10:52 AM

Environmental impacts of meat production (#37)

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Short Abstract

Introduction

The global food production is a major source for environmental impacts. It occupies 38% of the ice- and desert-free land, causes 26% of greenhouse gas (GHG) emissions, 32% of terres-trial acidification, 61% of freshwater withdrawals, and 78% of eutrophication. Within the food sector, animal-sourced food cause 83% of land use, 58% of climate change (36% of meat alone), 56% of terrestrial acidification, 57% of eutrophication and 37% of freshwater use.

Methods

The environmental impacts of food are analysed by environmental life cycle assessment. The method is characterised by i) the consideration of multiple environmental impacts, ii) the in-clusion of the life cycle from the extraction to the resources to the disposal of the waste (cra-dle-to-grave), and iii) relating the environmental impacts to a reference, a so-called functional unit. This presentation refers mainly to a meta-analysis, calculating five harmonised environ-mental impact indicators (land use, freshwater withdrawals (andscarcity-weighted freshwater withdrawals), global warming (climate change), terrestrial acidification and eutrophication).

Results

The environmental impacts of different meat production systems worldwide show high vari-ance. For the same product, the best 10% of meat producers have 4x less greenhouse gas emis-sions than the worst 10%. These findings indicate a large optimisation potential, even if part of the variability is determined by natural conditions. The distributions of the impacts are highly skewed; 43% of the climate change impacts are caused by 25% of the producers. The analysis showed that different producers require different ways to reduce their impacts; no universal solutions exist. Trade-offs between environmental impacts are frequent. To define a mitigation strategy, a detailed analysis of each production system in its context is therefore indispensable.

Large differences exist between different categories of meat. Meat from ruminants (beef, lamb, mutton) generally has the highest impacts, followed by pork; the lowest impacts are ob-served for poultry meat. The environmental impacts are related to the feed conversion ratio, which depends on the fattening duration. Furthermore, ruminants produce the strong green-house gas methane during enteric fermentation. On the other hand, ruminants can use feed sources not suited for human nutrition and agricultural areas, which are not suitable for grow-ing food crops. In the areas where no food crops can be grown, dairy production is generally more efficient than beef; beef and dairy production should therefore be analysed simultane-ously. Beef from beef herds has higher land use and greenhouse gas emissions, but lower wa-ter scarcity than beef from dairy herds. On the one hand, in beef herds all impacts are allocat-ed to meat. In the dairy system, calves are a co-product of milk and most of the impacts are allocated to milk. On the other hand, beef herds are often held in extensive pasture systems, with predominantly grass-based feeding, while beef cattle from dairy herds often are fattened more intensively with higher use of concentrate feed.

Organic and animal friendly production systems tend to have slower growth and therefore longer fattening periods, often resulting in lower feed conversion efficiency. Animal friendly housing systems tend to have higher N emissions. Organic farming is characterised by 20-25% lower yields of feed crops on average, but also by lower use of pesticides and mineral fertilis-ers, which has favourable effects on ecotoxicity and natural resource use.

Three factors drive the environmental impacts of meat: the design of the production system (e.g. dairy beef vs. suckler cow system), its efficiency (mainly the feed conversion ratio), and the composition of the feed ration.

Looking at the whole supply chain, the environmental impacts of meat are largely dominated by the agricultural production; the contribution of the post-farm processes like slaughtering, transport, storage, packaging and retail is generally low. The ratio of retail weight to live weight is a key figure determining the environmental impacts per kg of meat. The production system is more relevant than the origin of meat (domestic production or imports), with the exception of transports by air freight and meat coming from deforested areas.

Consumers can reduce their impacts by choosing meat from producers with lower impacts, and by reducing their meat consumption. The combination of both options offers marked syn-ergies. Reducing the consumption of animal-based products by 50%, while simultaneously avoiding producers with high impacts, would reduce the global environmental impacts of the food sector by about one third. An optimisation study for Switzerland showed that environ-mental impacts of food can be even reduced by over 50%; meat consumption would drop by 70%.

Notes

Conclusions

Meat production has comparatively high and highly variable impacts. Changes in production and consumption offer manifold opportunities to reduce the impacts. The solutions depend on the production system and its context, a specific and detailed analysis is therefore required.
Consumers can mitigate environmental impacts by reducing their meat consumption and by avoiding products with high environmental impacts. To achieve these improvements, better information on the environmental impacts must be made available and communicated along the value chain.

Notes