california almonds
Almond Board of California

ALMOND ORCHARD 2025 GOALS

zero waste

ACHIEVING OPTIMAL USE OF EVERYTHING WE GROW

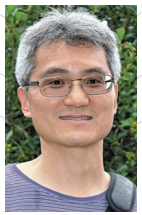
Almonds grow in a shell, protected by a hull, on a tree: products traditionally used for livestock bedding, dairy feed and electricity generation. With changing markets for these coproducts, the almond community is spurring innovation for higher value and more sustainable uses, with promising leads in the areas of recycled plastics, fuel and more. By 2025, the California almond community commits to **ACHIEVE ZERO WASTE IN OUR ORCHARDS BY PUTTING EVERYTHING WE GROW TO OPTIMAL USE.**

Given that almond coproducts are widely utilized already, progress toward this goal focuses on reducing our environmental footprint and adding value—economically and environmentally—via three key measures. These include significant increases in recycling trees into the soil when an orchard is removed, diversifying applications for hulls and shells beyond current uses in the California dairy industry and the effective elimination of open burning as a means to dispose of woody biomass.

Progress toward these goals will be measured with data from periodic surveys of almond huller and sheller operations as it relates to hulls and shells and the California Almond Sustainability Program's (CASP) air quality module in which farmers assess and report woody biomass-related practices.

NOVEL APPROACH: STRENGTHENING RECYCLED PLASTIC

"The almond industry has traditionally used shells as livestock bedding, but research has shown they can serve a higher purpose with greater economic and environmental benefits. Through torrefaction, burning in the absence of oxygen, almond shells are transformed into a charcoal-like material that can be ground up and added to post-consumer recycled plastics, giving them added stiffness, heat stability and color. If we can scale this beyond the lab, this will translate to less new plastic in the world and a valuable, novel use for almond shells."



Bor-Sen Chiou, RESEARCH CHEMIST, USDA AGRICULTURAL RESEARCH SERVICE

1. Brent Holtz, et al. Whole almond orchard recycling and the effect on second generation tree growth, yield light interception and soil fertility. VII International Symposium on Almonds and Pistachios. 2017. **2.** Michael Wolff, et al. Whole Orchard Recycling report for the Environmental Farming Act Science Advisory Panel. 2019. **3.** Seth Wynes, et al. The climate mitigation gap: education and government recommendations miss the most effective individual actions. Environmental Research Letters. 2017.

Document #2019CN0208

pursuing continuous WASTE improvement

While the Almond Orchard 2025 Goals set specific targets, the almond community's use of almond coproducts has been evolving for decades. This timeline focuses on one coproduct—woody biomass—and how almond trees are utilized at the end of their 25-year lifespans.

PAST

With significantly fewer almond orchards in the state and less protective air-quality laws, **BURNING OF AGRICULTURAL WASTE** was the norm prior to the 1990s. This included whole trees upon orchard removal as well as branches from regular tree pruning.

PRESENT

While **COGENERATION FACILITIES** that converted almond tree wood into electricity were a reliable option in the ensuing decades, these power plants are being phased out in California. With that change, farmers have started shifting to a new technique for almonds: whole orchard recycling.

FUTURE

Instead of removing the material from the orchard system, **WHOLE ORCHARD RECYCLING** grinds up the trees, spreads the wood chips across the field and works them into the soil prior to replanting. This practice improves soil health[1] and helps to address climate change. Models show that recycling the orchard sequesters 2.4 tons of carbon per acre,[2] equivalent to living car-free for a year.[3] Researchers are also exploring transforming almond wood into biofuels.