

Almond-Alfalfa Intercropping in Young Orchards for Profitability and Sustainability

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Almond and alfalfa are important and dominant field crops in California. In the last decade, almond's acreage has increased significantly while alfalfa acreage declined. Diversified cropping systems offer both economic benefits and ecosystem services. During early years, almond trees are non-bearing, but use of interrow space for forage production can generate on-farm revenue and potentially enhance soil and tree health.

Through this trial we plan to evaluate if these crops be grown together to diversify and improve the overall cropping system's sustainability and profitability.

Project goals: Provide scientific documentation of co-benefits or risks of alfalfa-almond intercropping with regards to orchard soil fertility, water dynamics, profitability, and tree health.

Objectives:

- Determine economic value of alfalfa intercropped in young almond orchards.
- Monitor and compare applied water use of mono- and intercropping systems.
- Evaluate impacts of alfalfa on soil health metrics (soil carbon, soil microbial biomass, soil beneficial and pathogenic fungal populations, etc.)
- Quantify soil nitrate leaching potential in mono- and intercropping systems.
- Quantify impact of almond-alfalfa intercropping on tree growth and nutrition (tree canopy size, orchard microclimate, trunk diameter, leaf N, and variations in leaf macro- and micro-nutrients and natural abundances of ¹⁵N).
- Determine if irrigation water supplied to alfalfa promotes almond trees to develop deeper and more robust root systems. Ground penetrating radar (GPR) technology will be used as a non-destructive method to examine interactions of these crops.

Experimental Design: Randomized Complete Block design with 3 replications

Treatments:

- Almond + Alfalfa with flood
- Almond + Alfalfa with flood & last harvest left as green manure
- Almond + bare alleys with flood
- Almond + bare alleys with no-flood



Almond + Alfalfa with flood



Almond + bare alleys with flood



Almond + bare alleys with no-flood



Alfalfa harvest & baling

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