Crimson clover management to enhance reseeding and no-till corn grain production. Agron. J. 85:62-67.
- Morse, R., D. Vaughan and J. Wilhoit. 1988. Low-input production systems conserving soil moisture with mulch tillage. The Vegetable Grower News 42(4):3-4.
- Luna, J., and S. Rutherford. 1989. A minimum tillage no-herbicide production system for transplanted vegetable crops using winter-annual legume cover crops. Virginia Polytechnic Institute & State Univ., Blacksburg, VA, 2p.
- Varco, J.J., W.W. Frye, M.S. Smith, and C.T. MacKown. 1993. Soil Sci. Soc. of Am. J. 57:750-756.
- <http://www.cals.ncsu.edu/sustainable/peet/cover/cover.html>

Cover crops and green manures

H. David Thurston writes: "Considerable confusion occurs relative to the use of the terms cover crops and green manures, as they are used in different ways by different authors. The terms are often used interchangeably. Traditionally the term "green manures" has referred to plants which are turned under or incorporated into the soil while green, or soon after flowering, in order to enrich the soil. In recent years however, the term has been used more loosely, and green manure may sometimes refer to plants or plant vegetation which may be applied as a mulch to the soil, either slashed and fresh or after the plant has dried out.

As long ago as 1927 Pieters, in his comprehensive treatment of green manures, stated that "Green manuring is the practice of enriching the soil by turning under undecomposed plant material (except crop residues) either in place or brought from a distance." He further stated "A cover crop is one planted for the purpose of covering and protecting the soil." The Soil Science Society of America (1987) defined green manure as plant material incorporated into the soil while green or at maturity, for soil improvement.

Cover crops are any crops grown to produce soil cover, regardless of whether they are later incorporated. They are used to cover and protect the soil surface, although they may be turned under as green manures. Further, the term cover crop also refers to crops grown between orchard trees or on fields between cropping seasons to protect the land from leaching and erosion (Martin 1975). Diver and Sullivan (1992) wrote: 'Any field or forage crop grown to provide soil cover is a 'cover crop.' Since a crop grown as a cover crop may later be soil-incorporated as a green manure, the two practices are often referred to interchangeably.'

Source: H. David Thurston,
http://ppathw3.cals.cornell.edu/mba_project/gmcc/home.html