



Destocking of livestock as a global phenomenon

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Abstract

Global rangelands are currently perceived as rapidly degrading because of overgrazing. Here, we report on our analysis of global stocking rates during the last 20 years. We found that regions containing 45% of the global livestock are being destocked, undergoing rapid reductions in livestock density since the 60s. On the contrary, the rest of global rangelands have exhibited a sharp increase in stocking rates. These trends intensified in the last 20 years. Our analysis shows that although almost half of the global rangelands exhibited destocking in the last 20 years, total meat consumption and per capita meat consumption have increased throughout the world. This trend resulted from increases in total number of cattle, sheep, and goat but even larger increases in pork and poultry.

We suggest that our report may lead to a shift in the rangelands paradigm from the idea of overgrazing as a dominant driver of degradation to a region-specific approach that assesses the global consequences of both overstocking and destocking for the functioning of the Earth system, including the carbon, water, and energy dimensions of global change. We conclude that it is critical to understand the global implications of these phenomena and develop management techniques for rangelands that are being overstocked as well as those that are either being abandoned and or rapidly destocked. A large fraction of rangelands research has focused on restoration, for example we, as rangeland scientist, have developed management techniques to reintroduce species that were lost because of overgrazing or eliminate invasive species. Now, we face the challenge of managing large areas that have been destocked or just abandoned. These rangelands need to be managed to avoid negative societal consequences ranging from biodiversity losses to wildfires. The challenge is large because managing abandoned rangelands is different than managing degraded lands and varies regionally.

Introduction

Rangelands represent a large fraction of the terrestrial surface, and their main use is livestock grazing (Asner et al. 2004). Moreover, 30% of the human population depend on livestock grazing for their subsistence (Steinfeld 2006). In addition, rangelands have a large impact on the global carbon cycle (Ahlström et al. 2015). The importance of rangelands is highlighted by the generalized perception that rangelands are

rapidly degrading (Alkemade et al. 2013), and therefore they are losing their ability to provide ecosystem services on which large fraction of the population depends.

Here, we tested the degradation perception by evaluating changes in stocking rates in the last 20 years. Specifically, we evaluated if there were geographical patterns, with some areas of the world being overgrazed while others were not. We explored potential drivers that might explain the observed trends in stocking rates. Finally, we discuss the implications of varying global stocking rate patterns on research needs and rangeland management.

Methods

We analysed data from FAOSTAT (FAO 2024) for global trends in stocking rates for each of the 18 regions recognized by FAO that are Eastern Europe, Eastern Asia, Oceania, Western Europe, South Africa, Northern Europe, Southern Europe, North America, North Africa, South Asia, South America, Central America, including the Caribbean region, South East Asia, Western Asia, East Africa, West Africa, Mid Africa and Central Asia. The data base included different types of animals, such as cattle and sheep. We converted all the animal types into a common unit using FAO standardization technique, which considers variability in region and animal species. We evaluated changes from 2004 to 2024. We assessed meat production efficiency for each region as the ratio between meat production and number of animal units per region.

Results

Our first finding was that global rangelands are not all overgrazed. In contrast, we found that in the last 20 years, 45% of the area of global rangelands has experienced a reduction of stocking rate. Destocking in 45% of global rangelands coexist with increases in stocking rate in the rest of the world. Destocking has been occurring in Australia, North America and Europe (Table 1). In contrast, Africa, Asia, and South and Central America have exhibited increases in stocking rate.

Table 1. Rate of change of cattle for the period 2000–2021 in the ten FAO regions with the largest cattle stocks. The rate of change is expressed as the log response ratio (i.e., $\log(N_{2021}/N_{2000})$). Data source: FAOSTAT.

Region	Cattle 2000-21
Central America	0,10
Eastern Africa	0,27
Eastern Asia	-0,19
Eastern Europe	-0,19
Northern Africa	-0,05
Northern America	-0,03
South America	0,10
Southern Asia	0,05
Western Africa	0,28
Western Europe	-0,09

Once we have established trends in global stocking rates, we explored the mechanisms behind this pattern. The first hypothesis is that destocking responded to a reduction in meat consumption. However, meat consumption has increased in the last 20 years in areas experiencing both destocking and increasing

stocking rates. And meat consumption per person and total consumption both have increased reflecting global increases in affluence and population.

Finally, the increase in meat production in regions experiencing destocking resulted from increases in the global efficiency of meat production (Thornton 2010). Increased efficiency has been documented in the past because of several husbandry improvements ranging from veterinary care to more water holes that result in better animal distribution (Oesterheld et al. 1992).

Discussion

Our findings have major policy and management implications. Destocking has positive and negative implications. Destocking has the potential of exacerbating biodiversity loss as demonstrated by large-scale syntheses of many studies across the world (Milchunas and Lauenroth 1993) and supported by ecological theory (Milchunas et al. 1988). Similarly, destocking leads to accumulation of standing dead that make rangelands prone to more frequent fires (Walsh et al. 2014). Destocking has also positive impacts reducing soil erosion and increasing soil-carbon stocks.

Most of the rangeland research has focused on understanding impacts of overgrazing on ecosystem functioning and developing tools to reclaim overgrazed rangelands. Therefore, our understanding of how to manage abandoned and destocked rangelands is scarcer. Policy, which is driven by research and drives research, has also mostly aimed at ameliorating the impacts of degradation resulting from overgrazing. As demonstrated through this study, the destocking of almost half of global rangelands highlights the need for greater research on the impacts of destocking on biodiversity, the carbon and water cycles as well as its impacts on albedo that directly affect the planetary energy balance. A better understanding of the effects of destocking may generate new tools to manage destocked lands in ways that match the increasing and changing demands that people impose on rangeland ecosystem services (Yahdjian et al. 2015).

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