Ex ante trade-off assessment of improved forage use in western Kenya and southern Ethiopia

Introduction

Improved forages have been developed and promoted by research and development organizations globally over the past couple of decades to diversify feed baskets and increase the quantity and quality of available feed. However, the use of these improved forages is associated with different yield potentials, land requirements, effects on livestock productivity, and related impacts on income and food security, which are also influenced by agroecology, season, and management. Farmers' preferences depend on their specific production objectives and challenges, and the weighing of these multi-dimensional benefits and trade-offs. The objective of the research was to explore selected impacts and trade-offs as well as the role alternative forage grasses can play in the mixed crop-livestock systems of Kenya and Ethiopia.

Map of study sites

Methodology

The Rural Household Multiple Indicator Survey (RHoMIS) was used to collect data on 401 smallholder farming households from two study sites in Ethiopia and Kenya. RHoMIS is a standardized farm household survey that collects information on household characteristics and farming systems such as household demographics, crop and livestock value production, farm income, gender control, and food security (van Wijk et al., 2020). To assess the trade-offs associated with the adoption of improved forages, a simplified conceptual framework of the mixed crop-livestock systems of the study areas was developed to estimate the net changes to forage land area requirements, food availability, and farm income (output variables). Assumptions made in the trade-off modelling were based on two field experiments assessing the yields of different forage grasses and the effects of improved forages on cattle milk production, as well as scientific literature from the region. For a detailed overview of the conceptual model and assumptions please see: hdl.handle.net/10568/114630. Households were split into four farming types based on the integration of cattle production activities: 1) cattle sellers – farming

households that had sold live cattle in the past year; 2) milk producers – farming households that had produced cattle milk; 3) mixed producers – farming households that both sold cattle and produced milk in the past year; and 4) non-cattle producers– farming households that neither sold cattle nor produced milk.

Farm type	Ethiopia (HHs)	Kenya (HHs)
Cattle seller	22	19
Milk producer	58	53
Mixed producer	18	44
Non-cattle producer	105	82

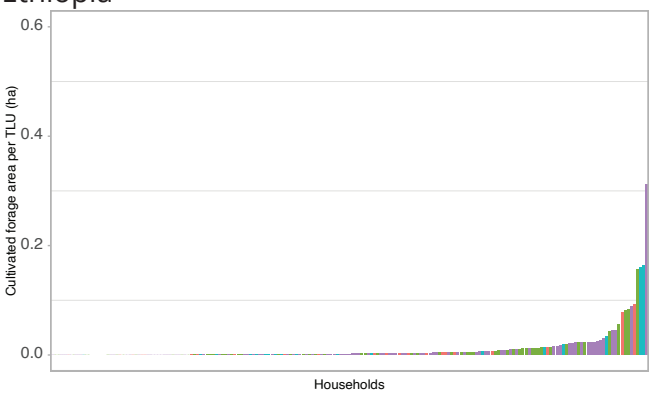
Context

Annual farm income

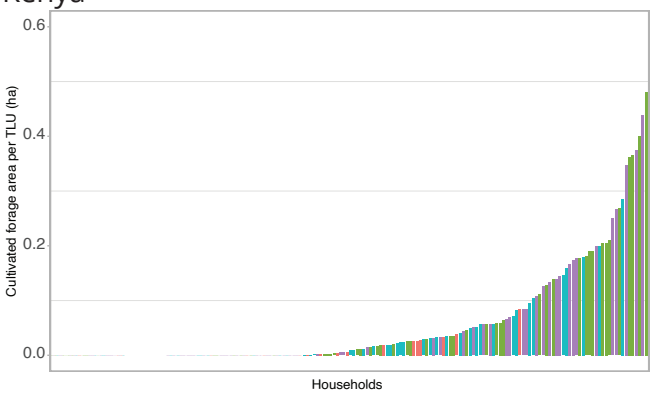
Farm type	Ethiopia Farm income ($ HH^{-1} year^{-1})	KenyaFarm income ($ HH^{-1} year^{-1})
Cattle seller	1,238 (1000)	1,831 (806)
Milk producer	891 (4244)	1,199 (241)
Mixed producer	1,282 (868)	2,455 (483)
Non-cattle producer	266 (1353)	250 (72)

Forage cultivation

Ethiopia



Kenya



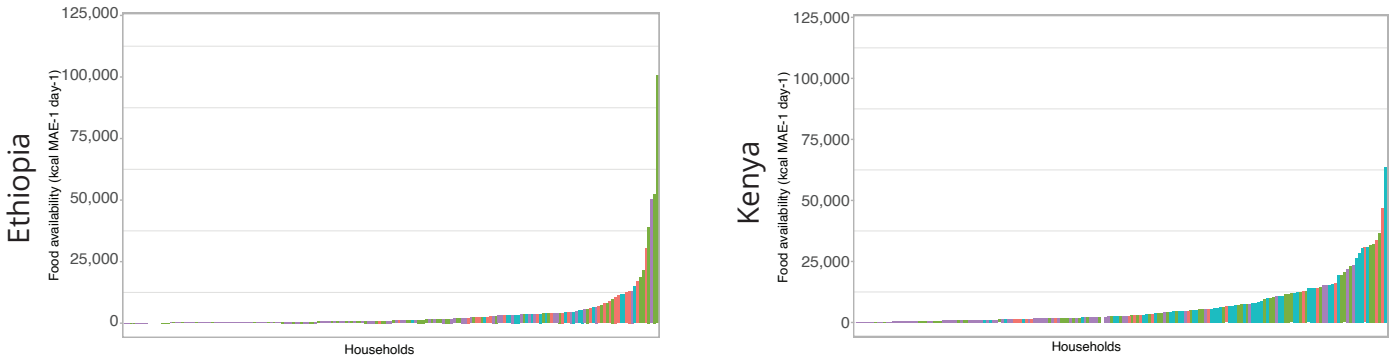
Farm type: Cattle seller Milk producer Mixed producer Non cattle producer

Cattle ownership

Farm type	Ethiopia (heads)	Kenya (heads)
Cattle seller	1.5 (0.7)	2.3 (0.9)
Milk producer	3.6 (2.9)	4.0 (2.8)
Mixed producer	3.7 (1.3)	5.0 (3.3)
Non-cattle producer	2.2 (1.2)	1.3 (1.4)

Food availability

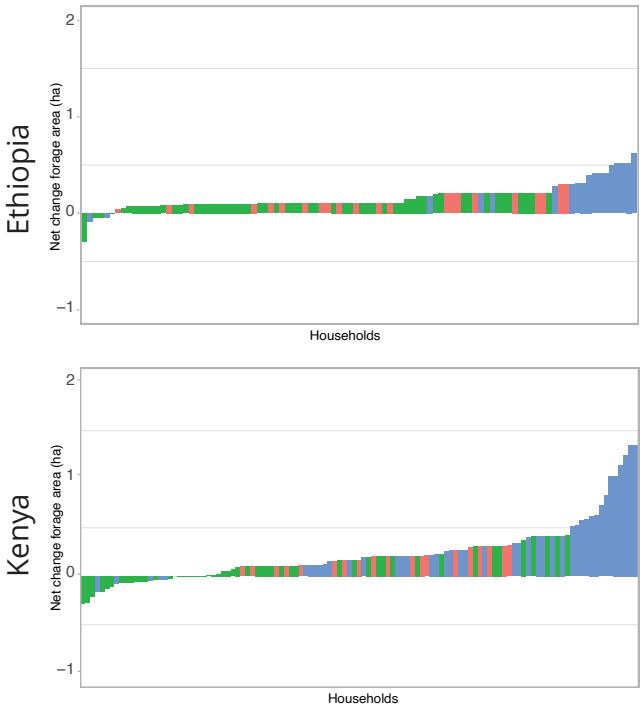
Annual farm income was low across categories, although it was noteworthy that mixed producers and cattle sellers were the farm types that generated the highest annual farm income. Cattle herds were small with even the mixed and milk producer farm types owning only between 3.6-5.0 heads on average. Cultivated forage area was larger in Kenya than Ethiopia, but in both sites, it was below the area required to feed a cow with 50% of cut forage per year indicating that farmers would need to significantly increase their land area dedicated to forage crop production should they wish to adopt improved forages. Food availability was highly variable with around only 50% of households having access to sufficient amounts of calories per day.

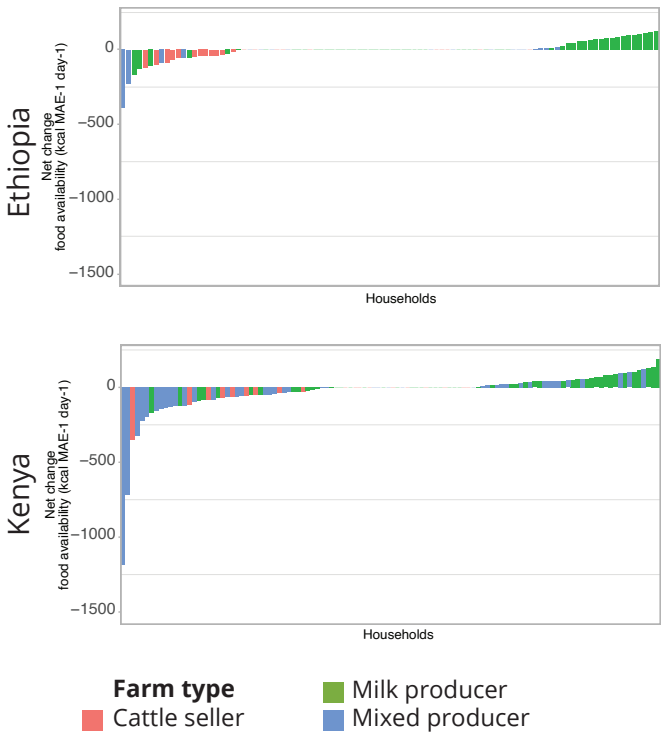


Results

Changes to forage land area requirements

Most farming households in both Ethiopia and Kenya would have to convert important amounts of cultivated land to improved forage grass should they choose to feed their cattle around 50% of these improved forages. Notably, mixed producer farm types would have to convert the greatest amount of cultivated land to forage crops. Meanwhile, given that milk producers already cultivate significant amounts of forage crops, these farms would have to convert the least amount of land with some farms already cultivating enough forage crops to experience net savings in forage land requirements due to the higher yields expected with the cultivation of Maasai grass.



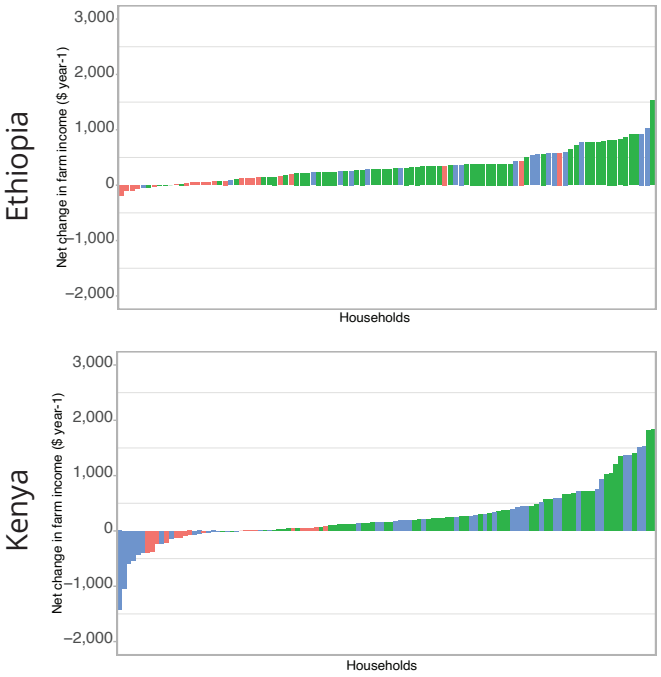


Changes to food availability

Food availability changes as a result of adopting improved forages were found to be both positive and negative depending on farm type. Milk producers in general were found to potentially experience increases in food availability as a result of adopting improved forages. These increases in food availability for milk producers are likely a result of the modelled increases in milk consumption by household members, and the fact that these farms already cultivate significant amounts of cut-and-carry forages and therefore would have to convert less crop land to improved forage crops, or could even benefit from net forage land savings due to Maasai grass having higher yields than Napier grass. It is noteworthy that most cattle sellers and mixed producers would experience decreases in food availability as a result of adopting improved forages.

Changes to annual farm income

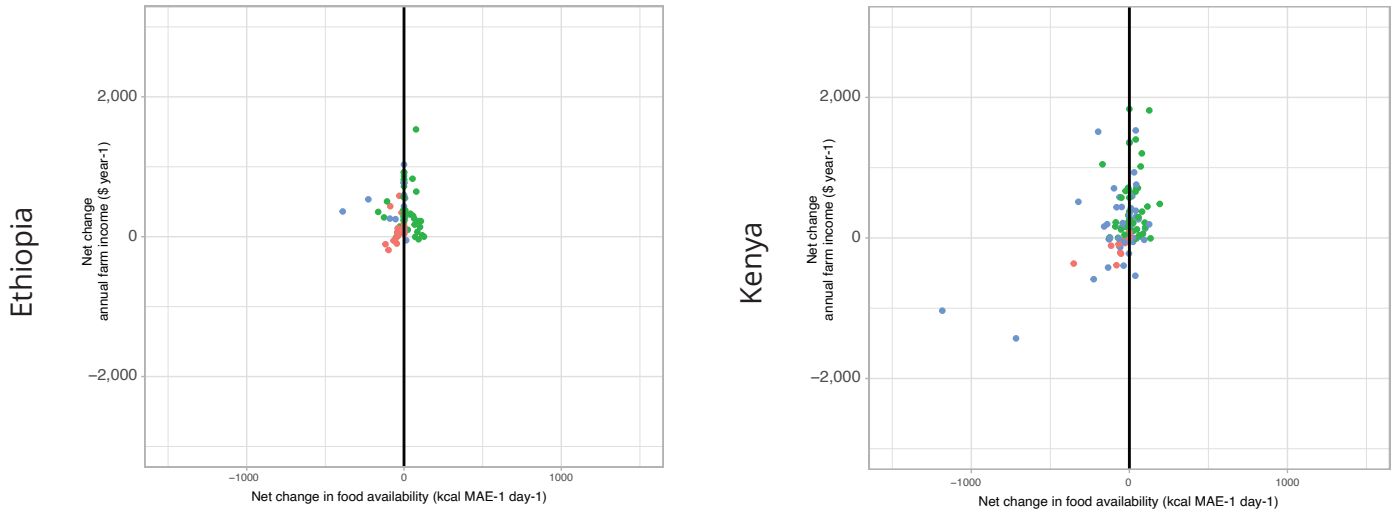
The results of the trade-off modelling underlined the potential for improved forages to contribute to increased levels of farm income. In both Ethiopia and Kenya, the majority of farms with some form of cattle livestock production could be seen to experience at least small increases in farm income. For milk and mixed producers, these increases in farm income could often be quite significant. It is important to note however, that a small proportion of farms were seen to experience net decreases in farm income.



Farm type
- Cattle seller
- Milk producer
- Mixed producer

Farm income and food availability trade-offs

The farm income and food availability trade-off plots visualise the potential "gains" and "losses" for farms adopting improved forages. Importantly, around 40% of farms, mostly milk-producers, seem to experience a "win-win" where they improve food availability while also increasing farm income. Cattle-sellers on the other hand were more likely to display important trade-offs with the adoption of improved forages.



Farm type: Cattle seller · Milk producer · Mixed producer

Conclusion

The ex-ante trade-off modelling conducted in this study in Ethiopia and Kenya provide further evidence that the use of improved forage crops present an important pathway towards greater farm income for a significant number of farming households in East Africa. Notwithstanding, these promising findings, the results also demonstrate that the use of improved forages does not lead to win-win results under all scenarios for all farm types. It is hoped that these insights can contribute to the refinement of targeting of public policies, programmes, and out-reach campaigns related to the use of improved forages.

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