Global trade in soy has major implications for the climate

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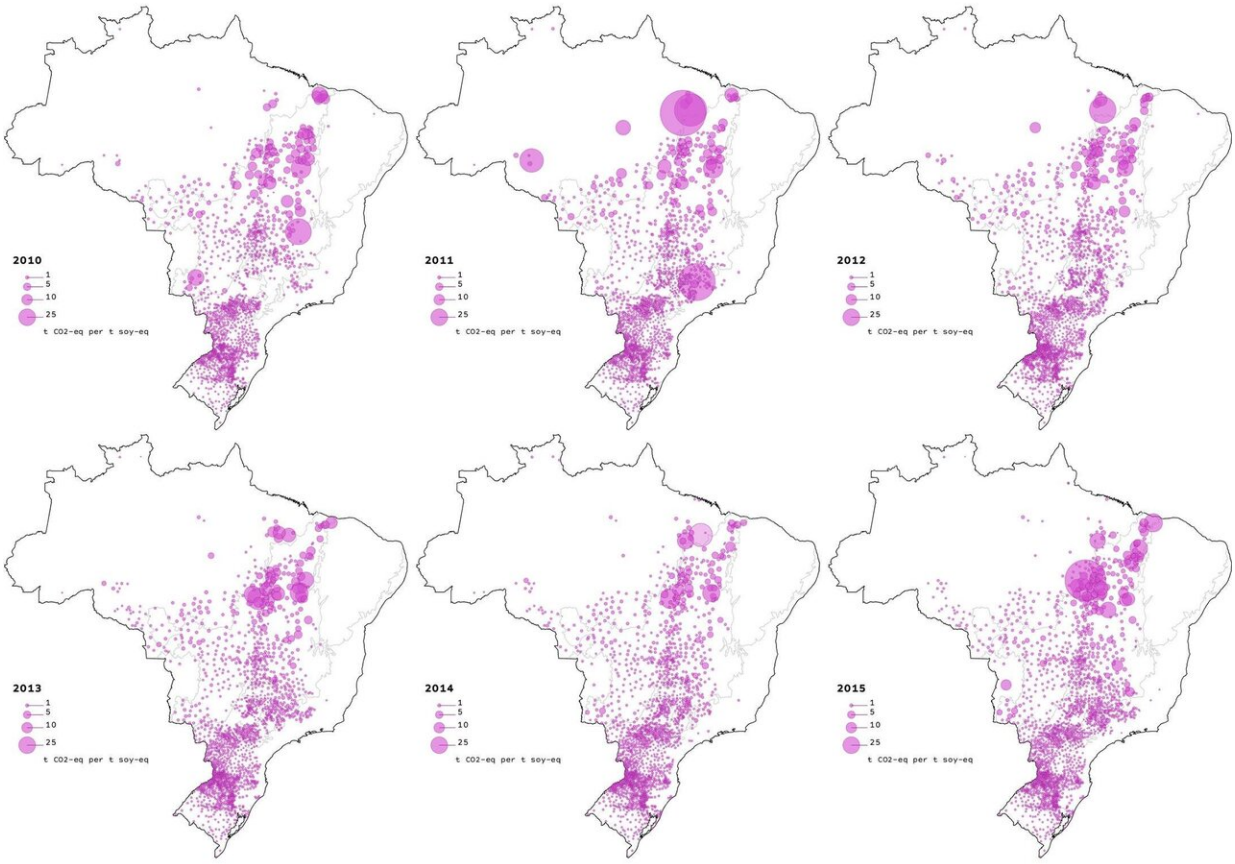
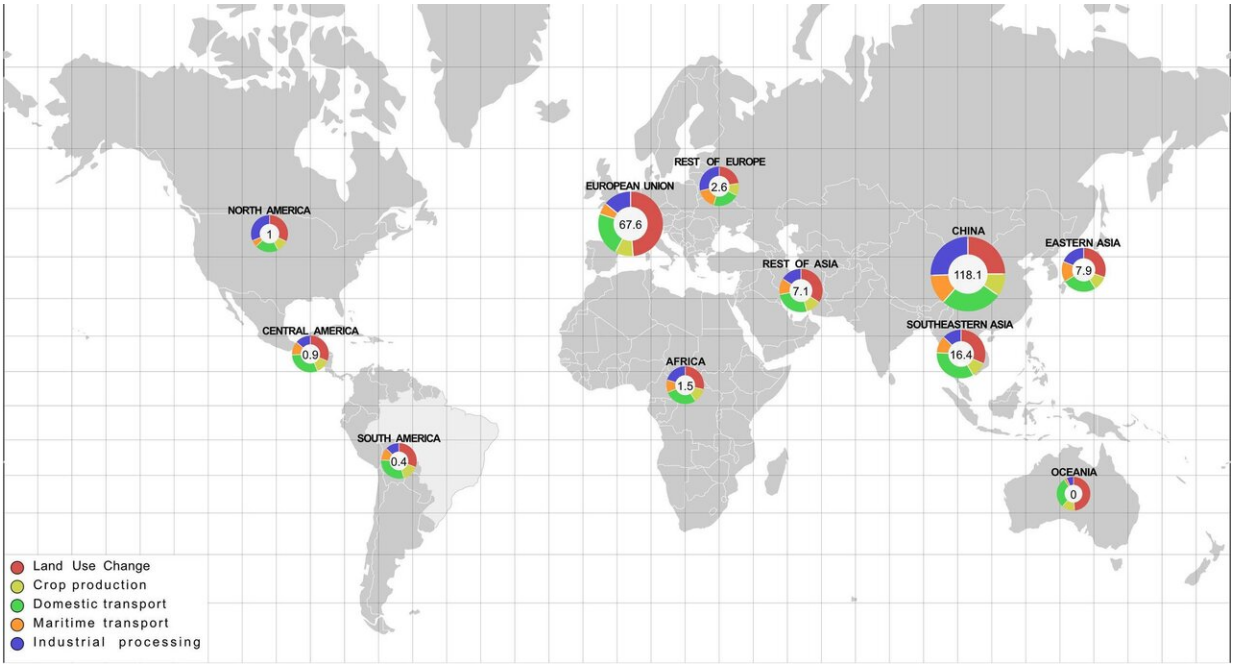


The quantity of greenhouse gases released through the production, processing and export of soybean and derivatives varies greatly from municipality to municipality and from year to year. Credit: Neus Escobar et. al., Global Environmental Change; DOI: 10.1016/j.gloenvcha.2020.102067

The extent to which Brazilian soy production and trade contribute to climate change depends largely on the location where soybeans are grown. This is shown by a recent study conducted by the University of Bonn together with partners from Spain, Belgium and Sweden. In some municipalities, CO_2 emissions resulting from the export of soybean and derivatives are more than 200 times higher than in others. Between 2010 and 2015, the EU imported soy primarily from locations where large forest and savannah areas had previously been converted into agricultural land. The analysis is published in the journal Global Environmental Change.

Global soy trade is a major source of greenhouse gas emissions for multiple reasons. The conversion of natural vegetation into arable land is probably the most important cause, since the latter generally binds considerably less CO_2 than the original ecosystems. Greenhouse gases are also released during the harvesting of soybeans and processing into derived products, the subsequent transport to ports of export and shipment.

To estimate the carbon footprint embodied in Brazil's soy exports, researchers used the Life Cycle Assessment (LCA) methodology. This allows quantifying the environmental footprint of a product, from its production until it is delivered to the importer. The researchers from the Institute for Food and Resource Economics (ILR) of the University of Bonn have performed this analysis for almost 90,000 supply chains that were identified in total soy exports from Brazil in the period 2010-2015. "Each of these 90,000 individual trade flows represents a specific combination of the producing municipality in Brazil, the location in which the soy was stored and pre-processed, the respective export and import ports, and, where applicable, the country where further processing takes place," explains the ILR researcher Dr. Neus Escobar. "Put more simply, we have calculated the quantity of carbon dioxide released per tonne of soy exported through each of these supply chains."



The EU imported 67.6 million tonnes of greenhouse gas emissions embodied in overall Brazilian soy imports in the period 2010-2015, while China imported 118.1 million tonnes. Credit: Neus Escobar et. al., Global Environmental Change; DOI: 10.1016/j.gloenvcha.2020.102067

Around 90,000 soy trade flows analyzed

For this purpose, the researchers used a database developed at the Stockholm Environment Institute (www.trase.earth). It traces the trade routes of agricultural commodity exports from the production region to the importer in detail. "The database also contains spatially-explicit information on the deforestation associated with the soy cultivation in the production region," says Escobar. "We supplemented it with additional data, for instance, on means of transport involved in the corresponding export route, as well as their CO_2 emission intensity. This enabled us to make a very detailed assessment of the impact of soy

cultivation in Brazil and subsequent transport on global greenhouse gas emissions." Interestingly, results show that: "The resulting greenhouse gas emissions vary considerably from municipality to municipality, depending on underlying deforestation, cultivation practices and freight logistics," emphasizes Escobar. "The carbon footprint of some municipalities is more than 200 times larger than others. The variability is therefore much higher than so far reported in scientific literature."

The greatest CO_2 emissions arise from the so-called MATOPIBA region in the northeast of the country. This region still has large areas covered with natural vegetation, particularly forests and savannahs, which have however been increasingly lost to agriculture in recent years. Furthermore, soy exports from municipalities in this region usually entail long transport distances to the ports of export, which are mostly covered by trucks due to the relatively poor infrastructure. Thus, greenhouse gas emissions from transport can be substantial and even surpass the effects of deforestation.

The researchers also investigated which countries generate particularly large quantities of greenhouse gas emissions by importing soy. First and foremost, the world's largest importer is China, however, the European Union does not fall far behind. "Although European countries imported considerably smaller amounts of soy, between 2010 and 2015, this came primarily from areas where sizable deforestation took place," notes Escobar.

"Regional factors can have a significant influence on the environmental impacts embodied in global agricultural trade," explains the researcher. "Our study helps to shed light on such relationships." Policymakers urgently need such information: It can help to design low-carbon supply chains, for instance with improvements in the transport infrastructure or more effective forest conservation policies. Furthermore, it can also inform consumers about the environmental implications of high meat

consumption, such as in many EU countries: A large proportion of the soy imported by Europe is used as animal feed.

More information: Neus Escobar et al. Spatially-explicit footprints of agricultural commodities: Mapping carbon emissions embodied in Brazil's soy exports, *Global Environmental Change* (2020). DOI: 10.1016/j.gloenvcha.2020.102067

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