87. Potential multi-dimensional impacts and tradeoffs of improved livestock feeding scenarios in Babati, Tanzania

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Two-thirds of smallholders in eastern and central Africa rely on mixed crop-livestock systems as a source of income and nutrition, for farm productivity, and as an asset. Rising population pressure leads to diminishing farm sizes, increased food-feed competition and soil fertility depletion due to disappearance of grazing areas, fallows and rotations. Such pressures, in combination with increasing climate variability put the livelihoods of millions of smallholders at risk. At the same time, livestock production in East Africa has one of the highest greenhouse gas (GHG) emission intensities and lowest feed use efficiency worldwide. Improved livestock feeding has been highlighted as one of the most promising climate-smart agricultural (CSA) option for these systems, contributing to increased crop-livestock productivity while also mitigating GHG emissions and adapting to climate change. While previous studies have mostly quantified single measures of whole-farm performance (*i.e.* income), in this study we quantify the potential impact of livestock feeding scenarios on multiple socio-economic and environmental performance indicators and their tradeoffs. Representative farms from Babati, Northern Tanzania are assessed with the whole farm model FarmDESIGN which has been extended with a GHG module. Calculations are mainly based on IPCC tier 2 methods, while CH_4 from enteric fermentation is estimated with the Ruminant model (tier 3 method). Participatory livestock feeding scenarios were developed together with farmers and livestock extension workers. Preliminary results underline the importance of such potential multi-dimensional impact estimations for prioritization of CSA interventions. A 1 ha farm with mixed cropping (maize, bean, pigeon pea, sunflower and sorghum) and livestock activities (11 cattle, 15 goats and 10 chickens) emitted 1863 kg CO_2-equivalent ha^{-1}, with 36% from enteric fermentation and 48% from change in soil organic carbon. Improved livestock feeding combined with sustainable land management could significantly decrease these GHG emission intensities.