

Unraveling the complex web of global food trade

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Growing global trade is critically important for providing food when and where it's needed—but it makes it harder to link the benefits of food and the environmental burden of its production. A study published this week in the journal *BioScience* by an interdisciplinary team of researchers at the University of Minnesota's Institute on the Environment proposes to extend the way we characterize global food trade to include nutritional value and resource consumption alongside more conventional measures of trade's value.

"Trade is usually described in terms of the value or weight of the goods being exchanged," said study lead Graham MacDonald, a postdoctoral research scholar with the Institute's Global Landscapes Initiative (GLI). "But these don't necessarily capture other important aspects of [food](#) production and distribution. Accounting for food's [nutritional value](#) and the land and water resources needed to produce exports offers a more holistic view of how [trade](#) affects global food security and the environment. Our study uniquely juxtaposes these perspectives."

"Economic, nutritional and environmental metrics all tell different stories of the geography of [global trade](#), so it's important to include a range of metrics to get a complete picture," said co-author and GLI co-director Paul West. "Our food system is increasingly globalized. The patterns we uncovered can help to assess how current and future policies affect the complex links between food and the environment."

The researchers compiled millions of global food trade statistics for the

2000s from the Food and Agriculture Organization of the United Nations to calculate the monetary value, calories, land use and irrigation water consumption associated with 390 traded food commodities derived from 139 crops and 10 domesticated animals. Traded goods were tracked back to which nations actually grew the underlying crops using cross-national data on agricultural production. They discovered that each of the four metrics—money, calories, land use and irrigation water use—revealed a distinct set of nations and commodities that shaped global totals, underscoring the importance of considering all of them when characterizing and making policy decisions related to global food trade. Among the findings:

- Global exports of food commodities were worth about US\$522 billion per year in the period 2000 to 2009.
- More than one-fifth of the calories grown in farm fields are ultimately traded, which also required about 20% of the world's croplands (~245 million hectares).
- Over 70% of the global trade according to all metrics is concentrated in only 20 exporting and 33 importing countries.
- Animal products comprised more than one quarter of the value of trade but only 5 percent of the calories traded. In total, exports of meat and other animal products use at least 8 percent of the global agricultural land base.
- The bulk of monetary value of food trade is concentrated in trades among European Union countries, but these trade relationships are often facilitated by land use in other regions where the crops behind those products are grown. These 're-exports' from European Union countries require over 9 million hectares of cropland in other regions.
- Interestingly, whether a country is a net importer or net exporter varied, depending on the metric considered. "For example, China exports apples and other fruits that are fairly high value, while it mostly imports land-intensive but much lower-value soybean.

Kenya exports high value tea and coffee, but imports wheat grown on foreign cropland that is an important food staple," said MacDonald.

- A handful of trade paths stood out as particularly prominent, especially the cropland area embodied in soybean exports from the U.S., Brazil, and Argentina to China. "In other words, we identified really land-intensive and water-intensive 'megatrades' that disproportionately contribute to global trade," MacDonald said. "Such trades are a reflection of highly specialized and export-oriented agricultural systems that manifested in rapid globalization."

MacDonald said the findings underscore the importance of choosing the right yardstick when analyzing the global trade network. He said that the study raises new questions about what other metrics could be used to evaluate the broader implications of international supply chains or interdependencies among countries in terms of food and resources.

Provided by University of Minnesota

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