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Soil Health Case Study

Ralf Sauter, Okuye Farms, CA

JULY 2019

Introduction

Ralf Sauter and his family grow almonds on 116 acres of flat, sandy loam soil in Merced County, California. The land has been in the family for over 100 years and is protected from development by a conservation easement. Fourteen years ago, Ralf took over the operations from his mother-in-law, Jean Okuye, when he and his wife moved their family from Germany to the San Joaquin Valley.

Jean is the president of the East Merced Resource Conservation District; she pioneered the use of cover crops, compost, and micro-sprinkler irrigation at Okuye Farms, as well as owl boxes, hedgerows, and solar energy. Since taking over in 2005, Ralf has grown their farm from 80 to 116 acres and extended these efforts throughout the orchard. Ralf credits increased adoption of soil health practices to the inspiration he gained from attending grower workshops. He learned about the dual opportunity to cut cost and increase yield by implementing nutrient management, conservation cover, mulching, and compost application.

Ralf has realized multiple financial benefits from soil health, including higher yield and lower cost.

His approach to nutrient management (leaf sampling and fertigation) resulted in greater fertilizer use efficiency. He observed an increase in beneficial insects from conservation cover, which led to fewer miticide applications. Ralf decreased his pruning cost and believes he increased soil organic matter by transitioning from burning to chipping prunings within the orchard alleyway. Finally, Ralf credits part of the increase in yield to compost application, which he believes improves microbial activity and water holding capacity.

Soil Health, Economic, Water Quality, and Climate Benefits

In the 14 years since Ralf took over the orchard, he experienced a 20% increase in yield, which he attributes to a combination of nutrient management and improved soil health from the use of compost as a nutrient source. Ralf's nitrogen management plan, a requirement of the state's Irrigated Lands Regulatory Program, includes an annual nitrogen budget. Ralf uses leaf sampling (about $3 per acre) to determine tree nutrient status. He then estimates his compost rate and supplements with synthetic fertilizer through his irrigation fertigation system.

Ralf applies compost at a rate of 5 tons per acre. Placing compost in the tree row adds organic matter to feed soil microbes and provides essential nutrients for tree uptake. Ralf attributes half of his yield increase to compost use, but these benefits come at a cost. Delivered compost costs $21 per ton and an additional $5 per ton to spread. At 5 tons per acre, compost costs Ralf $130 per acre.

Fertigation facilitates delivery of the right fertilizer rate in the right location at the right time. Increased yield from fertigation as a nutrient management strategy more than offsets

Farm at a Glance

COUNTY: Merced, CA

WATERSHED: Merced River

CROPS: Almonds

FARM SIZE: 116 orchard acres

SOILS: Sandy loam soil on flat slopes of the San Joaquin Valley floor

SOIL HEALTH PRACTICES: Nutrient management, conservation cover, mulching, compost application

I do all these soil health practices for their economic benefit. A lot of people talk about 'sustainable farming.' What is that? For me, it's being profitable each year with healthier trees and healthier soils.

—RALF SAUTER

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the cost of the micro-irrigation system and the added $60 cost per acre of switching potassium forms from granular to liquid.

Ralf allows native vegetation to grow as conservation cover over winter and mows the orchard floor in spring and summer. The cover also provides habitat for beneficial insects. Since adopting this practice, Ralf has reduced miticide sprays from four times to one time every five years, saving him $30 per acre per year.

Ralf also hires a brush shredder to chop and mulch the orchard prunings. This practice replaced burning that required a tractor to push prunings to the end of the orchard row where they were piled and burned costing $75 per acre. The brush shredder costs $13.50 per acre saving him $48 per acre. Ralf believes that mulching has led to increased soil organic matter, greater microbial activity, and improved water holding capacity.

To estimate the water quality and climate benefits experienced on one of Ralf's 11-acre fields, USDA's Nutrient Tracking Tool (NTT) was used, which found that Ralf's use of nutrient management, conservation cover, mulching, and compost application reduced nitrogen losses by 98%. On the same 11-acre field, USDA's COMET-Farm Tool estimates that Ralf's soil health practices resulted in a 16% reduction in total greenhouse gas emissions, which corresponds to taking $^{3}/_{4}$ of a car off the road.

Partial budgeting analysis was used to estimate the benefits and costs of adopting nutrient management, conservation cover, mulching, and compost application for the Okuye farm. The study limited its focus to variables affected by the adoption of these soil health practices. The table below presents a summary of these economic effects. Ralf improved his bottom line by $657 per acre and by $76,155 on all 116 of his orchard acres by adopting the soil health practices.

Closing Thoughts

Ralf's experience in agriculture for 14 years has centered on implementing soil health practices in collaboration with his mother-in-law, Jean Okuye. Ralf's early adoption and expansion of soil health practices including nutrient management, conservation cover, mulching of prunings, and use of compost resulted in reduced cost and higher yield. He firmly believes that these practices have made his trees and soils healthier, all the while protecting groundwater from nitrate pollution. Though many soil health practices are more expensive to implement than conventional practices, Ralf has found the increase in yield and other benefits far outweigh these costs.

Economic Effects of Soil Health Practices on Okuye Farms (2018)

Increases in Net Income

Increase in Income

ITEM	PER ACRE	ACRES	TOTAL
Yield Impacts due to Nutrient Management	$455.40	116	$52,826
Yield Impacts due to Compost Application	$455.40	116	$52,826
Total Increased Income			**$105,652**

Decrease in Cost

ITEM	PER ACRE	ACRES	TOTAL
Pesticide Savings due to Conservation Cover	$30.00	116	$3,480
Savings due to Switch from Burning to Mulching	$48.00	116	$5,568
Total Decreased Cost			**$9,048**
Annual Total Increased Net Income			$114,700
Total Acres in this Study Area			116
Annual Per Acre Increased Net Income			$989

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
Nutrient Management Learning Activities	$2.11	116	$244
Conservation Cover Learning Activities	$2.11	116	$244
Mulching Learning Activities	$2.11	116	$244
Compost Application Learning Activities	$2.11	116	$244
Leaf Sampling	$3.45	116	$400
Compost Application Cost	$130.42	116	$15,129
Annualized Cost of Irrigation System	$130.00	116	$15,080
Increased Nutrient Cost due to Nutrient Mgt.	$60.00	116	$6,960
Total Increased Cost			**$38,545**
Annual Total Decreased Net Income			$38,545
Total Acres in this Study Area			116
Annual Per Acre Decreased Net Income			$332

Annual Change in Total Net Income = $76,155

Annual Change in Per Acre Net Income = $657

This table shows costs & benefits over the entire study area (116) acres as reported by the farmer. All values are in 2018 dollars.
Crop price used in the analysis: Almond: $2.53 per lb. Average yield in 2017/18 was 2,260 pound per acre. Source: Almond Board of California.
Fertilizer prices use in the analysis: 0-0-50: $.80/LB, KTS 0-0-30: $1.40/LB. Source: Ralf Sauter.

For information about study methodology, see http://farmland.org/soilhealthcasestudies. For information about USDA's Nutrient Tracking Tool, see https://www.oem.usda.gov/nutrient-tracking-tool-ntt. For information about USDA's COMET-Farm Tool, see http://cometfarm.nrel.colostate.edu/. This material is based on work supported by a USDA NRCS CIG grant: NR183A750008G008.

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