# Soil Quality Enhancement Activity – SQL11 –Cover cropping in orchards, vineyards and other woody perennial horticultural crops

**Enhancement Description**
Grow perennial or annual cover crop mixtures of grass, legumes, native flowering plants and/or other forbs year round to provide soil coverage, organic mulch, beneficial insect habitat, and other conservation benefits in orchards, vineyards or other perennial horticultural crops. Cover crops, once planted, are replanted annually or maintained year after year.

**Land Use Applicability**
Cropland

**Benefits**
Maintaining orchard and vineyard floors or row middles of perennial horticultural crops with continuous cover protects the soil resource from erosion, enhances soil quality, reduces compaction and rutting from field operations, and suppresses weeds. Cover crops provide habitat for pollinators and natural enemies of crop pests, fix nitrogen (legumes), and conserve moisture via organic mulch and suppress weeds.

**Conditions Where Enhancement Applies**
This enhancement only applies to acres of orchards, vineyards, and other woody perennial cropping systems.

**Criteria**
1. Plant cover crops in the inter-row spaces to be compatible with optimum yield and quality of the fruit crop. Grow cover crops on a minimum of 60% of the field area year annually. When annual cover crops are used, plant each succeeding cover crop within as soon as possible after termination of the preceding cover. Residue from the previous cover crop must be left on the soil surface until immediately before the next cover crop is planted.
2. Areas near crop rows or young, establishing trees that must be kept free from competing vegetations shall be maintained with organic mulch to control erosion, conserve soil moisture, and sustain soil quality. Select mulching material, application rate, and placement compatible with needs of the production crop. Total soil coverage (living cover + mulch) shall be maintained at a minimum of 85% of the field area. Replenish mulch as needed. Exception: In lieu of using mulch to meet the 85% minimum requirement, the area beyond the 60% minimum shall be seeded to a cover crop for systems where the mulching material would hinder harvest operations.
3. Select and seed cover crop mixtures at rates and within planting date ranges as determined or agreed to by the NRCS State Agronomist. Perennial mixtures must consist of at least two

species from different plant families. Annual cover crops must include at least three species from a minimum of two different plant families.

4. Select a mixtures and sequence of cover crop species to accomplish two or more of the following objectives:
   a. High biomass and root mass to build soil organic matter. Expect at least 2 tons/ac of aboveground biomass annually.
   b. Biologically fixed nitrogen for the production crop. Choose a mixture that will provide sufficient but not excessive amounts of N to the crop. Schedule mowing or termination of the cover to optimize rate and timing of N release for crop needs. Leave clippings near crop rows for desired N delivery.
   c. Mulch generation. Plant mixtures which can be cut periodically to generate mulch material for application to crop rows or areas not protected by living cover.
   d. Weed suppression. Select covers that establish rapidly form a heavy canopy and suppress weeds without competing excessively with the production crop. Schedule mowing of perennial covers to optimize weed control and prevent weed propagation.
   e. Habitat for beneficial insects. Select a mixture of flowering plants based on the habitat needs of key predators or parasitoids to control the most economically important pests of the crop to be protected.
   f. Pollinator habitat. Select a mixture of flowering plants to provide food and habitat for desired pollinators. Time mowing and other management operations to minimize competition for pollinators while the fruit crop is blooming.

**Adoption Requirements**

This enhancement is considered adopted when cover crop mixture are established and total ground coverage (living cover + organic mulch) reaches 85% of the field area.

**Documentation Requirements**

1. Cover crop species mix, planting dates, mowing dates and (for annual species) termination dates and methods.
2. Pattern and layout of production and cover crops plus mulch used to document how soil coverage criteria were reached.
3. The accomplished items from “Criteria #4.”
4. Photographs of representative fields showing cover crops added to the rotation, timing and method of cover crop establishment, and cover crop management.
5. Seed and legume inoculant tags and receipts.

**References**

Ames, G. K., G. Kuepper, and A. Baier. 2004. Tree Fruits: Organic Production Overview. National Sustainable Agriculture Information Service. http://attra.ncat.org.

Dufour, R. 2006. Grapes: Organic Production. National Sustainable Agriculture Information Service. pp 44. http://attra.ncat.org

Hinman, T., and G. Ames. 2001. Apples: Organic Production Guide. National Sustainable Agriculture Information Service. pp 40. http://attra.ncat.org

Kuepper, G. L., S. Diver, K. Adam, M. Guerena, and P. Sullivan. 2004. Blueberries: Organic Production. National Sustainable Agriculture Information Service. pp 26. http://attra.ncat.org

Kuepper, G.L., H. Born, and J. Bachman. 2003. Organic Culture of Bramble Fruits. National Sustainable Agriculture Information Service. pp 20. http://attra.ncat.org

USDA Sustainable Agriculture Research and Education (SARE) Handbook Series Book 9. Managing Cover Crops Profitably, 3rd Ed. http://www.sare.org.

**United States Department of Agriculture**
**Natural Resources Conservation Service**

# IDAHO ADDENDUM 2013
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**Additional guidance for cover crop mixes:**

Cover crops must be grown on a minimum of 60% of the field. Mulches will also be used to provide a minimum of 85% total field coverage (when combined with cover crop coverage). Use cover crops and mulches that best fit the operation. **Cover crop mixes and seeding rates/planting dates will be approved in advance by the Idaho NRCS State Agronomist.**

Table 1. Legume cover crop species with associated agronomic data.

| Cover Crop Species | Life Cycle | Potential Fixed Nitrogen (lbs/A) | Seeding Rate (lbs/A) | Seeding Depth (inches) | % Nitrogen Content[1] | Rhizobium Inoculant Type |
|---|---|---|---|---|---|---|
| **Legumes** | | | | | | |
| Annual medic* | SA | 40-100 | 10-40 | 1/4 to1/2 | 1.5 | A |
| Berseem clover* | SA | 60-90 | 9-20 | 1/4 to1/2 | 2.6 | R |
| Crimson clover* | SA | 50-60 | 12-20 | 1/4 to1/2 | 2.7 | R |
| Austrian peas | SA / WA | 30-100 | 70-150 | 1 to 2 | 2.2 | C |
| Hairy vetch | WA | 60-180 | 25-40 | 1/4 to1/2 | 3.7 | C |
| Mammoth red clover | B | 60-70 | 8-15 | 1/4 to1/2 | 2.9 | B |
| Sweetclover (yellow) | B | 70-90 | 8-15 | 1/4 to1/2 | 3.1 | A |
| Alfalfa | P | 50-150 | 9-25 | 1/4 to1/2 | 3.3 | A |
| White clover | P | 60-100 | 5-7 | 1/4 to1/2 | 3.9 | B |
| Medium red clover | P | 60-70 | 10-15 | 1/4 to1/2 | 2.9 | B |
| Alsike clover | P | 60-70 | 4-10 | 1/4 to1/2 | 2.9 | B |

*Cover crops not commonly used in Idaho
[1] Dry weight basis, data from USDA Plant data base and UC SAREP online Cover crop database (http://www.sarep.ucdavis.edu/ccrop/)

Table 2. Non Legume cover crop species with associated agronomic data.

| Species | Life Cycle | % Nitrogen Content[1] | Seeding Rate (lbs/A) | Seeding Depth (inches) |
|---|---|---|---|---|
| Buckwheat* | SA | 1.25 | 35-60 | 1/4 to1/2 |
| Forage turnips | SA | 3.3 | 3-5 | 1/4 to1/2 |
| Forage radish | SA | | 10-15 | 1/4 to1/2 |

| | | | | |
|---|---|---|---|---|
| Oilseed radish | SA | 3.8 tops<br>2.5 roots | 25 | 1/4 to1/2 |
| Mustards (White) | SA | 3.5 | 15 | 1/4 to1/2 |
| Mustards (Oriental) | SA | 3.5 | 10 | 1/4 to1/2 |
| Canola / Rape | SA/WA | 3.5 | 15 | 1/4 to1/2 |
| Annual ryegrass | SA | 1.3 | 15-25 | 1/4 to1/2 |
| Barley | SA / WA | 2.2 | 50-100 | 1 to 2 |
| Rye | SA / WA | 2.8 | 50-100 | 1 to 2 |
| Triticale | SA / WA | 2.0 | 50-100 | 1 to 2 |
| Wheat | SA / WA | 2.3 | 50-100 | 1 to 2 |
| Oats | SA | 2.1 | 35-70 | 1 to 2 |
| Sudangrass | SA | 1.3 | 20-60 | 1 to 2 |

*Cover crops not commonly used in Idaho
1 Data from USDA Plant data base and UC SAREP online Cover crop database (http://www.sarep.ucdavis.edu/ccrop/)
Notes:
Life cycles: P = perennial, WA = winter annual, SA = summer annual, B = biennial
Nitrogen values vary depending on cover crop densities (biomass produced) and date of planting

**Estimating Yields and Amount of Nitrogen (N) in Cover Crop (Criteria #4.b.)**

The total yield of the cover crop and the percentage of nitrogen in the plants should be determined just prior to termination.

Yield

Take cuttings from several areas in the field, dry and weigh them. Using a yardstick or metal frame of known dimensions (1 ft x 2 ft which equals 2 $ft^2$ works well), clip the plants at ground level within the known area. Dry them out in the sun for a few consecutive days, or use an oven at about 140 degrees Fahrenheit for 24 to 48 hours until they are "crunchy dry". Use the following equation to determine per-acre yield of dry matter:

$$\textbf{Yield (lbs) / acre} = \frac{\textbf{total weight for dried samples (lbs)}}{\textbf{\# square feet sampled}} \times \frac{\textbf{43,560 sq ft}}{\textbf{1 acre}}$$

While actually sampling is more accurate, you can estimate your yield from the height of your green manure crop and its percentage of groundcover. Use these estimators: At 100 percent ground cover and 6-inch height, most non-woody legumes will contain roughly 2,000 lbs/ A of dry matter. For each additional inch, add 150 lbs. For most small grains and other annual grasses, start with 2,000 lbs /A at 6 inches and 100 percent groundcover. Add 300 lbs for each additional inch and multiple by percentage of ground cover. If the stand is less than 100% groundcover, multiply the final result by the % of groundcover.

Nitrogen Yield

To estimate the exact % N in your plant tissue, you should have it analyzed by a lab. IF you don't have tissue test results, use the information in Table 1 and 2 to estimate. Soil testing in the spring and fall is recommended to provide trend data for nitrogen residual.

Soils contain from 1,000 to 6,000 pounds of nitrogen per acre (about 1,000 lbs for each percent organic matter) in the top 7 inches of soil. However, most of it is unavailable to plants as it is tied up in stable organic matter which decomposes very slowly. The process of organic matter decomposition by microorganisms, referred to as mineralization, releases some organic nitrogen as ammonium (NH4+), a plant available form.

Annual legumes typically have between 3.5 and 4 percent N in their aboveground parts prior to flowering (for young plants use the higher end of the range), and 3 to 3.5 % after flowering. Most cover crop grasses contain 2 to 3 percent N before flowering and 1.5 to 2.5% after flowering. Other covers, such as brassicas and buckwheat, will generally be similar to, or slightly below grasses in their N content.

$$\textbf{Total N in cover crop (lbs /A)} = \textbf{yield lbs/A} \times \frac{\textbf{\%N}}{\textbf{100}}$$

To estimate what will be available to the subsequent crop, divide this quantity of N (lbs/ac) by**:**

- 2, if the green manure will be conventionally tilled (this assumes about 50% mineralization rate)
- 4, if it will be left on the surface in a no-till system

Example: Wheat cover crop, 18 inches tall, 100% cover, conventionally tilled into the soil.

Initial 6 inches = 2,000 lbs
12 additional inches = 300 lbs /inch x 12 = 3,600 lbs
Total = 5,600 lbs

$$5{,}600 \text{ lbs /A} \times \frac{2.3\% \text{ N}}{100} = 129 \text{ lbs of N}$$

$$\frac{129 \text{ lbs N}}{2} = \text{about 65 lbs N available for the subsequent crop}$$

**This activity may NOT be used with the following enhancements:**
**ENR10, SQL04, SQL08, WQL10**

**Potential Duplicate Practices:**
**340 – Cover crop, 327 – Conservation cover**