

Cover Crops and Green Manures

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Cover Crops

Provide Many Benefits for the Soil and Crop

- ✦ Least expensive nutrient and soil improvement method
- ✦ Increase organic matter and humus content
- ✦ Sequester carbon
- ✦ Increase beneficial microorganisms and earthworms
- ✦ Increase soil nitrogen content
- ✦ Increase availability of *all* nutrients
- ✦ Stabilize soil; prevents erosion
- ✦ Extracts nutrients from subsoil to topsoil for crop use
- ✦ Provides habitat, pollen and nectar for beneficial insects
- ✦ Improve water, root and air penetration

Cover Crops

More Benefits for the Soil and Crop

- ✦ Increase water holding capacity and availability
- ✦ Suppress and compete with weeds
- ✦ Break up subsoils and hardpans
- ✦ Reduce populations of pest organisms
- ✦ Reduce populations of nematodes
- ✦ Provide grazing and hay for animals
- ✦ May be used for mulch or compost pile
- ✦ Used in no till systems, annual and perennial
- ✦ Marketable as greens, flowers and seed
- ✦ Provide aesthetic value and color

Organic Matter (Carbon) Increases

Species	Dry Matter Per Acre
Annual Ryegrass	2.7-4.8 tons
Barley	2.2-4 tons
Bell Beans	2.1-4.6 tons
Buckwheat	.5-1.2 tons
Cereal Rye	3.6-5.3 tons
Common Vetch	1.8-3.2 tons
Crimson Clover	2.8-4.5 tons
Field Peas	.9-1.7 tons
Lana Vetch	2.2-3.9 tons
Mustard	2.0-3.2 tons
Oats	2.4-5.2 tons
Oats/Peas/Vetch/Bell Beans	3.2-6.1 tons
Red Clover	1.7-3.3 tons
Subterranean Clovers	2.2-3.3 tons
Sudangrass	3.4-6.6 tons

Nitrogen Fixation By Legumes

Legume Species	Nitrogen Fixed (Pounds Per Acre)
Alfalfa	70-225
Bell Beans	135-220
Berseem Clover	90-200
Birdsfoot Trefoil	44-105
Crown Vetch	98-145
Cowpeas	90-225
Crimson Clover	57-90
Fava Beans	58-225
Field Peas, Winter	85-190

Nitrogen Fixation By Legumes

Legume Species	Nitrogen Fixed (Pounds Per Acre)
Red Clover	60-115
Soybean	20-275
Subterranean Clovers	52-165
Sweet Clover, Yellow	85-120
Vetch, Common	90-140
Vetch, Lana	125-270
Vetch, Purple	90-220
Vetch/Bell Bean/Field Pea/Oat Mix	160-295
White Clover, Perennial	115-180

Cool Season Annual Cover Crops



Austrian Winter Peas



Magnus Pea

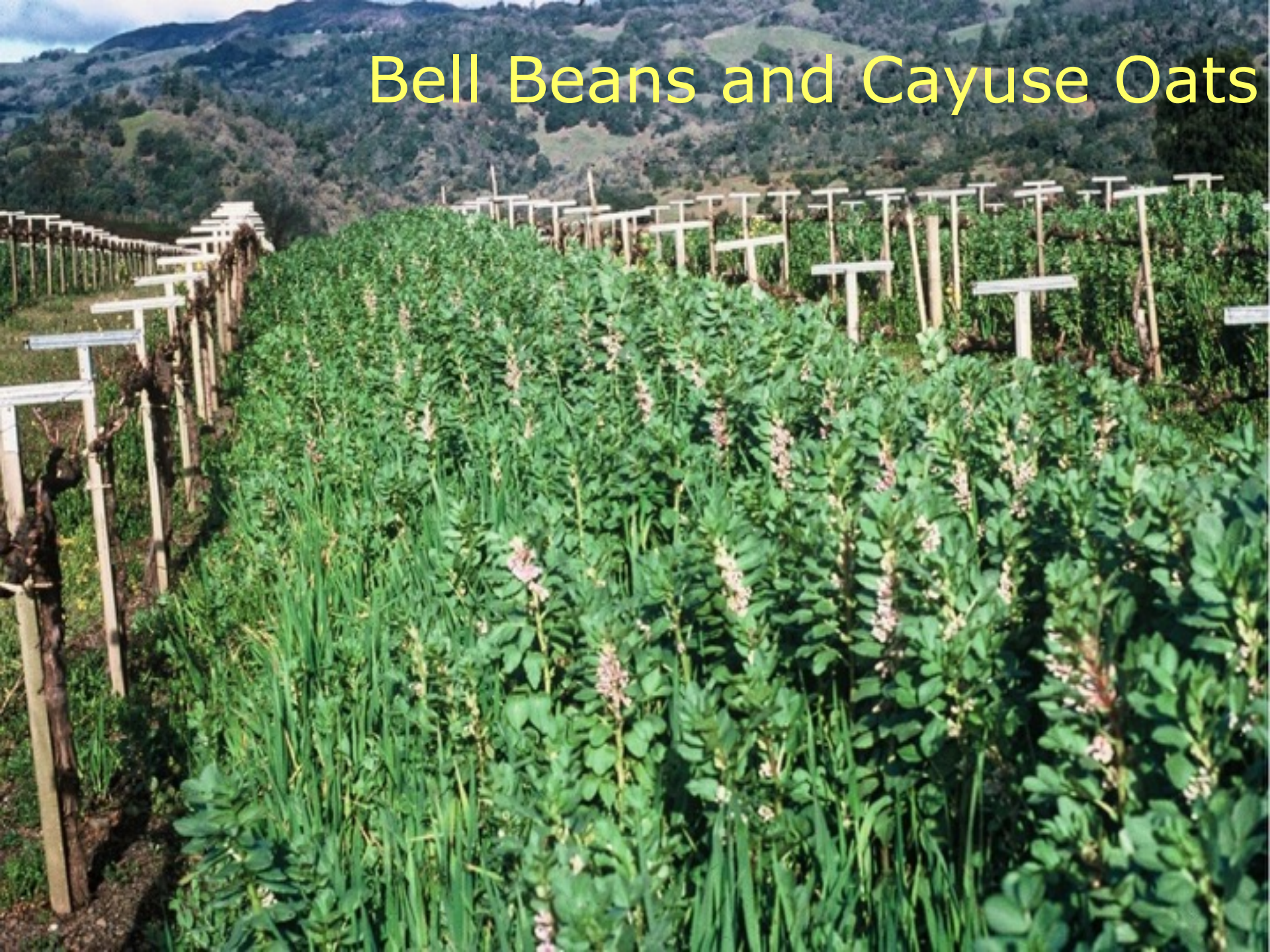


Bell and Fava (aka Faba)
Beans

Bell Beans, Lana & Purple Vetch, Magness Peas, Cayuse Oats



Bell Beans and Cayuse Oats







Purple Vetch



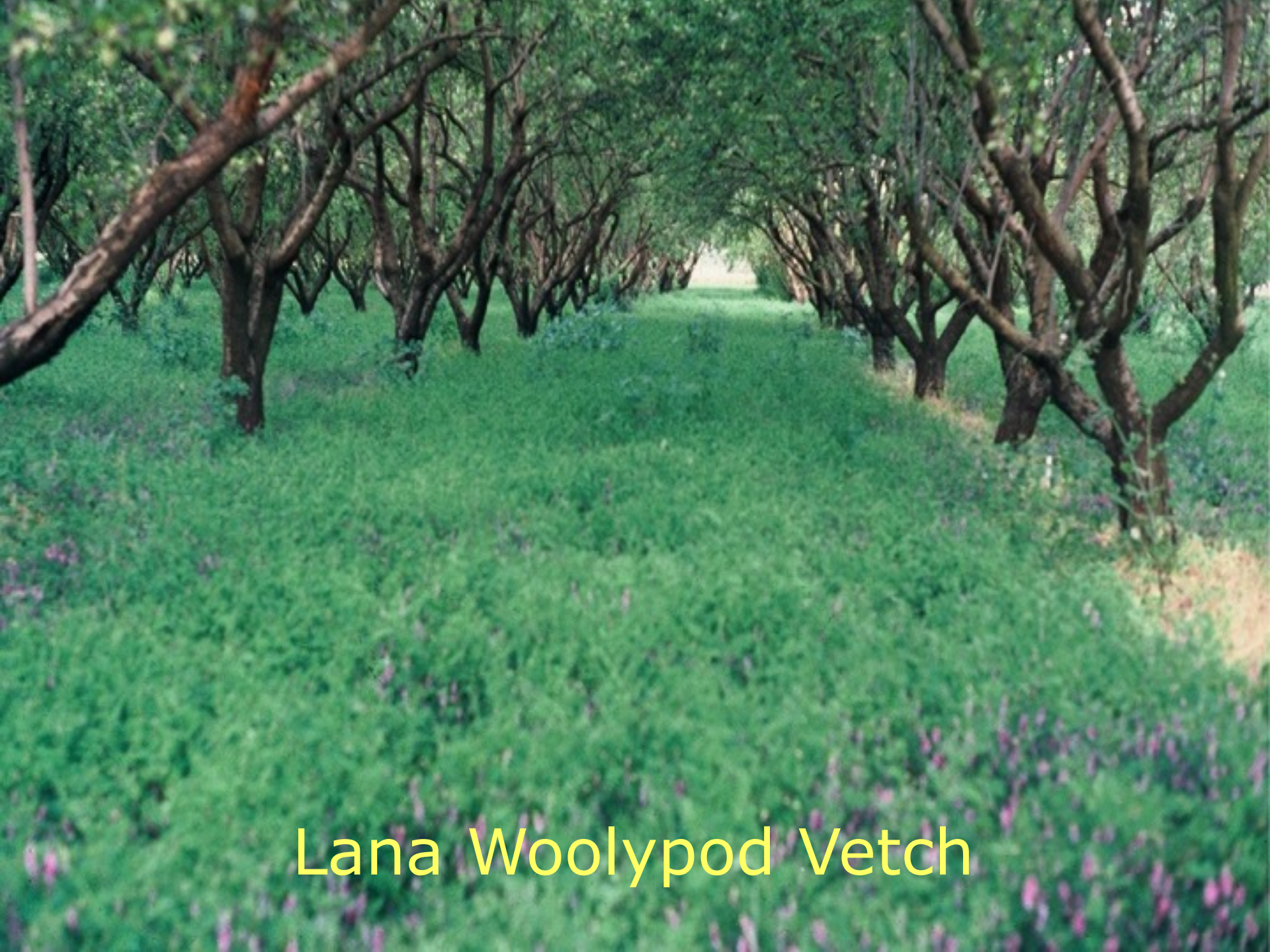
Purple Vetch and Cayuse Oats



MERCED RYE GRAIN



Purple & Lana Vetch, Austrian Winter Peas,
Bell Beans, Cayuse Oats



Lana Woolypod Vetch



Cayuse Oats, Lana Vetch, Subterranean Clovers

Common Yellow Mustard



Nematicidal Mustards



Daikon Radish aka Tillage Radish





Daikon Radish aka Tillage Radish

Daikon Radish aka Tillage Radish





Subterranean Clover



Medics

Indian Sour Clover





Crimson
Clover



Hykon Rose Clover



Hykon Rose Clover



Red Clover



Berseem Clover
aka Egyptian Alfalfa



87613

Sub Clover Mix, Medics and New Zealand White Clover



Subterranean Clovers and Medics



Sub Clover Mix



Annual Lupin





White Grain Lupin



Grain Lupin aka Lupini



Garbanzos (aka Chickpeas)



Lentils

Sweet Peas



Wheat





Wheat



Wheat and Bean Relay Cropping

Red Clover Seeded Under Flax





Underseeding Clover in Winter Squash

Warm Weather Annual Cover Crops



Field Beans



Garden Beans



Cowpeas and Black Eye Beans

Iron and Clay Cowpeas



Red Ripper Cowpeas





Castor Beans

Crotolaria
aka Sunn Hemp





Crotonaria



Sesbania

Velvet Beans



Sudan Sorghum and Purple Vetch



Sudangrass

Artichoke and Sudangrass



Buckwheat



Lab Lab



Perennial And Biannual Cover Crops

New Zealand and Strawberry Salina Clovers





Ladino and Strawberry Perennial Clovers



New Zealand White Clover



Alfalfa





Artichoke and Alfalfa Interplan



Lab Lab Living Mulch

Desmodium aka Prayer P





Arachis Perennial Peanut



Yellow Sweet Clover

Pest Management with Cover Crops



Bell Bean
Extra Floral Nectary

Onion





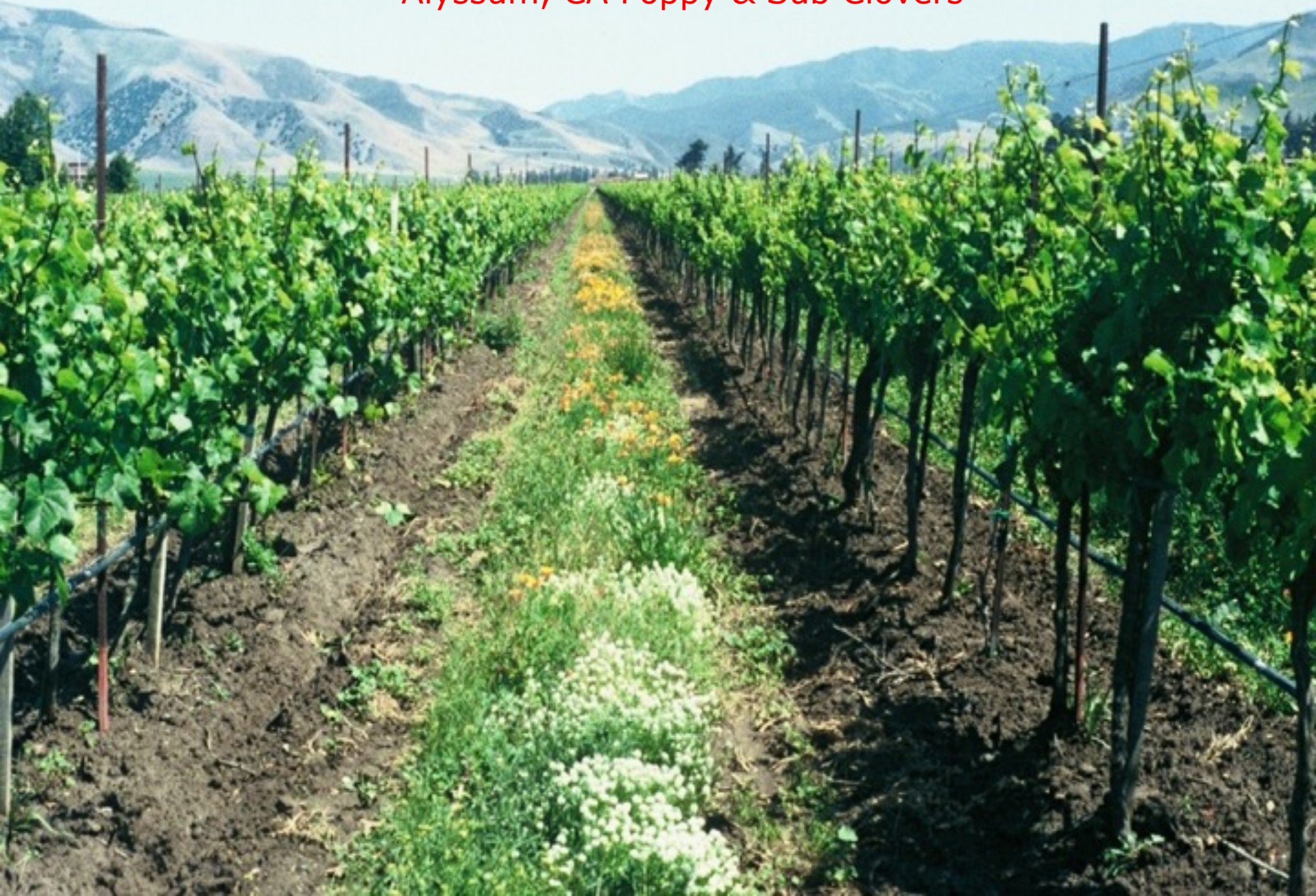
Alfalfa



Cover as Border Insectary

Winter Cover Incorporated
2 weeks earlier

Alyssum, CA Poppy & Sub Clovers





Artichoke and Alfalfa Interplant



Oats and Vetch

Buckwheat

A wide-angle photograph of a lush green field of Caliente Nematicidal Mustard plants. The plants are densely packed and appear to be in the early stages of flowering, with some yellow buds visible. The field extends to the horizon under a clear, bright blue sky. In the far distance, a small town or village with buildings and trees is visible on the horizon line.

Caliente Nematicidal Mustard















Oats and Peas as Mulch









New Zealand and Sub Clovers

Tips for Growing A Great Cover Crop

-  Select best species and varieties
-  Mixes usually outperform single species
-  Proper seeding rate
-  Use a drill; or increase seed rate
-  Prepare seedbed to meet seed needs
-  Correct seeding depth; common mistake
-  Plant at the right time; irrigate if necessary
-  Inoculate legumes just before planting
-  Provide adequate fertility
-  Mow or graze competition as needed

Requirements for Maximum Legume Growth

-  Proper planting date
-  High levels of phosphorus, calcium and sulfur
-  Properly inoculated with correct Rhizobium species
-  Adequate moisture during germination and growth
-  Incorporate quickly at early pod forming stage
-  Adequate light; manage competition

Rhizobium Bacteria With Good Nodulation



Poor Nodulation












Look For Pink Nodules

White and Yellow Nodules
are NOT Fixing Nitrogen



Inoculation Tips to Maximize Nitrogen

-  Use correct species of Rhizobium
-  Use fresh product; protect from heat
-  Use 2 times the recommended rate
-  Use milk for sticking agent
-  Pellet with soft rock phosphate
-  Inoculate, then plant immediately
-  Get the seed covered with soil ASAP
-  Inoculate for at least 2 years
-  Select most vigorous plants, with lots of pink or red nodules for home brewed inoculant; site adapted microbes

N-DURE

A Premium Inoculant

Buy In Bulk
See Us at
12345 St
12345 St
12345 St

DIRECTIONS FOR USE:

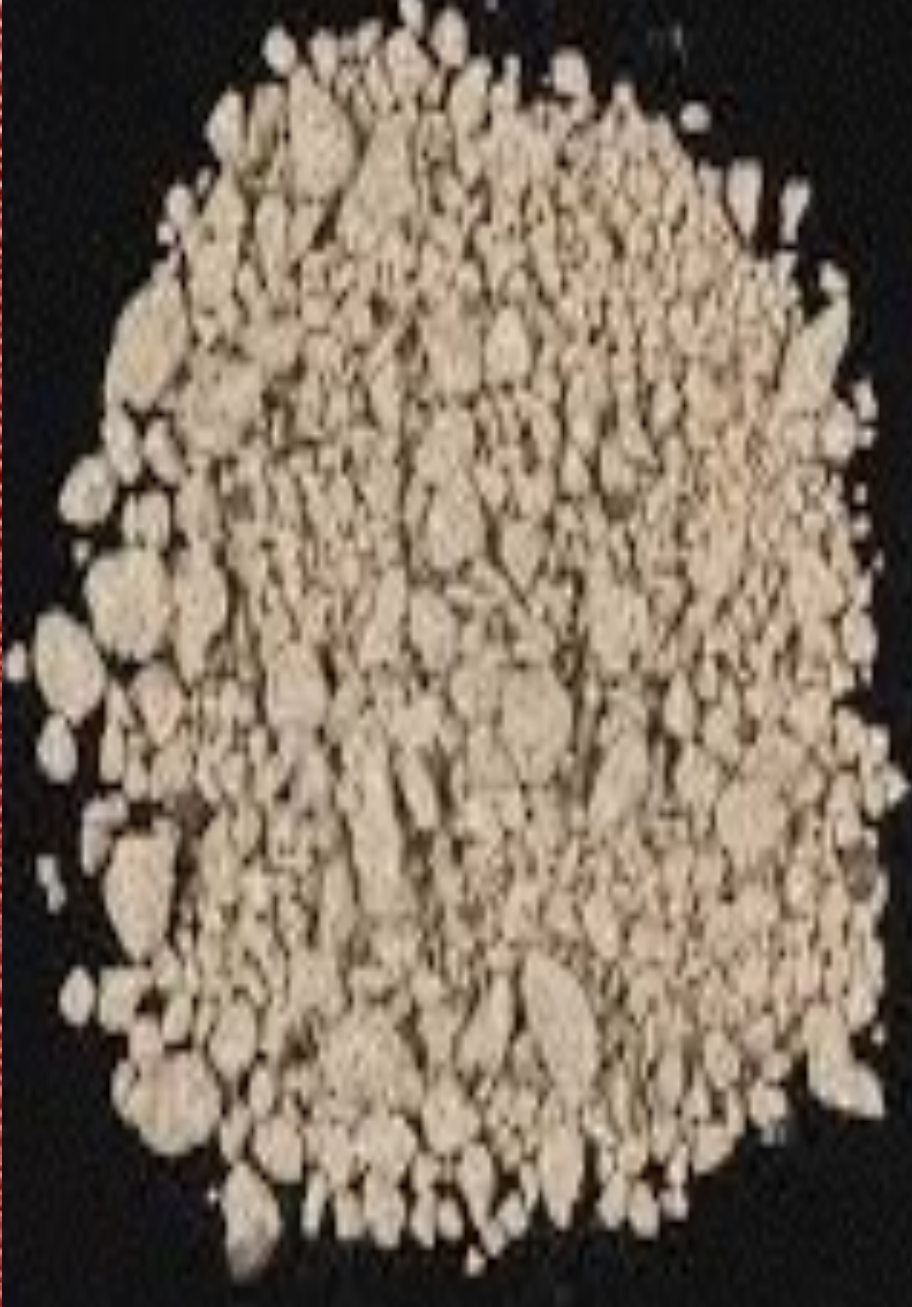
- 1. The most effective method for applying N-DURE is by using the shaker head...
- 2. Apply the amount of inoculant per seed as indicated on the label...
- 3. The inoculant should be stored in a cool, dry place...
- 4. Do not use the inoculant if the expiration date has passed...

- Get Correct Species of Bacteria
- Make Sure It's Fresh, Check Date
- Keep Refrigerated Until Use



Freshly Inoculated Raw Clover Seed












Pelleted Seed Farm Made
With Soft Rock Phosphate



Commercial Pelleted Seed

Maximizing Nitrogen Availability from Cover Crops

-  Incorporate at early to full bloom stage
-  Shred completely before tilling
-  Apply LAB, compost tea, compost or cellulose digester microbes at shredding or tilling
-  Incorporate immediately into moist soil, avoid rapid N loss
-  Use a spader
-  Cultivate 1-2x to increase oxygen
-  Irrigate if necessary



Optimum Stage For Maximum Nitrogen

Percent Nitrogen in Legume Tops and Roots

	%N Tops	%N Roots
Vetch	89	11
Cowpeas	84	16
Alfalfa	58	42
Red Clover	68	32
Soybeans	93	7

Fully Incorporate When Fresh and Green
For Maximum Nitrogen Availability





Cultivate to Add Oxygen and Speed
Decomposition

Cover Cropping Mishaps



Poor Weed Managment



Wrong Plant Choice



Austrian Pea & Oat Mix Planted early
October



Same Farm, Same Mix, Planted 3 Weeks

Seed Company Provided Wrong Oat Variety





Ryegrass Going To Seed



Topos



Poor Weed Management

Fescue Is Hard on Your Back!





Letting Cover Grow Too Long

Tools and Equipment for Cover Cropping

Broadfork



Walk Behind Rototiller











Seed Drill



No Till Seed Drill



Broadcast Seeders

Sheep Grazing Sudangrass



Cows Grazing Forage Turnips



Scything Buckwheat



String Trimming Cover Crop



Add To Compost Pile Fresh and Green



High Wheel Walk Behind Mower





Flail Mower



ATV with Flail Mower





Mowing and Disking Mustard Cover



Spader

Resources for Detailed Info on Cover Crops

 Amigo Bob Cantisano Organic Ag Advisors
orgamigo@gmail.com 530-292-3619

 "Green Manuring, Principals and Practices"
Adrian Pieters

 "Using Cover Crops In Oregon"
Oregon State University

 UC SAREP Cover Crop Database

Cover Crops Create Happy Soils and Happy Farmers

