Sacramento Valley Field Crops Newsletter
Issue 13 October 2023
University of California
Agriculture and Natural Resources Cooperative Extension

In This Issue

Submitted by:
Sarah Light
UCCE Farm Advisor
Sutter-Yuba and Colusa Counties

Organic Agriculture Workshop

Location: Sutter-Yuba UC Cooperative Extension Office
142 Garden Hwy A, Yuba City, CA 95991
Date: November 7 (Tuesday), 2023,
Time: 8:30 am -1:30 pm (free lunch included)

DPR and CCA credits requested,
INMP approved.

Program

8:30-9:00	Registration: Coffee and light snack
9:00-9:05	Introduction Sarah Light, *Agronomy Farm Advisor, Sutter and Yuba Counties*
9:05-9:35	Organic Rice Production: Pest Management Whitney Brim-Deforest, *County Director, Sutter and Yuba Counties and CE Rice and Wild Rice Advisor*
9:35-10:05	Growing Organic Almonds in the Sacramento Valley Franz Niederholzer, *Orchard Systems Farm Advisor UCCE Colusa, Sutter and Yuba Counties*
10:05-10:35	Integrating Livestock into Organic Cropping Systems Dan Macon, *County Director, Placer and Nevada Counties and Livestock and Natural Resources Advisor*
10:35-11:05	Cover Cropping and Weed Management: Considerations Sarah Light, *Agronomy Farm Advisor, Sutter and Yuba Counties*
11:05-11:20	UC Organic Agriculture Institute - Background and Current Activities Krista Marshall, *UC Organic Agriculture Institute*
11:20-11:40	Organic Nitrogen Management in Annual Cropping Systems Patricia Lazicki, Vegetable Crops Advisor. *Yolo, Solano and Sacramento Counties*
11:40-12:00	Integrated Soil Health Management for Plant Health in Organic Production Joji Muramoto, *CE Organic Production Specialist, UC Santa Cruz*
12:00-12:20	Accelerating Sustainable Pest Management: What does the new DPR roadmap mean for organic farmers? Margaret Lloyd, *Organic Agriculture and Small Farms Advisor, Yolo, Solano and Sacramento Counties*
12:20-1:30	Lunch
1:30	Adjourn

This free event requires an online registration from the link below or scan the QR Code:
https://ucanr.co1.qualtrics.com/jfe/form/SV_428ClixyI1ZIwv4

For questions, contact Sarah Light 530-822-7515, selight@ucanr.edu, or Joji Muramoto 831-247-3804. jmuramoto@ucanr.edu.

Cover Crops generate a Resource Rich Soil Environment for Soil Biota and Crop Roots

Lauren Hale, Research Soil Scientist, USDA-ARS, Parlier, CA
Sarah Light, UCCE Farm Advisor

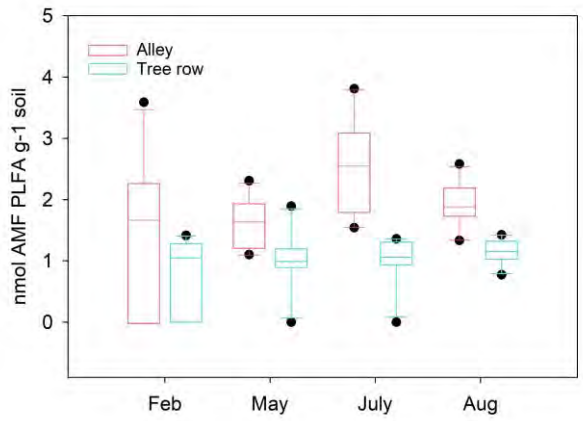
Cover crops are an important tool to protect soil from wind and water erosion and can confer on-farm benefits, such as increased soil water infiltration, pollinator habitat, and weed control. Living roots and litter from the cover crop can enhance soil organic matter and promote beneficial microbial activity. But, reasonably, growers have concerns that withdrawal of soil water and nutrient resources by cover crops might negatively impact cash crop yields. Whether the soil beneath the cover crops is subsequently planted with a cash crop, or in orchard and vineyard interrow spaces, depletion of water and nutrients in a production system is not ideal. To address this concern, we evaluated soil health characteristics in a cover cropped pecan orchard, examining both soil from both the interrow and in the tree rows.

We used both phospholipid fatty acid (PLFA) analysis and DNA sequencing of microbial molecular barcodes to help understand cover crop impacts on the soil microbiome. Our sequencing data provided a grand picture of all the bacterial and fungal species present in the soil and their portions relative to one another (excluding just the very rare species). Whereas, the PLFA data show us how the cover crops impacted the total abundance of the soil microbiota and partitioned that abundance into major microbial groups using biomarkers. From these two lines of evidence, we saw consistent trends. Microbial groups and species that tend to flourish in resource-rich environments were more abundant under the cover crops while the cover crops were actively growing. We looked specifically at arbuscular mycorrhizal (AM) fungi and ectomycorrhizal (ECM) fungi, because these organisms can colonize tree roots, extending their reach through soils, increasing crop uptake of nutrients and water. Interestingly, we found that AM fungi were higher in the interrows and ECM fungi were higher in the tree rows. ECM fungi tend to associate with trees, so their presence in the tree rows was expected and reassuring to see.

Cover crops in a pecan orchard supported microbial communities that thrive in resource rich environments and had higher soil carbon and nitrogen than did adjacent soils beneath trees

But AM fungi are generalists, so they can interact with roots of the cover crops as well as the

tree roots. Colonization of tree roots with both ECM and AM fungi offers more benefits to the trees, as these groups tend to differentially access disparate pools of soil nutrients. Results of a correlation analysis indicated that one of the grasses in the interrow, which was actually part of the native vegetation, positively correlated with the abundance of AM fungi in the soil.



Abundances of arbuscular mycorrhizal fungi were higher in alleys under actively growing cover crops than in adjacent tree rows in a pecan orchard in Colusa, CA

We also found that soil moisture, carbon (C) and nitrogen (N), and the ratio of soil C to N were all higher in the interrow beneath the cover crops. This impact was more dramatic in a 7-year-old orchard compared to a 5-year-old orchard. Litter cover from the cover crop residues positively correlated with soil moisture, nitrate content, and microbial biomass. This provides some evidence that the cover crops can stimulate an active microbial community and provide residues that return nutrients to the soil system and can reduce soil moisture losses. Altogether, our results suggest that cover crops shaped a soil environment with greater resources availability than is present in the tree rows, supporting beneficial microbial populations and promoting soil health. A few plant species co-varied with beneficial microbial groups and soil nutrients, which can inform future decision making for cover crop species selections with different goals.

This project was supported by the Environmental Defense Fund and the USDA-ARS in cooperation with Ben King and Pacific Gold orchard. More information on the results can be found in Rodriquez-Ramos, et al., 2022, AE&E https://doi.org/10.1016/j.agee.2022.108049 or by directing questions to Dr. Lauren Hale, lauren.hale@usda.gov. The USDA is an equal opportunity provider and employer.

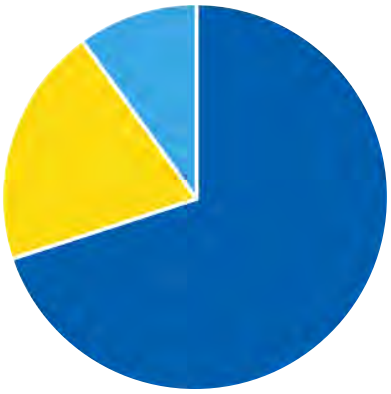
Cover Crop Performance in the Sacramento Valley During a Wet Year

Sarah Light - UCCE Agronomy Advisor, Clair Akin - UCCE Cover Crop Selection Tool Coordinator, Peter Bowman - Graduate Fellow

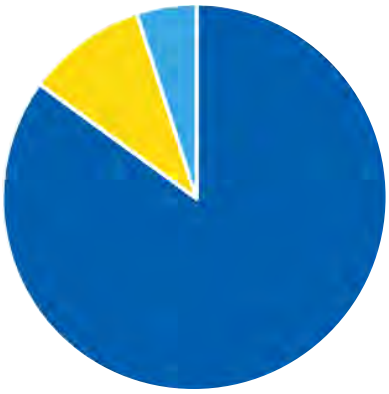
Single bed plots were planted with a push planter on December 21, 2022. Percent Cover (cover crop, weeds, bare soil) and height were collected on February 22, 2023. Photos were taken on the same day. Planting depth was not adjusted by species and seeding rate was dependent on seed size and planter seed plate. This was intended as a demonstration of species performance in the region. No irrigation was applied to plots. There were approximately 8.3 inches of precipitation from cover crop planting to data collection.

For mixes, the visual composition of the final cover crop stand is included in a second pie chart. The seed mix composition by weight is included in the treatment description. Not all cover crop plots are pictured.

Spring Triticale
Height: 22 inches

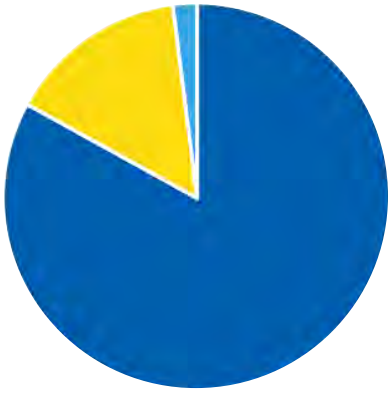


Winter Triticale
Height: 14 inches

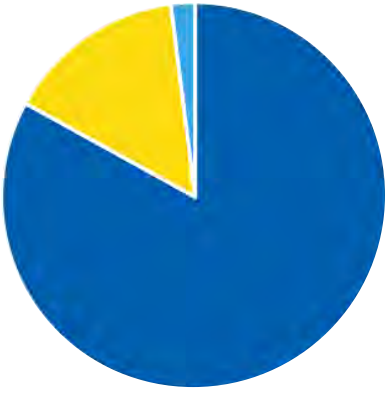


Beardless wheat in field

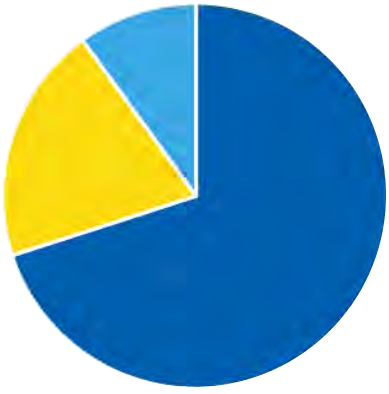
Bearded Barley
Height: 19 inches



Beardless Wheat
Height: 21 inches



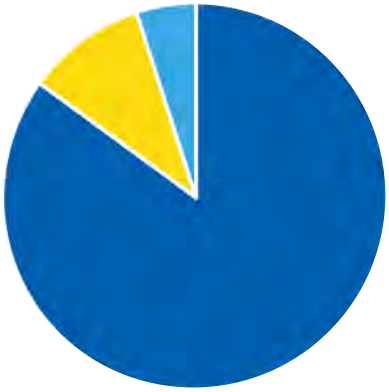
Cayuse Oats
Height: 23 inches



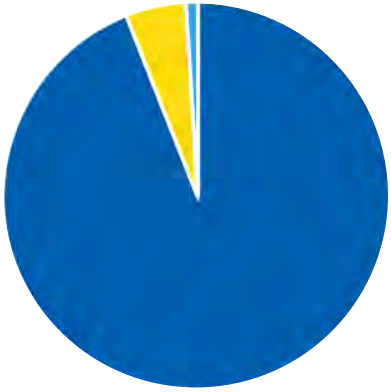
Key: Percent Cover Crop=dark blue, Percent Bare Soil=yellow, Percent Weeds=light blue

Daikon radish in field

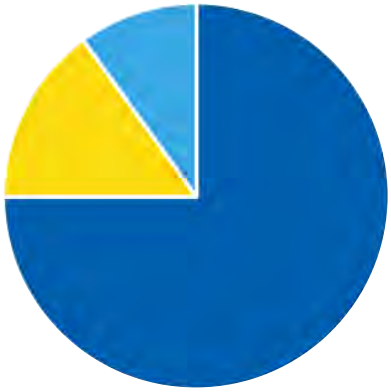
Purple Top Turnip
Height: 18 inches



Daikon Radish
Height: 27 inches



Black Mustard
Height: 20 inches



Common vetch in field

Purple vetch in field

Lana Woolypod vetch in field

Common Vetch

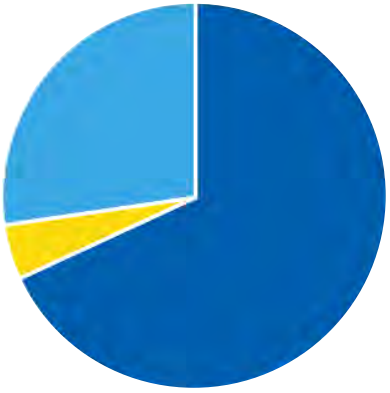
Height: 5 inches

Purple Vetch

Height: 6 inches

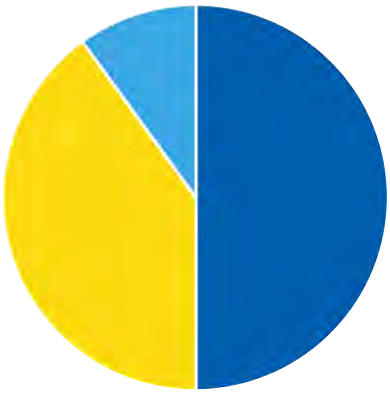
Lana Woolypod Vetch

Height: 8 inches

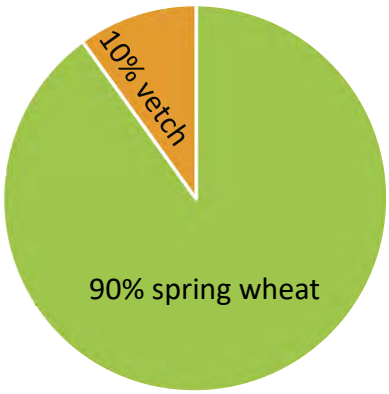


Key: Percent Cover Crop=dark blue, Percent Bare Soil=yellow, Percent Weeds=light blue

70% Spring Wheat, 30% Common Vetch
Height: 19 inches

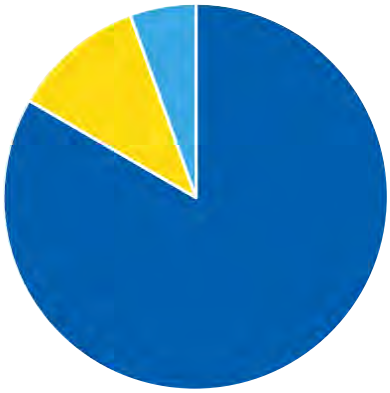


Final Cover Crop Composition

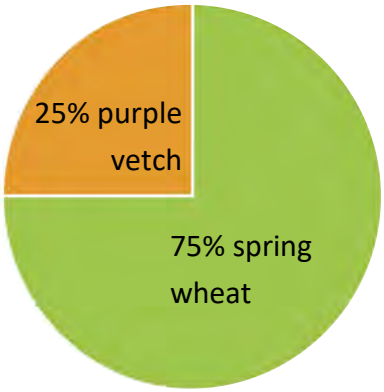


Spring wheat/common vetch mix

70% Spring Wheat, 30% Purple Vetch
Height: 20 inches

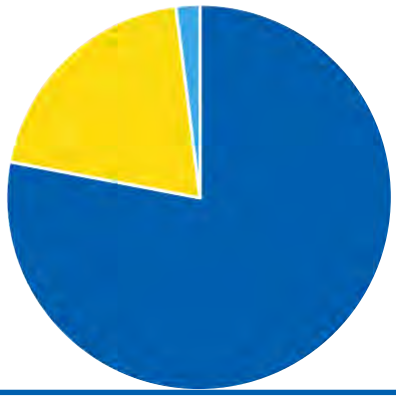


Final Cover Crop Composition

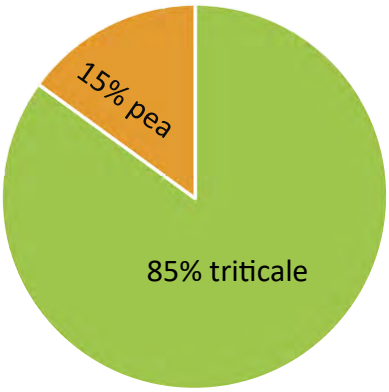


Spring wheat/purple vetch mix

70% Spring Triticale, 30% Spring Pea
Height: 14 inches

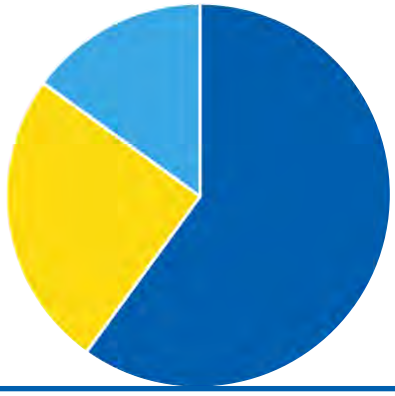


Final Cover Crop Composition

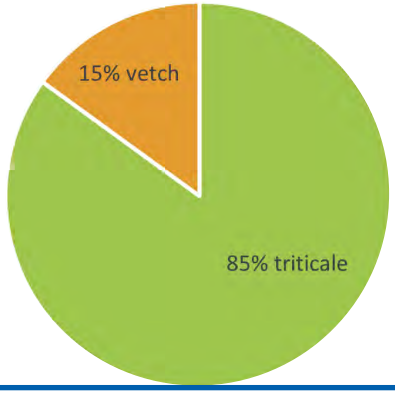


Spring triticale/spring pea mix

70% Spring Triticale, 30% Common Vetch
Height: 17 inches



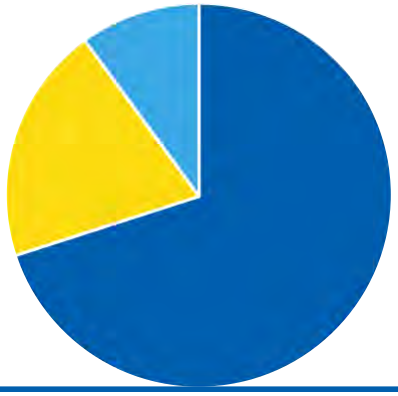
Final Cover Crop Composition



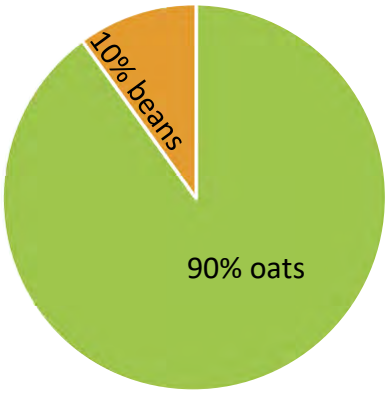
Spring triticale/common vetch mix

Key: Percent Cover Crop=dark blue, Percent Bare Soil=yellow, Percent Weeds=light blue

50% Common Oats, 50% Bell Beans
Height: 21 inches

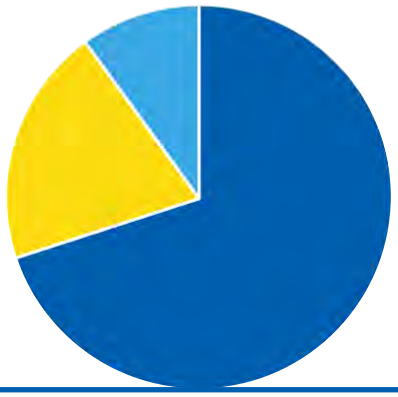


Final Cover Crop Composition

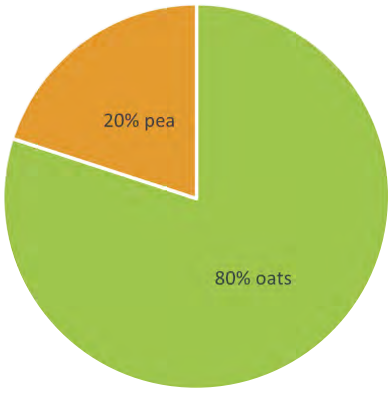


Common oats and bell bean mix

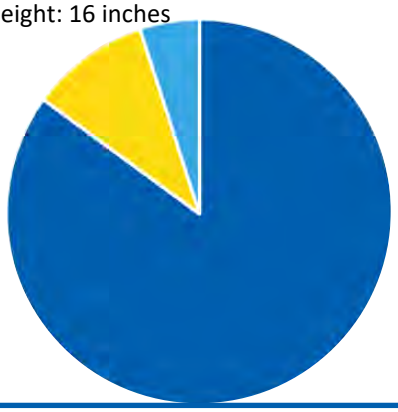
70% Common Oats 30% Spring Pea
Height: 22 inches



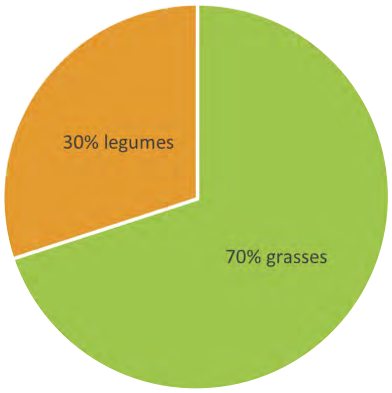
Final Cover Crop Composition



16% Woolypod Vetch, 16% Biomaster Pea,
18% Bell Beans, 25% Oats, 25% Winter Rye
Height: 16 inches

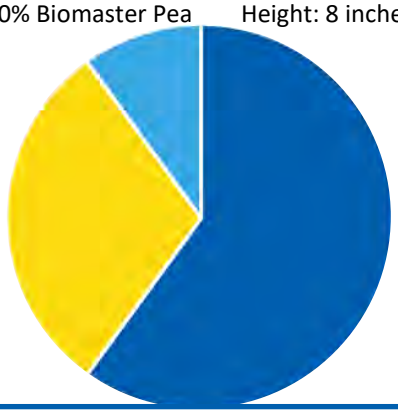


Final Cover Crop Composition



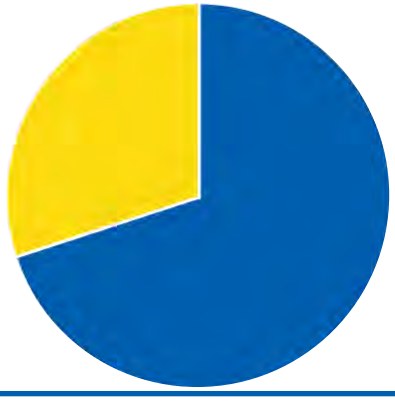
Legume-grain mix

20% Bell Bean, 20% Winter Pea, 20%
Purple Vetch, 20% Woolypod Vetch,
20% Biomaster Pea Height: 8 inches



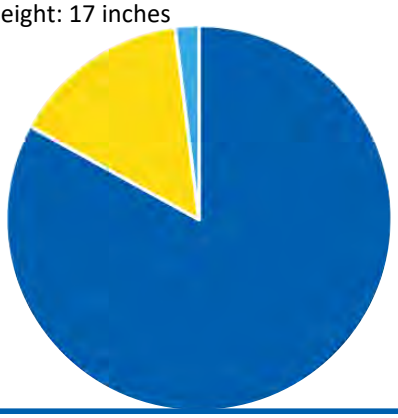
Legume mix in field

50% Oats, 25% Rye, 25% Triticale
Height: 26 inches

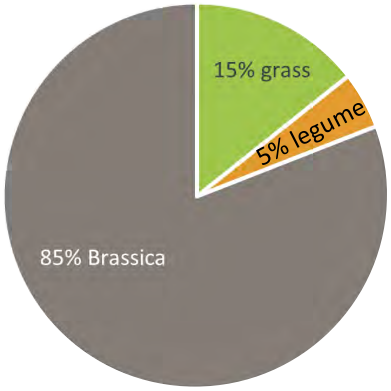


Key: Percent Cover Crop=dark blue, Percent Bare Soil=yellow, Percent Weeds=light blue

5% Black Mustard, 10% Common Vetch, 35% Triticale, 45% Fava Bean
Height: 17 inches



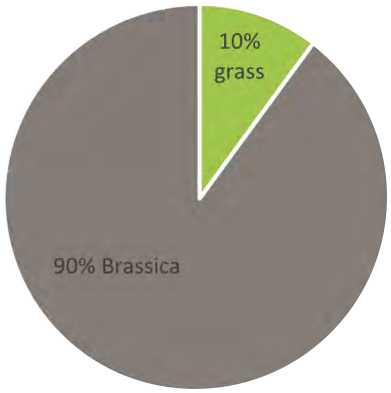
Final Cover Crop Composition



Radish/black mustard/common vetch/triticale/fava bean mix

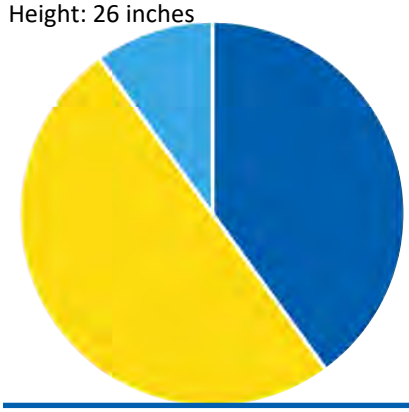
40% Spring Peas, 35% Triticale, 15% Purple Vetch, 5% White Mustard, 5% Radish
Height: 44 inches

Final Cover Crop Composition



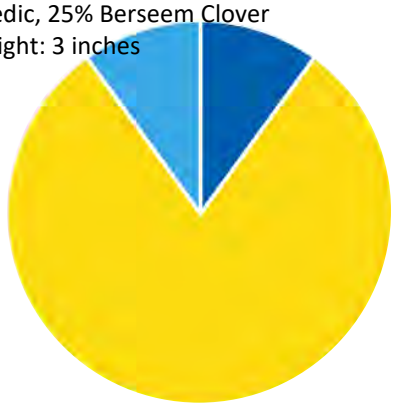
Spring pea/triticale/purple vetch/ white mustard/radish mix

30% Triticale, 35% Bell Beans, 28% Peas, 1% Canola, 3% Mustard, 3% Daikon Radish
Height: 26 inches

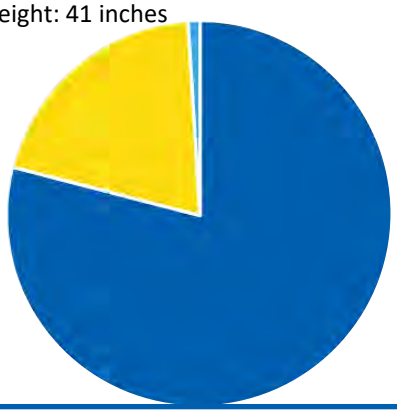


Project Apis M. Soil Builder mix (triticale, bell bean, pea, canola, yellow mustard, daikon radish)

17% Balansa Clover, 25% Persian Clover, 8% Rose Clover, 10% Crimson Clover, 15% Medic, 25% Berseem Clover
Height: 3 inches



40% Bell Beans, 50% Triticale, 5% Mustard, 5% Black Mustard
Height: 41 inches



Bell bean/triticale/mustard/black mustard mix

Key: Percent Cover Crop=dark blue, Percent Bare Soil=yellow, Percent Weeds=light blue