

# THE STATE OF CALIFORNIA: ALMONDS & WATER

## CALIFORNIA WATER 101

California is a center for food and agriculture, as one of the most productive agricultural regions in the world. California is also one of only five places on Earth with the Mediterranean climate needed to grow almonds. Its cool, wet winters and hot, dry summers offer ideal growing conditions for many diverse crops, including almonds, and more than 80% of the world's almonds are produced in California.



On average, 10 percent of California's water goes to cities and urban areas, while 40 percent is used to grow food, producing over 50 percent of the United States' fruits, nuts, and vegetables. The other 50 percent is water devoted to environmental uses – things like maintaining healthy river ecosystems, wetlands, and more.<sup>1</sup> Yet even though California has invested in one of the most advanced water supply infrastructures in the world, it remains susceptible to extreme drought, made even worse by a changing climate. California's drought brings with it broader discussion of the water needed to grow the state's agricultural bounty, including almonds, and it remains our responsibility to use its limited water in the most sustainable way possible.

## ALMONDS & WATER

All food takes water to grow, and almonds are no exception. But what sets California almonds apart is that the industry has learned, innovated, and committed to use water in the most efficient way possible.

It's true that plants require more energy, and thus water, to grow proteins and fats than carbohydrates and sugars.<sup>2</sup> So even though nuts like almonds need more water than most fruits and vegetables, they provide protein and good fats and are rich in essential nutrients – making them a perfect ingredient to support a diverse, nutritious diet.

And when it comes to growing almonds, the water used actually grows four products: the shelf-stable **kernel** you eat, which is protected by a **hull** and a **shell**, as well as the **tree**.



Almond trees store carbon and at the end of their lives are recycled back into the soil, a climate smart approach.



Almond shells become livestock bedding.



Almond hulls are nutritious dairy feed, reducing the water needed to grow other feed crops.

So unlike other snack components that may spoil quickly and can leave behind pits, peels, and rinds, **with almonds, nothing goes to waste**. And using and recycling these coproducts offset some of almonds' carbon footprint.<sup>3</sup>

<sup>1</sup> California Department of Water Resources. California Water Plan Update, 2013.

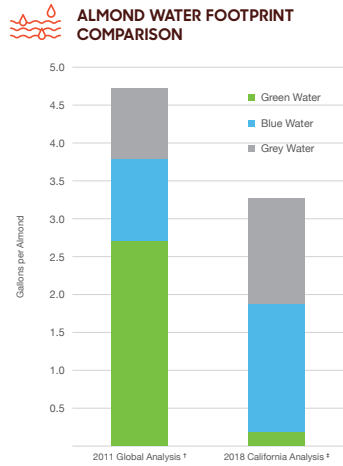
<sup>2</sup> Munier-Jolain, et al. Are the carbon costs of seed production related to the quantitative and qualitative performance? An appraisal for legumes and other crops. Plant, Cell & Environment. Volume 23, Issue 11, Nov. 2005.

<sup>3</sup> Marvinney, E., Kendall, A. A scalable and spatiotemporally resolved agricultural life cycle assessment of California almonds. *Int J Life Cycle Assess* 26, 1123–1145 (2021)

## DOES IT REALLY TAKE 1.1 GALLONS OF WATER TO GROW AN ALMOND?

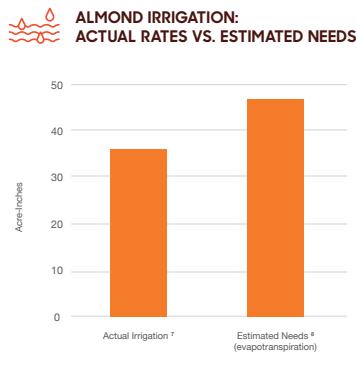
To answer this question, it's important to understand that there are many ways to measure water use. Two relevant to almonds are **water footprint** and **irrigation water applied**.

A **water footprint** (WFP) is calculated using a standard global methodology<sup>4</sup> to estimate the total amount of water used to make a product or grow a crop. Each WFP has three components: green water (precipitation), blue water (irrigation) and grey water (theoretical amount of water needed to dilute any water pollution impacts from the production of the product). Heavily reported during the 2014-16 drought was the blue water component of almonds' WFP, 1.1 gallons per almond, based on a 2011 mega-analysis of food.<sup>5</sup> The same study found the blue water component for a head of lettuce was 3.5 gallons and a walnut was 5.



<sup>1</sup>Hoekstra, et al. The Water Footprint Assessment Manual: Setting the Global Standard. 2011. <sup>2</sup>Fulton, et al. Water-Indexed Benefits and Impacts of California Almonds. Journal of Ecological Indicators. Apr. 2018. <sup>3</sup>Hoekstra, et al. assume 28 almond kernels per ounce. Fulton et al. assume 23 almond kernels per ounce.

While WFP calculations are useful for comparing different products, they are typically based on global averages. In 2018 ABC partnered with researchers to better understand the WFP of almonds grown in California. That study found variation in the blue, green and grey components, with an overall WFP significantly lower than the 2011 report.<sup>6</sup>



### So, does it really take 1.1 gallons of water to grow an almond?

The short answer is yes, according to the 2011 study, but it depends on your source and how you're measuring.

When farmers think of water use, they measure the amount of **irrigation water applied** to their fields. In practice, almond farmers are using less water than estimated in almonds' WFP. California's almond farmers report applying 36 inches of water, per acre, per year, on average statewide.<sup>7</sup> By comparison, almonds' blue WFP number is based on the maximum amount of water needed to grow healthy, productive almond trees in California, an average of 47 inches of water, per acre, per year.<sup>8</sup> The difference between those is made up by rainfall during the growing season, satisfying some of the trees' water needs.

Ultimately, it's much more complicated than water per almond – and maybe the actual number isn't the headline. What is? **That water is the top priority for almond farmers, and they are focused on efficiency, conservation goals, and putting all four products grown on their farms (nuts, hulls, shells, wood) to good use to get the most out of this essential input.**



## A COMMITMENT TO WATER STEWARDSHIP

As climate change makes California more susceptible to water scarcity, it's everyone's responsibility to use its limited water in the most sustainable way.

Since the 1980s, California almond farmers have been investing in irrigation efficiency research to ensure farmers get the most crop per drop. This has resulted in improvements in production practices and water-saving technologies, **reducing the amount of water it takes to grow a pound of almonds by 33 percent between the 1990s and 2010s.**

**We know we must do more – and we're doing it.** By 2025, the California almond industry has committed to reducing the amount of water to grow a pound of almonds by an additional 20 percent.

While almond farmers have made strides in irrigation efficiency, further improvements are underway. The Almond Irrigation Improvement Continuum, created by irrigation experts, is helping almond farmers accelerate adoption of water-conserving best practices and technology.

And almond farmers are exploring how California's almond orchards can be leveraged to replenish groundwater, a vital resource in the state. Research has shown that 675,000 acres of California almond orchards have soil suitable for groundwater recharge. Combined with access to excess stormwater in wet years, these farms would be good sites for replenishing underground aquifers. This would improve groundwater sustainability for all Californians.

**California is our home, and we are committed to taking care of it.**



Scan the QR code to learn more about almond farmers' ongoing water efficiency improvements.

<sup>4</sup> Hoekstra, et al. The Water Footprint Assessment Manual: Setting the Global Standard. 2011.  
<sup>5</sup> Mekonnen, M., & Hoekstra, A. The Green, Blue and Grey Water Footprint of Crops and Derived Crop Products. UNESCO – IHE Institute for Water Education. 2010.  
<sup>6</sup> Fulton, et al. Water-Indexed Benefits and Impacts of California Almonds. Journal of Ecological Indicators. Apr. 2018.  
<sup>7</sup> California Almond Sustainability Program. Nov. 2021.  
<sup>8</sup> Fulton, et al. Water-Indexed Benefits and Impacts of California Almonds. Journal of Ecological Indicators. Apr. 2018.

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