# Cover Crops

by Dana Visalli

Crimson clover

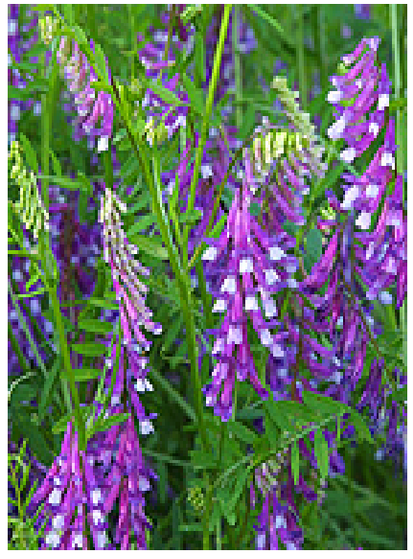
Our agricultural fields are artificial ecosystems, maintained by importing energy external to the systems themselves. Industrial agriculture simply adds energy from 'ancient sunlight'; the energy stored in fossil fuels is used to turn the soil, to acquire and add necessary nutrients (especially nitrogen and phosphorus), and to deal with adversity such as insect pests and weeds. This approach cannot be sustained because fossil fuels are finite. A sustainable approach to agriculture is to add energy to the system using plants that will pump energy into the soil in the form of organic plant matter produced by photosynthesis, and that will add nutrients to the soil, loosen the soil, and will suppress harmful insects and weeds. The primary tool for this process is the use of cover crops.

Cover crops—which are crops that are grown to be turned back into the soil rather than eaten—are a vital component of maintain fertile soil over time. The most important attributes of cover crops are that they 1) increase the amount of organic matter in the soil, which supplies nutrients, retains moisture and feeds soil organisms, including earthworms and bacteria, and 2) add critical nutrients to the soil, especially nitrogen, which is extracted from the atmosphere (which is 79% nitrogen) by nitrogen-fixing bacteria that live in mutual (symbiotic) relationships with plants of the Legume or Pea Family. Because they increase the fertility of the soil, cover crops are also known as green manures. In addition, Cover crops prevent soil erosion, keep down weeds, bring subsoil nutrients to the topsoil, loosen the subsoil, and provide habitat and nectar for beneficial insects.

Some cover crops seeds are quite small; the smaller the seed the more care must be taken in planting them. If they are too deep they will not germinate, if they are too shallow they may dry out. The very small seeds of mustards and clover should be planted no more than ¼" deep, and preferably shallower than that. The soil must be kept reasonably moist until the seeds germinate and establish roots. A seed drill that packs soil over the seed after planting is the preferred method, and a fine seed bed should be prepared beforehand. Legume seeds must be inoculated with the appropriate bacteria before planting; inoculants are available at feed stores and through seed supply companies. Irrigation should be applied immediately after planting, wetting the soil to at least 2", with several subsequent waterings.

Hykson rose clover

Fall planted cover crops in the Methow should be planted between August 1 and August 15, striving for 5-6 weeks before the first frost. Plants need time to develop beyond the seedling stage to survive the winter. Spring planting is best done between April 15 and May 15, after the soil has warmed a bit but before the weather gets hot and dry.



Hairy vetch

The best time to till the cover crop into the soil is when 50% of the flowers are first in bloom; this captures the most nitrogen from the plants. Green crops turned under will decompose much more rapidly than dry plants; chopped or mowed dry plant matter has advantages over green, in that the slower decomposition acts as a time-release of nutrients. If turning the cover crop into the soil is problematic due to lack of machinery, another option is to harvest the crop and put it in the compost pile. The peas and beans that we grow for food are legumes and fix nitrogen in the soil, but because we allow the plants to develop seeds, much of the nitrogen is invested in the seeds, and thus is not available to the soil. Legumes turned under in the fall will lose 70% of their nitrogen to the atmosphere by spring, whereas legumes turned in in the spring, before the food crop is planted, will loose only 35% of their nitrogen.

When the cover crop serves as pasture for grazing animals, animal manure is deposited on the soil, and fertility is enhanced even more. To save the time, energy and cost involved in planting cover crops, they are often maintained in place for 2-4 years, serving as pasture for grazing and as a hay crop (manure from the animals eating the hay must be returned to the field to gain any benefit in this case). It is common in Europe to plant as many as 4 species together as a cover crop (two legumes, a grass and a mustard), each one interacting with the soil ecosystem differently. Gardening guru Eliot Coleman has developed a technique of 'undersowing' a green manure crop in the rows between his vegetables 4-5 weeks after the main crop is planted, in effect 'double-cropping' his plots. There are many ways to utilize cover crops; each individual tends to develop his/her own favorite methods.

For more information on cover cropping, read Eliot Coleman's chapter on 'Green Manures' in his book, *The New Organic Grower.*

Rapeseed

**Cover Crops**
May be available at local feed store; most carried by Peaceful Valley Farm & Garden Supply (www.groworganic.com ) and Johnny's Seeds (www.johnnyseeds.com )
Nitrogen fixation and pounds of organic matter per acre differ wildly in references as it will in the field, thus the quantities in the table should only be used as a general guideline.

| Scientific Name<br>a=annual, b= bi, p= perennial | Common Name | Hardiness | Nitrogen Fixation | Planting lbs/acre, Price/lb | lb/ac Organic Matter | Planting Season | HT | Notes<br>An asterisk * after the common name indicates species used/recommended by Eliot Coleman |
|---|---|---|---|---|---|---|---|---|
| **Legumes:** | | | | | | | | All legumes fix nitrogen, all should be mixed with inoculant before planting |
| Glycine max | Soybeans | 32d | 85-130 lbs/ac | 150/$9.00 | 1000-6000 | s/s | 48"+ | High yield of organic matter, beneficial before potatoes to inhibit scab |
| Lathyrus sativus-a | Chickling vetch | 22d | 60 lbs/ac | 50-70/$9.35 | 1000 | s | 48" | Fixes N in 45 days, very drought tolerant, seed eaten in quantity can cause nerve damage |
| Medicago sativa-p | Perennial alfalfa | 0d | 200 lbs/ac | 25/$6.90 | 2000-5000 | s/f | 24" | Bees, hay, deep taproot, biomass, N fix |
| Medicago sativa-a | Annual "summer" alfalfa | 15d | 200 lbs/ac? | 15-20/$20 | 2000-5000 | s/f | 24" | Good for bees, high biomass, taproot, forage. Grows more rapidly than perennial alfalfa. |
| Melilotus alba-a&b | White sweetclover* | 0d | 125 lbs/ac | 12-20/$5.50 | 3000-7500 | s/f | 72" | Deep taproot, bees, pasture, hay, needs moisture, good for dry organic matter |
| Melilotus officinalis-b | Yellow sweetclover* | 0d | 125 lbs/ac | 12-20/$3.50 | 3000-7500 | s/f | 72" | Deep taproot, bees, pasture, needs less moisture, may need to plow in spring |
| Pisum arvense-a | Austrian winter peas | 10d | 70-125 lbs/ac | 80-120/$1.10 | 5000 | f | 36" | High biomass, ground-hugging |
| Pisum arvense-a | Biomaster peas | 10d | 70-125 lbs/ac | 80-120/$1.90 | 5000+ | f | 72" | High biomass, grows to 6' if supported |
| xTrifolium alexandrinum-a | Berseem clover | 20d | 100-300 lbs/ac | 15-20/$3.40 | 3000-7500 | f | 24" | Good for bees, green manure, pasture, hay |
| xTrifolium hirtum-a | Hykon rose clover | 10d | 75-100 lbs/ac | 15-25/$5.10 | 2500-3000 | f | 18" | Good for bees, will grow in poor soil & low rainfall |
| xTrifolium hybridum-p | Alsike clover | -5d | 75-100 lbs/ac | 15-20/$3.30 | 2000 | s/f | 18" | Needs moisture, does well on moist ground, not for dry conditions, good for bees |
| xTrifolium incarnatum-a | Crimson clover | 10d | 80-100 lbs/ac | 10-40/$7.40 | 2000-4000 | s/f | 36" | Bees, cover crop in grain, grows well in cool weather, shade tolerant, 50% hard seed |
| xTrifolium pratense-p | Red clover* | 0d | 140 lbs/ac | 10-20/$5.30 | 4500 | s/f | 36" | Bees, planted with grain for nectar after harvest, deep taproot, moderate % hard seed |
| Trifolium repens-p | Dwarf White clover* | 0d | 50-100 lbs/ac | 15-30/$6.50 | 1000 | s/s | 10" | Good for walkways, can be mowed regularly, a rather invasive plant |
| xTrifolium resupinatum-a | Nitro-Persian clover | 15d | 200 lbs/ac | 6-10/$5.10 | 2000-4000 | s/f | 24" | Good for bees, long-blooming, good forage, low rainfall, moderate % hard seed |
| Vicia atropurpurea-a | Purple vetch | 20d | 200 lbs/ac | 40-80/$2.50 | 2000-4000 | s/f | 36" | Good for bees, good pasture & hay, very vigorous |
| Vicia dasycarpa-a | Lana woolypod vetch | 10d | 275 lbs/ac | 30-50/$2.50 | 3000-8000 | s/f | 36" | Good for bees, matures early, fixes boo-ku nitrogen |
| Vicia faba-a | Bell & fava beans | 10d | 150 lbs/ac | 80-125(175)/$2.80 | 4000-8000 | s/f | 80" | Good for bees, biomass |
| Vicia sativa-a | Common vetch* | 0d | 80-200 lbs/ac | 60-90/$1.50 | 2000-4000 | s/f | 36" | Very good for bees, hay, forage, lower yielding but cheap, moderate % hard seed |
| Vicia villosa-a | Hairy vetch* | -5d | 80-250lbs/ac | 20-80/$3.40 | 2000-6000 | s/f | 36" | Cold-climate vetch, grows well in spring after fall planting, not as vigorous as others |
| Vicia villosa dasycarpa-a | Namoi woolypod vetch | 0d | 80-250 lbs/ac | 30-50/$2.50 | 2000-6000 | s/f | 36" | Same as above but more vigorous, moderate % hard seed. |
| **Grasses** | | | | | | | | |
| Avena sativa-a | Oats | 20d | 0 | 150/$6.70 | 1000-5000 | s/s/f | 36" | A quick-growing green manure crop, fall planted will not re-grow in spring, nurse crop |
| Hordeum vulgare-a | Barley | 15d | 0 | 85/$4.75 | 1000-5000 | s/s | 36" | A quick growing green manure crop, nurse crop for legumes |
| Secale cereal-b | Winter rye | 0d | 0 | 80-115/$4.75 | 3000-8000 | s/s/f | 48" | Hardy winter cover crop, high yield of organic matter, easy to grow |
| Triticum aestivum-a | Spring wheat | 15d | 0 | 120/$2 | 1000-5000 | s | 36" | A quick growing green manure crop, nurse crop for legumes |
| **Mustard** | | | | | | | | |
| Brassica napus & others-a | Rape, mustard, canola | 15d | 0 | 5-10/$2 | 1000-4000 | s/f | 36" | Deep-rooted, breaks up sub-soil, stimulates soil microbes, excellent forage |