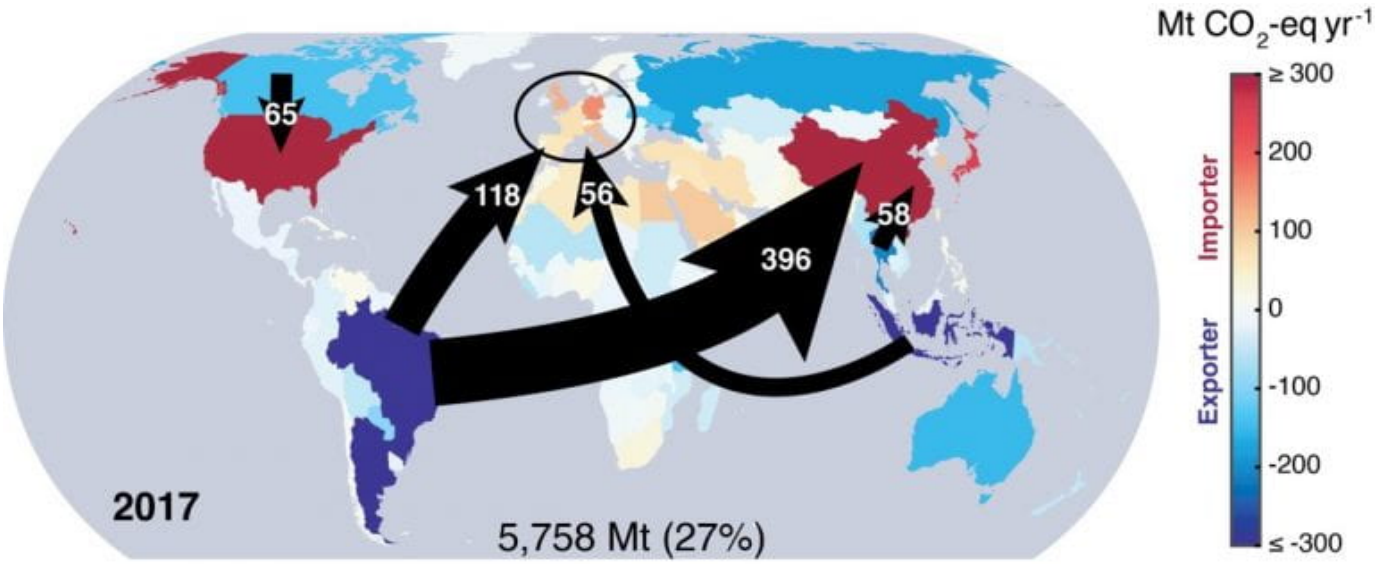
Emissions tied to the international trade of agricultural goods are rising

UCI-led study shows the global shift of land-use greenhouse gas emissions.
Friday, May 06, 2022
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UCI News



For a new paper in the journal Science, Earth system scientists at UCI and other institutions tracked the greenhouse gas emissions embodied in the international trade of agricultural goods. They found a significant shift from 2004, when China was a net exporter of farm produce, to 2017, when that nation was the largest importer of Brazilian exports.

Picture Credit:
Steven Davis/UCI

Irvine, Calif., May 6, 2022 – Earth system scientists at the University of California, Irvine and other institutions have drawn the clearest line yet connecting consumers of agricultural produce in wealthier countries in Asia, Europe and North America with a growth in greenhouse gas emissions in less-developed nations, mostly in the Southern Hemisphere.

In a paper published today in *Science*, the researchers report that trade in land-use emissions – which come from a combination of agriculture and land-use change – increased from 5.1 gigatons of carbon dioxide equivalent (when factoring in other greenhouse gas emissions such as nitrous oxide and methane) per year in 2004 to 5.8 gigatons in 2017.

In the paper, the scientists found that land-use change – including clearing of carbon-absorbing forests to create space for farms and pastures – contributed roughly three-quarters of the amount of greenhouse gases driven by the global trade of agricultural goods between 2004 and 2017.

“Roughly a quarter of all human greenhouse gas emissions are from land use,” said co-author Steven Davis, UCI professor of Earth system science. “Our work shows that large shares of these emissions in lower-income countries are related to consumption in more developed countries.”

The top sources of land-use-change emissions during the period studied were Brazil, where the practice of removing natural vegetation such as forests to make room for livestock pastures and farms has caused large transformation of land use in the country, and Indonesia, where ancient, carbon-storing peats have been burned or otherwise eliminated to enable the cultivation of plants to produce palm oil for export to wealthy countries.

About 22 percent of the world’s crop and pastureland – 1 billion hectares – is used to cultivate products destined for overseas consumers, according to the researchers. Commodities such as rice, wheat, corn, soybeans, palm oil and other oil seeds occupy nearly one third of the land used for traded goods and contribute roughly half of traded greenhouse emissions.

The study showed shifts that took place in certain regions between 2004 and 2017: In the early phase, China was a net exporter of agricultural goods, but by 2017, it had become an importer of both goods and land-use emissions, in part from Brazil. At the same time, Brazil’s exports to Europe and the United States, which had been the nation’s largest trading partners in agricultural goods in 2004, declined.

In 2017, the last year the researchers examined, the largest source of export-related emissions was Brazil, followed by Argentina, Indonesia, Thailand, Russia and Australia. The largest net importers of products tied to such emissions were China, the U.S., Japan and Germany, with the U.K., Italy, South Korea and Saudi Arabia

following.

In addition to adding greenhouse gases to the atmosphere, human land use practices have caused significant ecosystem disruption, degraded biodiversity, depleted water resources and introduced other types of pollution to local environments.

From an economic standpoint, the exporters producing the highest amounts of land use emissions are also heavily dependent on export agriculture as a contributor to gross domestic product.

Davis said, “We hope this study will raise awareness of the role of international trade in driving land-use emissions. In turn, importers can adopt ‘buy clean’ policies to reduce the most emissions-intensive imports and discourage regions from gaining an environmentally destructive trade advantage. We recognize that several regions, including Europe, the U.S., and China, have seen an increase in efforts taken to improve supply chain transparency in recent years – a good sign indeed.”

The project – funded by the National Science Foundation and U.S. Department of Agriculture, the ClimateWorks Foundation, and the Gordon and Betty Moore Foundation – also included researchers from the University of California, San Diego; the University of California, Davis; Stanford University; China’s Tsinghua University, Beijing Normal University, Peking University, Chinese Academy of Sciences; and Germany’s Ludwig-Maximilian University.

About UCI’s Brilliant Future campaign: Publicly launched on Oct. 4, 2019, the Brilliant Future campaign aims to raise awareness and support for UCI. By engaging 75,000 alumni and garnering $2 billion in philanthropic investment, UCI seeks to reach new heights of excellence in student success, health and wellness, research and more. The School of Physical Sciences plays a vital role in the success of the campaign. Learn more by visiting https://brilliantfuture.uci.edu/uci-school-of-physical-sciences/.

About the University of California, Irvine: Founded in 1965, UCI is the youngest member of the prestigious Association of American Universities and is ranked among the nation’s top 10 public universities by *U.S. News & World Report*. The campus has produced five Nobel laureates and is known for its academic achievement, premier research, innovation and anteater mascot. Led by Chancellor Howard Gillman, UCI has more than 36,000 students and offers 224 degree programs. It’s located in one

of the world’s safest and most economically vibrant communities and is Orange County’s second-largest employer, contributing $7 billion annually to the local economy and $8 billion statewide. For more on UCI, visit www.uci.edu.

Media access: Radio programs/stations may, for a fee, use an on-campus ISDN line to interview UCI faculty and experts, subject to availability and university approval. For more UCI news, visit news.uci.edu. Additional resources for journalists may be found at communications.uci.edu/for-journalists.

Original Source
Earth System Science
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