What is the Impact of closing the global Gap in Pasture Performance on Land Use for Food and Energy in a Carbon and Land-constrained World?

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Sustainably increasing agricultural production on existing managed lands is a key strategy for meeting anticipated food and energy needs from a finite amount of land. Use of climatically-defined "bins" is a leading approach for evaluating the potential of intensifying per hectare crop yields.
In this study we apply the climate binning approach to global pastureland for the first time, and initiate evaluation of the potential for intensification of pastured livestock production within this framework. Although animal product yield per hectare would be preferable, stocking density is used as a performance variable due to limitations of available data. Livestock densities considered in climate space show a strong positive correlation with precipitation but a much weaker correlation with temperature. Nearly half the land classified as pasture by Ramunkutty e*t al.* does not have livestock on it according to the FAO Gridded Livestock Study.
We find that increasing stocking densities to climate-appropriate, maximum currently attainable levels would allow existing pastureland to support nearly four-fold more animals, and that bringing the poorest-performing pastures up to 50% of maximum livestock densities attained within their climate bin would double the global stock of grazing animals. The intensification potential for pasture appears to be substantially larger than for grain crops determined using a similar approach. Including increased animal performance in the analysis could increase estimated intensification potentials by several fold. Comment is offered on refining and extending analysis of pastured livestock production using climate binning, including evaluating the impact of climate change.