

INTERCROPPING ALFALFA WITH ALMOND IN YOUNG ORCHARDS FOR PROFITABILITY AND SUSTAINABILITY

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ABSTRACT

Alfalfa and almond are among the major crops and vital components of cropping systems in California (CA), but in the last two decades, alfalfa's production area has decreased significantly while almond production increased. Some of the increases in almond's production resulted from farmers replacing alfalfa fields with almond. Many farmers in CA grow both crops but in separate fields. Intercropping alfalfa in young almond orchards can be a sustainable method of land and resource use for diversifying and intensifying crop production if plants' complementarity in sharing resources occurs. During the first three years, almond trees are establishing and non-bearing, but with conventional 6.71 m tree row spacing, using middle alleys space for growing alfalfa not only can allow forage production to result in farm income but also provide ecosystem benefits to strengthen the sustainability, profitability and resilience of the system. However, there is little information on co-benefits or risks of alfalfa-almond intercropping in CA. A three-year field study was initiated to evaluate feasibility of alfalfa intercropped (3.04 m alleys, i.e. 45 % of the tree row spacing) in young almond orchards and aspects of soil C-N and water dynamics, root system, tree health and alfalfa economic value. Treatments included almond + alfalfa + flood irrigation (AAFI), almond + bare-alleys + flood irrigation (ABAFI), and almond + bare alleys + no-flood irrigation (ABANFI). The May 2023 planted alfalfa resulted in four cuts with yearly total yield of 5.3 ton ha⁻¹. Nutritional value of alfalfa produced compares well to commercially produced alfalfa in the area with yield achieved in 2023 translating into \$985 ha⁻¹ farm revenue (more revenue is expected with up to seven cuts in full production year of 2024). Soil moisture content in the alleys at 90cm depth was the lowest in AAFI while the highest was recorded in ABAFI. Soil N loss measured in the alleys at 60cm depth was greatest in ABAFI and lowest in the AAFI indicating alfalfa's potential not only to reduce N leaching but also use it efficiently. First year benefits to soil C, N, and other biological and chemical properties can be attributed to a compost amendment applied in AAFI for alfalfa establishment. Future impacts of the AAFI treatment on soil health metrics will be compared to these baseline values. Overall, the ecosystem benefits observed in this potential almond-alfalfa intercropped agroecosystem in one year were attributable to augment on farm resource use efficiency and revenues. Second year of data collection and samples processing are in progress and some of the results will be part of the discussion.

Key Words: Intercropping, Alfalfa, Almond, economic and ecosystem benefits

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