# Orchard Removal Carbon Recycling and Replant Disease

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## PROJECT SUMMARY

### Objectives:

- Compare effects of grinding of whole trees and soil incorporation as a pre-plant soil treatment with burning and incorporation on young tree growth.
- Compare the two treatments with and without soil fumigation (Inline) on young tree growth.
- Assess the effects of the soil treatments on tree growth, plant pathogen presence, disease incidence, and soil characteristics.

### Background and Discussion:

This project examines second generation orchard growth and replant disease when planted into ground where whole trees were ground up and incorporated versus where whole trees were burned and the ash incorporated. More growers are grinding up orchards upon removal. Can this organic matter be incorporated or should it be removed from the orchard? Burning is no longer an option in the San Joaquin Valley for air quality reasons.

Almond orchard soil is traditionally very low in organic matter, though higher organic matter is generally associated with better water holding capacity, better mix of soil microbial communities, etc. This project is assessing whether incorporating the biomass of the removed trees into the soil prior to replanting is a net benefit/ detriment to establishing a new orchard, as well as whether carbon can be sequestered in the soil. Soil biomass treatments were completed in early 2008; soil fumigations in fall 2008, and Nonpareil, Butte, and Carmel on a Nemaguard rootstock were planted in replicated blocks in early 2009.

Initial results indicated that young tree growth was not different whether ground trees were incorporated or burned.

Despite incorporating high levels of organic matter, no reduced growth due to a nutrient (N:C ratio) imbalance was observed. The whole tree grinding (30 tons / acre) did not stunt replanted tree growth or affect third leaf yield. This may be due to the ground tree material being spread out and incorporated rather than left in one location at a very high density.

Sampling from plots showed elevated levels of fungal and bacterial feeding nematodes (Tylenchidae) associated woody soil aggregates in the grind treatment. Fungal mycelium was readily observed colonizing woody aggregates and more basidiomycetes (mushrooms) were observed in the grind plots.

Yields were determined in 2011 and 2012 and there were no differences between the grind and burn treatments. In 2010, more carbon, organic matter, and a greater cation exchange capacity were initially observed in the burned plots, but by 2012 the grind plots had significantly more calcium, manganese, iron, magnesium, boron, nitrate, copper, electrical conductivity, organic matter, total carbon, and organic carbon. The soil pH was significantly less in the grind treatment plots. Nutrients released by the decomposition of the woody debris are beginning to become available in the soil analysis.

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**Project Cooperators and Personnel:** Greg Browne, USDA/ARS, Davis; David Doll, UCCE - Merced County;

**For More Details, Visit**

- 2012.2013 Annual Report CD (12-PREC3-Holtz); or on the web (after January 2014) at www.almondboard.com/researchreports
- Related Projects: 13-PATH1-Browne; 13-AIR9-Doll; 12-STEWCROP4-Kimmelshue