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Response to a Letter to the Editor

Transformation of animal agriculture should be evidence-driven and respectful of livestock's benefits and contextual aspects

We appreciate that Muñoz-Ulecia et al. (2022) have respectfully engaged in the conversation we wished to initiate with our article 'Animal source foods in healthy, sustainable, and ethical diets' (Leroy et al. 2022). What we are all in agreement with is that livestock agriculture should be part of future food systems, albeit in a more ethical and sustainable manner (cf. Eisler et al., 2014 on what that may look like). To which *degree* and *how* reform must take place is the next step in a debate in which there are no simple answers.

With respect to environmental sustainability, Muñoz-Ulecia et al. rightfully argue that the type of production system is critical. Although we mostly referred to silvopastoral (ruminant) systems as an example of sustainable practices - mainly because of substantial data backing (Lal 2020) and its 'very high' climate adaptation and mitigation potential (IPCC, 2022) – this does not preclude that other practices could be mentioned to make this point (e.g. rotational grazing, integrated-crop livestock systems, multi-species systems, improved breeding, and the use of feed additives). Neither did we mean to imply that there are no existing systems with clear harmful outcomes, including heavily confined feeding operations that fail to properly recycle nutrients, require substantial fossilfuel-based inputs, overuse antibiotics, compete for human-edible crops, and jeopardise animal welfare. When properly integrated, livestock systems can provide ecosystem services and food security; ill-managed, they lead to deforestation and land degradation. Despite our agreement on the general premise, a few of the specific points mentioned in their Letter are indicative of some divergence in perspective which we would like to elaborate on.

First, the potential of grazing systems in global food and nutrient supply should not be underestimated. Stating that 'grazing systems just produce around 9 % of global meat' obscures a larger reality, as mixed systems combining grazing and on-farm crop production make up considerably greater components of the food supply. These systems are common throughout the world, being dominant in key meat-producing countries (e.g. Brazil, China, New Zealand, and the US). They supply > 50 % of the world's meat production and 90 % of the milk (Gerbens-Leenes et al., 2013). Grazing systems, whether or not mixed, are also key production systems in the Global South (which is likely to suffer more from climate change-driven food insecurity), where they often need to be protected and promoted. In high-income countries, production indeed requires a shift towards agro-ecology and less food-feed competition, even if the inputs of feed that is not fit for human consumption, by-products, and crop surpluses are already sizable. For ruminants in particular, the input of grazing is usually predominant, even for grain-finished animals. Unsurprisingly, however, the potential of grazing systems to substitute current, more intensified systems at no production loss, is large and should not be ignored (Jackson 2022), even if it may not fully support current production levels. Also, the role of grazing systems needs to be evaluated carefully by taking into account protein quality and bioavailability of micronutrients and not, as done alltoo often, as a simplistic assessment of the yield of calories and crude protein. Moreover, as outlined in our article (Leroy et al., 2022), grazing systems are net producers of protein with high net protein efficiency when those systems use little to no concentrates.

Second, we caution against an undifferentiated negative outlook on 'industrial systems'. The definition of 'industrial' or 'intensive' is often done with a broad stroke, rather than based on a robust cost-benefit analysis and by using a holistic set of contextually appropriate metrics. 'Sustainable intensification' can lead to both more food and improved environmental goods and services (Pretty & Bharucha, 2014). Interventionist policies that strongly suppress livestock farming in regions where it is most efficient could be counterproductive if this were to result in a compensatory increase in regions where it is least efficient (Harrison et al., 2021). The least intensive and smallest farms are not necessarily the best for the environment, nor for animal welfare (Robbins et al., 2016). At the same time, regions where livestock production is less efficient may also be those where it is most important to local people, and where the risk of 'green colonialism' is greatest. The food system requires a diversified approach based on local (ecological) conditions and resources, as well as societal needs and urgencies. Certainly, systems that are disruptive to the environment or provide poor animal welfare will need to adapt.

With respect to the health arguments, the authors make the valid point that we did not refer to the impacts of animal source foods other than through nutrition. By focusing on the latter, we did not elaborate on zoonoses or on indirect effects of antibiotic use (even if this has been substantially reduced in various countries). Those are important indeed and we wish to stress the value of a One Health approach, as the health aspects of soils, plants, animals, and humans are interrelated (Gregorini et al., 2017).

We agree that the ethical discussion is one of worldviews, which also pertains to the domain of personal eating culture. Yet, regardless of calls for reasonable dietary change and higher inclusion of a variety of wholesome plant foods where appropriate, the imposition of diets that are poor in, or devoid of, animal source foods at the population level is what we find concerning, especially in the context of low- and middle-income countries and at-risk

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populations in high-income countries (children, pregnant and lactating women, women of childbearing age, and older adults). Muñoz-Ulecia et al. suggest that calls for severe reductions in animal-sourced food consumption are 'extreme positions [...] that do not correspond with the thoughts of most consumers'. That may well be the case, but it would be unwise to neglect that such viewpoints are now increasingly part of the debate, being propagated by various activists and think tanks, and that they are popular on (social) media (Mroz & Painter, 2022). The fact that severe restrictions are unlikely to 'correspond with the thoughts of most consumers' is precisely a point that worries us as it runs counter to the dietary preferences, needs, and culture of the large majority.

We concur with the closing statement by the authors that food systems should not be left at status quo. Rather, the focus should be on the contextuality of production systems, and less so on specific animal species or categories of animal source foods. Upholding a plant/animal binary and pitting important staples of the diet against each other only leads to further polarisation and impairs progress. By focusing on the 'how', we can embrace principles of soil health, farm resilience, and lower environmental impacts of the system as a whole. The premise for such an approach is that the scientific and policy conversations will need to be pragmatic, comprehensive, multivocal, fully transparent, and rigorously evidence-based.

Ethics approval

Not applicable.

Data and model availability statement

Not applicable.

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Declaration of interest

All authors follow omnivorous diets. FL is a non-remunerated board member of various academic non-profit organisations including the Belgian Association for Meat Science and Technology (president), the Belgian Society for Food Microbiology (president), and the Belgian Nutrition Society. On a non-remunerated basis, he also has a seat in the scientific committee of the Institute Danone Belgium, the World Farmers' Organization, and the Advisory Commission for the "Protection of Geographical Denominations and Guaranteed Traditional Specialties for Agricultural Products and Foods" of the Ministry of the Brussels Capital Region. PM is a non-remunerated member of the Spanish Platform for Extensive Livestock and Pastoralism. SvV reports financial renumeration for academic talks, but does not accept honoraria, consulting fees, or other personal income from food industry groups/companies. On a non-remunerated basis, FL, PM, SvV, and TB are part of a Scientific Advisory Committee of the Food and Agriculture Organization of the United Nations.

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