Gemperle's cover crop blooming with the almond trees

Christine's mule customized with a seed spreader

Soil Health Case Study

Christine Gemperle, Faith Home Orchard, CA

JULY 2022

Introduction

Erich and Christine in front of a newly redeveloped block

Christine and her brother Erich have been growing almonds since 1999, the year they purchased their farm in Ceres, California. Now, the sibling duo farms 40 acres in Ceres and 92 acres in Gustine. Throughout the last two decades of their farming careers, they have sought to learn more about better farming practices; not just to be better stewards of their land for future generations, but also to be more profitable. Christine's newest orchard practices include planting cover crops, monitoring soil moisture, and whole orchard recycling. She has become an influential almond industry leader and is on the Almond Board of California's Board of Directors. All of the Gemperles endeavors are with the mindset of conserving natural resources, providing habitat for the pollinators their almonds rely on, and increasing their bottom line.

In 2012, Christine started planting clover and mustard along the canal banks of her Ceres orchard. Quickly she realized how successful the cover crop was in providing forage and habitat for the bee pollinators and beneficial insects. The next year she planted cover crops across 9-feet of the orchard alleys. Historically, resident vegetation grew in the alleys, but they mowed throughout the season and kept it as narrow as possible, about 3–4 feet.

The Gemperles have fine-tuned an every-other-row, staggered cover crop planting strategy—a unique management tactic to maximize the economic and soil health benefits of cover crops. "Getting the timing down of when to prepare the rows for seeding and how that fits in with [fall operations]... is like weaving. Once you till in the seed you don't want to go in and disturb the ground."

In the fall, after almond harvest, Christine seeds every other row with a mustard cover crop mix then waters with her last irrigation, usually through her maintained flood system. "If you get in early enough with water to establish them, they can go a long time without [additional water]...[cover crop seeds] do amazing with how little water they get," Christine commented. She then completes mummy nut sanitation, pruning, shredding, and other post-harvest operations in the "open" rows.

In December, she seeds the "open" rows with a clover cover crop mix. Every couple of years she rotates her cover crops between the alleys. Now, they have a beautiful cover crop every winter across their orchard providing many benefits to their soil health and moisture, the bees, other beneficial insects, and their yield.

Soil Health, Economic, Water Quality, and Climate Benefits

A partial budget analysis (PBA) was used to analyze the marginal benefits and costs of adopting cover crops within a 20-acre study area. We used a combination of published machinery and material cost estimates and producer-provided data to estimate the cost of operations, on average, before and after soil health practice adoption. The analysis was limited to only those income and cost variables affected by cover crop adoption.

The PBA table (below) reveals that a yield increase and a decrease in pesticide costs offset the slight increase in costs to establish cover crops, resulting in the Gemperle's net income increasing by $499/ac/yr, or $9,976/yr, achieving a 459% return on investment. In some better

Farm at a Glance

COUNTY: Stanislaus, CA

WATERSHED: San Joaquin

CROPS: Almonds

FARM SIZE: 40-acres in Ceres, 92-acres in Gustine

SOILS: Sandy loam, flat terrain

SOIL HEALTH PRACTICES: Clover & mustard cover crops

Christine checking on her cover crop in her orchard centers

USDA United States Department of Agriculture Natural Resources Conservation Service

california almonds Almond Board of California

American Farmland Trust

yielding years, this return has been even higher. For this analysis, Christine attributes an 8% increase in yield, or 224 lbs/ac, to maintaining a cover crop for over a decade, despite no increase in fertilizer inputs and accounting for tree age (the trees were 9-years old which is full-bearing, when the cover crops were first planted in 2012). Visually, Christine has observed that her trees are more resilient, less prone to leaf drop, and less prone to wilting during harvest.

Christine applies less pre-emergent and berm herbicides throughout the year due to the cover crop outcompeting and changing the composition of the weeds. Many hard-to-kill weeds have disappeared, and she has cut out a berm spray. Additionally, beneficial insect populations have visibly increased, like six-spotted thrips, lacewings, and ladybugs. She has stopped spraying mite insecticide in May, as the beneficial insects and dust reduction in the orchard keep the mite populations low in early season. Overall, she saves $162/ac on pesticide material and labor.

To sow the cover crops, Christine uses a $20 Scott lawn seeder strapped to the front of her Kawasaki Mule then a Northwest Tiller to lightly work the seeds into the ground. She lets the cover crops grow as tall as possible until March when she starts with one high mow. Then she does several progressively lower mows to prepare the ground for almond harvest. Christine approximated her total cover crop cost to be $76/ac—$30/ac establishment and maintenance costs plus $46/ac seed cost.

In high rain years, Christine has noticed improved soil water infiltration and capacity. Christine said, "after receiving 5 inches of rain in a week last January, my orchard had no standing water whereas the neighboring orchard with minimal to no ground cover looked like a lake." Also, with the ability to look at data from soil moisture probes, Christine learned that she could reduce her water use in early spring because the soil was not drying out as quickly as in the past. Probe readings confirmed that the soil held substantial moisture in the spring.

To estimate the climate benefits associated with the study area, USDA's COMET-Planner Tool found that Christine's cover crop practices resulted in an average reduction of 32 tonnes CO_2-equivalent/yr, corresponding to taking nearly 7 cars off the road.

Closing Thoughts

The Gemperles have adopted cover crops in a way that does not interfere with their day-to-day operations. It took time to figure it out, but it was well worth the effort as they now are doing what they can to give back to their soil for future generations, while providing habitat to bees and other beneficial insects, increasing water infiltration, and increasing water-holding capacity. Alongside all of these soil health benefits, they have also experienced a 459% increase in their return on investment in cover crops.

Economic Effects of Cover Crop Adoption on Faith Home Orchard, CA (2021)

Increases in Net Income

Increase in Income

ITEM	PER ACRE	ACRES	TOTAL
Almond yield improvement (+8%)	$446	20	$8,915
Total Increased Income			**$8,915**

Decrease in Cost

ITEM	PER ACRE	ACRES	TOTAL
Reduction in pesticide use	$162	20	$3,232
Total Decreased Cost			**$3,232**
Annual Total Increased Net Income			**$12,147**
Total Acres in this Study Area			**20**
Annual Per Acre Increased Net Income			**$607**

Decreases in Net Income

Decrease in Income

ITEM	PER ACRE	ACRES	TOTAL
None identified			$0
Total Decreased Income			**$0**

Increase in Cost

ITEM	PER ACRE	ACRES	TOTAL
Cover crop establishment & maintenance	$76	20	$1,516
Learning costs (25 hrs/yr)			$655
Total Increased Cost			**$2,171**
Annual Total Decreased Net Income			**$2,171**
Total Acres in this Study Area			**20**
Annual Per Acre Decreased Net Income			**$109**

Annual Change in Total Net Income = $9,976

Annual Change in Per Acre Net Income = $499

Return on Investment = 459%

• This table represents estimated average costs and benefits reported by the producer, Christine Gemperle, with her adoption of cover crops over the 20-acre study area. • Values are in 2021 dollars. • Prices used: Almond: $2.15/LB (USDA NASS Quick Stats, 2022). • Prices are stated as per acre values for items that vary by area. Price such as learning costs, which don't vary by area, are only given as total costs. • Return on Investment is the ratio of Annual Change in Total Net Income to Annual Total Decreased Net Income, as a percent. • For information about: (1) study methodology, see https://farmland.org/soilhealthcasestudies, and (2) USDA's COMET-Planner Tool, see http://comet-planner.com/. • This material is based on work supported by a USDA NRCS CIG grant (NR183A750008G008) and a grant by the Almond Board of California.

For more information about this study or to discuss soil health practices, please contact

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