

CORRESPONDENCE:

Lifting livestock's long shadow

To the Editor — In the News Feature entitled 'Light is cast on a long shadow' by Anna Petherick¹, it is stated that developing countries' middle classes "are on course to demand twice the current amount of livestock products in 2050."

This statement does not take into account the International Food Policy Research Institute's scenario by which global meat consumption will decline until at least 2030². Moreover, Petherick¹ cited mainly livestock researchers, whereas good practice is to consider assessment by environmental specialists where significant environmental risk occurs³.

As environmental-risk specialists employed by the World Bank and International Finance Corporation — two United Nations agencies — my colleague Jeff Anhang and I have estimated that livestock products account for at least 51% of anthropogenic greenhouse-gas emissions⁴. Links to consequential citations of our analysis can be found on our website⁵.

In our assessment, reality no longer reflects the old model of the carbon cycle, in which photosynthesis balanced respiration. That model was valid as long as there were roughly constant levels of respiration and photosynthesis on Earth. However, respiration has increased exponentially with livestock production, and intensified livestock and feed production accompanied by large-scale deforestation and forest-burning have

caused huge increases in volatilization of soil carbon, resulting in a dramatic decline in the Earth's photosynthetic capacity. Therefore, either carbon dioxide in livestock respiration, or its reflection in carbon debt created where land is used for livestock and feed production, must be counted as emissions.

In assessing livestock, emissions relating to land use for livestock and feed production are considered indirect emissions. According to the Greenhouse Gas Protocol — the most widely used tool for greenhouse-gas accounting — indirect emissions should be counted when they are large and can be mitigated or reduced⁶. One of the key sources in Petherick's Feature¹, Mario Herrero, co-authored an estimate that 45% of all land is now used for livestock and feed production⁷.

Kanaly *et al.*⁸ summed up our study as follows: "Goodland and Anhang explained what may be a large-scale paradigm shift in the approaches to mitigating climate change." Previously, renewable-energy infrastructure was thought to be the key to reversing climate change. After years of inadequate action, sufficient new infrastructure is now projected to take at least 20 years and US\$18 trillion to develop⁹.

Yet the Intergovernmental Panel on Climate Change and the International Energy Agency have both warned that the next five years may be the last real chance to reverse climate change before it's too late^{10,11}. We say that the only pragmatic

way to do so is to replace at least 25% of today's livestock products with better alternatives — this would both eliminate much more than 4% of agricultural emissions, and allow reforestation and forest regeneration on vast amounts of land, which could then absorb enough atmospheric carbon to reduce it to a safe level. □

References

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Climate warming and Mediterranean seagrass

To the Editor — We have a limited understanding of how seagrass communities will respond to climate change. A dramatic decline of *Posidonia oceanica* seagrass meadows around the Balearics, even under active conservation, is forecasted by Jordà *et al.*¹

after linking the modelled increase in sea surface temperature with a purported decline in shoot demography. I contend that this prediction is derived from flawed statistics and field methods, is contradicted by observations in the study area, and renders the reported

vulnerability of seagrasses a specious claim that may have a negative effect on marine biodiversity conservation.

Assessing shoot mortality (as a proxy for clone dynamics) is the major source of error for the predicted time series (Supplementary Fig. S2). The relationship