

# Improving Water Footprint Calculations Using Local Agronomic and Environmental Data

## Executive Summary

### What's the issue?

A product's water footprint is the volume of freshwater used to produce that good. Many companies, including Barilla, have begun tracking the water footprint of their final products and supply chains to improve their stewardship of global water resources. Water footprint assessments consider three types of water use. Green water is rainwater stored in the soil and taken up by crops. Blue water is irrigation water that is taken up by crops. Grey water is the amount of freshwater required to dilute pollutants to meet water quality standards. Grey water footprint analyses have focused on nitrogen from fertilizer applications entering into water bodies. This study estimated the green, blue, grey, and overall water footprints of durum wheat production in Yuma County, Arizona. Earlier footprint studies have found that durum cultivation accounts for most of the water used in the pasta supply chain.

### What did the study find?

This study relied on two separate, detailed local data sources to estimate the green water footprint of Yuma durum production. One source was the Western Regional Climate Center (WRCC) network. The second was the U.S. Bureau of Reclamation's Lower Colorado River Accounting System (LCRAS). Both sources led to similar results, with an estimated green water footprint of  $21 \text{ m}^3 / \text{MT}$  based on WRCC data and  $15 \text{ m}^3 / \text{MT}$  based on LCRAS data. Such low green water estimates are not surprising because of the very low rainfall in the Yuma area. The WRCC estimates were based on simple, unweighted averages of precipitation from weather stations. The LCRAS estimates weighted green water use by durum wheat acreage in different parts of Yuma County.

Past studies have reported Yuma durum's blue water footprint to be  $848 \text{ m}^3 / \text{MT}$ . But, this was not based on local data. Based on the most recent 10-year average of yields and University of Arizona Cooperative Extension estimates of crop ET (evapotranspiration), Yuma durum's blue water footprint ranges between  $708 \text{ m}^3 / \text{MT}$  and  $778 \text{ m}^3 / \text{MT}$ . Based on LCRAS crop ET estimates, the blue water footprint for Yuma durum was  $747 \text{ m}^3 / \text{MT}$ . Again, two different local data sources provided similar and consistent results. This study used nitrogen fertilizer application data from University of Arizona Cooperative Extension to calculate the grey footprint of Yuma durum of  $328 \text{ m}^3 / \text{MT}$ . This was higher than estimates from previous studies of  $156 \text{ m}^3 / \text{MT}$ . Adding up green, blue, and grey water footprints, the overall water footprint for Yuma durum production was  $1,090 \text{ m}^3 / \text{MT}$ . This overall footprint is 22% lower than that reported by past research. This places Yuma durum's water footprint at the lower end of sources supplying Barilla's pasta supply chain.

Return flows from Yuma farms provide water to the Lower Colorado River Delta wetlands. These wetlands support rare fish species and birds migrating along the Pacific Flyway. Scholars working on ecological restoration of the Colorado Delta have begun to recognize the environmental values of these return flows. Return flows once thought of as irrigation "inefficiencies" can improve species habitat. Yuma durum farms produce three things: durum

wheat for pasta, vegetables (frequently grown as part of wheat-vegetable rotations), and ecosystem services in the Lower Colorado River Delta. This three-fold production is consistent with Barilla's goals of "Good for you, good for the planet."

### **How was the study done?**

The study reviewed past water footprint assessments for durum wheat and pasta production. Earlier estimates of the durum water footprint for Arizona published were based on rough, state-level averages. These do not reflect actual Yuma production conditions. The study used the best available local weather and agronomic data to estimate the green, blue, and grey water footprints for Yuma durum production. This included data from

- University of Arizona Cooperative Extension,
- the U.S. Bureau of Reclamation's Lower Colorado River Accounting System,
- the U.S. Department of Agriculture's National Agricultural Statistical Service, and
- the National Oceanic and Atmospheric Administration's Western Regional Climate Center.

Yuma's water footprint is lower than previously estimated, based on better, local data. The study also examined the role of agricultural return flows from Yuma farm fields in providing ecosystem services to local wetlands.