Rapid ex-ante environmental impact assessment of livestock intensification strategies on mixed crop-livestock and agro-pastoralist farmers in Tanga region, Tanzania

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Background

- Livestock production supports around 600 Mio. smallholders in the developing world
- Environmental impacts include water pollution, global warming, soil degradation, water use and pollution, and biodiversity loss
- Long-term sustainability needs to be assessed before designing large-scale livestock development projects, but data is sparse and quick results needed
- Therefore, a quick ex-ante environmental impact assessment tool was developed, focusing on soil nutrient balances and greenhouse gas emissions[1]

Figure 1. Manure heap in mixed crop-livestock system (left); agro-pastoralist family (middle); zero-grazing unit in mixed crop-livestock farm (all pictures Jessica Koge, CIAT)

Materials and Methods

- A participatory GIS exercise[2] in June 2014 in Lushoto, Tanga region, Tanzania, resulted in two types of farming systems: intensive mixed crop-livestock systems and extensive agro-pastoral systems (Figure 1 and 2)
- Representative farms of both types were visited and interviewed in May 2015 in Lushoto (mixed crop-livestock) and Handeni (agro-pastoral). Data was complemented with a previously conducted feed assessment in the area[3]. Data described agro-ecology, crops, land use, inputs, livestock herd, manure, and livestock feeding
- Intervention scenarios were based on village development plans from both sites: improved breeds, improved feeding, and increased animal health
- Modeling of farm-level GHG emissions was based on IPCC tier 2 guidelines[4]
- Nutrient balances were calculated using the NUTMON method[5]

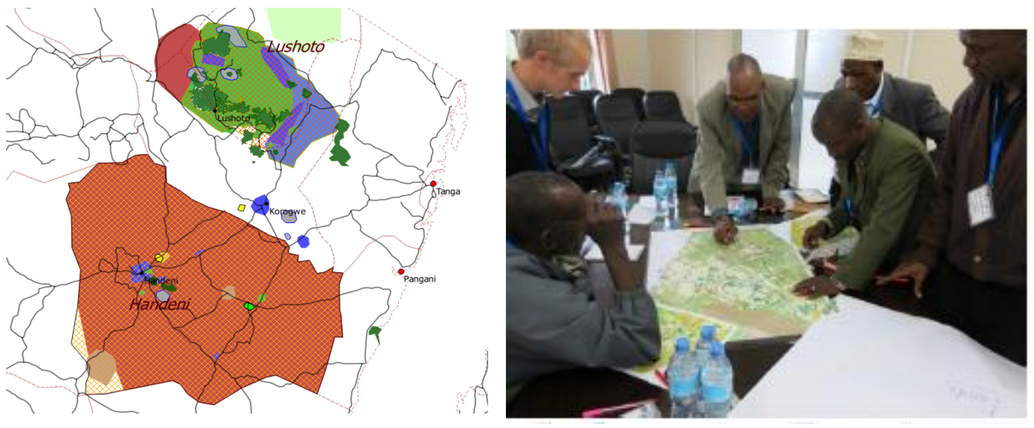

Figure 2. Farming systems in Lushoto and Handeni as mapped by the participants of a participatory GIS workshop (from Morris et al. 2014)

Results

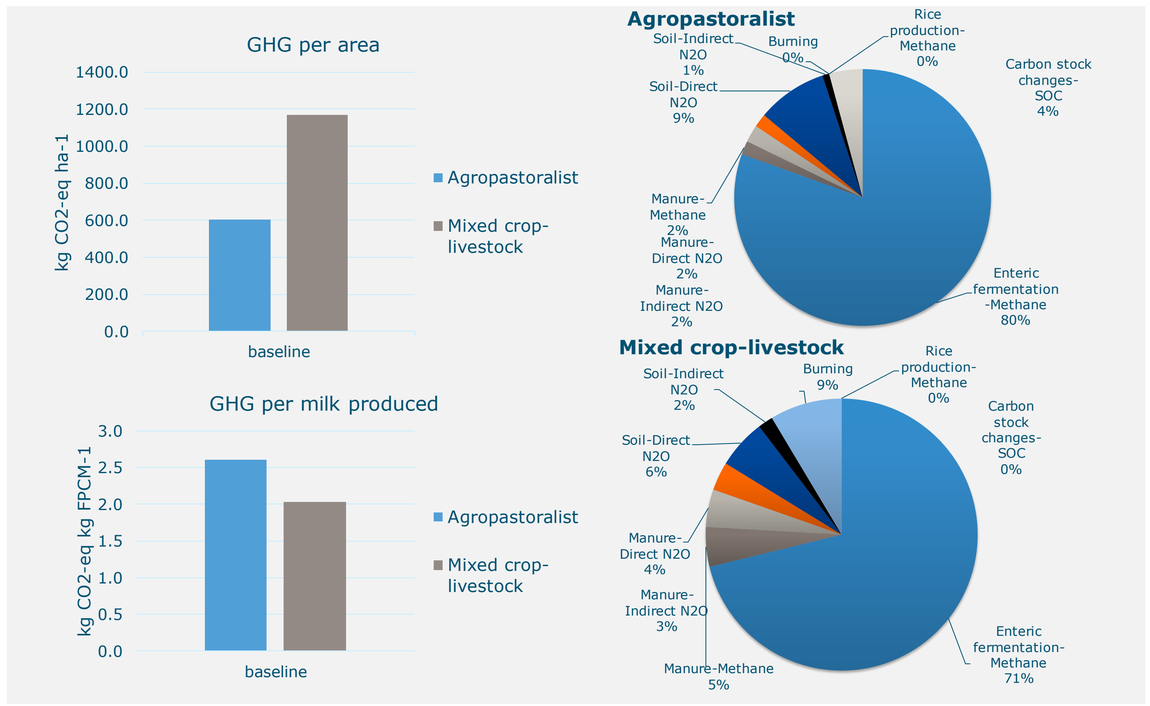

Figure 3. Baseline GHG per farm type in per area and milk basis (left); baseline sources of GHG emissions in % for the different farm types (right)

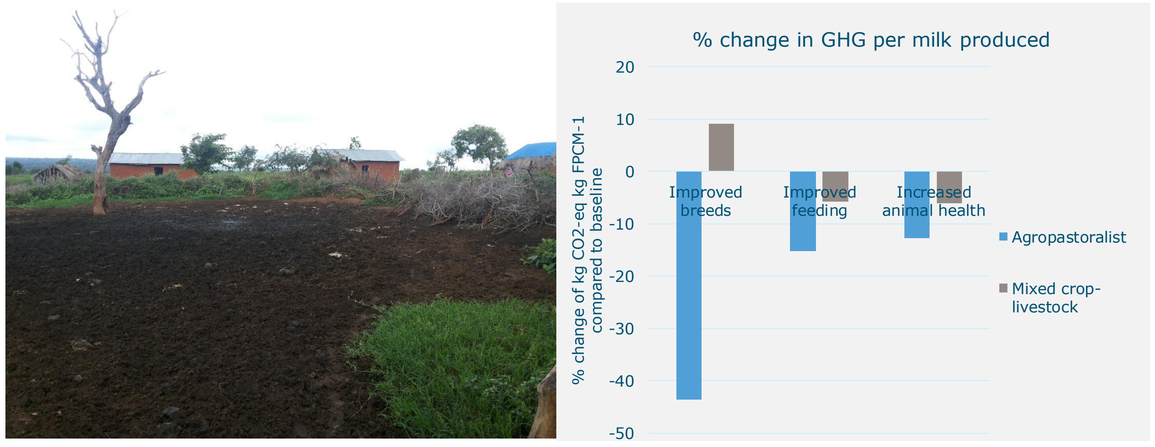

Figure 4. Livestock kraal in agropastoral system (left); changes in GHG emission intensity Nutrient balances of baseline and scenarios (right)

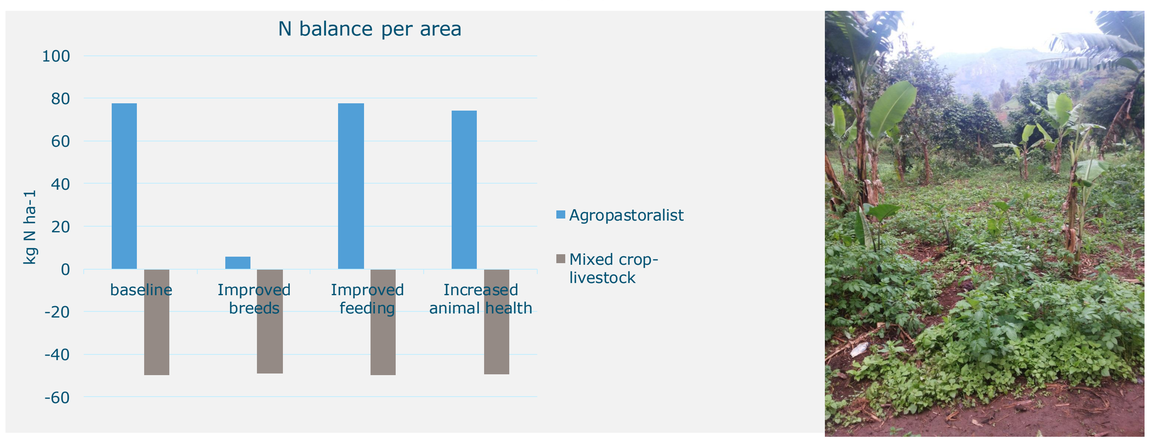

Figure 5. Nitrogen balances for baseline and scenarios (left); cropping system diversity in mixed crop-livestock system (right)

Results and discussion

- Enteric fermentation is the largest contributor to GHG emissions
- Emission intensities are higher for mixed crop-livestock systems when measured per area, but lower per liter milk produced
- N balances are negative for mixed farming, and positive for agro-pastoralists due to the manure produced by the relatively big herd
- Livestock intensification strategies result in almost all cases in lower emission intensities, especially in the agro-pastoral system
- Further work: outscaling to regional level, flagging risks into low/medium/high, feeding results into regional/national dairy platforms

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