Photo: Fran Collin

Mulching to Mimic the Avocado's Native Environment

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Project Description

The Abbott family began farming in the Carpinteria Valley in 1923. Known locally as Hilltop & Canyon Farms, about 50 acres of the Abbott farm is devoted to avocado trees, which they began planting in the 1930s. The farm spans a wide range of microclimates and soil types, and portions of the Hilltop Farm are on a heavy expansive clay, which is typically inhospitable to avocados and marginal for most other crops.

Duncan Abbott, a second-generation farmer, manages the farm with his son, Robert. Both Duncan and Robert are devoted to using sustainable farming practices on their property and to collaboratively promoting sustainable avocado farming with fellow community members. In 2005, the farm was certified organic.

All the avocados on the farm are hand pruned and hand picked, and about half the crop is hand packed for local distribution including the Santa Barbara and Ojai Farmers Markets.

In addition to implementing sustainable farming practices, the Abbotts are committed to preserving and restoring the land. Their efforts have focused on creek restoration, the reintroduction of steelhead fish, and the preservation of live oaks. Robert believes that creeks are a good indicator of the general health of an environment and, as a farmer, is concerned about the condition of the water his trees receive.

More information on the Abbotts and their farm can be found at hilltopandcanyonfarm.com.

Location

Hilltop & Canyon Farms is located in Rincon Canyon, Carpinteria Valley, California

Partners

- Hilltop & Canyon Farms
- UC Davis
- University of California Cooperative Extension (UCCE)
- MarBorg Industries (local waste management company)

Water Stewardship Practices

Compost/soil management (mulching) & irrigation management.

Mulches are materials placed over soil surfaces to maintain moisture and improve soil conditions. In the case of avocado trees, mulch helps to simulate their natural forest environment by providing a blanket of organic materials that replenish nutrients and provide an ideal environment for root growth and mineral uptake.

Irrigation is required for all avocado groves; however, too much water can lead to avocado root rot (phytophthora cinnamomi), resulting in tree damage and reduced fruit productivity. A severe root rot epidemic in the

late 1970s and early 1980s caused most of the avocado trees on the Abbott property to need to be replaced. The Abbotts manage their irrigation carefully to ensure tree health and limit water costs.

Application: Mulching

The Abbott family participated in a variety of trials with UCCE and UC Davis in order to determine which sustainable practices would benefit the farm. One of the practices identified in this collaboration was the use of coarse, organic mulch to prevent avocado root rot.

The farm began applying mulch more than 15 years ago, but heavy use of mulch began in 2003. The mulch is composed of wood chips, horse manure, and municipal green waste from Santa Barbara County residents. The green waste can contain large amounts of calcium and nitrogen, which act within the mulch to create a rich compost layer that is beneficial for avocado trees. MarBorg Industries, the local waste management company, processes and delivers the nutrient-rich material in 40-yard dump trucks, containing approximately 40,000 pounds of material. Up to four dump trucks of material, totaling roughly 160,000 pounds of mulch, can be applied in one day.

The frequency of application depends on the soil and the health of the trees, and ranges from once per year to once every two or three years. Mulch application takes place during the fall and the spring, when there is less work on the farm and the ground is relatively dry, as the heavy weight of the equipment makes it difficult to use in the wet season.

During their 15 years of mulching, the Abbotts have moved from hand mulching to mechanized mulch application. At full capacity, the machine holds enough mulch to cover a 100-foot row six inches deep. In order to ensure efficiency, the application process requires the use of two tractors: one to tow the distribution machine, and another to load the machine. The distribution machine is very heavy and requires relatively high horsepower compared to most orchard tractors. It distributes mulch at a constant rate under the trees using a hydraulic wheel, after which it is hand raked to ensure even application. On heavy applications, each tree receives up to 1,000 pounds of mulch, which adds 50-70 tons of material per acre.

"There are a few spots on the land where the trees would not survive without mulch," Robert observed, reinforcing heavy mulching as a vital component of the Abbotts' avocado farming process.

Mulching Challenges

- Trash in the green waste. Before application, the Abbotts and their staff must hand-sort the waste, which is time and labor intensive.

TOP TO BOTTOM: Duncan and Robert Abbott in the avocado orchard; mulching the orchard. Photos courtesy of Fran Collin Photo (http://www.francollin.com).

- Effects of unknown chemical components in trash. In spite of hand sorting the green waste, trash products can be mixed into the mulch, which could lead to unidentified chemicals being applied to the avocado trees.
- Cost. Mulching is a significant expense, costing the farm more than $1,000 per acre per application cycle.
- Labor intensive. Between hand sorting tons of waste and applying it to the farm, mulching requires a lot of time and physical exertion.
- Application on sloping orchards. Moving mulching materials up on to slopes is more difficult and expensive than on flat ground. Since most of the avocados in the Carpinteria vicinity are grown on slopes, this is a large impediment to the proliferation of the practice.

Mulching Benefits

- Water savings. Mulch creates a barrier to evaporation and seals the moisture into the soil, thus reducing the need for water and protecting the crop during dry spells. This layer is especially beneficial for plants grown in marginal soil, as in the Abbotts' case. According to Dr. Ben Faber, a Farm Advisor at the UCCE in Ventura County, growers use about 18 inches of applied water in an average year and mulching can reduce evaporative loss by about 20%.
- Prevents disease. Mulching promotes the development of beneficial microorganisms that prevent pathogens, including avocado root rot, from getting a foothold and damaging the crop. Many studies have demonstrated that avocado root rot is reduced with mulching, so much so that it is now a standard recommendation to prevent and alleviate root rot. More information can be found at http://www.avocadosource.com/wac5/papers/wac5_p719.pdf.
- Productivity. Mulching helps trees thrive, increasing productivity and tree health. The Abbotts have experienced an increase in 5-year production averages, even in non-bumper crop years.

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- Reduces soil erosion. Mulching holds the soil in place.
- Soil health. Mulching provides nutrients for healthy soil and roots with fewer chemical inputs.
- Revenue. Neighboring landowners have observed the success of the Abbotts' mulching application, and have now contracted Robert Abbott to apply mulch to their properties. He predicts that more than 50% of avocado farmers are now heavily mulching. Of the land farmed by approximately 100 growers in the Carptineria area, Dr. Faber of UCCE predicts that 20% of the overall acreage is mulched.

Mulching Lessons Learned

- Mimic the environment where the crop evolved. Avocado trees originated in forested habitats, and they depend on their own leaf litter, as well as the decomposing material around them. Trees are good at mining resources from a heavily mulched environment. Mulch helps to simulate a native environment, resulting in thriving trees.
- In a native environment, a diversity of plants, animals, and microbes are one factor in a healthy ecosystem. Replicating this scenario on the farm means that it's harder for pathogens to get a foothold, resulting in a healthier and more buffered environment.
- Education and leading by example are fundamental for influencing and proliferating sustainable practices. Through education, the public can be informed about proper green waste recycling and about the destination of their waste; farmers can also stay abreast of new and innovative farming practices.

Application: Irrigation

Avocado trees absorb a large amount of water, requiring 20-30 gallons daily per tree. The Abbotts utilize a micro-sprinkler irrigation system that applies

water directly to the tree roots and soil surface area. Micro-sprinkler irrigation has gained popularity due to its potential for decreased water use and labor requirements.

Planned Irrigation Upgrades

The farm currently uses steel irrigation pipes that were installed during the World War II era, and for which replacement parts are challenging to find. Robert is collaborating with the Cachuma Resource Conservation District to seek funding to upgrade his irrigation system. The project will replace 60 acres of irrigation mainlines over heavily irrigated property. In addition to installing new pipes, the project will also include an automatic irrigation monitoring system that would measure soil moisture and evapo-transfer rates, resulting in more accurate water application. With this new system, Robert projects a 20% efficiency gain, resulting in less energy spent on pumping and less time spent on irrigation.

This case study written by Erica Gross of Ag Innovations Network. It was produced for the California Agricultural Water Stewardship Initiative by Ag Innovations Network, a nonprofit organization dedicated to helping stakeholders solve problems in the food system through effective collaboration. For more information visit agwaterstewards.org and aginnovations.org.

TOP TO BOTTOM: The avocado orchard at Hilltop & Canyon Farms; Duncan Abbott in the orchard. Photos courtesy of Fran Collin Photo (http://www.francollin.com).