Identification of Lower Water Use and Higher Nutritional Value Agricultural Food Commodities in California

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Objectives: As the world's population increases, a focus on nutrition security and water sustainability is needed to ensure the availability of resources for the survival and wellbeing of future generations. The agricultural (Ag) sector accounts for 70% of global water withdrawals and California (CA) is the biggest Ag state in the country with 12.5% of Ag cash receipts, almost double the next largest Ag state. Therefore, the purpose of this study was to identify CA Ag products that are both more nutritious and use less water.

Methods: The analysis was conducted using the latest publicly available data on water footprint (WF) and nutrient content of 57 out of 82 Ag products listed in the 2019–2020 CA Ag Statistics Review report. WFs per ton of commodity produced were calculated using precipitation and irrigation data from the CA Department of Water Resources' report. Nutrient Rich Food (NRF) scores were calculated with data from the USDA's Food Data Central based on each commodity's content of nutrients to encourage (protein; fiber; vitamins A, C, D, E; calcium; magnesium; iron; potassium) and to limit (saturated fat, added sugar, sodium). Higher scores indicate higher nutrient density per 100 kcal. WF and NRF scores were separately sorted numerically and the foods that were both above the median NRF score and below the median WF were identified.

Results: The WF ranged from 71 (strawberry) to 9,907 m^3/ton (pistachio) with a median of 332 m^3/ton. The range of NRF scores was 1.39 (olive) to 605.67 (spinach) with a median of 91.13. Foods with lower water use ($\leq$332 m^3/ton) and higher nutritional value ($\geq$91.13) from highest to lowest NRF score were spinach, lettuce, pumpkins, tomatoes, peppers, cabbage, cantaloupe, cauliflower, squash, carrots, celery, lemons, strawberries, raspberries, onions, sweet potatoes, cucumbers, honeydew, sugar beets, watermelon, and peaches. On the other hand, most animal products, most field crops, and all nuts had higher water use and lower nutritional value per 100 kcal.

Conclusions: This study characterizes which CA Ag products could be encouraged at the consumer, business, and policy levels to increase water conservation while maintaining a higher nutritional value. It is the first study on water use and nutritional value that uses CA water data and includes animal products.