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Planet at risk from grazing animals?

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Introduction

The famous FAO report “Livestock’s Long Shadow” (Steinfeld *et al.* 2006) and hundreds of subsequent publications blamed domestic livestock, in general, and grassland-based production systems in the (sub) tropics, in particular, of causing serious environmental hazards such as climate change, claiming that 18% of anthropogenic greenhouse gas (GHG) emissions are from livestock, more than from the transport sector. Few reviews challenged this claim, and those that did received little attention from the media. Pitseky *et al.* (2009) revealed the double standard applied by the FAO in this matter. Whereas for livestock products a full life cycle assessment for GHG emissions was applied, for the transport sector only fuel consumption was taken into account. This striking weakness of the FAO report alone considerably disburdens livestock husbandry.

Approach

In this review the most widely spread claims of alleged negative environmental impacts produced by livestock are discussed, partly in the light of lesser known publications, as well as empirical facts and data determined on a global scale, and partly with specific reference to the grazing systems in the Paraguayan Chaco.

Results and Discussion

Critique: “Livestock contributes to climate change.”

The basic assumption for human-caused climate change is a noticeable climate sensitivity to anthropogenic GHG emissions, which is supported by the conclusions of the latest IPCC Assessment-Report AR4 (IPCC 2007). There is, however, quite a bit of empirical evidence which casts doubt on these conclusions:

- In the AR4 report (Table 2.11), 16 variables are identified as global warming forcing agents and the level of understanding for 11 of them is specified as ‘very low to low’. Yet the IPCC comes up with a 90 to 99% certainty in the results of its models, a conclusion which is logically unacceptable and scientifically irreproducible.
- Mean global temperature has not increased in the past 15 years in spite of steadily increasing CO₂ levels in the atmosphere, an observed reality contrary to all the model projections published by the IPCC.
- There is a large number of recently published peer reviewed papers which show evidence of the existence of various eras during the Holocene (since the end of the latest ice age about 12,000 years ago), which were

warmer than or at least as warm as the present age (in spite of the pre-industrial atmospheric CO₂ levels at those times).

Even if we ignored these objections and kept assuming a measurable climate sensitivity to anthropogenic GHG emissions, there still remain many inconsistencies between the reality and the popular claim “meat = heat”. CO₂ emitted by livestock respiration, forage digestion and also by the consumption of meat and milk, does not increase atmospheric CO₂ levels as it is part of the natural carbon cycle. Not a single livestock-born CO₂ molecule is added *additionally* to the atmosphere as it has previously been captured through photosynthesis. The amount of CO₂ released annually by livestock is offset by re-growing CO₂ assimilating forage. The only sources of *additional* CO₂ emissions caused by livestock husbandry beyond the natural carbon cycle are: (1) fossil fuel consumption during the production process, which is particularly low in grazing systems; and (2) deforestation for pasture establishment, which is partly offset by carbon captured by deep rooted tropical grasses (Fisher *et al.* 1994), and by persistent charcoal residues from burned wood (Mannetje 2007), and bush encroachment and forage hedgerow establishment. Deforestation causes a unique “carbon debt” which has to be shared out over the animal products generated during the total utilization period of the pasture, replacing forests, which may easily be hundreds of years (as in the case of European grasslands). However, for life cycle assessments of livestock products this carbon debt is either neglected or charged entirely to the year of its appearance.

Just like CO₂, methane emissions also form part of a natural cycle with a relatively short atmospheric lifetime of 8.7±1.3 years (IPCC, 2007). Therefore, constant emissions from ruminant enteric fermentation cannot change atmospheric methane concentration as they are counteracted by a constant or oscillating rate of breakdown. To my knowledge not a single relevant publication takes this consideration into account, as livestock-born methane emissions are consistently interpreted at a 100% level as an *additional* anthropogenic GHG source, just like fossil fuel born CO₂. Methane baseline scenario considerations over time and space are virtually absent in literature.

Between 1990 and 2007, the global cattle and buffalo population rose by more than 125 million head, or by 9% (FAO: <http://faostat.fao.org/site/291/default.aspx>), while the growth rate of atmospheric methane fell to zero (NOAA: http://www.esrl.noaa.gov/gmd/aggi/aggi_2012_fig2.png). These empirical observations are hardly consistent with a domestic livestock contribution to anthro-

pogenic methane emissions of 35 to 40% as claimed by Steinfeld *et al.* (2006). Quirk (2010) showed that historical increases of atmospheric methane concentrations are best explained by human fossil fuel consumption. Also, the stabilization of methane emissions in the 1990s is very likely to be associated with the adoption of modern technology in fossil fuel production and use, particularly the replacement of leaking pipelines in the former Soviet Union. Since 2008, methane is slightly rising again which Quirk (2010) attributes to natural atmospheric changes modulated by El Niño. The idea of a considerable livestock contribution to global methane emissions relies on theoretical bottom-up calculations. However, there is no discernible relationship between mean atmospheric methane concentrations, as measured by the ENVISAT satellite (http://www.iup.uni-bremen.de/sciamachy/NIR_NADIR_WFM_DOAS/xch4_v1_2003-2005.png) over three full years (2003-2005) and global livestock distribution (Steinfeld *et al.* 2006, Map 20, p. 344).

Critique: “Livestock affects groundwater recharge and ineffectively uses huge amounts of water.”

In the Chaco, groundwater recharge is less under bushland than under grassland (Glatzle *et al.* 2008). A great part of the beef industry in the semi-arid Chaco relies entirely and sustainably on locally harvested rainwater.

Critique: “Livestock causes loss of biodiversity through deforestation and grazing land development.”

Paraguayan regulations on land clearing strictly prohibit pasture establishment on more than half of each cattle ranch's area, bringing about a diversification of habitats (pronounced bush-border effects, savannah-like grasslands, and rain water collection basins that provide water for wild game throughout the year as well). This causes an increase in the diversity of native vertebrate species by about 50% as compared to the closed pristine dry forest (Glatzle 2012).

Critique: “Grazing livestock ‘consumes’ a lot of land and ruminant food energy conversion is very poor.”

Enteric cellulolytic bacteria enable ruminants (unique

among vertebrates) to convert the most abundant substance in the biosphere, cellulose, into high value food, such as meat and milk. Therefore, grazing makes efficient use of marginal lands with high fiber feed, which comprise up to half the global terrestrial surface. Hence grass-fed beef is complementary and not competing food for humans, thereby contributing considerably to global food security.

Conclusion

Domestic livestock's and particularly grazing animals' contribution to climate change is not detectable. Careful land development and management practices assure full compatibility of grazing systems with the environment.

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