

Intercropping alfalfa into young tree nut orchards; belowground impacts of alfalfa in tree rows and middles

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Abstract:

To gain revenue during early, non-bearing years, tree nut growers can intercrop alfalfa for forage into orchard alleys. In addition, as a deep-rooting, perennial legume, alfalfa has potential to enhance soil health in orchard floors, thereby extending legacy benefits for the orchard trees. But, the impacts of intercropping on soil health parameters in alley soils and in adjacent tree berms are unclear. A field trial with four management practices was established in Parlier, CA and included; trees flanked by alleys with alfalfa (Alf/flood), trees flanked by alleys with alfalfa for which residues from the last alfalfa harvest were left in the field to serve as green manure (Alf/flood/GM), trees flanked by herbicide-maintained bare alleys and flooded to disentangle the impacts of flooding alone (Bare/flood), and a standard practice control with non-irrigated bare alleys flanking trees (Bare). We evaluated soil carbon (C) and nitrogen (N) contents, soil cation exchange capacity (CEC), soil microbial biomass (SMB) based on phospholipid fatty acid analysis, and water stable soil aggregates in both tree row berms and alley soils from two depths (0-20 cm and 20-40 cm) under each management practice at three time points per year across two years. Preliminary results revealed that the Bare/flood treatment had the greatest impact on soil chemistry, with significantly lower soil C, N, and CEC in berms and alleys. Aggregate stability was not impacted by any treatment in either location, depth, or year. While SMB marginally increased in response to alfalfa in alley soils in the first year, by the second year, there were significant increases in SMB in alley soils and marginal increases in SMB in tree row soils. Research is currently ongoing to expand on these data by adding additional analyses of fungal pathogen pressure and by evaluating the system across three years. However, preliminary results are indicative that the alfalfa is reducing some potential leaching losses, which were associated with the Bare/flood treatment, but not revealed for Alf/flood treatments. Further, soil health benefits typically take time to accrue, and initial SMB trends reveal promising indications for enhanced soil biological health in both alleys and tree rows in response to the alfalfa.