

Seeking Optimal Uses

Almonds grow in a shell, protected by a hull, on a tree. Traditionally, these coproducts have been used as livestock bedding, dairy feed and transformed into electricity. However, changing markets and increased production have led the almond industry to investigate new, optimized uses.

Guided by ABC's Biomass Workgroup, research is exploring a variety of options that will bring both environmental and economic benefits. While some ideas will take longer to research and develop, others are already well on their way to becoming viable options, with promising leads in the areas of recycled plastics, fuel and more.



WHOLE ORCHARD RECYCLING

MATERIAL: WOODY BIOMASS

At the end of their productive lives, whole almond trees are ground up and incorporated back into the soil. Research has found this practice improves soil health¹ and helps to address climate change. Models show that recycling the orchard sequesters 2.4 tons of carbon per acre² equivalent to living car-free for a year³



OPTIMIZED POULTRY FEED

MATERIAL: HULLS

Almonds' sugary, fibrous hulls can feed animals big and small. New research has shown Nonpareil almond hulls are a safe alternative feed ingredient for both broilers and laying hens⁴ Upcoming research is testing if feeding antioxidant-rich almond hulls can combat a common parasitic disease in broilers and improve egg yolk composition from layers.



SOIL AMENDMENT

MATERIAL: SHELLS

A common practice in broccoli farming, discing under the plant residue after harvest, can release nitrogen that could eventually make its way into underground aquifers. Research using ground almond shells in the soil to immobilize the nitrogen has shown positive results with the added benefit of increasing yields in the subsequently planted crop, like strawberries⁵

**ALMOND
ORCHARD**
2025 GOALS

BY 2025, the almond community **COMMITTS TO ACHIEVE ZERO WASTE IN OUR ORCHARDS** by putting everything we grow to optimal use.

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. 4. Woo Kyun Kim, et al. Effect of almond hull as an alternative ingredient on broiler performance and nutrient digestibility. Poultry Science Association 108th Annual Meeting. 2019. 5. Joji Muramoto, et al. Mobilizing mineralized nitrogen from cole crop residues using organic amendments. Final report to California Specialty Crop Block Grant Program. 2019.