Sheep Grazing as a Cover Crop Management Tool in Almond Orchards: **Assessing Food Safety Risks and Economic Incentives**

Julie A. Finzel, Mohammad Yaghmour, Theresa A. Becchetti, Fadzayi Mashiri, Cameron A. Zuber, Sara Rosenburg, Dr. Brittney Goodrich, Dr. Alda Pires, and Dr. Edward R. Atwill

Introduction

Interest in integrating cover crops in almond orchards and using sheep as a cover crop management tool is growing. However, there are concerns regarding potential food safety risks. Documented benefits of cover crops in orchards include:

- More effective nutrient cycling
- Reduced fertilizer use
- Increased water infiltration

Grazing can further enhance these benefits by:

Reducing herbicide use

Project Objectives

1. Measure food safety risk in almond orchards grazed by sheep by testing for the prevalence and die-off of fecal pathogens in the soil.

2. Compare the costs and returns of conventional almond production to the costs and returns from a livestock and crop integrated almond production system.

Methods

Soil Analysis

We collected soil samples from two farms in the San Joaquin Valley. Farm A in Kern County and Farm B in Merced County. Each orchard contained a control 'ungrazed' plot. Vegetation in the ungrazed plots was mowed. Baseline sampling was conducted before grazing occurred in the spring. After the sheep were moved out of the orchard, soil samples were collected on Day 0, 7, 14, 30, 60, 90, and 120.

We collected soil in four places under the trees in the wetting zone and three places in the row middle for each tree sampled (Figure 1). Trees were randomly selected for sampling. At each sampling date we sampled three trees from the ungrazed and seven trees from the grazed portion of the orchard. Yield samples were taken at each orchard during harvest.

Decreasing the need for tractor fuel

Currently, the actual food safety risks of sheep grazing in almond orchards are unknown. This project tested for potential fecal pathogens in the soil.

An important part of piloting a new orchard management practice is determining economic feasibility. A partial budget analysis will help producers understand potential benefits and trade-offs to make the best decision for their operation.



Partial Budget Analysis

The team completed a partial budget analysis using data from a recent almond production cost and return study from UC Davis and input from our grower partners on the project.

Soil Testing Results

Three hundred soil samples were collected from two almond orchards and tested for the presence of fecal pathogens; 150 from each. Soil tests looked for STEC, generic E. coli, and E. coli O157:H7. On Farm A, 6 out of the 150 samples tested positive for E. Coli O157, all on Day 0, immediately after grazing. Generic E. coli results are presented in Figure 4.

On Farm B, 9 out of the 150 samples tested positive for E. Coli O157:H7. All positives were found on Day 60.







Generic E. coli in the soil (2024)

Partial Budget Analysis

Grower partners provided input on potential reduced costs and increased costs and related factors. Built-in assumptions are based on the UC Davis almond cost study and grower input.

- A labor rate of \$28.60/hour
- Equipment labor at \$31.46/hour
- Mow cost/acre/pass of \$13.77
- Nut sweeper/blower/acre of \$34.19
- Grazing rate of \$60/acre/pass

Other costs included diesel, gasoline, and equipment time.

	Additional costs	
	Grazing fee for 2 livestock passes	\$ 120.00
	2 @ \$60/acre	
	Additional time coordinating with grazer	\$ 31.46
	0.5 hours per pass @ \$31.46/hour	
	Reduced Costs	
	Reduce 2 mowing operations	\$ 27.54
	2 @ \$13.77/acre	
	Reduce dormant strip spray	\$ 53.13
	1 @ \$11.17/acre application	
	1 pint Roundup PowerMax @ \$6/pint	
	4Oz Matriz SG @ \$8.99/Oz	
	Reduce sweep and mow for NOW winter	
	sanitation	\$ 47.96
	Sweep @ \$34.19/acre	
	Mow @ \$13.77/acre	
	Reduce compost by 1 ton per acre	\$ 30.00
	1 ton @ \$30/ton	
	Total Additional Costs	\$ 151.46
	Total Reduced Costs	\$ 158.63
100	Total Net Change in Profit (\$acre)	\$ 7.17

