



# Is eating soy bad for the environment?

Last Updated : 14 October 2024

Soybeans are a widely grown crop, known for its use in a wide variety of food products, Soy is also used to produce animal feed and for several other industrial purposes. In the last 50 years, soy production has expanded rapidly and has been scrutinised for its impact on the environment. This article explores the environmental impact of soy production with respect to deforestation, greenhouse gas emissions, land use, and water use.

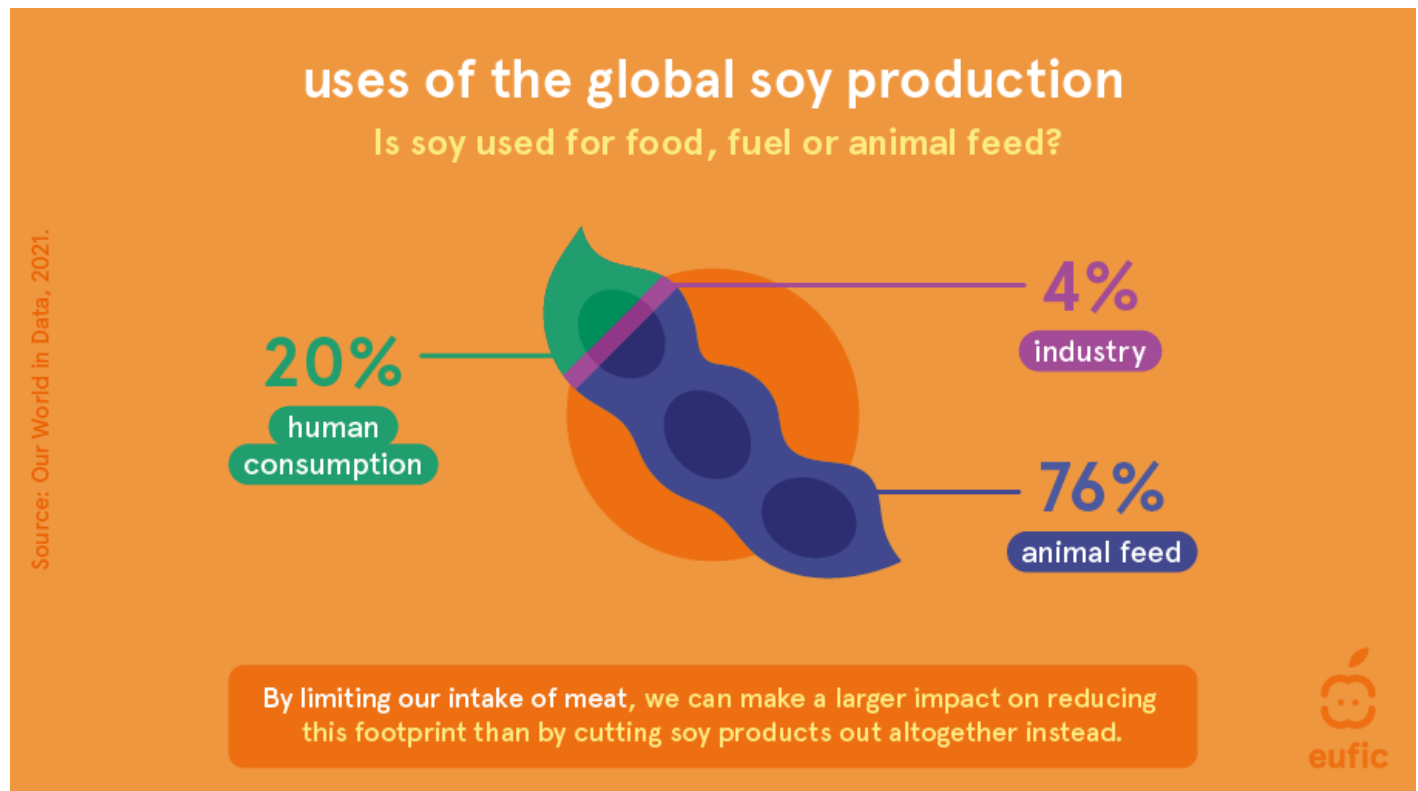
## What is soy used for?

In the last 50 years, soy production has expanded rapidly. But what products have been driving this growth? Soybeans are not only used to make tofu, soy drink, edamame, and other soy-based foods but also for animal feed and industrial purposes, like biofuels and lubricants. The high protein content of soy, compared to other raw materials used for the production of animal feed (e.g., cereal grains), makes soy the best option for optimal growth rates for livestock. Most of the growth in soybean production has come from the increased demand for processed soy – animal feed, biofuels, and vegetable oil. More than three-quarters (77%) of the soy produced worldwide is fed to livestock, mainly to chickens and other poultry, pigs, and aquaculture. One-fifth (20%) of the world's soy is used for direct human consumption, of which the majority gets processed into soybean oil. Typical soy products like tofu, soy drinks, tempeh, and edamame beans only make up 7% of global demand. A final 4% of the world's soy production is used for industrial purposes.<sup>1</sup>

## Deforestation

Soy has gained a lot of attention due to its potential relation with deforestation. In Brazil, which accounts for over one-third of the global production<sup>1</sup>, land use for soy has tripled since 1980. For many years, this was done at the expense of the Amazon rainforest. Clearing forests for soy cultivation releases CO<sub>2</sub> and other greenhouse gases into the atmosphere, which contribute to climate change. Soy cultivation also contributed to biodiversity loss in this area.

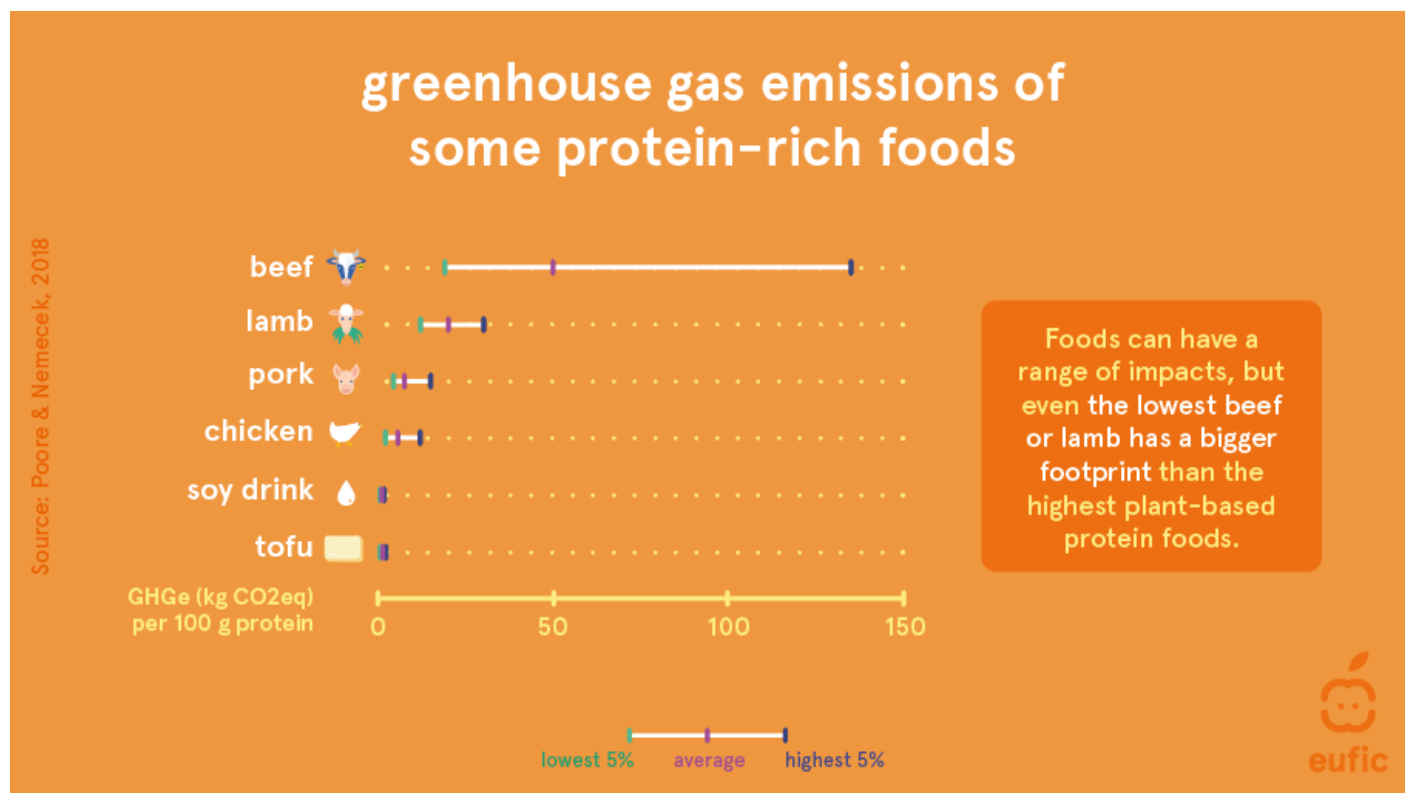
Numerous studies have concluded that the leading driver of deforestation in Brazil was the expansion of pasture to produce beef.<sup>2</sup> Nowadays, deforestation for soy in the Brazilian Amazon has declined rapidly due to new agreements on trading soy from deforested lands. However, soy production has also shifted to other areas at risk of deforestation (where these agreements have not been set in place). So, what can we do, as consumers, to reduce the environmental footprint of soy? Reducing our intake of meat is one of the most effective methods to reduce soy-related environmental damage. This would have a greater impact than cutting soy products like tofu, soy drinks, edamame, etc., out altogether instead.



**Fig. 1** - Allocation of the global soy production to its end uses (by weight).<sup>1</sup>

## Greenhouse gas emissions, land use, and water use

Other than soy's impact on deforestation, soy generally has a low environmental footprint. Soy crops can fix nitrogen from the air to enrich the surrounding soil. This reduces the need for nitrogen fertilisation and can benefit crop yields and agricultural practices.<sup>3</sup> Eating soy-based foods also has a low impact on greenhouse gas emissions, water use, and land use compared to other high-protein foods such as beef, lamb, or pork. For example, per 1 kg of food, tofu emits only 3% of greenhouse gas emissions, uses 10% of water and 1% of the land compared to beef. Similarly, for one litre of drink, soy drink emits only 31% of greenhouse gas emissions and uses 4% of water and 7% of land compared to dairy milk.<sup>4</sup> If one would eat tofu 1-2 times per week over a single year instead of beef, it would save 592 kg in carbon emissions - enough to heat the average UK home for about 93 days.<sup>5</sup>



**Fig. 2** – Greenhouse gas emissions (GHGe) of some animal-based foods compared to soy-based foods.<sup>4</sup> Lowest 5% describes that 5% of production systems for that particular food emit that amount or less. The highest 5% means the top 5% of production systems for that particular food emit that amount or more.

## The [Microbiomes4Soy](#) project

[Microbiomes4Soy](#) is advancing the role of soy as a sustainable protein source by enhancing the productivity and nutritional value of the crop. By leveraging microbiome-based research, this initiative aims to improve soy's resilience against climate change and reduce the need for chemical inputs. Promoting soy as a plant-based protein alternative will contribute to reducing the dependence on animal-based protein sources, which are associated with more intensive natural resource use and higher GHGe. The project also works towards the development of improved soy-based fish feed for aquaculture industries, advocating for more sustainable animal protein options. Through these efforts, Microbiomes4Soy strengthens the position of soy as a protein alternative with a more positive impact on the environment and natural resources.

## Summary

It's a common misconception that foods such as tofu and soy drinks are major forces in driving deforestation and, as such, are 'unsustainable.' Only a very small percentage of soy is used directly in products for human consumption, while a large majority is fed to livestock and used in aquaculture. Instead, by reducing our intake of animal-based products, we can make a larger impact on reducing the environmental footprint of soy than by cutting out soy products like tofu, tempeh, soy drinks and

edamame.



**Funded by  
the European Union**

*Microbiomes4Soy has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101083671.*

## **References**

1. [Ritchie H. \(2021\). "Is our appetite for soy driving deforestation in the Amazon?" Retrieved from https://ourworldindata.org/soy \(Accessed 09/10/2023\)](https://ourworldindata.org/soy)
2. Tyukavina, A., Hansen, M. C., Potapov, P. V., Stehman, S. V., Smith-Rodriguez, K., Okpa, C., & Aguilar, R. (2017). Types and rates of forest disturbance in Brazilian Legal Amazon, 2000–2013. *Science advances*, 3(4), e1601047.
3. Messina, M., Duncan, A., Messina, V., Lynch, H., Kiel, J., & Erdman Jr, J. W. (2022). The health effects of soy: A reference guide for health professionals. *Frontiers in nutrition*, 1837.
4. [Our World in Data. \(2022\). Environmental Impacts of Food Production. Retrieved from https://ourworldindata.org/environmental-impacts-of-food#licence \(Accessed 09/10/2023\)](https://ourworldindata.org/environmental-impacts-of-food#licence)
5. [BBC News. \(2019\). Climate change food calculator: What's your diet's carbon footprint? Retrieved from https://www.bbc.com/news/science-environment-46459714 \(Accessed 09/10/2023\)](https://www.bbc.com/news/science-environment-46459714)