

Sorghum and other drought-tolerant cereal crops can provide better nutrition and more sustainable agriculture

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Sorghum. Credit: Public Domain

One of the biggest factors in determining the health of humans and the environment is the foods that we grow and consume. While there have

been many efforts over the years to define sustainable diets and to try to get people all over the world the proper nutrition that they need, many of these efforts do not take into account local dietary preferences or the adverse impacts that growing certain foods have on the environment.

A new paper from the University of Delaware's Dongyang Wei and Kyle Davis attempts to remedy this situation by looking at how staple grains can be used as an effective food group for dietary shifts that can be culturally appropriate as well as environmentally sustainable.

Their paper was recently published in *Environmental Research Letters*.

Wei, a doctoral candidate in the Department of Geography and Spatial Sciences, served as the lead author on the paper and said that while previous studies have focused on parts of this issue—such as considering foods that have lower environmental impacts and offer higher nutrition levels—this study wanted to incorporate local dietary preferences to see if the proposed shifts would actually be feasible.

"We wanted to take the local preferences and the cultural acceptance into consideration because that will increase the chances that sustainable diets will actually be accepted," said Wei.

Working with Davis, assistant professor in the College of Earth, Ocean and Environment's Department of Geography and Spatial Sciences and the College of Agriculture and Natural Resources' Department of Plant and Soil Sciences and a resident faculty member with UD's Data Science Institute, Wei examined how country-specific shifts in [cereal](#) supply, which currently accounts for more than 40% of dietary calories, protein, iron and zinc world-wide, could contribute to more sustainable diets.

While cereals are not consumed as widely in the United States, western Europe and Australia, they play a vital nutritional role in many other

countries.

"Regions facing food security challenges include the Middle East, Africa and South Asia," said Wei. "These areas are also the ones that consume large proportions of cereals, so sustainable dietary shifts on cereals can have larger impacts in these places."

The researchers identified two shifts in particular that would be locally acceptable and help to increase nutrition while lowering the environmental impacts of crop production. This includes incorporating more drought-tolerant cereals—such as [maize](#), [sorghum](#) and [millet](#)—and increasing the share of whole grains.

Wei said that unlike cereals such as rice and wheat—which are widely consumed but offer fewer nutritional benefits—other drought-tolerant cereals use water more efficiently, release less greenhouse gases during their production, and are able to maintain their nutrient content in the face of elevated CO₂ in the atmosphere. These drought-tolerant cereals used to be much more widely consumed.

There is also widespread consumption of refined grains, such as bleached flour, which is derived from cereals but is devoid of much of the original nutrients contained in the crop. "Promoting increased whole grains in the diet while reducing refined flours and other processed items such as white bread can have important benefits for nutrition and [health](#)," said Davis.

To conduct the study, Wei and Davis looked at [historical data](#) from 1961 through 2011 from the Global Expanded Nutrient Supply database, which contains information on 225 food commodities. The data were available for 152 countries, which account for 96% of the world population.

They looked at dietary scenarios at the country level to take into account each nation's historical and current dietary patterns to better understand what dietary shifts would be locally acceptable and feasible.

They found that shifting diets to include more drought-tolerant grains and more [whole grains](#) would lead to substantial increases in dietary nutrients while at the same time helping to lower the environmental footprint of crop production.

For instance, demand for [freshwater resources](#) used to irrigate crops could be reduced globally by up to 11%, and water-scarce countries such as Yemen could reduce their water demand by up to 60%.

Because all of the crops considered in the study have been and still are cultivated and consumed within each country, there is the possibility to identify locally acceptable dietary shifts that can lead to multiple environmental and human health benefits.

More information: Dongyang Wei et al, Culturally appropriate shifts in staple grain consumption can improve multiple sustainability outcomes, *Environmental Research Letters* (2021). [DOI: 10.1088/1748-9326/ac32fc](#)

Provided by University of Delaware

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