Almond Orchard Recycling

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PROJECT SUMMARY

Objectives for current year:

- The overall goal of this project is to comprehensively assess management implications of two forms of whole orchard recycling (WOR), chipping (C) vs. orchard grinding (G), compared to orchard removal for energy co-generation.
- Refine life cycle assessment (LCA) model for evaluation of carbon dynamics and balance.
- Quantify effects of the treatments on the physical and chemical soil properties and tree nutrients.
- Quantify effects of the treatments on biological soil properties.
- Assess impacts of the treatments on replanted orchard growth, health, nutrition, production, and water relations.

Background and Discussion:

The first orchard grinding trial established in 2008 compared WOR to burning and incorporating the ash. The former peach orchard was replanted to almond. Ultimately, greater yields, significantly more soil nutrients, organic matter, and total carbon were observed in the grind treatment when compared to the burn. Cumulative yields from 2011- 2017 found the grind treatment greater than the burn by 1,587 pounds/acre. A significant increase in tree circumference was observed in the grind treatment trees from 2014 - 2016 when compared to the burn. Greater photosynthetically active light interception was observed in the grind treatment. Leaf petiole analysis revealed higher nutrient levels in trees growing in the grind treatment.

Preliminary evidence suggests that WOR, and the addition of 30 tons per acre wood chips, was beneficial to second generation trees. Trees growing in the grind plots have shown less water stress than trees growing in the burn plots, suggesting increased water holding capacity. Significantly more soil nutrients (calcium, manganese, iron, magnesium, boron, nitrate, potassium, copper), higher electrical conductivity, organic matter, total and organic carbon were measured in the grind treatment soils when compared to the burn treatment. Greater ion ratios were observed in soils from the grind plots. Soil pH was significantly lower in the grind treatment plots. This project has demonstrated whole orchard recycling as an alternative to burning in the field or in a co-generation facility. We estimate that over 20,000 acre in CA have been ground and incorporated in the last three years. Impacts of orchard debris on incidence and severity of soil-borne diseases of almond are largely unexplored, but increases in soil organic matter content have resulted in favorable soil microbial community shifts, resulting in suppression of some soil-borne diseases and improved plant nutrient dynamics. Four additional WOR trials with almond were established and fumigated in 2016 and re-planted to second-generation almond trees in 2017.

Project Cooperators and Personnel:
Amélie CM Gaudin, Elias Marvinney, and Emad Jahanzad, UC Davis, Greg Browne, USDA-ARS / UC Davis, Andreas Westphal, UCANR/UC Riverside, David Doll, UCCE - Merced County, Mohammad Yaghmour, UCCE - Kern County, Mae Culumber, UCCE - Fresno County, Franz Niederholzer, UCCE - Colusa, Sutter, Yuba Counties, Phoebe Gordon, UCCE - Madera County

For More Details, Visit

- Poster location 55 and 56, Exhibit Hall A + B during the Almond Conference; or on the web (after January 2018) at Almonds.com/ResearchDatabase
- 2016 - 2017 Annual Reports (16-PREC3-Holtz (COC) on the web at Almonds.com/ResearchDatabase
- Related Projects: 17-HORT3-Yaghmour (Culumber);