Towards climate smart livestock systems in Tanzania: assessing opportunities to meet the triple win

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Introduction & Study Objective

- Climate change is expected to have significant negative impact on livestock production systems especially in sub-Saharan Africa (SSA)
- In SSA livestock play an important role in the livelihoods of many rural communities.
- Furthermore, livestock systems in this region are characterised by poor performance, resulting in low herd productivity and high emissions intensity.
- The reasons of this are mainly associated with poor feed quality, which in turn determines low digestibility, and poor animal health. These problems can be tackled by improving forage quality and by using low inputs breeding strategies.
- This paper quantifies the potential synergies and trade-offs of adopting improved feeding practices and livestock breeds in Lushoto, Tanzania.

Fig 1. Left panel: Cut Napier grass is packaged into a sac to be taken to the animals
Right panel: A farmer feeding her cow on maize residue
Photos: An Notenbaert (CIAT)

Methodology

- The study draws on CCAFS IMPACTLITE household surveys, stakeholder feedback, livestock and economic modeling tools.
- We use RUMINANT model (Herrero, 1997) to assess sustainable intensification alternatives to the current base system (local cattle and grazing of maize residues), such as:
  - i) improved Napier grass + maize bran + concentrates;
  - ii) improved Napier grass + more maize bran + more protein concentrates;
  - iii) improved cattle + improved Napier grass + more maize bran + more protein concentrates.
- We use the Trade-Off Analysis Model for Multi-Dimensional Impact Assessment (TOA-MD) (Antle, 2011) to compare sustainable intensification scenarios at the household level.
- Incremental' and 'Systemic' scenarios were designed following the classification of Vermeulen et al (2013).
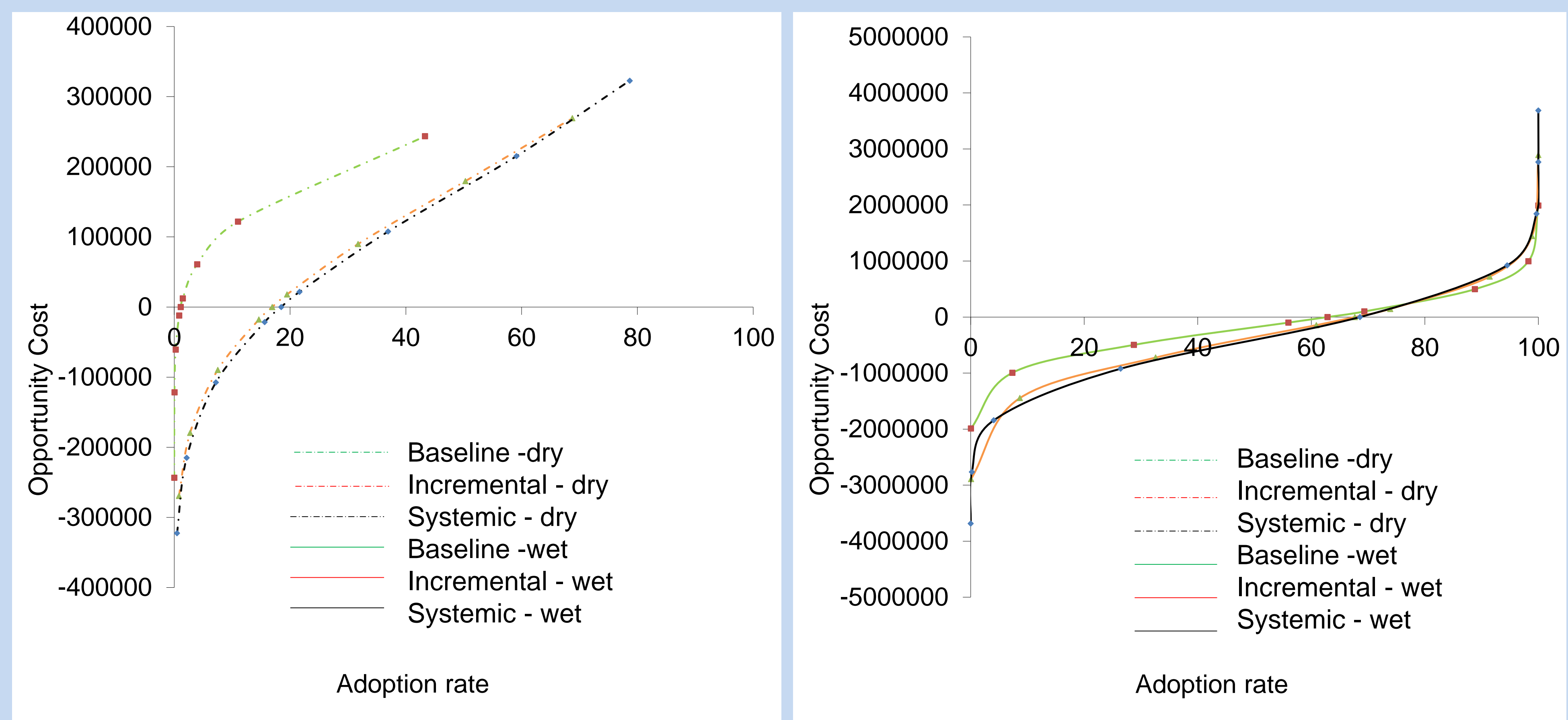
Results

Fig 2. Adoption rate for the dry (left panel) and wet (right panel) season and per scenario : Adoption rate is shown at the point of intersection of the graphs and the x-axis

Table 1. Simulated impact of adoption on net farm returns and per capita income for the wet and dry season and per scenario

| Scenario		Predicted Adoption rate (%)	Base Average Farm Net Returns (Tshs)	Average Farm Net Returns at Adoption rate (Tshs)	Base Average Per-capita income (Tsh)	Average Per-capita income at Adoption rate (Tsh)
Baseline	dry	1.1	107,097	107,538	39,550	39,650
	wet	62.9	108,431	433,924	39,852	113,863
Incremental	dry	16.9	109,789	123,927	40,162	43,376
	wet	67.7	109,382	639,101	40,069	160,517
Systemic	dry	18.5	108,933	126,326	39,967	43,922
	wet	68.6	107,233	675,110	39,581	168,704
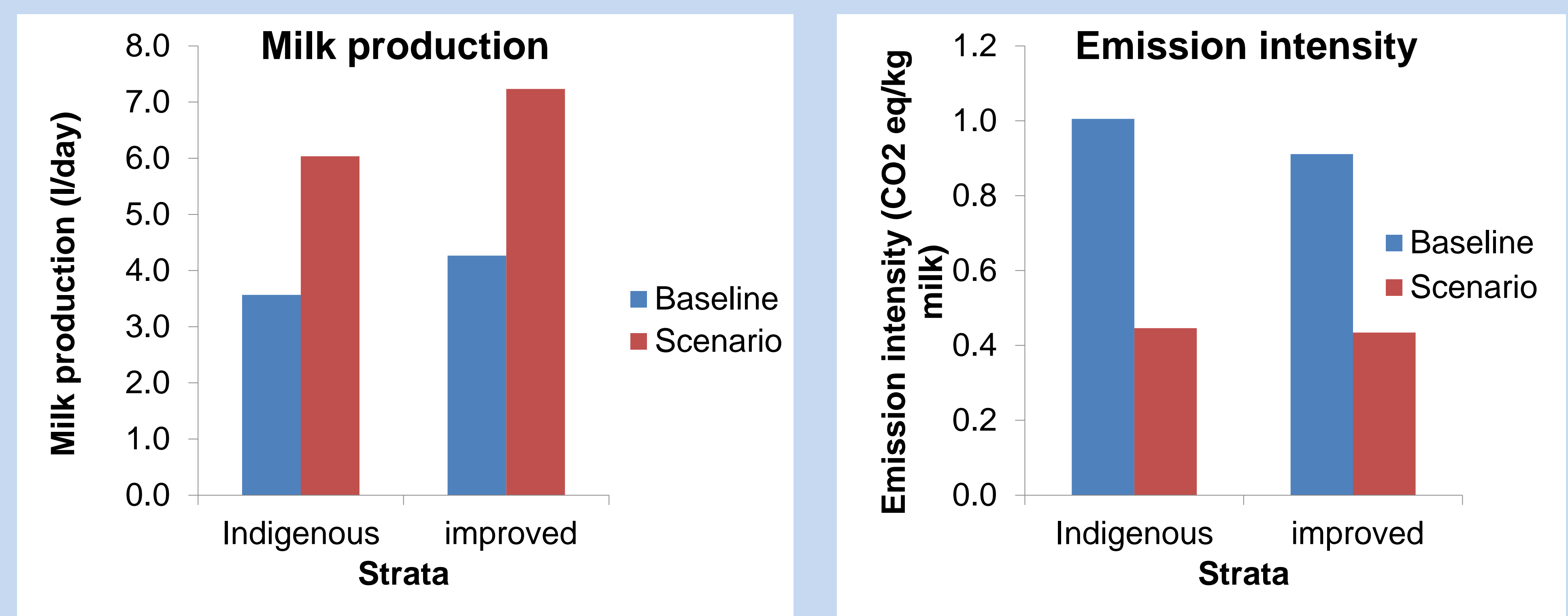
Fig 3. Simulated impact on milk production and CO_2 emission intensity

Discussion, conclusions & implications

- The results of the Trade-Off Analysis Model for Multi-Dimensional Impact Assessment (TOA-MD) suggest that adoption rates are higher for the improved feeding and improved feeding plus improved breeds compared to the baseline scenario; however, adoption rates are very low during the dry season compared to the wet season.
- At the simulated adoption rates, both scenarios: improved feeding and improved feeding with improved cattle breeds have positive impacts on per capita income and contributes to overall poverty reduction.
- The simulations with RUMINANT model showed increased milk production and a marginal decrease in CO_2 emissions intensity.
- Based on the results, the paper concludes that it makes economic sense to introduce improved feeding strategies and/or or change cattle breeds during the wet season but not in the dry season.
- The study further concludes that much of the increase in per capita income and reduction in poverty emerges from improved feeding.
- These findings imply targeted dissemination of improved feeds and the need to educate farmers on the proper timing of feeding in order to maximize benefits together with the fact that farmers could benefit more from simply changing animal diets without necessarily changing the breeds.
- This is a preliminary rapid analysis to assess the impacts of the scenarios, but further analysis is required to assess the economic and environmental impacts.

References:
Herrero, M. 1997. Modelling dairy grazing systems: an integrated approach. Phd Thesis, University of Edinburgh, Edinburgh, Scotland .
Antle, J.M., 2011. Parsimonious Multi-dimensional Impact Assessment. Amer. J. Agr. Econ. 93(5): 1292–1311; doi: 10.1093/ajae/aar052

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