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CLIMATE CHANGE MITIGATION & ADAPTATION: CLIMATE-SMART AGRO-PASTORAL PRACTICES: A CASE STUDY OF NAROK COUNTY, KENYA

Githae, E.W.

Department of Environmental Studies, Forestry and Agriculture, Maasai Mara University,

P. O. Box 861-20500, Narok. Email: egithae@mmarau.ac.ke, Tel. +254 0725286095

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ABSTRACT

Pastoralism is described by a high reliance on livestock production systems for socio-economic wellbeing. In Kenya it is the dominant form of livelihood in the arid and semi-arid lands, which constitute more than 80% of the total land area, host about 10 m people and 70% of the national livestock herd. Despite these areas being the major meat producers in the country, production is threatened by climate related hazards as witnessed by livestock deaths, reduced daily yields and prices, degraded natural resources, and high incidences of livestock pests and diseases. The traditional coping strategies applied in terms of nomadic pastoralism, has been reduced due to fragmentation of rangelands, forcing them to transform towards sedentary lifestyles. Thus, what can be done to improve this sedentary lifestyle and how can it be sustained within the ASALs? What are the on-the-ground coping strategies that enhance environmental conservation? This study assessed the coping mechanisms applied to the changed lifestyle within the pastoral communities of Narok County that not only improve livelihoods through climate change adaptation but also contribute towards climate change mitigation. This was done using key informant and focus group discussions. Policy guidelines are provided on building capacity through participatory approaches to enhance long-term sustainable systems that will ensure food security to these vulnerable communities, while at the same time contributing to natural resource conservation and ecosystem services.

Key words: *ASALs, Climate change adaptation, Environmental conservation, Mitigation, Pastoralists*

INTRODUCTION

Pastoralism is described by a high reliance on livestock production systems for socio-economic wellbeing. These systems occupy about 40% of Africa's land mass, mostly in the arid and semi-arid areas, which are characterized by erratic and unreliable rainfall (AU, 2010). Pastoralists traditionally move from one place to another in search of water and pasture in response to climatic stress. However, the increasing droughts and food insecurity has forced majority of them to completely drop out of nomadic pastoral lifestyle and engage in other forms of livelihood (Adow, 2008). In Kenya, pastoralism is the dominant form of livelihood in the arid and semi-arid lands (ASALs), which constitute more than 80% of the total land area, host about 10 million people and approximately 70% of the national livestock herd (GOK, 2007). They are the major meat producing areas in the country with an annual slaughter of approximately 1.6 million tropical livestock units (Muthee and Wahiu, 2006).

The demand of livestock products is expected to increase in future especially due to the influence of the upcoming urbanization that mainly alters the patterns of food consumption (FAO, 2009). However, climate change poses a major threat to this productivity leading to livestock deaths, reduced daily yields and prices, degraded natural resources, and high incidences of livestock pests and diseases. In addition, majority of the pastoralists especially in the Southern Kenya have lost pasture land due to the expanding population and large scale agriculture (Norton-Griffiths *et al.*, 2007). The traditional coping strategy applied in terms of mobility, which has supported them for many years, has also been reduced. It is estimated that close to one million have already been forced to abandon pastoralism and majority transforming towards sedentary lifestyles. Proper assessment of the needs of these communities in line with the changing paradigms is therefore required that should involve their participation for development (Musimba and Nyariki, 2003). This study addressed the following questions; i) what should be done to improve this sedentary lifestyle and how could it be sustained within the ASALs? And ii) what are the on-the-ground coping strategies that improve livelihoods while simultaneously enhancing environmental conservation? The information will be essential in informing policies and strategies for improving livelihoods while at the same time conserving natural resources and ecosystem services.

MATERIALS AND METHODS

The Study Area

Narok County is situated in the South West of Kenya and covers an area of about 15000 Km². Rainfall is highly variable and increases along a gradient from the lowlands with an average of about 500 mm/yr to the highlands (with about 1800mm/yr). The highlands have fertile soils suitable for intensive agricultural production hence dominated by large scale farming of wheat, barley, maize, beans and potatoes as well as production of wool sheep and dairy farming. The lowlands cover over three quarters of the county

with low unreliable rainfall hence dominated by nomadic pastoralists. Most of these lands fall under trust and host large group ranches owned by local communities. Nearly 60% of the district's households are dependent on livestock for their livelihood (PricewaterhouseCoopers 2005). The County also hosts the 7th Wonder of the world, the Maasai Mara National Reserve, which is one of the richest in biodiversity in the world. Being an ASAL, the area is most vulnerable to climate change which has been worsened by encroachment of agricultural activities associated with the increasing human population. The area is undergoing rapid changes due to fragmentation of rangelands, urbanization and associated changes in land use.

Data Collection

Three study sites (Mulot, Ewasong'iro and Ntulele) were purposively selected to represent pastoral areas facing massive land use changes. Within each site, semi-structured focus group discussions were carried out to provide a wide background on the concerning perceptions of change and the past and present coping mechanisms, particularly those contributing to mitigation (natural-resource based). Each group was composed of eight participants who were village elders and were all male due to cultural practices. The facilitated group discussions lasted for about 4 hrs and the information was recorded collectively as a group. Discussions were summarized according to the comments that had risen. Interviews were also conducted with key informants such as the sub-county leaders with specialized knowledge on the current challenges facing these communities. A total of three focus group discussions and nine key informants were interviewed in the three study sites.

RESULTS AND DISCUSSION

The focus group discussions gave an overall picture of the impacts of change of pastoral livelihoods to sedentary lifestyles. In summary of the information that was discovered across the three sites, climate change and land fragmentation due to population pressure were stated to be the main sources of vulnerability for the past five years. This led to reduced land, land degradation, decline in grazing resources causing reduced livestock yields. To cope with these challenges, pastoralists had diversified from livestock into agropastoralism with subsequent shift from communal land to land ownership. Attempts had also been made to diversify into other sources of livelihood strategies to increase food security (Fig. 1).

Income diversification was through selling food-crops such as potatoes and vegetables in the local markets. Women were generally involved in small-scale sale of dairy products such as milk and yoghurt. Others practiced bee-keeping and ecotourism. Majority were also diversifying livestock species by keeping emerging livestock such as pigs and poultry which are easily maintained with high yielding

breeds. Overall, all groups accepted that most of their family members were employed within Narok town while all the participants practiced charcoal burning.

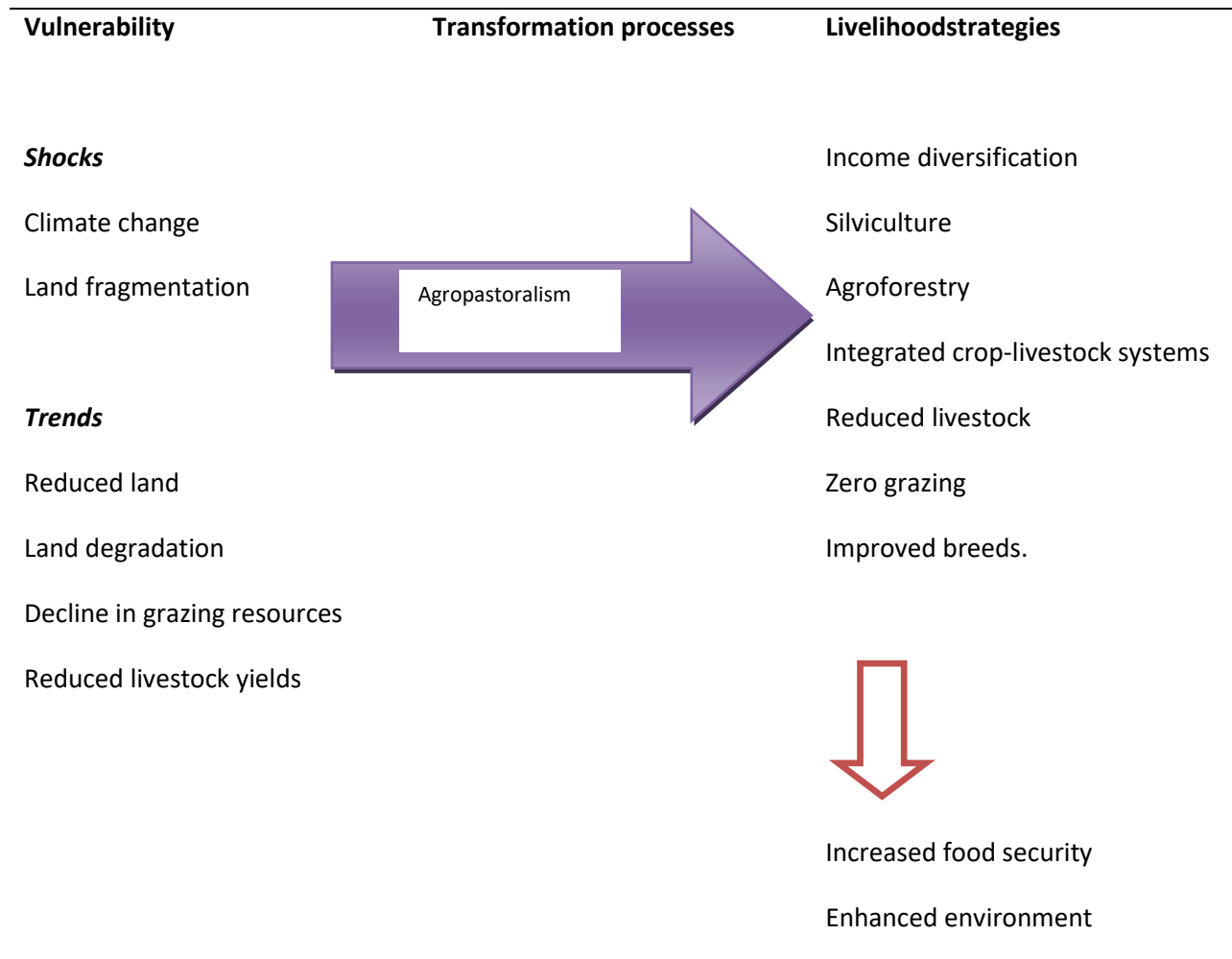


Fig. 1 Influences of the changing pastoralism in Narok County

According to the Kenya ASAL policy, the Government strategizes to support pastoralism and agropastoralism by encouraging diversification through value addition in livestock products, introduction of other livestock such as poultry and beekeeping, irrigated crop farming, ostrich farming, mining, fishing, harvesting of non-wood forest products, eco-tourism and cottage industries and introduction of camels in areas not previously rearing them including Narok (GOK, 2005). Although the new livelihood shift had many constraints, the communities applied various natural resource based strategies in order to increase food security while simultaneously improving the environment. These strategies are examples of livestock related climate-smart production systems.

Silvicultural practices

Majority of the pastoralists had maintained indigenous nitrogen-fixing legume trees on their pasture land in order to provide shade, fodder and limit wind tornadoes. Shade trees reduce heat stress on animals and help increase productivity. They also improve soil fertility and enhance carbon sequestration. Forage/legume mixtures increase pasture productivity and when legumes are included in livestock feeds they increase the food conversion ratio and decrease GHG emissions (FAO, 2012). Practices that enhance soil carbon sequestration can result in greater biodiversity, improved water management in both quantity (reduced run off and evaporation or flood control) and quality (reduced pollution) and restoration of land degradation (Neely *et al.*, 2010).

Agroforestry

About 20% of the participants had abandoned pastoral livelihoods and adopted rain-fed agropastoralism. They maintained and or planted indigenous nitrogen-fixing trees on their farm to improve soil fertility and provide shade to crops. Agroforestry is said to be crucial for both climate change adaptation by diversifying production and mitigation through carbon sequestration, improved feed and consequently reduced enteric methane (FAO, 2013).

Integrated crop-livestock systems

This involved leaving crop residues after the cropping season for use as fodder while at the same time rejuvenating the land. This increased soil fertility which in turn increased crop yields and enhanced income while at the same time provided fodder for livestock. These systems increase soil organic matter and improve soil structure hence plays a major role in carbon sequestration. They also increase crop yield, improve livestock production, enhance nutrient cycling, improve water infiltration and recharge of groundwater reserves and can therefore help reduce poverty and malnutrition and strengthen environmental sustainability (Rota and Sperandini, 2010)

Livestock management

About 60% of the participants had reduced the number of livestock and herd composition while simultaneously improving feed resources. They also kept more sheep and goats during the dry periods and increased their cattle numbers during the onset of the rains. Most of the respondents had maintained the traditional cattle breeds which they thought were more tolerant to drought. About 8% of the respondents were investing in improved cattle breeds that gained weight more quickly than the traditional ones and hence had a better sale.

Grazing management

Managing grazing lands reduce grazing pressures, enhance water retention and soil health and hence increase grassland productivity. About 40% of the participants practiced rotational grazing which conserved vegetation cover and soil organic matter. Those who practiced it were the pastoralists with very large pieces of land but with reduced number of livestock. Rotational grazing can lead to greater forage production, sustainable use of resources, enhanced profitability, land rehabilitation and restoration of ecosystem services (FAO, 2012). It also reduces and offsets GHG emissions by lowering enteric emission intensities through selecting more nutritious forage (FAO, 2009). The participants recommended the importance of mobility as a coping strategy due to the unpredictable climatic changes. Nevertheless, mobility in this area had been short and temporary and mostly towards Maasai Mara National Reserve where grazing resources were available. Neely *et al.* (2010) reported that mobility of pastoralists enables them to sustainably utilize harsh environments and therefore increase resilience of these livestock systems to climate change.

Use of organic Manure

All participants who practiced agriculture agreed that the use of fertilizers in their farms was very expensive. To supplement this, a few applied cattle manure as organic fertilizer on planting pits before sowing crops. They reported an increase in crop yield compared to the use of synthetic fertilizer alone. Cattle manure is reported to be a good fertilizer and presents a low risk of over-fertilization and improves soil structure by adding organic matter and nutrients (FAO, 2009). It also improves productivity and allows for reductions in use of synthetic fertilizers and the associated direct and indirect GHG emissions (FAO, 2012).

CHALLENGES AND OPPORTUNITIES

A number of challenges and opportunities for improvement of these agropastoral livelihoods were identified. The key constraints were the limited knowledge on sustainable land management practices and post-harvest handling, inappropriate land laws and policies, limited capital and insurance and frequent crop and livestock pests and diseases. In order to improve the livelihoods of these communities, support is required in climate change adaptation and mitigation and disaster management for sustainable and resilient pastoral systems through the following areas.

- (a) Providing incentives to adopt environmentally friendly practices that would result in both environmental socio-economic benefits that including payments for environmental services (PES)

- (b) Raising awareness on sustainable land management practices that improve soil while simultaneously enhancing food security.
- (c) Ensuring prompt and appropriate diagnostics and treatment of crop-livestock pests and diseases that should incorporate the massive indigenous knowledge.
- (d) Training on fodder management techniques such as harvesting and storage, re-seeding and use of supplements in order to increase livestock productivity.
- (e) Ensuring proper resource monitoring systems that fit within the ASALs in order to inform communities on pasture availability and future climate change.
- (f) Promotion of drought-tolerant crops and dryland multipurpose trees
- (g) Providing access to capital and markets

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