

Food footprint

part II

peas unite 2022—2023

Eating locally?

Eating local only slightly reduces your emissions

Eating local beef or lamb has many times the carbon footprint of most other foods. Whether they are grown locally or shipped from the other side of the world matters very little for total emissions.

Transport typically accounts for less than 1% of beef's GHG emissions: choosing to eat local has very minimal effects on its total footprint.

You might think this figure is strongly dependent on where in the world you live, and how far your beef will have to travel, *but you are wrong! (I'll show you why in a sec...)*

Whether you buy it from the farmer next door or from far away, it is not the location that makes the carbon footprint of your dinner large, but the fact that it is beef!!

That's why you are wrong...

Let's take the example of beef from a beef herd - the average footprint is approximately 60 kilograms of CO₂eq per kilogram of beef.

Let's compare the transport footprint of buying from your local farmer versus someone in the UK buying beef from Central America (approximately 9000 kilometers away).

That's why you are wrong...

Transporting food by boat emits 23 grams of CO₂eq per ton. of product per kilometer.

To transport the 9000 kilometers from Central America to the UK therefore emits 0.207 kilograms CO₂eq.

This is equivalent to 0.35% of the total footprint of the 60 kilograms of CO₂eq per kilogram of beef.

If you buy from your local farmer – let's assume you walk there, and have zero transport emissions – your beef footprint is 59.8 kilograms CO₂eq per kilogram.

It almost makes no difference.

Especially for foods with a large footprint, transport as a share of the food's total emissions is fairly insensitive to the distance travelled.

Weber & Matthews (2008)

👉 Weber, C. L., & Matthews, H. S. (2008). Food-miles and the relative climate impacts of food choices in the United States. *Environmental Science & Technology*.

Investigated the relative climate impact of food miles and food choices in households in the US.

Their analysis showed that substituting less than one day per week's worth of calories from beef and dairy products to chicken, fish, eggs, or a plant-based alternative reduces GHG emissions more than buying all your food from local sources.

**Eating
sustainably?**

How to reduce carbon footprint of our diet

What we choose to eat has the largest impact, making a bigger difference than how far our food has traveled, or how much packaging it's wrapped in. This is because only a small fraction comes from transport and packaging and most of our food emissions come from processes on the farm, or from land use change.

Regardless of whether you compare the footprint of foods in terms of their weight, protein content or calories, the overall conclusion is the same: plant-based foods tend to have a lower carbon footprint than meat and dairy.

As an example: producing 100 grams of protein from peas emits just 0.4 kilograms of carbon dioxide equivalents (CO₂eq). To get the same amount of protein from beef, emissions would be nearly 90 times higher, at 35 kgCO₂eq.²⁶

How to reduce carbon footprint of our diet

There is a big caveat, though: comparisons are made based on global averages.

This overlooks the large variation in the footprints of foods across the world.

Using global averages might give us a misleading picture for some parts of the world or some producers. If I source my beef or lamb from low-impact producers, could they have a lower footprint than plant-based alternatives?

The evidence suggests, no: plant-based foods emit fewer greenhouse gases than meat and dairy, regardless of how they are produced.

Let's take a look at the full range of footprints for protein-rich foods.

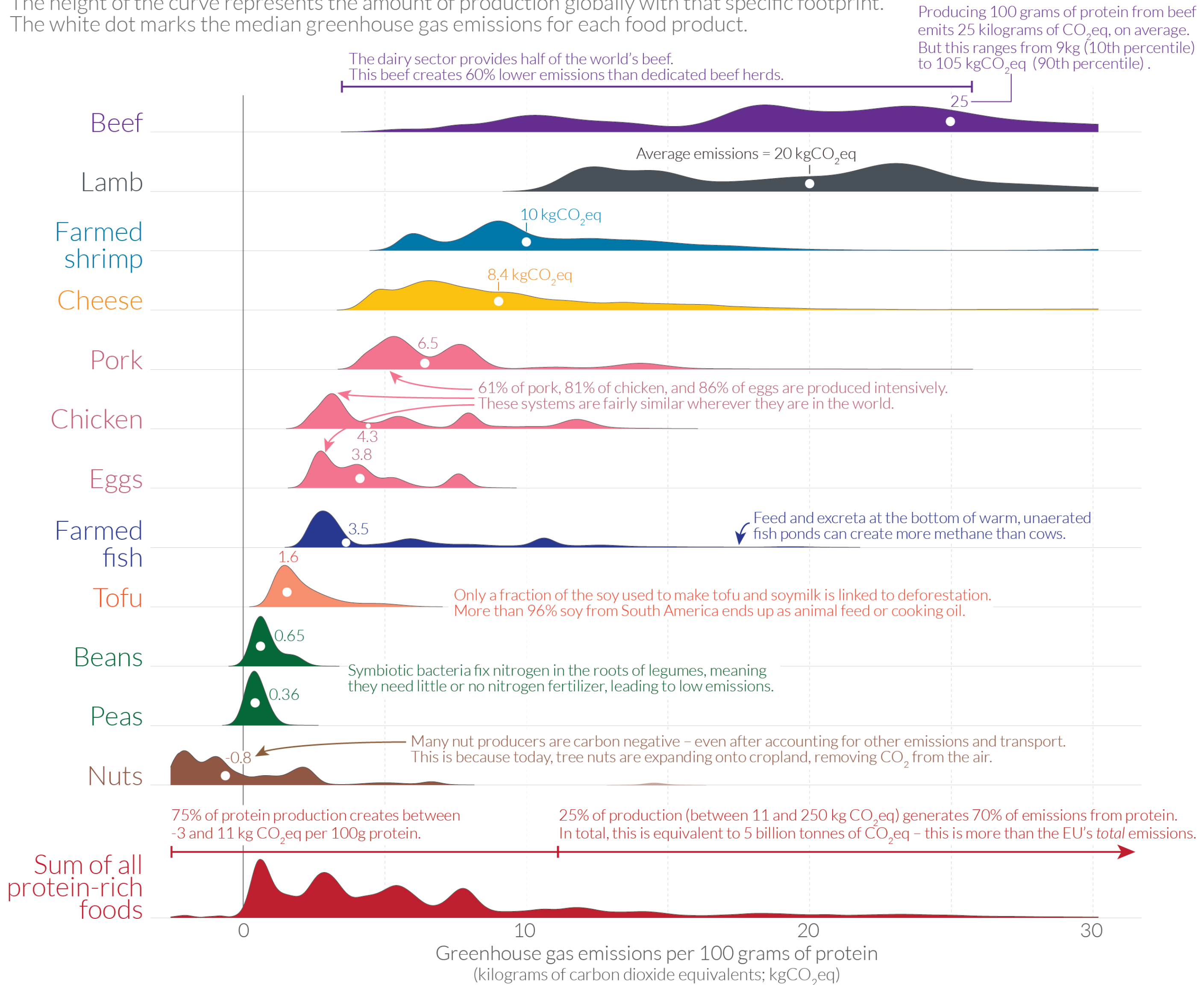
How does the carbon footprint of protein-rich foods compare?

Greenhouse gas emissions from protein-rich foods are shown per 100 grams of protein across a global sample of 38,700 commercially viable farms in 119 countries. The height of the curve represents the amount of production globally with that specific footprint. The white dot marks the median greenhouse gas emissions for each food product.

In the visualization we see the range of carbon footprints for these foods.

All greenhouse gas (GHG) emissions are measured in kilograms of carbon dioxide equivalents per 100 grams of protein

The visualization shows the median footprint - highlighted by a small white circle for each food product.

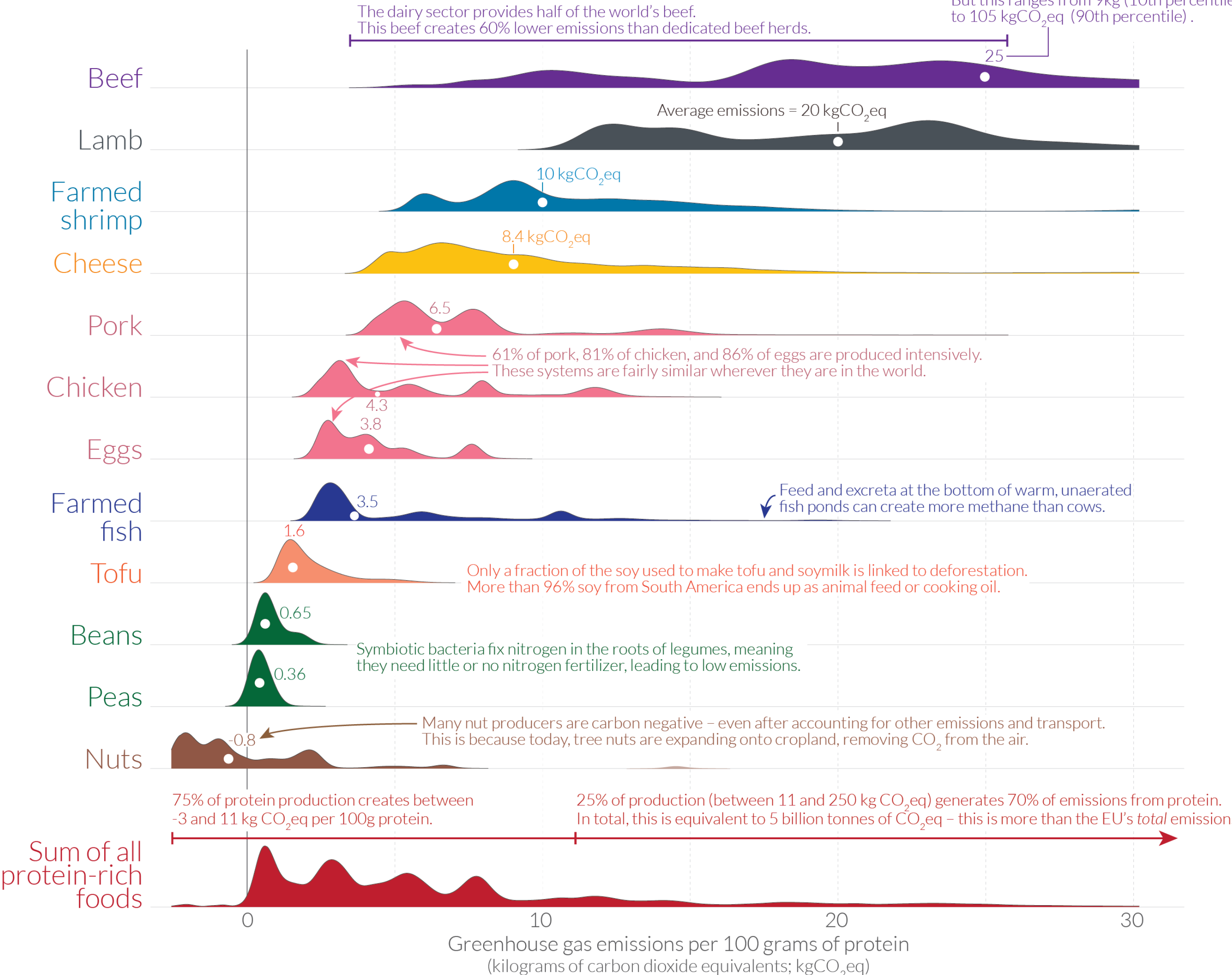


Note: Data refers to the greenhouse gas emissions of food products across a global sample of 38,700 commercially viable farms in 119 countries. Emissions are measured across the full supply-chain, from land use change through to the retailer and includes on-farm, processing, transport, packaging and retail emissions. Data source: Joseph Poore and Thomas Nemecek (2018). Reducing food's environmental impacts through producers and consumers. *Science*. OurWorldinData.org - Research and data to make progress against the world's largest problems. Licensed under CC-BY by the authors Joseph Poore & Hannah Ritchie.

Do we need to pause for a quick reminder of average, median and modal values of a distribution?

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There are large differences between producers: this chart also shows the full spectrum of emissions – from the lowest to highest producers.

The height at each point in the curve represents the amount of global production with that specific footprint.

The median footprint for beef is 25 kgCO₂eq.

But some producers have a much higher footprint: ten percent emit more than 105 kgCO₂eq per 100 grams. At the other end, some are much lower. Ten percent emit less than 9 kgCO₂eq.

We see from the height of the curve that most beef production lies in the range between 17 to 27 kgCO₂eq.

How do the distributions between plant-based and meat-based sources compare?

Plant-based protein sources - tofu, beans, peas and nuts - have the lowest carbon footprint.

This is certainly true when you compare average emissions.....

.....but it's still true when you compare the extremes: there's not much overlap in emissions between the worst producers of plant proteins, and the best producers of meat and dairy.

A comparison

Let's compare the highest-impact producers (the top ten percent) of plant-based proteins with the lowest-impact producers (the bottom ten percent) of meat and dairy.

A comparison

The pea producers with the highest footprint emit just 0.8 kgCO₂eq per 100 grams of protein.³⁰

For nuts it is 2.4 and for tofu, 3.5 kgCO₂eq.

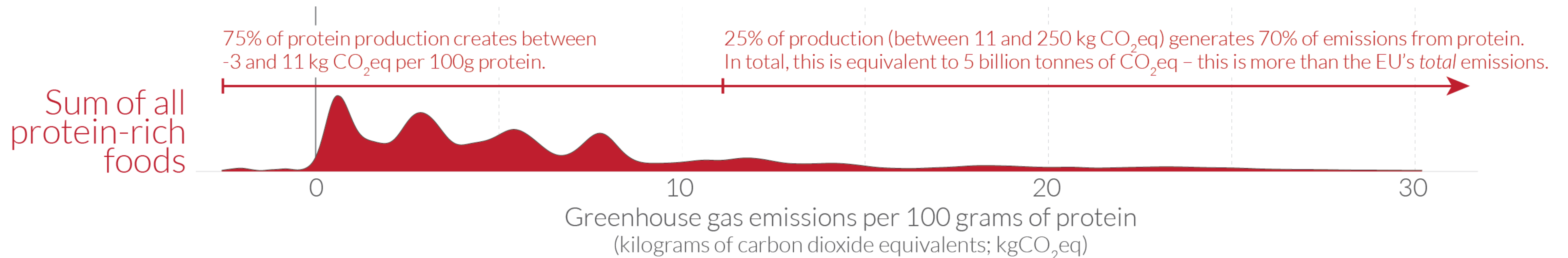
All are several times less than the lowest impact lamb (12 kgCO₂eq) and beef (9 kgCO₂eq).

Emissions are also lower than those from the best cheese and pork (4.5 kgCO₂eq); and slightly lower or comparable to those from the lowest-footprint chicken (2.4 kgCO₂eq).³¹

However, sustainable production can still make a difference...

Globally, greenhouse gas emissions are massively skewed towards high-impact producers.

This can be seen here: the red curve shows the sum of all protein products.

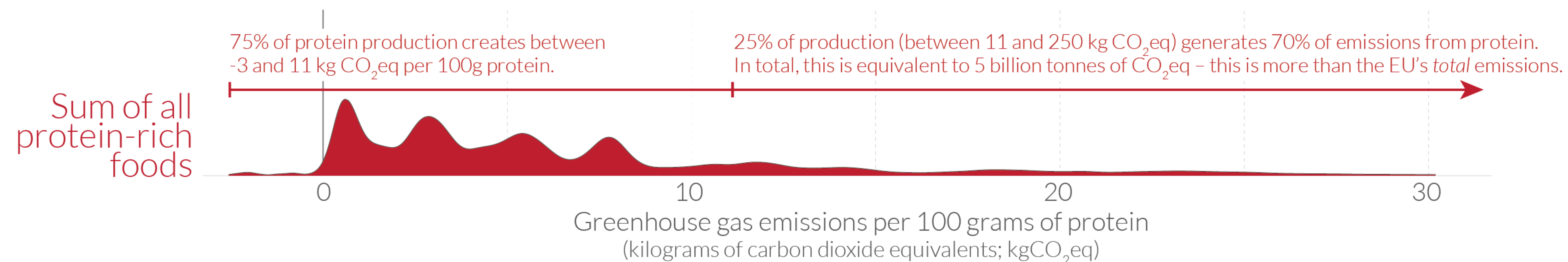


However, sustainable production can still make a difference...

Most of the protein we produce is relatively low-impact: 75% of production has a footprint between -3 and 11 kgCO₂eq per 100 grams of protein. This creates just 30% of protein's emissions.

High-impact production - with a footprint greater than 11 kgCO₂eq - produces just 25% of our protein, but 70% of its emissions.

To put this 'high-impact production' in context: the top quarter of protein production emits more than five billion tonnes of CO₂eq each year. This is more than the EU's total annual greenhouse gas emissions from all sectors.



Eating in the EU

Footprint of EU diet

☞ Sandström, V., Valin, H., Krisztin, T., Havlík, P., Herrero, M., & Kastner, T. (2018). The role of trade in the greenhouse gas footprints of EU diets. *Global Food Security*, 19, 48-55.

They compared greenhouse gas emissions from the average diet across countries in the European Union.

In this study the researchers quantified the emissions from food production, land-use change and trade (i.e. transport) for each food group.

Sandström, V. et al. 2018

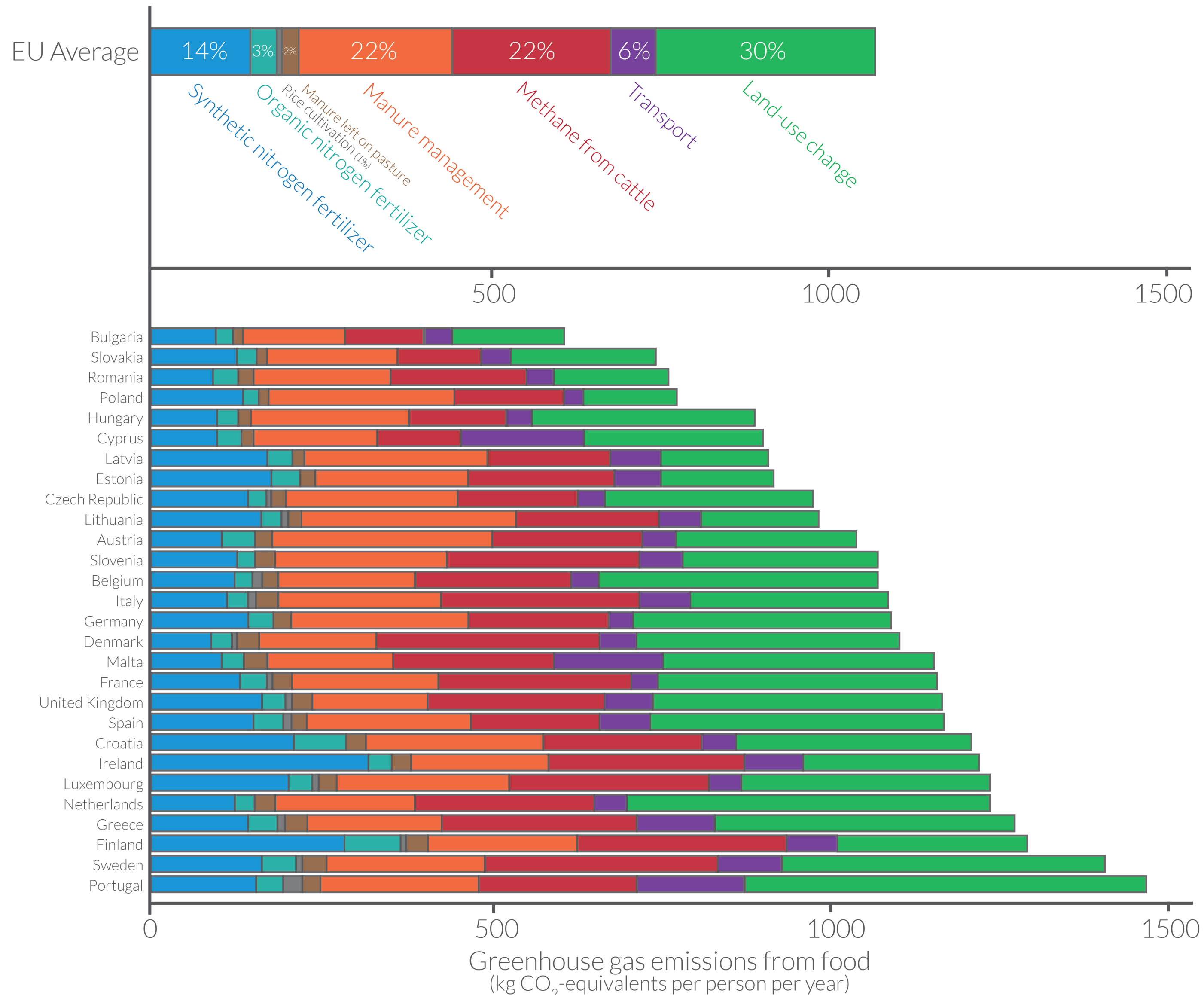
The majority of emissions result from land use change, or emissions at the farm level – either methane emissions from cattle; management of manure; or use of fertilizer.

Food transport accounted for only 6% of emissions.

When broken down by food items, dairy, meat and eggs dominate. They account for 83% of GHG emissions from the average EU diet. Only 17% results from plant-based foods. Most of the variation between countries comes from how much meat and dairy products they eat.

What Europeans ate has the biggest impact on their footprint. We see this clearly in this visualization when we look at the footprint of the average European diet by source and by food type side-by-side.

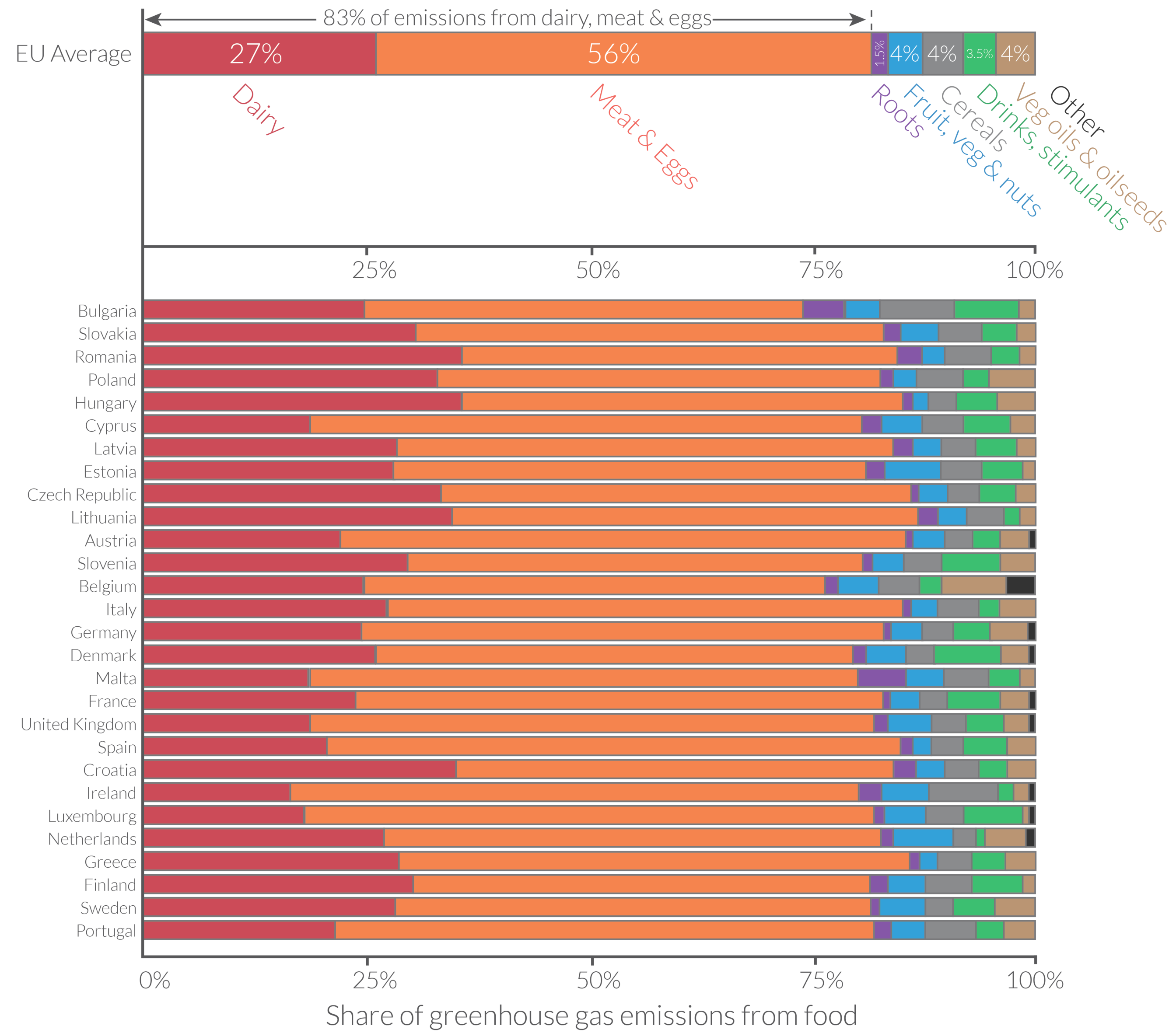
Carbon footprint of diets across the European Union: where in the supply chain do emissions come from?



Data source: Sandström et al. (2018). The role of trade in the greenhouse gas footprints of EU diets. [OurWorldinData.org](https://www.ourworldindata.org) - Research and data to make progress against the world's largest problems.

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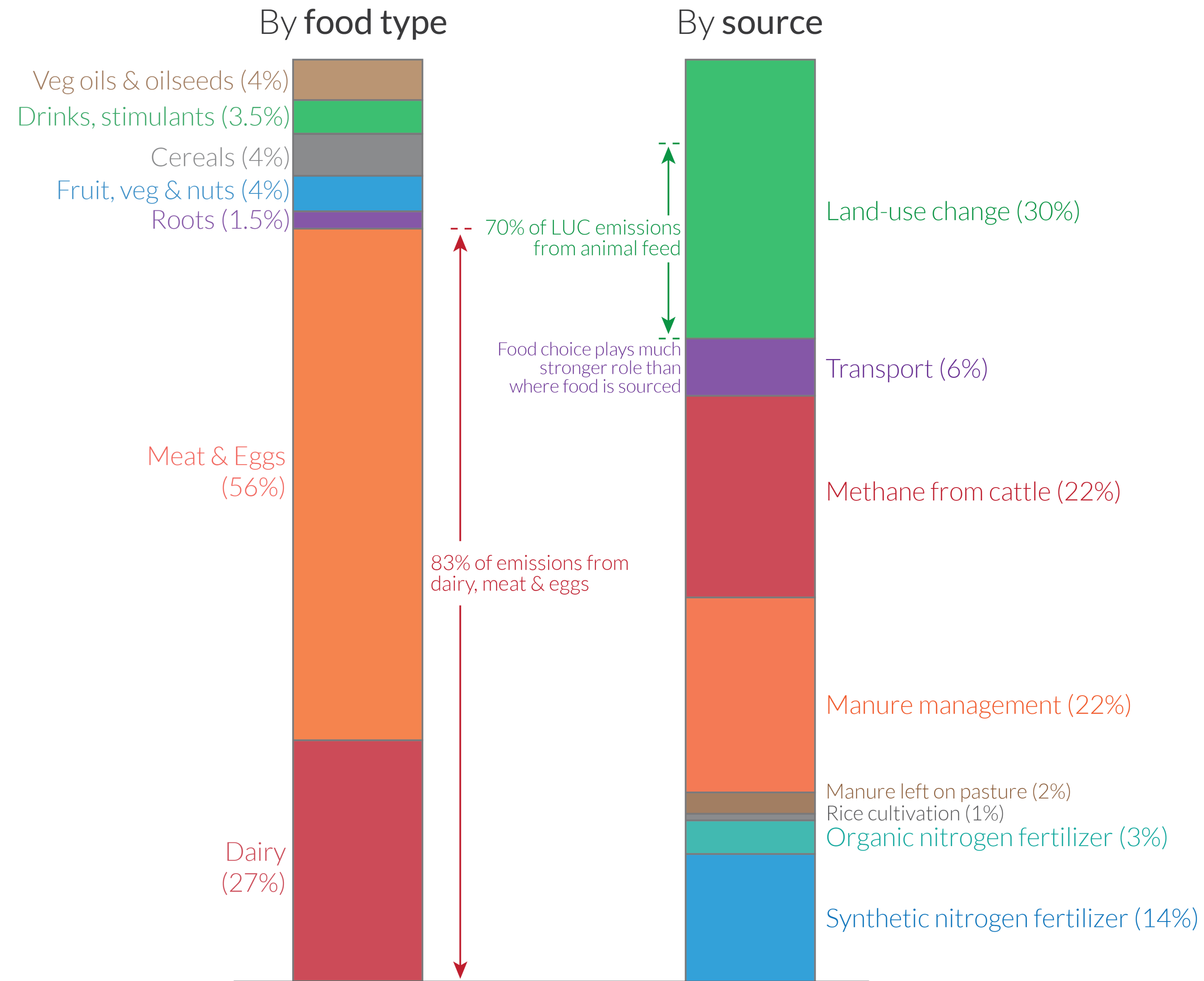
Carbon footprint of diets across the European Union: which foods are responsible for greenhouse gas emissions?



Data source: Sandström et al. (2018). The role of trade in the greenhouse gas footprints of EU diets. [OurWorldinData.org](https://www.ourworldindata.org) - Research and data to make progress against the world's largest problems.

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Carbon footprint of diets across the European Union: by food type and source



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