Adaptation and Coping Strategies to Climate Change among Agro-Pastoralists Community in Mvomero District, Tanzania

Regina Mollel, John Jeckoniah[*], Henry Mahoo

[1]Sokoine University of Agriculture P.O. Box 3024,Morogoro, Tanzania
**Corresponding author's email: jjeckoniah@yahoo.co.uk*

Abstract

The climate is perceived to be changing, thus calling for understanding of livelihoods strategies to guide in developing climate-resilient livelihoods. This paper investigated adaptation strategies undertaken by agro-pastoralists to cope with climate change impact in Mvomero district. A cross sectional research design was adopted where data were collected only once and 135 sampled households were involved in the study. Household questionnaires, key-informants interviews and Focus Group Discussions (FGDs) were the main methods for data collection. Descriptive statistical analysis and content analysis were the main methods used in data analysis. The study revealed various adaptation strategies used by agro-pastoralists in the study area including, timing and the use of improved crop varieties. The coping strategies for livestock keepers were to reduce the number of livestock, moving the animals to other places temporarily and some of them permanently. However, such coping strategies were not sustainable and some household became more vulnerable to climate change due to their ineffective coping strategies. Therefore, the study recommends to government and nongovernmental organisations to improve agro-pastoralists access to extension services for the access of reliable information and knowledge on predicting weather forecast using both local/indigenous and improved means. Institutions dealing with climate related issues including the meteorology agency should be strengthened to improve the packaging and the dissemination of weather forecast and information related to climate change

Key words: Climate change, agro-pastoralists, adaptation, and climate-resilient

1. Introduction

The impacts of a changing climate on the lives and livelihoods of the global poor become clearer with each passing year (IPCC, 2007). Climate change is largely attributed to both natural and anthropogenic factors. Natural factors such as solar variations and volcanic activities occur beyond human involvement while anthropogenic factors are human based activities causing changes in earth's atmosphere. According to the Intergovernmental Panel on Climate Change (2010), any increase in global average temperature above the range of 1.5-, 2.5°C is likely to result in significant alterations in the structure, function, and geographical ranges of ecosystems. Adverse climate change impacts are considered to be particularly strong in countries located in tropical Africa that depend on climate sensitive economic sector like subsistence crop cultivation and livestock production (IACR, 2004; Dixon *et al*., 2001and Hope, 2009). Similarly, Tanzania is experiencing greater weather extremes including increases in temperature and changes in rainfall patterns. Such effects have increased drought, floods, land resources degradation as well as health problems. The intensity of droughts, floods and changes to growing seasons have significant effects on agricultural productivity, water supply, food security and human welfare (Maclean, 2009; Mubaya *et al*., 2013).

Agro-pastoralists and pastoralists everywhere encounter numerous hardships with respect to climate change due to their reliant on rainfall as the source of pasture growth and seasonal rainfall for crops production, this put greater challenge to their livelihoods (Antezza, 2008). Consequently, climate change, including climate variability, is a major driver of changes in livestock production through impacts on ecological conditions, in particular on pasture growth and quality and on the availability of water resources, as well as on the distribution of livestock diseases (Cooper *et al.,* 2008). Generally, the agro-pastoralists have experienced devastating droughts and their strategies based on centuries of exposure to the droughts are not working due to partly an inability to

implement them (RoK, 2002). Mvomero is one of the districts in Tanzania, which is the pastoralist and agro-pastoralists zones and has typically experienced drought. Due to recurrent drought the district is facing water shortage for both human and livestock consumption, this is to say that, climate change impacts have a direct consequences on the economy, ecosystems, water resources, weather events, health issues and desertification among this communities. While many communities in the world have historically adapted to the impacts of changing climate; little empirical evidence is available on how the agro-pastoral communities in Mvomero district is copping to the impact of climate change and variability. It is also argued that adaptation mechanisms are hampered by the severity and the speed of climate change effects and resource constraints (Masike, 2007). According to IPCC (2001), climate change adaptation measures vary from society to society owing to its geographical, sociological, and economical characteristics. Based on this fact, this paper assesses the adaptation and coping strategies towards climate change among agro-pastoralists community of Mvomero.

2. Study Area and Methodology

The study was conducted in Mvomero district. This district was selected because it is among the districts which have been experiencing adverse impact of extreme events associated with climate change such as droughts and floods. There are also many agro-pastoralists communities which made the district ideal for the study. A cross-sectional research design was adopted whereby data were collected once. Three villages Mkindo, Hembeti, and Msufini were selected purposively due to relatively higher agro-pastoralists population. A total of 135 respondents were randomly selected to participate in the study. The sampling unit was those who practices both livestock keeping and crop cultivation. The combination of simple random and systematic sampling techniques was employed in selecting the respondents who participated in the study. The structured questionnaire with closed and open-ended questions was used to collect information on adaptation and

coping strategies. Moreover, checklists were used for key informants and Focus Group Discussions (FGDs). Key informant and participants to FGDs included: village leaders, wards officers, well-known agro-pastoralists' leaders, crops and livestock extension workers, members of village government committees and elderly farmer's men and women. Descriptive statistical analysis was computed to establish the social- socio-economic characteristics of the respondents and their adaptation and coping strategies on the impact of climate change. Ethnographic content analysis was used to analyze qualitative data.

3.0 Results and Discussion

3.1 Demographic and Social Characteristics of the Respondents

The demographic and social characteristics of the respondents namely age, sex, marital status, education level and economic characteristics like agricultural activities undertaken by the community gives information to explain the social and economic set up of the people in the study area. For example, one's formal education is an essential determinant for agro-pastoralists to adopt and use recommended strategies in dealing with the impact of climate change and vulnerability. Findings presented in Table 1 reveal that, generally, the study population has low levels of education. For example, about one third (36.3%) the respondents have no formal education while (45.2%) had completed primary education (Table 1). Findings presented in Table 1 reveal that the 40-49 age groups were domination. This is an appropriate age group in studies related to climate change and majority of the respondents were married (85.8%). The majority of the respondents had the average family size of between 4-6 people that correctly depicts the typical rural household sizes in Tanzania. Some studies e.g. Selemani, *et al.*, (2012) have argued that the household characteristics is related to its ability to cope with the adverse condition caused by climate change in the area.

Table 1: Socio-economic characteristics of the respondents

Variable	Category	Frequency	Percent

Age	20-29	9	6.7
	30-39	31	23.0
	40-49	45	33.3
	50-59	29	21.5
	60<	21	15.6
Sex	Male	82	60.7
	Female	53	39.3
Education	No formal education	49	36.3
	Primary education	61	45.2
	Secondary	15	11.1
	Post-secondary	10	7.4
Family size	1-3	32	23.7
	4-6	81	60.0
	7-9	21	15.6
	10&<	1	0.7
Marital status	Married	116	85.9
	Widowed	12	8.9
	Separated	3	2.2
	Divorced	3	2.2
	Single	1	.7

3.2 Coping StrategiesAdopted in Relation to Climate Change

3.2.1 Livestock keeping

The study findings show that the agro-pastoralists use different coping options to reduce the shocks of climate change. Some of the respondents preferred to reduce the number of livestock keeping (Figure 1). To cope with cost involved in keeping the livestock. This study found that agro-pastoralists destocked their animals to maintain a number that they can manage. On the other hand, 32.4% of them moved their animals to other places temporarily. This implies destocking strategy as adopted by livestock keepers enabled the survival of few animals that they were able to feed especially during the peak season for drought. These findings compare with that reported by Pavola, (2003) who found that both farmers and pastoralists have adapted to some ways of predicting short to long-term climatic changes such as drought. He further reported that, once the drought is locally predicted, pastoralists and agro-pastoralists would prefer first to distribute livestock and/or shifting herd to safer places to reduce risk.

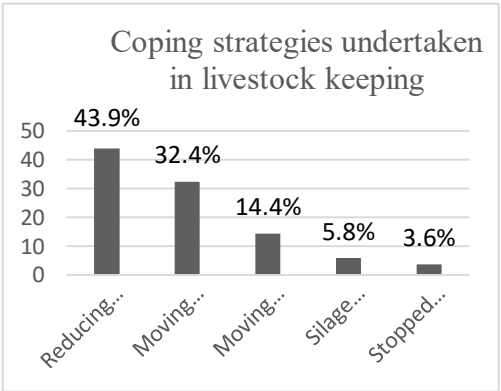

Figure 1: Coping strategies undertaken in livestock keeping

3.2.2 Crops production

This study found that the farm practice especially planting dates were highly changing from season to season due to

unreliability of rainfall, therefore, in the part of crop production a significant number of the agro-pastoralist adopted changing planting seasons where by timing was the major coping strategy used as reported by 48.6% of the respondents (Figure 2). Other copying strategies that were reported include planting high yield varieties. However, the nature of these effects and the agro-pastoralists responses to them are complex and uncertain. This implies that timing strategy adopted by crop producers were ambiguous, resulting into loss of inputs due to wrong timing in some instances. Similar findings have been reported (Nhemachena, 2008) in his study to compare the practices in 11 African countries which revealed that farmers'adaptation included timing of the planting season as well as planting high yield varieties among others.

Furthermore, one of the respondents in the group discussion explained that, to some extend timing of farming practices were not much reliable. Sometimes ago-pastoralists do wrong timing, they admitted cases where they did early planting (before or just after the first rain, the rain delayed resulting to loss of inputs). The following quote from FGD participant of Mkindo village amplifies the different scenarios that happen:

...we use our own forecast signals and sometimes it does not work in favour of our predictions....

Also planting of hybrid seed (short maturity time, drought tolerant high yield) was practiced and claimed to be useful but less than fifty percent of the respondents adopted this practice. This is due to the fact that these varieties are not affordable to every household. Nevertheless, agro-pastoralists are doing their best in coping with climate variability without being influenced by weather forecast. Therefore, provision of more accurate weather forecast information is important in assisting agro-pastoralists in their decision

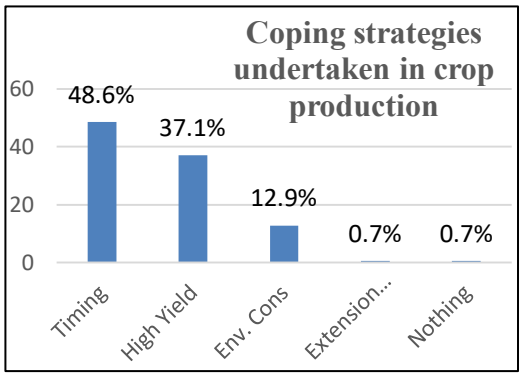

Figure 2: Coping strategies undertaken in crop production

4. Conclusions and Recommendations

The adaptation and coping strategies on climate change among agro-pastoralists community in Mvomero district rely heavily on weather forecast. However, there is inadequate knowledge on the accuracy of the predicted outcome that put them to be vulnerable to climate change. Timing strategy adopted by crop producers was ambiguous, resulting into loss of inputs due to wrong timing. Destocking strategy as adopted by livestock keepers enabled the survival of few animals but the sustainability of this strategy is not known. Therefore, the study recommends to government and nongovernmental organisations to improve agro-pastoralists access to extension services for the access of reliable information and knowledge on predicting weather forecast using both local/indigenous and improved means. Institutions dealing with climate related issues including the meteorology agency should be strengthened to improve the packaging and the dissemination of weather forecast and information related to climate change.

References

Antezza, J. (2008). Climate change induced displacement in the IGAD: Implications for policy and livelihoods among pastoral communities. *First workshop on climate induced migration and displacement held in MENA Marseille – June 15-16 2010.*

Cooper, P. J., Dimes, J., Rao, K. P., Shapiro, B., Shiferaw, B and Twomlow, S. (2008). Coping better with current climatic variability in the rain-fed farming systems of sub- Saharan Africa: An

essential first step in adapting to future climate change? *Agriculture, Ecosystems and Environment* 126: 24–35.

Dixon, J., Gulliver, A and Gibbon, D. (2001). Farming systems and poverty: Improving farmers' livelihoods in a changing world. FAO (Food and Agriculture Organization), Rome, and World Bank, Washington, DC. pp 99.

Hope, K, R. (2009). Climate Change and Poverty in Africa. *International Journal of Sustainable Development and World Ecology* 16 (6): 451-461.

IACR (Inter Academy Council Report). (2004). Realizing the promise and potential of African agriculture. Royal Netherlands Academy of Arts and Sciences, NL-1000 GC Amsterdam: The Netherlands.

Intergovernmental Panel on Climate Change (IPCC). (2007). Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge 60 pp.

Intergovernmental Panel on Climate Change (IPCC). (2001).Impact Adaptation and Vulnerability. Cambridge University, Press, Cambridge, United Kingdom 1033 pp.

Intergovernmental Panel on Climate Change (IPCC). (2010).*Economics of Adaptation* Cambridge University Press, Cambridge. 49pp.

Maclean, R. (2009). Environmental Management Policy and Planning. *Environmental Quality,* 18(4)101-106.

Masike, S. (2007). The impacts of climate change on cattle water demand and supply in Khurutshe, Botswana. PhD thesis, University of Waikato, New Zealand pp 316.

Mubaya, C.P., Nyuki, J., Liwenga, E., Mutsavangwa, E.P and

Mugabe, F.T. (2010). Perceived Impacts of Climate change related Parameters. *Journal of Sustainable Development in Africa,* 12 (5): 170-186.

Nhemachena, C. (2008). Determinants of African farmers' strategies for adapting to climate change: *Multinomial choice Analysis Afjare,*2(1): 230–265.

Republic of Kenya (RoK). (2002) First National Communication of Kenya to the Conference of the parties to the United Nations Framework Convention on Climate Change (UNFCCC). Nairobi, Kenya: Ministry of Environment and Natural Resources, National Environment Secretariat, (http://unfccc.int/resource/docs/natc/kennc1.pdf) (Accessed on 14 April 2015)

Selemani, I., Eik, L.,Holand, Ø., Ådnøy, T., Mtengeti,E and Mushi, D. (2012).The role of indigenous knowledge and perceptions of pastoral communities on traditional grazing management in north-western Tanzania, Norwegian University of Life Sciences, Norway; *African Journal of Agricultural Research,* 7(40): 5537-5547.

United Republic of Tanzania. (2007). National Adaptation Programme of Action (NAPA); Vice President's Office, Division of Environment, January 2007 pp. 52.

United Republic of Tanzania. (2012). *Five Year Environmental Action Plan, 2012 – 2017*. Ministry of Agriculture, Food Security and Cooperatives. *Tanzania Agriculture Climate Resilience Plan,* 2014–2019 pp 83.

United Republic of Tanzania. (2010). The *National Irrigation Policy United Republic of Tanzania* Ministry of Agriculture Food Security and Cooperatives, Dar es Salaam, Tanzania. 96pp.