

Who will feed the world in 2035? AI research offers clues

An analysis reveals what makes a global food powerhouse and which countries are gaining ground

By Kelly deVos, ASU News
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The United States will remain on top. Brazil will gain ground. China will expand its share. And some longtime European agricultural powers may fall behind.

That is the picture of the global food trade in 2035 emerging from a new analysis led by Arizona State University researcher [Deniz Berfin Karakoc](#), an assistant professor of industrial engineering in the [School of Computing and Augmented Intelligence](#), part of the [Ira A. Fulton Schools of Engineering](#) at ASU.

In “[Underlying export characteristics and projected country positions in the agri-food trade: A global system analysis](#),” a new peer-reviewed study published in npj Science of Food, a Nature Portfolio journal, she and her collaborators used artificial intelligence to analyze approximately three decades of agricultural trade data from 25 countries that together account for more than 75% of the global agri-food export market.

That scale is where machine learning, a form of AI, became particularly useful.

Instead of examining one country, commodity or influence on trade at a time, the researchers could look across the global system, searching through huge volumes of data for relationships among economic, social and infrastructure factors. They then used those patterns to project how countries’ shares of the global market could change by 2035 if long-term trends continue.

The results suggest that the world’s food-export map won’t be completely redrawn over the next decade. But some of its borders are shifting.

Why this research matters

And those rankings are about more than who exports the most food. Millions of people rely on food produced outside their borders, making the global trade system a critical link between where food is grown and where it is needed. Knowing which countries are likely to gain or lose influence could help policymakers anticipate vulnerabilities, strengthen trade relationships and build more resilient food supply chains.

For [Ross Maciejewski](#), director of the School of Computing and Augmented Intelligence, the research illustrates how AI can help people make sense of systems with many interconnected pieces.

“Food security is one of those challenges that touches nearly every part of society, including infrastructure, economics, technology and public policy,” Maciejewski says. “AI gives us new ways to understand how all of those pieces interact.”

For Karakoc, looking ahead to 2035 can give policymakers a chance to make better decisions about the global food system today.

According to Karakoc’s research, by 2035, the U.S. is projected to remain the largest exporter among the countries studied, with 9.74% of the market. Brazil’s share is projected to account for 5.34%, while China reaches 4.59% and Australia reaches 3.4%

Other countries could make substantial gains. Canada’s share is projected to reach 4.03%, India’s 2.41% and Poland’s 2.96%. Meanwhile, traditional European exporters are projected to command smaller shares than they did historically as competitors gain ground.

The result is a food trade system whose leading exporters are more widely distributed around the globe.

It takes more than farmland

What makes a country a global food powerhouse? With data spanning everything from gross domestic product and population to disasters and transportation investment, the researchers used AI to sort through the possibilities and identify which characteristics were most closely associated with export power.

The strongest was logistics, including the ports, roads, customs operations and other infrastructure that gets food from producers to markets around the world. Population, government reliability and the value of agricultural production were also among the strongest factors.

“When we think about agricultural power, we tend to think first about how much food a country can produce,” Karakoc says. “What we found is that production is only one part of the system. The ability to move those products efficiently, maintain reliable institutions and connect producers to global markets can be just as important.”

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Just as revealing was what didn't rise to the top. Geopolitical risk and the number of days a country experienced disasters did little to explain which countries commanded the largest shares of the global export market.

That doesn't mean wars or natural disasters don't disrupt food supplies. Instead, Karakoc says the findings suggest that a country's long-term position in global food trade is more closely associated with the systems that support production and move goods to market.

Forecasting tomorrow's food system

The team, including Amirhosein Ghozatfar, a professor at the University of Strathclyde, and Tina Sardashti, a doctoral student at Lancaster University, then turned those insights toward the future.

Using historical patterns from 1988 to 2022, they utilized a machine-learning model to project how the factors associated with export power could change through 2035. A second model applied those projections to estimate countries' future shares of the global export market.

The researchers didn't set out to use AI to predict winners and losers. They sought to connect decades of changes in infrastructure, economies, institutions and agricultural production to shifts in the global food system.

Karakoc cautions that the results aren't a crystal ball. The forecasts assume that relationships observed over the past three decades broadly continue, meaning an unexpected war, climate shock, policy change or transformation of the food system could alter the trajectory.

"We're not saying this is exactly what the world will look like in 2035," Karakoc says. "These projections show us where countries are headed if the patterns we've observed over the last three decades continue. That gives policymakers an opportunity to think about where vulnerabilities are developing and what they can do about them now."

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Main image



Deniz Berfin Karakoc, an assistant professor of industrial engineering in the School of Computing and Augmented Intelligence, part of the Ira A. Fulton Schools of Engineering at Arizona State University, uses artificial intelligence to uncover patterns in the complex systems that move food around the world. Graphic by Erika Gronek/ASU