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"Management of land use systems for enhanced food security: conflicts, controversies and resolutions"

Livestock and Water Linkages - Opportunities for Sustainable Intensification

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Abstract

Large quantities of water are appropriated to produce the feed annually consumed in global livestock production. Rising concerns about increasing competition for water resources and projected increase in demand for livestock products make it imperative to look for strategies to sustainably increase livestock production, with water being one key natural resource to consider.

Using a combination of different datasets, a mechanistic livestock model, and a dynamic vegetation model, we estimate the annual consumptive water use (CWU) in the global livestock sector associated with crops and fodder cultivated on cropland and grazed biomass from pastures.

We go beyond earlier studies and explicitly account for the generally lower suitability of pasture CWU for crop production. Thus, from a water resource perspective, we can demonstrate that ruminant rearing can be a quite resource efficient alternative, in many cases even a better choice than to grow crops.

In the next step we use our analytic framework to quantify the effect of increasing the amount of crop-based feed to the diet of ruminants. For dairy cattle the results show an increase in protein production per m^3 of cropland CWU that lie in the upper range of protein water productivity for crops. For the less efficient beef cattle production, estimated increases correspond to the lower range for crops, but generally exceed protein water productivity of pigs and poultry.

For scenarios with constant global production of both the dairy and beef sectors, we find that the increase in productivity in some cases can result in an overall decreased pressure on water resources, despite the increase in cropland CWU needed to produce the additionally required crop-based feed. Whether a shift towards more cropland CWU can help to decrease pressure on water resources essentially depends on the amount and suitability of the saved pasture CWU for crop production.

Keywords: Consumptive water use, livestock, sustainable intensification, water productivity

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