Rangeland Resources use and Monitoring for Sustainable Development in Tanzania

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Abstract

Tanzania rangelands covering nearly 50% of the total land mass of 94 mill ha is endowed with a range of natural resources that provide diverse goods and services. Rangelands provide a number of ecosystem services including clean air, consumable products such as red meat, milk, fiber, water and medicinal plants. Also, they non-consumptive services such as recreation and tourism and acts as a carbon dioxide sink and thus sustaining economic development of the country. The rangeland water catchment areas of Tanzania provide water that generates over 55 % of Tanzania's hydropower. The livestock sector employs about 50% of her population, equivalent to 4.6 million households. The travel and tourism compititiveness index of 2021 by the World Economic Forum ranked Tanzania 1st in Africa and 12th worldwide regarding the quality of its nature-based tourism resources. As a result, tourism value chain contributes nearly 17 % of the country GDP and is a third lagest of direct employement sector with over 850,000 workers. Tourism has been accounted for over one-quater of the country 's foreign earnings in 2019, representing USD 2,605 mill. Production of red meat from cattle, goat and sheep by 2023 stood at 544,983.8 metric tons and export was about 4,577.5 tons. Despite the economic benefits of these rangeland resources to the country, they are faced with a number of threats that undermine their productivity, namely: agricultural expansion, deforestation, wildfires, overgrazing and invasive alien species. These threats emanate mainly from the lack of coherent approaches to planning and decision making for sustainable utilization of the available

rangeland resources. Haphazard development of water points (dams, pans and boreholes) in wet season and/or dry season grazing areas is an example of malpractice due to improper planning as it attracts spontaneous sedentarization of pastoral communities and year-round grazing that result in rangeland degradation. Exploitation or rationing of rangeland resources to uses or users has in most cases not been based on their availability or condition (healthy) to satisfy needs. Reserved rangeland areas for grazing and wildlife conservation lack nationally organized range reources inventory and monitoring because of the lack of enough employed well trained personel to carry out this valuable task. Sustainable utilization of rangeland resources entail uses that conserve soil, water, desirable plant genetic resources, environmentally non-degrading, technically appropriate, economically viable in terms of grazing animal productivity, and socially acceptable. Thus, sustainable use of rangeland resources requires access to reliable baseline information. Data provided by rangeland resources inventory and monitoring gives a variety of information, including; the distribution, productivity and composition of natural vegetation; rainfall and temperature regimes; edaphic and hydrological data, grazing land utilization and wild and domesticated animals; land tenure and ownership; and socio-economic information and marketing. A thourough interpretation of such information can lead to an informed decision and a guide to appoprate policy and regulation in allocation and use of rangeland resources for sustainable economic development. This paper elaborates the importance of guided rangeland resources use through inventory and monitoring for sustainable economic development in Tanzania. **Keywords**: Sustainable utilization, Inventory and monitoring, unguided resources use, Economic benefits.

1.0 Introduction

Rangeland (syn. Range) is land supporting indigenous or introduced vegetation that is either grazed or has the potential to be grazed and is managed as a natural ecosystem (SRM, 1999).

Rangeland includes grassland, grazeable woodlands, shrubland, savannas, deserts, and riparian areas. Large proportion of rangelands is arid and semiarid covering 50% of world surface, 54 % of Africa and nearly 40% of Tanzania land mass (Winrock International, 1992). The most limiting factor for primary biological production in rangelands is water. These rangelands are also under frequent drought with low annual rainfall ≤ 600 mm/yr, high evapo-transpiration rates nearly 4 times the annual rainfall with an aridity index (the ratio between annual rainfall and annual potential evapotranspiration, of below 0.65) (Njenga et al. 2014, Pratt and Gwynne, 1977), with high percentage variabilty of rainfall in many parts (Tivy, 1990; Ellis, et al., 1993) and in some instances receiving normal rain in one year out of six years (Fig 1). Predictions points to even worse drought conditions in near future, particularly in African regions. According to Yahaya et al. (2014), long-term drought conditions across Africa and its sub-regions are anticipated to become less frequent, yet more prolonged and severe.

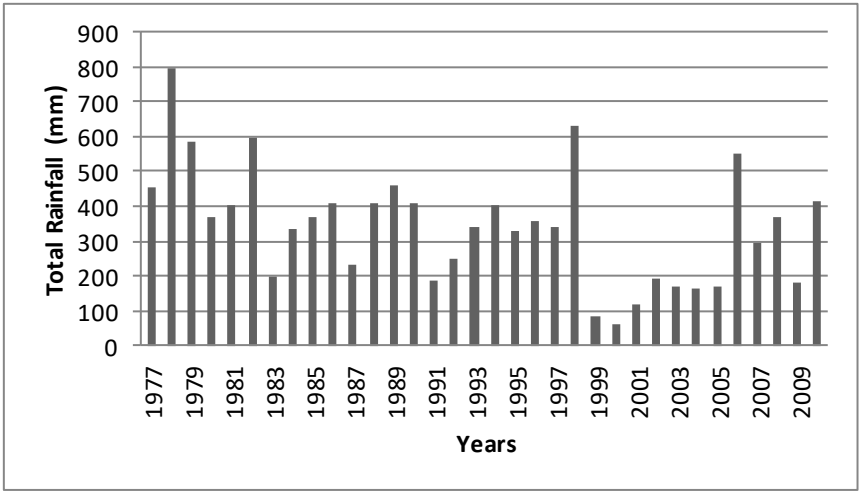

Figure 1. A case study of an arid area in Tanzania; Mwanga district rainfall data, only 5 years out of 30 years recorded ≥ 500 mm of rainfall per year (Mtengeti et al. (2013)

In these rangelands, however, high rainfall intensity sometimes as high as 279-381mm per day (Pratt and Gwynne, 1977) increases surface runoff which results in large amounts of water becoming inaccessible to plants. Thus, soil infiltration capacity is normally low due to high proportion of bare land because of low vegetative growth (Mtengeti, 2015), overgrazing and shift cultivation. Most parts of our rangelands are therefore, ecologically fragile and it takes several decades to rejuvenate its degraded areas (Herlocker, 1999). The main aim of this review paper is therefore; to elucidate the importance of guided rangeland resources use through inventory and monitoring for sustainable economic development in Tanzania.

1.1 Extent of rangelands resources in Tanzania

Tanzania has 60 million ha of rangelands providing over 90% of the feed resource for the livestock (MLFD, 2011) and wild ruminants population. Out of those 60-mill ha only about 9.3 mill ha are designated as grazing land (NAFORMA, 2015) and though only about 3.5 mill ha has so far been gazetted as grazing lands and needs protection under Grazing Land and Animal Feed Resources Act No 13 of 2010. The rest of the rangeland area nearly 54 mill ha is under conserved forest and wildlife.

Tanzania rangelands is endowed with a range of natural resources that provide diverse goods and services that can sustaining economic development of the country. Rangelands provide consumable products (goods) such as red meat and milk from forage, fiber, water, medicinal plants, clean air, industrial raw materials and non-consumptive services such as regulation of climate (including the hydrological cycle), water catchment and ground water recharge, formation of top soil and soil fertility, biodiversity, assimilation of wastes and pollutants (acting as carbon dioxide sink) recreation and tourism and wildlife.

1.2 economic benefits of rangeland resources

Among the most conspicuous benefits of rangelands resources to Tanzania's economy are through livestock, tourism, water and forest sectors:

a) The livestock sector employs about 50% of the population, equivalent to 4.6 million households. Production of red meat from cattle, goats, and sheep by 2023 stood at 544,983.8 metric tons and export was about 4,577.5 tons (Fig 2). The goats are able to excel and survive better in bushed bare drylands because they are are browsers. Sheep are also coming up as important ruminants in the degraded rangelands.

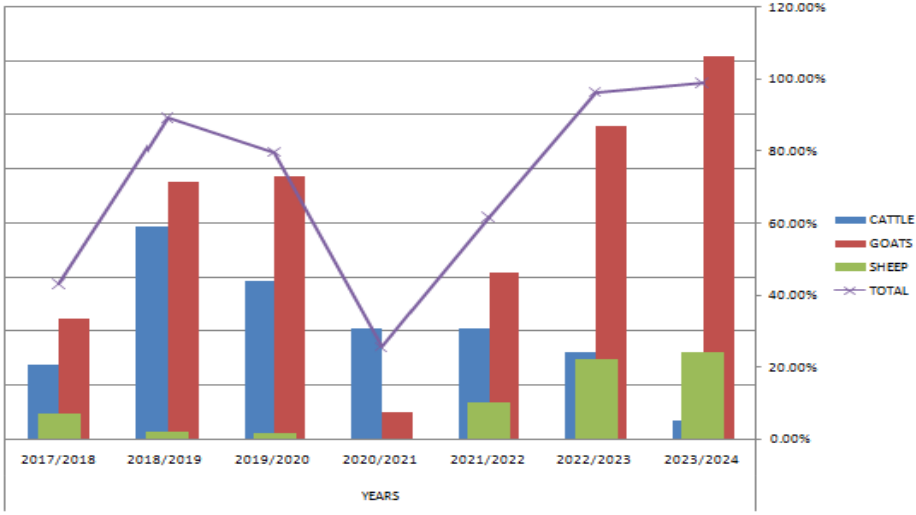

Figure 2. Overall red meat export market trend in Tanzania as percentage contribution to the overall meat export over the years (Ngunyale, 2023).

b) The travel and tourism competitiveness index of 2022 by the World Economic Forum ranked Tanzania first in Africa and 12th worldwide with regard to the quality of its nature-based tourism resources (UNWTO, 2022). As a result, tourism value chain contributes nearly 17 % of the country GDP and is a third largest

sector with respect to direct employment hosting over 850,000 workers. Tourism has been accounted for over one-quarter of the country ‘s foreign earnings in 2019, representing USD 2,605 mill. (UNWTO, 2022). Tanzania is a globally recognized destination for nature-based tourism, a competitive market segment in eastern and southern Africa. Beyond attracting tourists, the country’s landscapes and seascapes produce a wide range of ecosystem services, including carbon sequestration and biodiversity co-benefits that are not efficiently priced and often generate little or no financial return. The global climate crisis has created significant demand for investment in these forms of natural capital. Tanzania is well positioned to take advantage of nature-positive investment opportunities. The additional revenue derived from global climate programs could be an opportunity to ease the government’s fiscal constraints while also supporting the livelihoods of local communities.

c) In 2002, 55% of the total energy supplied in Tanzania came from hydropower (Ministry of Energy and Minerals, 2013) produced through water from rangeland water catchments. Without proper protection of these water catchment areas less water will flow and thus less electricity and reduced development unless alternative sources of electricity is in place. By the year 2019, however, contribution to hydroelectric in the country was 36.64 % (PSMP, 2020). Also, nearly 90 % of rice produced in dry season depend on irrigation water from water catchment from these rangelands. This improves food sustainability let alone with numerous livelihoods of smallhoder farmers in those areas.

d) The annual consumption of wood is estimated to be 62.3 million cubic meters though the allowable annual use from productive woods is about 42.8 mill cubic meters. These woods provide fuel energy, wood for construction and other uses such as industrial inputs in addition of accessing employment to the country population (the Citizen 6th Jan 2023).

1.3 **Threats of the rangelands' resources**

Despite the economic benefits of these rangeland resources to the country, they are faced with a number of threats that undermine their productivity and sustainability. These threats include: agricultural expansion, unmanaged fires, overgrazing, mass tourism, deforestation due to timber and fuel wood extraction. All these results into high rangeland degradation and as a consequence to accelerated soil erosion, deplete top soil, lower ground water table, increased floods due to low rate of rain water infiltration and thus encourage accelerated bush encroachment, increase in invasive plants and high siltation rates of water reservoirs. About 2-10 mm of top soil is washed away in sloping land due to overgrazing and unguided cultivation in Tanzania (Christianson et al 1993). Tanzania has about 40 million Tropical Livestock Unit (1 TLU =250 kg l. wt.) second largest number of livestock population in Africa (MLF, 2021). These livestock units require 160 mill ha of grazing land. Since the available grazing land is about 9.3 million ha there are signs of severe overgrazing in various parts of the country. Increased expansion of agricultural land because of low productivity of the two staple food crops (i.e. maize at 1.5 t/ha and rice at 2.3 t/ha) (MAFC, 2010) has encroached most of the set-aside grazing lands. The country loses about 400,000 ha of forests/year (Project Gaia 2015). Forests provide about 85 % of all the energy consumed in the country, especially as charcoal (MNRT, 2021). Many of the trees cut down resprout and become impenetrable bush thickets and these cover many millions of hectares of grazing land across Tanzania. These bush thickets make the land for grazing by livestock and larger wildlife ruminants diminished or inaccessible. Over-exploitation and illegal rangeland resource extraction therefore, threatens rangeland resources to sustain community livelihoods and economic development of the country.

1.4 **The causes of the threats of the rangeland resources**

a) Threats emanates mainly from the lack of coherent approaches to planning and decision making for sustainable utilization of the available rangeland resources.
b) Exploitation or rationing of rangeland resources to uses or users has in most cases been based on their availability not on their condition (healthy) to satisfy needs.
c) Reserved rangeland areas especially for grazing and wildlife conservation lack nationally organized range reource inventory and monitoring institution.

2.0 Possible solutions of the threats

For a sustainable utilization of the available rangeland resources there should be Participartory Rangeland Planning. A process based on continous engagement of stakeholders towards achieving sustainable rangeland productivity (Flintan and Cullis, 2010 and Mahadi et al. 2013). For effective rangeland planning and management, it is critical to understand the different stakeholders and resource user groups who are involved in the use and management of the rangelands resources as for the case of ALOLE, KIMBO, NAPALAI and OLENGAPA joint grazing lands in Kiteto District with a total of 161,290 ha (URT, 2022). It is important to understand key stakeholders, their *(i)rights, (ii) responsibilities, (iii) relationships and (iv) the type of benefits derived from each resource*. This will help to understand in more details the problems and opportunities related to resource utilization. Also, it reveals the potential risks and actual conflict between user-groups, and the different relationships between them.

A well-planned sustainable management and utilization of rangelands resources in the country should be based on a good Range Resources Inventory and Monitoring System that should cover the whole country. There is a need to organize a multidisciplinary consortium of all different natural resources experts including soil, range management, wildlife management, foresters, water, agriculture, anthropologists and animal scientists

coming together with one tailored message for setting a national range resources inventory and monitoring system that will be used in the whole country for sustainable utilization of our rangeland resources. The National Rangeland Inventory and Monitoring Agency (Mtengeti, 2015) is, therefore, an important entity for utilizing sustainably the rangeland resources for country economic development.

The nation should recognize that; lack of adequate technical assistance assessing rangeland health is the most limiting factor in efficient and effective implementation of sustainable utilization of our rangeland resources. Technical assistance for various natural resources has been trained and employed to take care for rangeland resources such as forest, wildlife, water but rather scanty range management technical assistance has been employed and even training seems to be in doldrums both for diplomates and degrees. The 9.3 mill ha designated as grazing land (NAFORMA, 2015) and heavily overstocked by 33.9 million cattle, 24.5 million goat and 8.5 mill sheep (NBS 2021), require enough range management experts who will be able to conduct regularly resources inventory and monitoring so as to avoid overgrazing and encourage sustainable ruminant livestock production.

3.0 Conclusions

Sustainable utilization of rangeland resources entail uses that conserve soil, water, desirable plant genetic resources, environmentally non-degrading, technically appropriate, economically viable in terms of resource productivity, and socially acceptable. Thus, sustainable use of rangeland resources will sustain economic development of the country but requires access to reliable baseline information. Data provided by rangeland resources inventory and monitoring gives a variety of information, including; the distribution, productivity and composition of natural vegetation; rainfall and temperature regimes; edaphic and hydrological data, grazing land utilization and wild and domesticated animals; land tenure and ownership; and socio-

economic information and marketing. A thourough interpretation of such information can lead to an informed decision and a guide to appoprate policy and regulation in allocation and use of rangeland resources for sustainable economic development.

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