



# for the Gardener

UCSC FARM & GARDEN  
Center for Agroecology  
& Sustainable Food Systems,  
UC Santa Cruz

## Cover Crops for the Garden

**B**efore you hang up your spade and fork for the season, think about treating your garden beds to a fall planting of cover crops. Cover crops are grown not to feed the gardener, but to feed the garden—often referred to as “green manures,” cover crops boost soil fertility, cycle nutrients, and improve soil structure. They’ll also help protect your soil from erosion by blanketing it with a protective cover of vegetation.

Cover crops fall into two categories: 1) legumes, which include clovers, bell and fava beans, Austrian peas, and vetches, and 2) grains and grasses, such as barley, ryegrass, brome, fescue, and oats. Thanks to the mild climate on California’s Central Coast, we can grow both legume and grain/grass cover crops during the fall and winter.

For those averse to using animal-based fertilizers such as bone and blood meal to amend their soil, cover crops provide a good alternative. According to staff of Santa Cruz’s General Feed and Seed store, some gardeners successfully use cover crops as their only soil amendment.

### ROOTS AND SHOOTS AT WORK

Cover crops create an abundance of lush growth that in the spring will translate into lots of organic matter for your soil or compost pile. Organic matter is that essential part of the soil made up of decaying plants and animals; soil organisms, such as fungi, bacteria and worms, break down organic matter and make its nutrients available to growing plants. Whether turned under in the spring or made into compost, cover crops will act as a slow-release fertilizer, feeding the organisms that will help feed your vegetables and flowers.

Cover crops also shield the garden’s surface from rain damage. As raindrops hit the ground, they can disrupt soil structure, breaking down the soil’s crumb-like texture and causing compac-

tion. And even if you don’t see gullies running through your garden beds, fall and winter rains can gradually carry away exposed topsoil and critical nutrients.

While cover crops send out greenery aboveground, their roots are also at work. Grasses and grains produce large, fibrous root systems that improve soil structure and effectively take up nitrogen and other nutrients. These crops also add organic matter to the soil during the winter and spring, since they constantly slough off roots as the plants develop. Legumes have relatively simple root systems that support nitrogen-fixing *Rhizobium* bacteria (see page 2) and penetrate deep into the soil to loosen hard-packed beds. When the cover crop root systems decompose, they release nutrients back to the soil.

### A COVER CROP TO FIT YOUR NEEDS

As a rule of thumb, legume cover crops provide more nitrogen to the soil, while grasses boost soil organic matter more effectively. Some crops control erosion better than others, and some grow better under poorly drained or low fertility conditions.

At the UCSC Farm and Garden, we’ve found that a legume/grain mix provides the best combination of cover crop features.

“In the fall, we plant a mix of bell beans, purple vetch, lana vetch and barley,” says UCSC Garden manager Orin Martin. “The beans and vetch are both excellent nitrogen-fixing crops, and the barley gives the vetch a support to climb on. The barley roots also work the topsoil into a fine, friable loam—essentially doing much of the work of digging for you. The deep tap roots of bell beans penetrate and loosen heavy clay soils, and retrieve nutrients—particularly trace elements—from the subsoil.” Staff of the Farm and Garden also plant cereals such as oats and annual rye as cover crops.

### SOWING THE CROP

In the Monterey Bay region, cover crops can be planted from mid to late fall (mid October through early December). Earlier sowings (before mid November) are easier to establish and less vulnerable to bird predation. If birds are eating your newly emerging crops, you may need to cover the beds with bird netting until the plants are well established. If you sow later in the season, you may want to sow more seeds as a hedge against bird damage and the cool, wet conditions that can limit germination.

To plant a cover crop, prepare the beds by removing finished crops, loosening the topsoil, and raking or tilling the top few inches of soil into a fine seedbed (water the bed first if the soil is dry). One way to plant a bell bean/barley/vetch mix is to sow the beans first in furrows 2 inches deep, with the beans 4–6 inches apart in the row, and the rows spaced 8–12 inches apart. Cover the beans, then broadcast the smaller vetch and barley seeds over the beds and rake them in lightly—make sure they’re covered with soil. If you’re planting a crop of fava or bell beans only, you’ll probably want to use more beans (see below). Unless you’re sure that a good rain is on the way, water the cover crop in to get it growing. In a year of normal rainfall the plants should need little supplemental watering.

How much cover crop seed to use will depend on the type of crop you plant and the size of your garden. Here are some recommended seeding rates for 1,000 square feet of beds (enough for 20 beds measuring 5’ x 10’):

- 3–4 pounds of a typical green manure mix (50% bell beans, 30% Austrian peas, 20% common vetch)
- 2 pounds of a legume/grass blend (65% bell beans, 35% barley)
- 3–5 pounds of bell beans (*Vicia faba*)

- 3 pounds of purple vetch
- 4–8 pounds of annual rye grass (*Lolium* sp.)

You can greatly increase the nitrogen-fixing capacity of your legumes by coating them with a legume inoculant, a fine powder containing the bacteria that fix nitrogen (see sidebar, below). Most clovers are pre-inoculated, but check when you buy your seed supplies.

If you don't get a chance to plant a cover crop, there are other ways to protect your beds. A heavy mulch of organic material such as straw or aged manure will act as a physical cover, protecting the beds from rain damage. These materials will also break down during the course of the season and add organic matter to the bed.

#### BACK TO THE SOIL

Between March and May, when the average daily soil temperature tops 55°F and decomposing organisms become more active, you can cut down the cover crop.

“Bell beans should be skimmed off with a sharp spade—leaving the roots in the soil—when thirty to fifty percent of the flowers are in bloom, before they start to direct nitrogen to seed formation and become too high in carbon,” says Martin. The vetch/rye mixture should also be skimmed at approximately fifty percent bloom, usually in April or May. If the crop gets too woody (high in carbon), it will break down more slowly and delay your planting time.

The cut crops can be handled one of two ways: either chopped up with a sharp spade, mower, or weed whip

(roots should be chopped, too) and worked into the top foot of soil with a spade or rototiller, or gathered up and added to your compost pile. The first method leaves your beds looking a little lumpy for a while, but bacteria, fungi, worms, and other soil organisms will break down the incorporated cover crops in several weeks, unless the soil is too cold. The deeper the crops are dug in, the slower they'll decompose. “Cover crops should be allowed to break down thoroughly before you plant your main crop, although potatoes, dahlias, and other tubers can be planted directly into the dug-in cover crop,” says Martin.

If you choose to harvest your cover crops rather than dig them in, they'll provide a good source of “green” material for your compost pile (balance it with an equal volume of “brown” material, such as straw or dry leaves). But remember that by removing the cover crops from your beds you also remove nutrients and organic matter from the soil that must be replaced.

“If you take cover crops from a bed to use for compost, it's important to add finished compost back to that bed before you plant your spring crops,” says Martin. “Otherwise, you may actually be reducing the amount of organic material in the soil.” Martin notes that by composting cover crops, you end up with a product that has a broader, more complete nutrient base than the cover crops provide by themselves.

#### SUMMER COVER CROPS

If your soil could use a boost in organic matter during the summer season,

consider planting a summer cover crop. Buckwheat is a fast-growing crop that suppresses weeds, attracts beneficial insects, and creates wonderful tilth when worked into the soil. It grows to maturity in 30–45 days and can be used to protect the soil prior to planting late-season crops such as fall vegetables.

Buckwheat can either be sown in furrows or broadcast over the bed and carefully raked in. The recommended seeding rate is 3 lbs. per 1,000 square feet—if you broadcast the seed, use double the rate. The crop should germinate following one or two irrigations. Once established, irrigate 1"–1.5" per week for good growth.

#### SOURCES

You can buy cover crop seed and legume inoculants at garden supply stores in Santa Cruz and Monterey Counties, or through mail-order garden supply companies. For information on cover crops best suited to your climate and soil type, consult your local University of California Cooperative Extension agent, Master Gardener information line, or garden supply store. Then give your garden a fall meal—you'll reap the benefits all year long.

#### References

*Building Soils for Better Crops*, by Fred Magdoff and Harold Van Es. Sustainable Agriculture Network Series #4, 2000.

*Start with the Soil: The Organic Gardener's Guide to Improving Soil for Higher Yields, More Beautiful Flowers, and a Healthy, Easy-Care Garden*, by Grace Gershuny. Emmaus, PA: Rodale Institute. 1997.

*The Soul of Soil: A Soil-Building Guide for Master Gardeners and Farmers, Fourth Edition*, by Joseph Smillie and Grace Gershuny. Chelsea Green Publishing. 1996.

*This material is written, produced and distributed by staff of the Center for Agroecology and Sustainable Food Systems at the University of California, Santa Cruz. For more information about CASFS resources and activities, call 831.459-3240, or write CASFS, University of California, Santa Cruz, CA 95064. The Center's web address is casfs.ucsc.edu.*

#### NITROGEN FIXATION

Legume crops such as bell beans “fix” nitrogen from the air via *Rhizobium* bacteria, which live in association with the legume roots. As they develop, the roots secrete chemical compounds that attract *Rhizobium* bacteria and stimulate the bacteria to multiply. Root hairs curl around the bacteria, which enter the hairs via an infection thread formed by the plant. The thread penetrates the root cortical cells, which develop into a distinct structure called a *nodule*. You can see these nodules when you harvest your cover crops—look for the pink, knobby growths on the roots.

Within the nodule, the bacteria multiply and differentiate into *bacteroids*, capable of producing a chemical that can convert nitrogen from the atmosphere into a form that the plant uses to make proteins. In return, the bacteria receive food in the form of sugars synthesized by the plant during photosynthesis. When the cover crops decompose, the nitrogen within the nodules becomes available for growing crops to draw on.