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“Resilience of agricultural systems against crises”

Different Environmental Indicators Lead to Conflicting Impact Assessments - The Example of South American Beef Production

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Abstract

Beef is one of the most important food commodities which is reflected in its high international trade volume. Global demand for beef has been rising consistently over the past five decades. About one third of all agricultural land on the globe is wholly or partially occupied by beef production systems. Beef production systems have a bad reputation in terms of environmental impacts from land area and total water requirements to GHG emissions. The paper examines three different evaluation tools applied to extensive and semi-intensive beef production systems in South America. System behaviour was tested for the impact of interventions on energy efficiency and methane output by using simulation models. Compensatory carbon sequestration area was calculated for 31 beef production enterprises with three levels of production intensity using a “carbon footprint” type of accounting. Evaluation of water productivity was carried out by calculating “virtual water contents” for three levels of production intensity typically found in South America. Results were conflicting. Energy efficiency was not improved through intensifying interventions. Likewise there was no reduction in methane outputs when yield enhancing interventions were applied. On the other hand intensification had a marked positive effect on carbon footprint, *i.e.* a significant reduction of the required carbon sequestration area. Yield enhancing measures had no effect in either way on water productivity with the exception of increasing nutrient densities in the diet, which were found to improve water productivity but not energetic and or economic efficiency. The complexity of the findings points to the necessity to develop an evaluation system which takes into account conflicting responses by weighted assessment of the different environmental impacts against different economic and political backgrounds.

Keywords: Beef production, environmental impact, greenhouse gases, landscape use, South America, water footprint