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## Economic performance and greenhouse gas emissions of two typical beef production systems in Eastern Kenya

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### Abstract

Kenya has one of the major cattle populations in Eastern Africa, of which around  $\frac{3}{4}$  are beef cattle. Especially for households in the arid and semi-arid regions of Kenya, beef cattle production is an important economic activity. Located in less favourable production environments, low opportunities for cropping or dairy production exist. The production systems in arid and semi-arid lands suffer climate change more directly, being less resilient to weather shocks. At the same time, they are a hotspot of greenhouse gas emissions per kilogram produced. In the recent past, Kenyans' meat consumption has been rising, with beef representing 77% of the annual intake in 2019. The expected further increase due to economic growth and a growing population offers economic opportunities to local producers. Despite the importance of developing pathways for sustainable beef production, only little data is available, particularly on the farm-level economics and greenhouse gas emissions related to the specific beef production systems. Based on the typical farm approach, we identified two beef production systems in Eastern Kenya: a pastoral beef production system and an agro-pastoral production system combining beef production with cropping. Data has been collected through expert interviews and producer focus groups in Isiolo County for the pastoral beef production system and in Kitui County for the agro-pastoral beef production system. We carried out an analysis of the economic performance, including factor use, production inputs, and farm outputs. We estimate the greenhouse gas emissions associated with beef production at farm-level by applying tier 2 IPCC 2019 methodology. Based on literature research and expert information, we model locally appropriate production scenarios addressing herd management and feeding strategies. In an ongoing analysis, we assess their impacts on economic performance and greenhouse gas emissions and discuss potential co-effects between climate change mitigation and adaptation. Our results contribute to the understanding of beef production at farm-level and identify levers for more sustainable beef production in typical Eastern Kenya production systems. This study contributes to a flagship project of the Global Research Alliance on Agricultural Greenhouse Gases (GRA), called Economics of GHG mitigation at farm level in global cattle production systems.

**Keywords:** Beef production, climate change mitigation, farm economics, greenhouse gas emissions