Traditional livestock systems in Tanzania;
An application of the TEEB Framework

Executive Summary

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Executive summary

Objective
The objective of this study is to evaluate the socio-economic and environmental impacts of value chain activities related to three traditional livestock sectors in Tanzania using the TEEBAgriFood evaluation framework, an ecosystem services model of the Maasai steppe, value chain and household income models and the Global Livestock Environmental Assessment Model (GLEAM). The aim is to improve decision-making in livestock production policies, to enhance its viability, not just economically but also socially and environmentally. The three livestock production systems studied, are:

- The pastoral cattle system (Maasai);
- The backyard poultry system; and
- The smallholder dairy system.

Two policy scenarios have been distinguished; a baseline scenario describing the current system and an improved scenario with a policy to increase the efficiency of livestock systems taking into account the social system and the ecosystem.

Main results
The main results are presented per livestock production system studied for the economic, ecosystem and social system.

Pastoral cattle
It is estimated that over 90% of cattle herds in Tanzania are kept by pastoralists who supply the bulk of meat consumed in the country. An assessment of the household income generated by an average herd of 300 cows and 110 sheep and goats is estimated to be $6,845 per year, mainly from sales of animals for meat, but also in-kind as food for the household. This figure is not small compared to local income benchmarks. However, it is uncertain how many people need to be supported by such a herd, which is kept by a group of households. Beside household income, an important value of the herd is as a form of savings, with the value of the whole herd estimated to be $66,000. At the regional level, ecosystem services (positive externalities) can be realised, provided that land degradation due to the conversion of cropland in the Maasai steppe is prevented. Through their customary way of managing the land, pastoralists create around $4.90 in ecosystem services per kilogram of pastoral beef, sum of carbon storage, land degradation and contribution to tourism, using the medium estimate of carbon storage. The largest share of this positive impact ($4.00) is the preservation of carbon stocks. For reference, one kg of meat costs $2.93 to a Tanzanian consumer in the region. If management practices (e.g. feed and health conditions of the herd) would be improved, it would be expected that more animals and meat could be sold within the same herd. In economic terms, this would increase the household income by more than 25% which could partly be spent on education for their children. Moreover, there would also be a small decrease in emissions produced in carbon dioxide equivalents (CO_2eq) on herd level, and a significant decrease per kg of meat (see Table S1). More of the produce could then be consumed and lead to improved human health. However, careful consideration should be given to the possible loss of ecosystem services.

S1: Some basic outcomes of an improved agricultural policy compared to the baseline for pastoral cattle systems

Pastoral cattle	Unit	Baseline	Improved
Environmental externalities (greenhouse gas emissions)	$ per kg meat	7.9	5.3
Ecosystem services - Contribution to tourism	$ per kg meat	0.35	n/a [3]
Ecosystem services - Carbon storage (land)	$ per kg meat	4.00	n/a[3]
Ecosystem services - Land degradation prevention	$ per kg meat	0.52	n/a[3]
Household income generation (financial + in kind[1] - costs)	$ per kg meat	1.38	1.21
Household income generation (financial + in kind[2] - costs)	$ per household	1,140	1,465

[1] Including sold and consumed meat, milk and skins for a herd of 300 cattle, 60 goats and 50 sheep.

[2] Conversion of results per herd to household-level has a level of uncertainty.

[3] Not available. The ecosystem services assessment focused on the baseline system.

Backyard poultry

Backyard poultry production in Tanzania is a traditional sector at smallholder level and has an important position in the rural household economy, supplying high quality meat and eggs, and increasing income for rural farmers. In the backyard, these chickens are generally kept in small scale traditional systems by the rural poor and managed by women and children. The socio-economic importance of backyard poultry is not in the absolute income generated, but rather in the ability for women to generate cash revenues and provide household nutrition at a very low cost. The household income generated in a year by a flock of 30 birds is estimated to be $140 per year. Better management practices such as additional feed and better animal healthcare could lead to small improvements, but the economic impacts are negligible since the additional costs for inputs are more or less equal to the additional benefits. Also, the environmental externalities do not differ much between the baseline and improved scenario. Human health is expected to improve because more eggs are available for home consumption. Backyard poultry is mostly kept by women, therefore small increases in income can play an important role for improving their position in the community.

S2: Some basic outcomes of an improved agricultural policy compared to the baseline for backyard poultry

Backyard poultry	Unit	Baseline	Improved
Environmental externalities (greenhouse gas emissions)	$ per kg meat	1.6	1.4
Household income generation (financial + in kind - costs)[1]	$ per kg meat	2.48	2.49
Household income generation (financial + in kind - costs)[1]	$ Per household	140	140

[1] Only income generated from backyard poultry, including income in kind by consumption of own produce.

Smallholder arable dairy

The dairy sector makes up about one-third of Tanzania's livestock sector's output. Despite the potential benefits of the dairy sub-sector, commercial dairy activities in the country are still at an early stage. Only about 3% of the milk filters through to the formal market. Despite this, the dairy sector contributes to the employment of over 2 million households working at different stages in the value chain. In the traditional value chain, about 80% of the sales price of milk is income for the dairy farmer because the value chain to the final consumers is short. For an average smallholder farmer, the largest share of production is sold rather than consumed. The annual net income of smallholder dairy farmers from milk, including the value of milk consumed at home, is estimated to be around $700 per year. In addition to this, other sources of income are crops, potential sales of meat and other livestock (sheep, goats or chickens). Because of the low use of inputs, it is expected that better management practices (improved diet, animal healthcare and artificial insemination) have the potential to increase the milk

production tenfold from 200 to 2000 litres per cow per year. This transition has a considerable impact on income as income per litre decreases with 25%, but the income per household from milk production increases from $700 to almost $4000 per year (see Table S3). The impact on the environment is positive per litre of milk (decreases with almost 90%). At the herd level the impact on the environment is also positive. Human (education, human health and working conditions) and social aspects (food security, empowerment and social cooperation) are also expected to develop in a positive way if the improved scenario were to be realised. It is important to keep in mind that this is a comparison between the traditional smallholder system and a smallholder system with limited use of additional inputs and increased knowledge of milk production. This is certainly not a high input system but it is also not an incremental change. A transition from the baseline to the improved system would require collaboration between farms and government support in extension services and infrastructure, for supplying the inputs. Policies have the potential to create an environment in which farmers could make this transition.

S3: Some basic outcomes of an improved agricultural policy compared to the baseline for smallholder arable dairy

Smallholder arable dairy	**Unit**	**Baseline**	**Improved**
Environmental externalities on product level (greenhouse gas emissions)	$ per kg milk	3.1	0.4
Environmental externalities on herd level (greenhouse gas emissions)	t CO_2 eq per herd	80	57
Household income generation (financial + in kind - costs)[1]	$ per kg milk	0.40	0.31
Household income generation (financial + in kind - costs)[1]	$ per household	705	3,990

[1] Only income and in-kind consumption of milk for dairy farming. Does not include the income from meat and the arable part of the farm, which are roughly estimated for the baseline scenario at $440 (meat) and $875 (crops), and $660 (meat) and $875 (crops) for the improved scenario.

Conclusions

Traditional livestock systems play an important role in household income generation in Tanzania, as well as providing ecosystem (for pastoralism) and socio-economic benefits. Since animals have low productivity, the environmental costs in relative terms are low per animal but high per unit of produce. Within livestock systems, policy options that support efficiency can improve livestock production, the economic system, social and human impacts, while decreasing greenhouse gas emissions. Two policy options can enable this:

- The improvement of farmers' access to inputs such as feed and veterinary care;
- Training of livestock farmers through improved extension services.

This is more or less in line with the present policy in Tanzania, which is based more on food security than on environmental, human and social aspects. The main risk of a successful policy is that livestock production, in number of both animals and herds, will increase. Additional policies need to be developed alongside the previously mentioned policies at the national level, to prevent excessive expansion strategies that can negatively impact ecosystems.