



UCCE Cover Cropping Field Day 10/23/14-Hurst Ranch, Jamestown, Ca.

L.R. Wunderlich, UCCE Farm Advisor-Central Sierra lrwunderlich@ucanr.edu

Chuck Ingels, UCCE Farm Advisor-Sacramento Valley caingels@ucanr.edu

Photos from: Cover Cropping in Vineyards, A Grower’s Handbook ANR publication 3338

I. Is cover cropping for you?

Pros	Cons
	Frost damage potential increased
Prevent soil erosion and water runoff	
Build organic matter-improve tilth and water penetration	
Take up excess soil moisture	Compete with crop for water
Improved orchard or vineyard accessibility (vehicle and crew footing)	
Legumes increase N	Grasses may compete with crop for nutrients
Potentially less pest damage	Potentially more pest damage
Economics-potential benefits over long term (difficult to measure, i.e. improved water penetration impact yield)	Economics-costs for start-up (seed, equipment)

**Note: Growers should consider individual site capacity – a lot of variability exists in the foothills and what works for your neighbor may not work for you. Consider soil type, depth, available crop water, elevation, nutrient status.

II. Discussion: Cover cropping in drought. (see handout)

III. Cover crop choices: To till or not to till.

Determines species choice.

Till (roots cut) aka “green manure”	No-till (mowed) aka “permanent” or “competitive” – though not all are competitive
Adds carbon source for soil microbes, increases microbial biomass	Increases soil permeability and soil organic matter content
Legumes – low C:N ratio, release N Grasses – higher C:N ratio, tie up N	Weed control (yellow star thistle competition)
Erosion control before till down (in winter)	Erosion control
Less competitive (tilled down before season starts)	Competitive
Gopher tunnels destroyed	Gopher tunnels persist; clovers and medics attract gophers

Species.

Till mix options (large seeded; can plant into Nov.):

- Oats
- Barley
- Cereal Rye
- Peas
- Vetch
- Bell Bean

- **Oats** tolerate wet, heavy soils and low pH soils, common in the foothills. However, oats are less tolerant to drought and cold temps.
- **Barley** is inexpensive and fast growing, providing good biomass and competition against weeds. It is not as tolerant to wet conditions as oats.
- **Cereal rye** can germinate with cooler temperatures and it is the most cold-tolerant cereal.
- **Peas.** Austrian Winter pea has pink and red flowers, is dormant during the winter but produces large biomass if allowed to grow into spring. Magnus peas have large light and dark pink flowers and large tendrils; it grows during the winter and matures earlier than Austrian Winter, allowing for earlier tillage in spring.
- **Vetch** species differ in cold tolerance and aggressiveness. Lana is vigorous, but if it will be incorporated in early spring, it shouldn't get out of control. Hairy vetch is the most cold tolerant and it also grows fast. Common vetch is the least aggressive but it doesn't grow as much in winter – it puts on most of its growth in late winter through spring. One of the vetches is often used in a high-biomass (large-seeded) mix.
- **Bell Bean** has a large taproot that helps open up heavy soils. May be omitted in frost prone areas due to its height. Doesn't tolerate mowing.



Oats



Barley



Cereal Rye



Austrian Winter



Magnus Pea



Vetch



Bell Bean

No-till options for winter annuals (plant in October-hopefully with rain):

Zorro fescue
 Blando Brome
 Rose clover
 Subterranean clover
 Bur medic

For color/flower appeal (mow high, plant every other row?):

Mustards
 Phacelia

- **‘Zorro’ fescue** is a fast growing, early maturing grass. It is well suited to soils with rocks, volcanic pumice or gravel. It’s a good choice for erosion control with minimal seedbed preparation needed. It can be mowed to 4 inches but avoid mowing for a month in spring, around early May, to allow reseeding. ‘Zorro’ fescue can substitute for ‘Blando’ brome where quicker fall growth and greater drought tolerance is needed, but it is more expensive than ‘Blando’ brome.
- **‘Blando’ brome**, a selection of soft chess, is low growing and mowable, and it matures early. It has strong seedling growth, excellent reseeding, and dense, fibrous roots. A good choice for reducing erosion without competing excessively with the vines.
- **Rose clover** grows well on rocky, dry soils with low pH but does poorly in wet, heavy soils. Reseeds well but stand can be thin and can let weeds encroach.
- **Subterranean clover** (sub clover) tolerates close mowing, provides weed suppression, is loved by livestock, and most varieties prefer low pH soils.



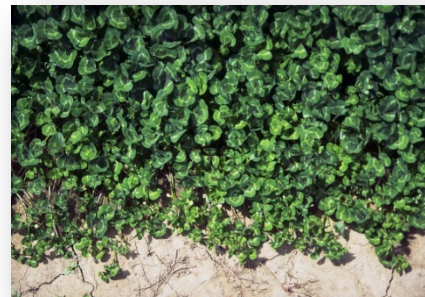
‘Zorro’ fescue



‘Blando’ brome



Rose clover



Subterranean clover

IV. Establishing the cover.

- Disking, to remove weeds so they don't compete with seeded cover, and then smoothing and levelling the area to be seeded, if possible, is preferred but not always possible.
- The best strategy is to use a regular seed drill to seed the cover crop (see Muratori demonstration) or a no-till drill.
- Alternatively, use a broadcast seeder, and use a shallow harrow and/or ring roller to lightly bury seed. Unburied seed risks drying out and failing to establish.
- **Fertilizer.** Some species will benefit from addition of N (grasses) and/or P or S (flowering species, legumes).
- **Inoculants.** Some legumes require inoculation with Rhizobia, the bacteria that fix N. Inoculants are living bacteria (with an expiration date) and care should be taken not to expose them to heat, pesticides, or direct sunlight.

V. Managing the cover crop.

Why timing is critical

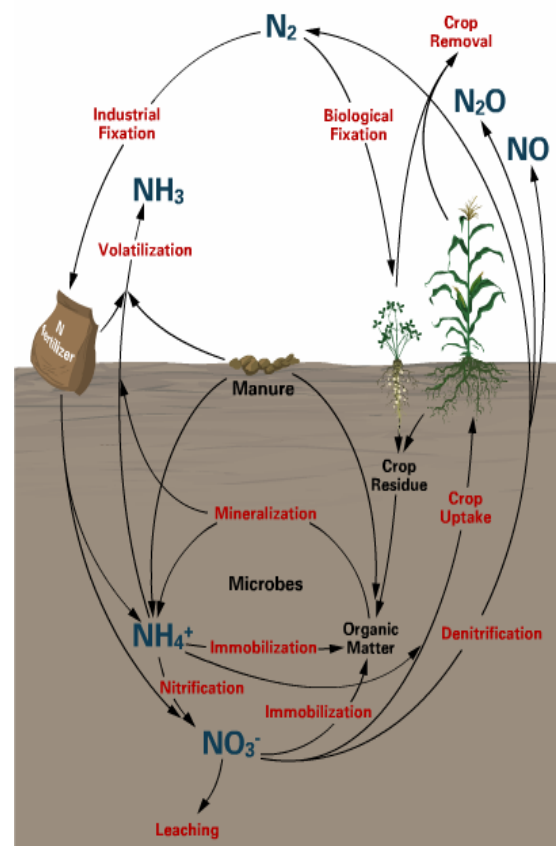
- Frost danger to crop
- Maximizing N
- Reseeding

What happens when a cover crop is tilled in?

Breakdown of cover residue and nutrient release depends on many factors, including:

The cover crop species; C: N ratio; timing of tillage; biomass accumulated (how much the cover crop grew); the soil texture, temperature and moisture level; and the degree of chopping and incorporation.

- ✓ **Discussion of N cycle and fate: is tilling always better?**



The Nitrogen cycle. From Cornell University Cooperative Extension Fact Sheet

Calculating the amount of plant available N (PAN) from your cover crop.

Table 4-1. Example calculation of nitrogen contribution by a legume cover crop

In a vineyard with a 'Lana' woollypod vetch cover crop, a total of 8 lb of the vetch was cut from three 1-ft by 3-ft sample areas. A 1-lb subsample was collected and submitted to the lab.

Lab analysis of moisture content	=	82%
Lab analysis of dry weight N content	=	2.8%
Sample dry matter	=	100% - 82%
	=	18%

To find the amount of N contributed per planted acre of cover crop:

$$8 \text{ lb} \times 18\% \text{ dry matter} = 1.44 \text{ lb dry matter} / 3 \times 3 \text{ ft area}$$

$$1.44 \text{ lb dry matter} \times 2.8\% \text{ N} = 0.04032 \text{ lb N} / 9 \text{ sq. ft}$$

$$0.04032 \text{ lb N} \div 9 \text{ sq. ft} = 0.00448 \text{ lb N/sq. ft}$$

$$0.00448 \text{ lb N/sq. ft} \times 43,560 = 195.1 \text{ lb N/planted acre of cover crop}$$

To determine the amount of N per vineyard acre:

$$\begin{aligned} \text{Swath covers 50\% of row:} &= 97.6 \text{ lb} \\ 50\% \times 195.1 \text{ lbs} &= \text{N/vineyard acre} \end{aligned}$$

Cover crop planted in every other row:

$$97.6 \text{ lb N/vineyard acre} \div 2 = 48.8 \text{ lb N/vineyard acre}$$

Adapted from Frate 1994.

Table 4-2. Estimated amounts of nitrogen fixed by various legumes

Cover crop	N fixed (lb/acre)
'Lana' woollypod vetch (<i>Vicia villosa</i> ssp. <i>dasycarpa</i>)	50–200
Medics (<i>Medicago</i> spp.)	50–100
Subclover (<i>Trifolium subterraneum</i>)	184–250
Rose clover (<i>Trifolium hirtum</i>)	50–100
White clover (<i>Trifolium repens</i>)	114–200
Strawberry clover (<i>Trifolium fragiferum</i>)	100–300

Source: Munoz and Graves 1987.

Equipment options for no-till management.

Flail mowing (can also chop up prunings at same time). Better at shredding biomass. More \$\$.
Need to sharpened and replace blades.

Rotary mowing. Work better with shorter stature covers. Less \$\$.

Roller/Crimper. Knocks down the cover crop without shredding to form a weed-suppressing mulch. “Chevron” design of blades prevents bouncing. Popular with no-till grain farmers.

VI. Pest Management and Cover Cropping

- Yellow starthistle and weeds.
- Leafhoppers in vineyards.
- Gophers and voles.

VII. Wrap up and Questions.