

IN THE SPOTLIGHT: DR. MAE CULUMBER

Managing Orchards for Healthy Soils

The Research

Dr. Mae Culumber's work involves research on whole orchard recycling and orchard floor management strategies and their implications for soil quality indicators.

Big Benefits to Whole Orchard Recycling

- Less burning means improved air quality and reduced smog
- Recycling trees into the soil means more soil carbon storage
- More opportunity for orchards to play a mitigative role in responding to climate change
- Improved guidelines for nutrient application mean a potential reduction in nitrate leaching and groundwater contamination

Check out a recent study by Dr. Culumber and her colleagues [here](#).

Interested in engaging with Dr. Culumber? Connect with her [here](#).

Nut crop specialist Dr. Mae Culumber works to support healthy soils in nut crop orchards.

DR. MAE CULUMBER is a University of California Cooperative Extension (UCCE) Farm Advisor in Fresno County. Dr.

Culumber has always been fascinated with studying natural landscapes and agricultural ecosystems. She obtained a BS degree in

biology at University of Wisconsin Stevens Point, which then led to her pursuing her MS in ecology and her PhD in soil science at Utah State University. Her dissertation research investigated the influence of leguminous cover crops and other organic production methods on soil health, tree vigor and productivity in Utah peach orchards. In her current position with UCCE, Dr. Culumber is focused on enhancing the sustainability and viability of nut crop agriculture by conducting applied research and providing outreach education in soil, water, and nutrition management.

Recycling: It's not just for plastic anymore

One of Dr. Culumber's current research projects is to evaluate the effect of a process known as whole orchard recycling (WOR) has on soil and greenhouse gas emissions in replanted orchards, and she is a principle investigator on a CDFA Healthy Soil Program funded project focused on understand how mulching orchards influences soil health, air quality, and greenhouse gases



in second generation orchards. Nut crops, mainly almond, pistachio, and walnut cover more than 1.7 million bearing acres throughout California. When orchard yields decline, farmers must decide how they will dispose of the massive amount of tree biomass on their land. Historically, burning or cogeneration of plants have been the preferred means of disposal, but environmental concerns have prompted researchers to find new methods that mitigate the harmful impacts of burning on air quality and greenhouse gases that can impact climate. Recycling orchards into the ground may be a viable approach to mitigating these issues. The orchard recycling process may also provide the benefit of storing carbon from trees incorporated in the soil. Preliminary studies have shown strong evidence for increases in soil organic matter, carbon sequestration, and overall improved soil health over the lifetime of an orchard established after WOR. Dr. Culumber's research group is taking a detailed look at the mechanisms of organic matter turnover, nutrient immobilization, and mineralization in these systems. Their work will help provide growers with guidelines for nutrient application, ensuring optimal nutrient levels are applied and leaching is avoided.



WOR of an almond orchard. Courtesy Almond Board

Dr. Culumber is also working to expand her research to understand water-related benefits provided by incorporating wood mulch prior to replanting orchards. Preliminary data suggests there may be a significant water use savings benefit for mulch-planted orchards, which is good news for growers who will need to meet new requirements for water use under the Sustainable Groundwater Management Act. Trials are being developed to quantify differences in water use efficiency between wood mulched and conventionally developed orchards.

Working Together for the Future

Dr. Culumber shared her thoughts on the future of agriculture research in California, noting that “The future of California agriculture depends on the protection of California’s soil, water, and air natural resources. Soil erosion, compaction, and salinization, declining soil organic matter levels, increased nitrate levels, dwindling groundwater stores, and increased levels of air pollutants are examples of the degradation of these resources and challenges to production faced by California growers. Farmers, researchers, and other industry members must work together to identify innovative solutions that protect the environment and promote the continued sustainability and profitability of agricultural production.”

The California Climate Hub will occasionally spotlight our collaborators or impactful research projects relevant to California agriculture, forestry, and rangelands. If you know of a researcher, resource manager, producer, or project that should be highlighted, please let us know. For recommendations or more information, contact Lauren Parker at leparker@ucdavis.edu