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CLIMATE CHANGE

Food transport emissions matter

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Trade enables food access and is therefore key to achieving global food security. However, greenhouse gas emissions associated to food transport are multiple times higher than indicated by previous estimates.

Without reducing greenhouse gas (GHG) emissions from food systems, it would not be possible to limit global warming well below 2°C even if fossil fuel emissions were immediately stopped[1]. Food systems contributed around 21–37% of global anthropogenic GHG emissions[2]. Response options are available to reduce these emissions at various stages of food systems, from pre-production to post-consumption[3,4]. One of these stages is food trade and transport, which plays a crucial role in increased global food distribution and accessibility[5]. However, the mitigation potential of food transport emissions, e.g., by reducing food miles, is debated. 'Food miles' is the distance food is transported to reach its consumers. Food transport emissions due to food miles have so far been considered a small share of the food systems emissions[4,6].

Writing in *Nature Food*, Li and colleagues[7] contribute to this debate by estimating food transport emissions comprehensively, using a global multi-regional input-output (MRIO) framework. MRIO frameworks provide accounts of the global economy by industrial sectors and regions with associated transactions across the entire supply chain; they are often used to understand embodied environmental footprints of goods and services[8]. In MRIO analysis, GHG emissions associated with various production activities throughout the supply chain are reallocated to consumers of the final products both spatially and sectorally. MRIO frameworks can also explicitly estimate transport emissions by linking the consumption of goods and services with their transportation distance[7].

Li and colleagues[7] applied a detailed MRIO framework, with 30 million direct trade connections, to estimate food miles and transport GHG emissions. The detailed framework consists of 73 regions and 37 sectors, including 25 food commodities. These regions represented more than 90% of food imports in 2018. Li and colleagues first calculated food production emissions, then estimated food miles and transport emissions by integrating physical transport distance and modes with the amount of food transported and associated emission coefficients. They distinguished international and domestic transport by different food-specific transport modes, including refrigeration needs.

The study estimates global food transport emissions to be about 3 Gt $CO_{2eq.}$/yr, or 30% of food systems emissions, considering the entire food supply chain[7]. This estimate is 3.5–7.5 times higher than previous ones[4,9]. Food consumption contributes to 18% of the total freight transport, i.e., food miles of 22.2 trillion t-km. International food trade is responsible for 70% of the global food miles, 46% of which is related to consumption in high-income countries. These countries have only 12.5% of the global population. Domestic trade, which is largely based on road transport (Figure 1), contributes to 60% of the global food transport emissions because road transport has higher emission intensity per food mile than maritime shipping. Around 64% of the domestic food miles and emissions are due to consumption in China, India, the United States, and Russia due to their large area and population.

Li and colleagues[7] also highlight that the transport of fruits and vegetables is a major emitter, i.e., about 1 Gt $CO_{2eq.}$/yr, due to their high volume and need to be transported in a temperature-controlled environment. Additionally, the supply chain required to produce food (e.g., transport of fertilizers, agricultural machinery, and pesticides) significantly contributes to the global food transport emissions. Since regionalization of food systems could shorten the supply chain[3,6], Li and colleagues also modelled a hypothetical scenario, replacing food imports with domestic production. However, this scenario would reduce food transport emissions by only 0.27 Gt $CO_{2eq.}$/yr, mostly in high-income countries. This limited reduction is due to increased domestic food transport on the road with a high emission intensity. Most international food transport occurs by maritime shipping.

The novel findings from Li and colleagues[7] emphasize the need to account for food transport emissions for effective climate action. A substantial share of food systems emissions comes from food transport, which varies across regions, transport modes, and sectors, including food commodities. Interventions to reduce food miles and associated emissions must be tailored according to these variations. For instance, simply replacing food imports with domestic production may reduce only a small share of emissions under business-as-usual conditions. Besides domestic food transport, the supply chain required to produce food contributes a huge share of food transport emissions. Thus, making the entire food supply chain as local as possible would reduce food transport emissions instead of focusing on food self-sufficiency only at a country scale.

As shown by Li and colleagues, consideration of food transport emissions would also support better strategies to transform food systems[7]. For example, interventions to promote the consumption of fruits and vegetables might increase food transport emissions without coupling them with the regionalization of food systems. Currently, the consumption of fruits and vegetables is below what is recommended in many countries[10,11]. Although this study enriches our understanding of food transport emissions, some open questions remain. Since foods are increasingly being transported internationally, it is also important to distinguish the roles of producer, consumer, and intermediary trading countries in reducing food systems emissions[12]. So far, the focus has been mainly on producers and/or consumers. However, intermediary trading of agricultural commodities is fastly growing globally, which is centralized among a few countries[13].

In summary, Li and colleagues[7] have shown that food transport emissions matter for climate action more than previously thought. However, replacing imports with domestic production is not enough; tackling this issue requiresa combination of measures, such as relying more on regional and seasonal produces, shortening the supply chain required to produce food, consuming healthy diets with a large share of plant-based foods, avoiding overconsumption, and reducing food loss and waste. Moreover, incorporating transport emissions into total food production emissions could provide new insights into the carbon loophole generated by trade and aid the design of climate action targeted at producers, consumers, and intermediary trading countries.

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Ethics declaration

The author declares no competing interests.

Figure 1. Vegetables being transported from rural to urban areas in Itahari, Nepal. Foods are mostly transported on the road within a country, which usually has a higher GHG emission intensity than international food transport via maritime shipping. Reducing food transport emissions requires systemic changes. Credit/Copyright: Photography by Sagar Kafle