

SHAFTER COVER CROP TRIAL GUIDE

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Growers throughout the country and the world plant cover crops to:

- Improve water infiltration
- Reduce erosion
- Reduce nitrate leaching
- Reduce compaction
- Fix nitrogen
- Increase soil organic matter
- Improve soil structure
- Increase nutrient holding capacity

Which cover crop species are best suited for Kern County?

We tried out 5 different cover crop mixes in Shafter, just north of Bakersfield in the southern San Joaquin Valley.



Disked the planting areas – an open field and in between grape vines on November 5, 2019. Plots were 5' by 10'.



Seeded the 5 mixes using a cone seeder on November 5, 2019



Applied irrigation water to all the plots on November 5 and 12 to ensure germination.

Total rainfall between November 1, 2019 and March 17, 2020: 3.45"

Because of the lack of rain in January and February (0.08" over the 2 months), we applied 0.5" water to one half of each plot on February 26 to observe the effects of irrigation on the cover crops.

COVER CROP OBSERVATIONS OVERVIEW

Continue reading on the following pages for pictures and more details on each mix!

Mix Name	Benefits	Drawbacks	Ideal for
1: Annual Plow Down Mix ¹	<ul style="list-style-type: none"> - Increase soil organic matter - Fix nitrogen 	<ul style="list-style-type: none"> - Potential frost risk - Might not outcompete weeds 	Fields with low soil organic matter and low nitrogen matter with more rainfall than Shafter or irrigation capacity
2: Erosion Control Mix ²	<ul style="list-style-type: none"> - Reduce erosion - Reduce nitrate leaching 	<ul style="list-style-type: none"> - Needs more water than the Shafter rainfall provides 	Sloping fields with erosion problems
3: Soil Cracker Mix ³	<ul style="list-style-type: none"> - Reduce compaction - Improve water infiltration 	<ul style="list-style-type: none"> - Potential frost risk 	Fields with compaction problems
4: Clover Mix ³	<ul style="list-style-type: none"> - Bee forage - Fix nitrogen 	<ul style="list-style-type: none"> - Needs more water than the Shafter rainfall provides 	Fields with more rainfall than Shafter or with irrigation capacity
5: Mustard Pollinator Mix ³	<ul style="list-style-type: none"> - Bee forage - Reduce compaction 	<ul style="list-style-type: none"> - Can become weedy - Potential frost risk 	Fields with nematode problems or pollinator needs

All 5 mixes did better in the open field compared to the plots in the grapevines. This is probably because the field was used for a fertilizer trial a few years ago. The cover crops appreciated the nutrients left over from the trial. In contrast, the managers of the grapevines have carefully fertigated the vines, so there aren't extra nutrients in the aisles.

Interested in trying cover crops on your farm?

The CDFA is offering incentives for planting cover crops through the Healthy Soils Program.

The deadline is June 26, 2020, but it's a rolling deadline, so the sooner you apply, the better.

For more information, contact Shulamit Shroder at 661-903-9442 or email her at sashroder@ucanr.edu.

¹<https://www.kamprathseed.com/copy-of-products>

²http://www.sseeds.com/media/218482/ssseeds_guide.pdf

³<https://www.projectapism.org/pam-seed-mixes.html>

Mix 1: Annual Plow Down Mix

Purpose: Add biomass, increase organic matter

Species: fava beans, field peas, common vetch, cayuse oats. 100 lbs/acre

Benefits

- Shade out weeds when established
- Increase soil organic matter
- Enhance soil structure
- Fix nitrogen

Other considerations

- Identify termination strategy – incorporating, knocking down, or mowing
- Can grow tall – think about frost risk
- Consider seeding location – avoid seedling establishment around irrigation
- Consider seeding timing – if located in a frost prone area consider seeding later to avoid high biomass production during the coldest days
- Consider rhizobial seed inoculants to ensure robust nodulation of legume roots
- Might need irrigation in dry winter

Shafter Observations

Open field (more nutrients): irrigation improved cover crop stand immensely, but also watered the weeds. Neither the irrigated nor the non-irrigated sections could out-compete the weeds. The irrigated section did end up producing a fair amount of biomass, including vetch, which fixes nitrogen.

Vineyard (fewer nutrients): poor stand establishment, very patchy. Irrigation didn't make a big difference because the stand came up so patchy. The patchiness may be due to the seeding equipment and not the mix itself, or perhaps this mix needs the extra nutrients found in the open field.



Irrigated Annual Plow Down Mix in open field



Non-irrigated Annual Plow Down Mix in open field



Annual Plow Down Mix in vineyard

<https://www.greencoverseed.com/product-category/seeds/>

Mix 2: Erosion Control Mix

Species: annual ryegrass, barley, and crimson clover.
75-100 lbs/acre.

Benefits

- Reduce erosion – especially important on a slope
- Scavenge nutrients – absorb soil nitrogen and reduce nitrate leaching

Other considerations

- May need supplemental irrigation
- Potential frost risk in a wet winter

Shafter Observations

Open field: irrigation allowed grasses to grow twice as tall. The crimson clover didn't do well at all, though. The non-irrigated section looks okay in some parts, but was completely invaded by a broadleaf weed in one area. The irrigated section was also very weedy.

Vineyard: both the irrigated and non-irrigated sections had very short grass and very little clover. The erosion mix did not do well with the lack of nutrients in the vineyard soil.



Irrigated erosion control mix in open field



Non-irrigated erosion control mix in open field



Erosion mix in vineyard

<https://www.greencoverseed.com/product-category/seeds/>

Mix 3: Soil Cracker Mix

Species: triticale, peas, white mustard, daikon radish, and common vetch. 75 lbs/acre.

Benefits

- Reduce soil compaction
- Improve water infiltration
- Enhance soil structure
- Increase soil organic matter

Other considerations

- Consider rhizobial seed inoculants to ensure robust nodulation of legume roots
- Potential frost risk in a wet winter

Shafter Observations

Open field: This mix did very well, even in the parts that didn't receive supplemental irrigation in February. The irrigated section is taller (hip high) than the non-irrigated section (knee high), but both sections are flowering and have produced significant biomass. Lots of bees in this plot. Vineyard: The cover crops were smaller than in the open field, but the irrigated section in the vineyard still had respectable growth. The non-irrigated section's plants were much shorter and thinner. The bees enjoyed this mix, too.



Irrigated Soil Cracker Mix in open field



Non-irrigated Soil Cracker Mix in open field



Irrigated soil cracker mix in vineyard



Non-irrigated soil cracker mix in vineyard

<https://www.greencoverseed.com/product-category/seeds/>

Mix 4: Clover mix

Species: rose clover, crimson clover, medic, balansa clover, Persian clover, berseem clover. 25 lbs/acre.

Benefits:

- Fix nitrogen
- Provide bee forage
- Will just dry up without needing a lot of resources to terminate it
- Low frost risk because of low stature

Other considerations

- Consider rhizobial seed inoculants to ensure robust nodulation of legume roots
- May need supplemental irrigation

Shafter Observations

Open field: the clover mix did very well with the additional irrigation but couldn't smother the weeds. The non-irrigated section barely grew. The irrigated section had plenty of flowers.

Vineyard: the clover mix did okay when it had supplemental irrigation but didn't even flower in the non-irrigated section.



Irrigated Clover Mix in open field



Non-irrigated clover mix in open field



Irrigated clover mix in vineyard



Non-irrigated clover mix in vineyard

Mix 5: Mustard Pollinator Mix

Species: canola, white mustard, yellow mustard, and daikon radish. 10 lbs/acre.

Benefits

- Provide bee forage
- Deep roots: better at surviving low water conditions
- Scavenge nutrients: absorb soil nitrogen and reduce nitrate leaching
- Suppress weeds
- May reduce nematode populations
- Establish easily
- Reduce compaction

Other considerations

- More management required so that they don't become weedy
- Frost risk: if located in a frost prone area consider seeding later to avoid high biomass production during the coldest days
- Don't grow before planting a cruciferous crop like broccoli



Mustard pollinator mix in vineyard

Shafter Observations

Open field: The mustards in the irrigated section grew up to 6 feet tall. Tons of flowers and bees – even a bird was observed in this area. Perhaps it was hunting some insect pests. The non-irrigated section also looked good, with plenty of biomass and flowers. It grew up to 4 feet high in some sections.

Vineyard: Little difference between the irrigated and non-irrigated sections. The plants are much shorter and thinner than their counterparts in the open field, but they are all flowering and providing bee forage. A decent amount of biomass has been produced.



Irrigated Mustard Pollinator Mix in open field



Non-irrigated mustard pollinator mix in open field

<https://www.greencoverseed.com/product-category/seeds/>

Mix Species Composition

	Annual Plow Down Mix	Erosion Control Mix	Soil Cracker Mix	Clover Mix	Mustard Pollinator Mix
<i>Legumes</i>					
fava beans	✓				
field peas	✓		✓		
common vetch	✓		✓		
rose clover				✓	
medic				✓	
balansa clover				✓	
Persian clover				✓	
berseem clover				✓	
crimson clover		✓		✓	
<i>Grasses</i>					
cayuse oats	✓				
annual ryegrass		✓			
barley		✓			
triticale			✓		
<i>Forbs</i>					
white mustard			✓		✓
daikon radish			✓		✓
canola					✓
yellow mustard					✓

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