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CLIMATE CHANGE CHALLENGES AND ADAPTATION STRATEGIES AMONG THE PASTORALISTS OF LAIKIPIA COUNTY KENYA

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ABSTRACT

Pastoralism has been the main source of livelihood for over 120 million pastoralists in the world. However, pastoral production systems have been facing pressure due to climate change, which is driving many pastoralists to adopt technologies appropriate to the adverse agro-ecological conditions and embrace sustainable livelihood strategies that enhance food security. Pastoralists have over time relied on their own knowledge to cope and mitigate against effects of arid environment by adopting to livestock production practices which enhance resilience and productivity. With increased climate change challenges, pastoralists need more than indigenous knowledge which calls for Agricultural Extension practices to improve on mitigating options for improved livelihoods. The coping and mitigation strategies in Laikipia North Sub County have not been identified and documented, for other pastoralists to learn and adopt which was the purpose of this study. A Cross-Sectional Survey research design was used and an interview schedule was used to collect data from a sample of 120 pastoralists drawn from 1410 households selected through simple random sampling. Validity of the instrument was ascertained by a group of extension experts from Egerton University, while reliability was determined qualitatively through a pilot test in Laikipia West District. Data analysis was done using Statistical Package for Social Sciences (SPSS). Findings indicated that pastoralists in Laikipia North Sub County experienced climate change related challenges which included drought, reduced amount of rainfall, livestock diseases and conflicts over resources. The recommendation was that change agents like extension workers and administrators needed to embrace various training methods to ensure pastoralists benefit from new and available technologies for sustainable food security. Policy makers and donors need to emphasize more on promoting the successful mitigating and coping options utilized by pastoralists, for faster development in the area.

Keywords: Climate change, coping strategies, Food security, Mitigating strategies, pastoralists.

INTRODUCTION

About 40% of land mass in Africa is dedicated to pastoralism. Dry lands occupy 70% of the Horn of Africa - ranging from 95% of Somalia, more than 80% in Kenya, 60% of Uganda. Severe and prolonged droughts have affected much of East Africa and have had devastating impacts on Kenya. In Kenya, 82% of the total land is classified as arid and semi-arid lands (ASALs) and is largely used for extensive livestock production and wildlife. More than 60% of ASAL inhabitants live in conditions of extreme poverty depending on less than one US dollar per day. The reason for this extreme level of poverty is

environmental degradation and climatic shocks (Heltberg, Siegel & Jorgensen, 2009).

In the midst of the high incidence of poverty in the ASALs lies an immense base of natural resources endowment. It is estimated that the ASALs support about 25% of the nation's human population and slightly over 50% of the entire livestock population (Mariara, 2008). Livestock accounts for 95 % of the family income and provides employment to 95% of the Kenyan population. However, pastoralists have continued being poor and food insecure mainly due to effects of climate change which have resulted in low livestock productivity, a factor that raises concern over the sustainability of pastoral systems in dry land Africa (Ayantunde, Leeuw & Tunner, 2011) and serious repercussions are anticipated thereby not only on

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agricultural productivity but also for the achievement of poverty reduction as per the Millennium Development Goal one.

Indigenous knowledge is socio-economically viable and effective, involves minimum risk to rural farmers, and is an important asset for their livelihood as well as conserving the natural resources (Logwa, Ngulube & Stilwell, 2010). There has been growing interest for communities to practice informal knowledge gathering especially on innovations (Oreszczyn, Lane, Carr & 2010). Although pastoralists have been using indigenous knowledge for sustainable socio-economic purposes (Logwa et al, 2010), the increased pressure from effects of climate change have forced them to graze their livestock on less land and also control animal diseases. For increased livestock production, agricultural extension is an important component to complement indigenous knowledge for improving farmer's livelihoods (Duveskog, 2011). The purpose of this study was to document the effects of climate change, the coping and mitigation strategies that pastoralists have practiced in Laikipia North Sub County.

Research Focus: Livestock production is important to the small farming enterprises and a source of capital to meet major household needs worldwide (Lisson et al., 2010). Livestock sector plays an important role in the process of economic development in Sub-Saharan Africa (SSA). In Kenya, agriculture accounts for 25% of the national GDP (Nalo, 2007) whereas the livestock sector contributes over 30% of the Agricultural Gross Domestic Product (GDP) and employs more than 50% of the agricultural labour force. Dairy and livestock farming generally account for utilization of 81% of the ASAL (KARI, 2011) and livestock related production alone accounts for utilization of nearly 421 million hectares out of a national total of 484 million hectares used mainly for crop and livestock production.

At the national level, the livestock sector's goal is to contribute towards year-round availability of livestock products through improved animal management that will enable the sector to economically ensure self-sufficiency in domestic supplies of milk, meat, eggs and other livestock products. Demands for livestock products exceed the local capacity to supply these products (Republic of Kenya, 2008). Public and private sector investments in the livestock sector can utilize these prospects and generate good returns in terms of

economic growth and poverty reduction, provided that (i) they are targeted to assist small livestock producers in enhancing livestock productivity rather than attempting to support the vast array of marginal livestock keepers and (ii) they focus on promoting intra-African trade of live animals and livestock products, rather than attempting to penetrate high-value international markets. According to the Government of Kenya (2007), the overall growth in national economy will require creative and dedicated efforts from all Kenyans and pastoralists who will benefit greatly through embracing this vision.

Pastoralists are expected to produce enough volumes to ensure self-sufficiency and generate surplus for export only when they foresee opportunities for realizing net returns. According to Koppen, Christiaanse and Huysman (2010), pastoralists need to improve on livestock management practices to be able to stay in the livestock market. However, the potential for the livestock sub-sector has not been fully exploited and especially given that the demand for livestock and livestock products is rising with increasing population. Dissemination of appropriate technologies on livestock management, feeding and disease control need to be developed and disseminated to livestock keepers through Agricultural Extension services so as to oversee catalyzed livestock production. Attainment of the Millennium Development Goals according to Pica-Ciamarra, Nouala, otte and N'guetta, (2011) is important and Laikipia North Sub County being a predominant livestock producer has the opportunity to participate in improving the national economy and reducing poverty. As Kenya endeavours to promote rural development and, therefore, to reduce poverty, there is need to consider livestock production potential in the Sub County in order to make crucial contribution to the country's economy.

The world's climate is changing at increasing rates and according to Pica-Ciamarra et al., (2011). Further, climate change poses the greatest environmental challenge of our time and is one of the major causes of environmental degradation. African agriculture and pastoralism stand to suffer some of the greatest impacts of the threats of global warming and increasing climate variability. The increasing global average temperatures are expected to amplify droughts and other extreme weather patterns (Herskovitz, 2011). The risks are greatest in the tropics, where people are

most reliant on natural resources, are most vulnerable to environmental disasters, and are least equipped to adapt to change. Climate change problems have made communities in the Sub County to lack human capacities leading to heightened conflicts, poor infrastructure, pettiness and inadequate financial base (Khalid, 2011). Developing of effective natural resource management (NRM) policies and agricultural extension programs necessitates better understanding of the people who manage natural resources, including their socio-economic circumstances and value systems (Bohnet, Roberts, Haring & Haug, 2011).

Agricultural extension has been the means of information delivery to farmers alongside dissemination of new technologies based on increasing production in food and animal products. The result is increased farm incomes and quality of life among the rural population. Projects should ensure that Agricultural extension messages are sensitive to local priorities, are correct in their assumptions, undertake key income sources of the people, and to lay necessary strategies to contact disadvantaged groups such as pastoralists to come up with sustainable methods which can expose them to various ways of coping and mitigating against climate change challenges. Laikipia North Sub County is among areas with the lowest development indicators and the highest incidence of poverty in Kenya due to the effects of climate change (Mohamed, 2010). These include: Lack of rainfall or/and erratic storms that are experienced during dry periods, increased distances for livestock herds to access pastures and water during times of extreme drought and deterioration of livestock body conditions during the off season, prolonged and increased insecurity as a result of cattle rustling used as a way of restoring livestock lost during drought.

RESEARCH METHODOLOGY

A cross-sectional survey research design was used to collect both qualitative and quantitative data. Face-to-face interviews in consultative meetings were used to collect data from pastoral household heads to while document analysis was used to obtain useful information from a variety of secondary data sources. The study took place in Mukogondo and Mumunyot wards of Laikipia North Sub County. The total area of the two wards is 281 square kilometers. The Sub county experiences numerous climatic problems that call for different ways through which pastoralists are

able to adopt to possible adaptation options to climate change challenges to enhance livestock production. The total population of Mukogondo and Mumunyot wards was 6,487 people (3,138 and 3,349 respectively) with 1410 households (705 and 613 respectively). The Population of study comprised all pastoralists who kept various types of livestock in Mukogondo and Mumunyot wards of Laikipia North Sub County.

Laikipia North Sub County was purposively selected on the basis that it is within arid and semi-arid areas and majority of the community members are pastoralists. The two wards were purposively selected on the basis of ease of accessibility. Simple random sampling method was used to sample 120 pastoralists as respondents for the study. According to Kothari (2008), the lowest sample size for a qualitative study should be 100. This study adopted a sample size of 100, plus an extra 20 which was used to cover for any attrition. Since the population and households of both the locations were almost equal, a total of 60 households were randomly selected from each of the two wards. An interview schedule containing closed and open-ended questions was used to collect both qualitative and quantitative data from the pastoralists. The face and content validity of the instrument was ascertained by a panel of 10 Egerton University extension experts. Reliability was determined through a pilot-test involving 30 farmers that was carried in Rumuruti Ward of Laikipia West Sub County. Findings were used to moderate the instrument which was to be used in the actual study since the pilot-testing procedures were identical to those that were to be used during the data collection as recommended by Mugenda (2008). Data were collected through interviews with the assistance of carefully selected and trained local enumerators. Data were analyzed through descriptive statistics and chi-square.

RESULTS AND DISCUSSIONS

Characteristics of the Study Area: Two wards in Laikipia North Sub county covered in this study were Mumunyot and Mukogondo. A sample of 120 pastoralists was interviewed from two different locations where 45% were drawn from Mumunyot and 55% from Mukogondo wards. Gender, marital status, age, and number of household members were some of the socio-economic aspects covered in the study. Fifty-five percent of the respondents were men while 45% were women. Men were slightly more than women

probably because traditionally they are the heads of the households and only in their absence do women head the households on a part-time basis. Female-headed households were not common. In terms of marital status, 83% of respondents were married while 17% were single. Traditionally majority of households are expected to be composed of married couples, which explains the reason for the low number of single households. Traditionally, division of labour in the

community ensured that every member was involved in undertaking an activity both at family and community level. Men mainly took care of the livestock while women undertook household chores like cooking, fetching water and collecting of firewood. The community assigned different responsibilities to men and women according to their age group and gender (Table 1).

Table 1: Respondents' Gender Roles.

Activity	Who undertakes the activity							
	Male Elder	Male Adult	Male youth	Male Child	Female Elder	Female Adult	Female Youth	Female Child
Cattle rearing during wet season		√	√	√		√	√	√
small stock (goats/sheep)rearing during wet season	√			√	√			√
Cattle rearing during dry season		√				√	√	
small stock (goats/sheep)rearing during dry season		√	√			√	√	
Livestock shifting		√	√					
Livestock Watering		√	√			√	√	
Livestock treatment		√	√					
Cooking, fetching water, collecting firewood and caring for family members during shifting?		√	√					
Cooking, fetching water, collecting firewood and caring for family members when there is no shifting?						√	√	√

Majority of the respondents were aged between 20 to 40 years (provide the percentage), which implied that most of the household heads were relatively young and had the ability to withstand environmental challenges within the arid and semi-arid environment. The traditional way that the community coped with the arid environment was for the families to bear many children. Most households (42.5%) had 4 to 6 family members and (22.5%) had 7 to 9 family members. The mean number of family members per household was 7 people.

The many members per family were a source of security and ability for the household to cope with problems encountered in an arid environment like high child mortality due to high incidences of human diseases and large distances to health centers. Many people per household could also be a source of labour for taking care of livestock, which was the source of wealth and food security within the community.

Importance of Different Types of Livestock among the Respondents: Livestock were reported as the main

source of wealth in the study area. The main types of livestock kept included goats, sheep, cattle, donkeys and camels. Sheep were ranked the most important type of livestock, which could be because they are fast growers and reach maturity quickly, which gives quick financial support to the households in the area. More than half of the households (52.5%) kept three types of livestock which was an adaptation strategy to diversify on the enterprises and help them cope with the challenges of arid and semi-arid environment. The number of animals owned by the different households was determined using the Tropical Animal Units (TLUs). A TLU is a 250 kilograms live weight of any domestic herbivore (provide a reference). The equivalence between the different animal species was expressed in terms of TLU. The equivalent figures used in this study were: cattle 0.7 TLU, camel 1.0 TLU, donkey 0.4 TLU, sheep or goat 0.1 TLU (Table 2). Goats were the most common type of livestock kept by the households interviewed. They accounted for 67.49 % of the total herd.

Table 2: Average Livestock Holding (TLU) in the Study Area (n=120).

Livestock type	Mean	% of the total herd	Standard deviation	Range
Goats	20.27	67.48	29.91	0-200
Cattle	6.4	21.30	11.49	0-773
Donkey	1.86	6.19	5.70	0-44
Sheep	1.27	4.23	2.07	0-17
Camel	0.241	0.80	1.23	0-10
Total	30.04	100.0	43.13	0-307
% below the mean	68.3	-	-	-

The total average herd in the two wards was 30.04 TLU; more than 68 % of the households in the division were below this figure. Drought and livestock diseases were cited as some of the major reasons why there has been fewer livestock in the study area. Livestock keeping among pastoralists is a sign of wealth and shows the economic status of a household. It would be necessary for change agents to identify the economic value provided by different livestock types so as to be able to provide important knowledge on their improvement to promote the economic status of the community. Many respondents kept none or less than ten heads of livestock in each species.

This shows that livestock keeping in the area is reducing in economic importance. This finding is confirmed by Ayantunde, Leeuw and Tunner (2011) who reported that the livelihood of pastoralists is focused on livestock keeping and majority of them continue to be poor and food insecure due to low livestock production, which has

led to poor livelihood for the pastoralists. Low livestock production further threatens the sustainability of local and international markets (Ministry of Livestock Development, 2008).

Description of the Livestock Systems Practiced by the Respondents: Land is a major resource for the pastoralists in providing grass and fodder for the livestock. The system of managing land determines the sustainability of the enterprises in a pastoral area. Majority of the households in the study area (85%) owned land communally and only 11% owned land individually, with title deeds. Communal land ownership is a traditional practice in the area and land is a resource free for use by all community members. This common resource use results in extensive land degradation through overgrazing of livestock which has led to reduced land value and low livestock productivity. There were four types of grazing systems that were used by pastoralists interchangeably (Figure 1).

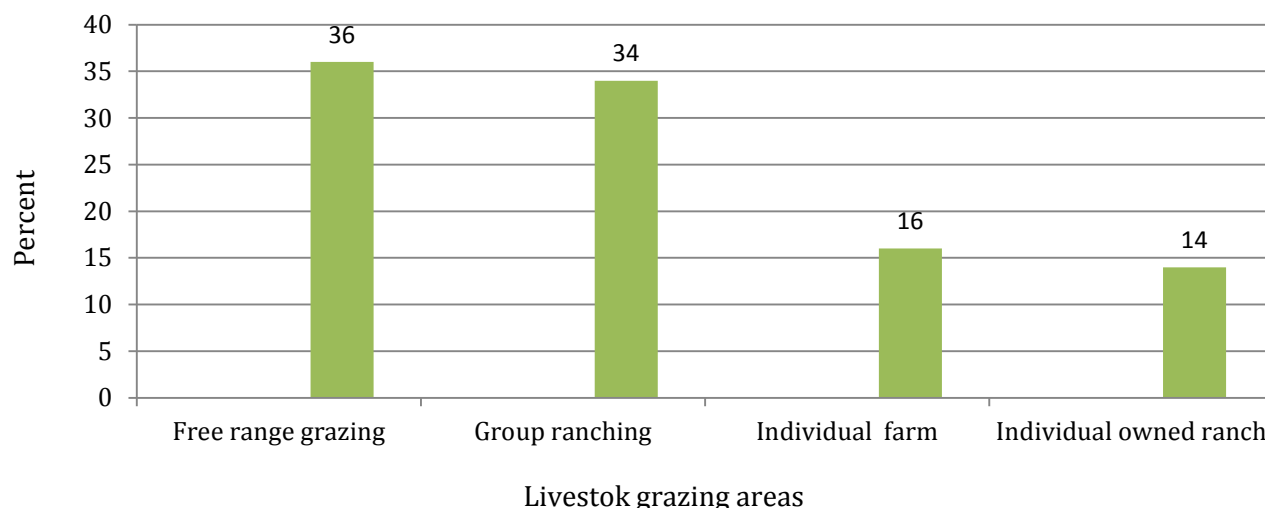


Figure 1. Types of grazing systems in Laikipia North Sub County.

Group ranching was normally done by members of a livestock group while free range grazing was done by any willing community member. Group ranching, individual farms and individual owned ranch grazing

were controlled as only group members were allowed to use the resource and there were laws governing the use.

Climate Change Challenges Experienced by Respondents: Pastoralists in the study area experienced

various climate change related challenges (Figure 9). There was a large variation in the experience of conflict over scarce natural resources where Mukogondo

experienced more conflicts than Mumunoyot Ward. Both locations experienced other climate change challenges almost equally (Figure 2).

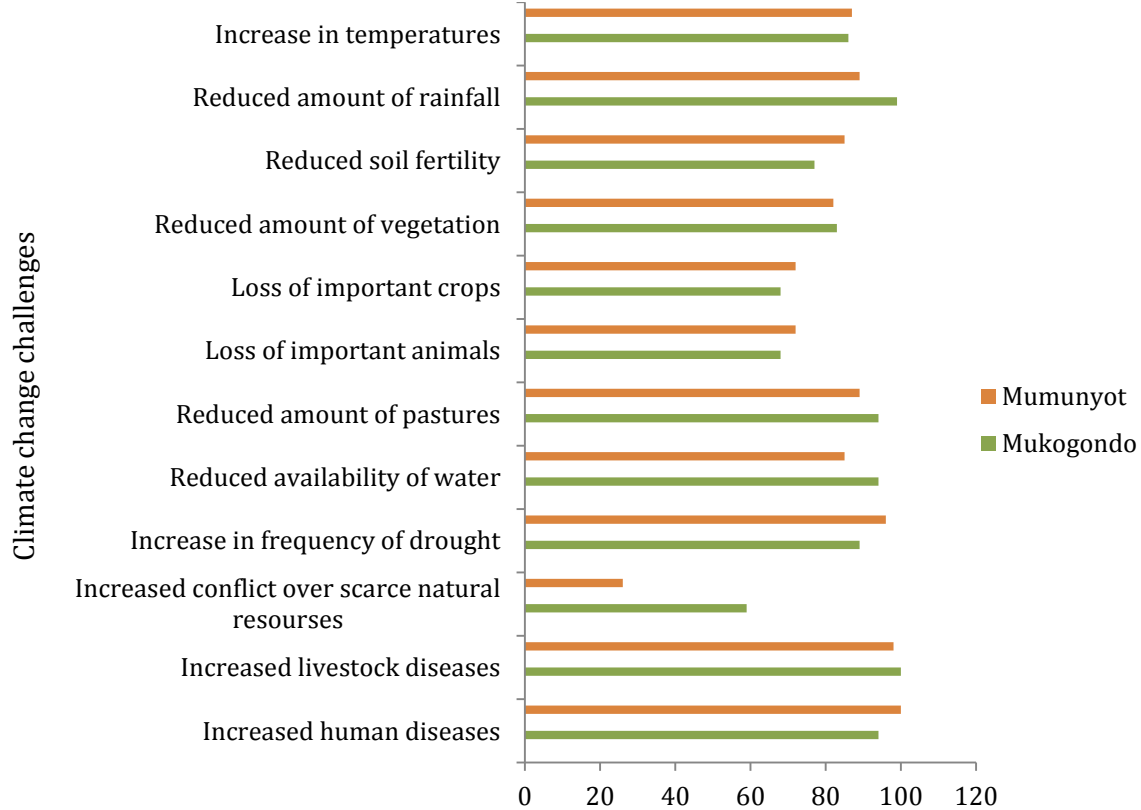


Figure 2. Climate change challenges in Laikipia East Sub County.

Respondents ranked the challenges in terms of their severity where 1 stood for high severity and 5 low severities (Table3).

Table 3: Ranking of the Severity of Climate Change Related Problems (n=120).

Climate change related problems	Sum	Mean	Rank
Drought	585	4.88	1
Livestock diseases	383	3.19	2
Reduced grazing	335	2.79	3
Human diseases	319	2.66	4
Conflicts over resources	113	0.94	5

Scores were added from the pooled scores and the mean and other related statistics calculated. Drought was ranked the highest in severity among the experienced climate change challenges in the study area. The heightened severity in the related challenges has created a vicious cycle of poverty resulting to increased vulnerability to the community and poor living conditions.

Climate Change Mitigation and Coping Strategies Employed by Respondents : The pastoralists suggested various mitigation and coping strategies to the

challenges experienced. Those arising from the scarcity of grass/pasture were: (i) migrating to other areas, (ii) use of traditional fodder, (iii) conservation of pastures, (iv) renting of pasture land, and (v) reducing the number of animals (Figure 3).

Migrating to other areas was highly practiced by the respondents during shortage of grass. The grazing area has been diminishing over time, and many community members are now looking for different livelihood choices. According to Heltberg, Siegel and Jorgensen (2009), climate change related challenges have forced

many households to change livelihood choices. Other choices included use of traditional fodder especially for

the goats, conserving fodder, renting pasture land and to reduce livestock numbers by selling.

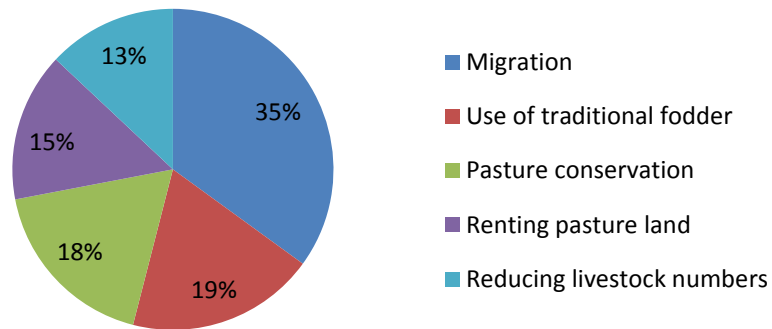


Figure 3. Coping strategies to scarcity of grass.

The Government of Kenya through the World Food Programme (WFP) has been providing relief food to the most vulnerable people in the community during times of food shortage. Food relief is a last option used to save human life mostly when drought has resulted in loss of animal lives. The vulnerable people include the elderly,

children, women and the sick because most times they get too weak to travel for long distances in search for food. Figure 4 shows the most commonly practiced mitigation and coping mechanisms used by the respondents to combat drought.

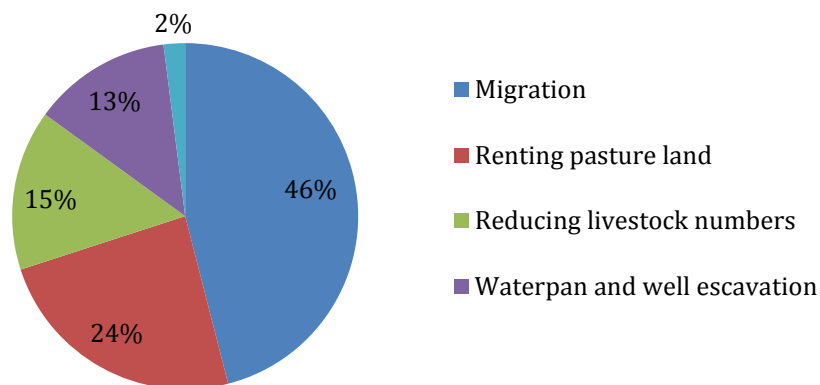


Figure 4. Coping mechanisms to drought.

Respondents dread the impact of drought as it leaves a lot of their livestock dead. Drought forces over half of the population to migrate in search for pastures and water. Most homes remain with the elderly, women and children while the younger persons migrate. Respondents coped with lack of water through excavation of water pans, digging of dams, moving animals to areas with water, storing water in tanks, and constructing rock catchment areas. Water pan excavation was the most utilized technique for collecting water from the ground runoff when it rains. The community members can utilize the collected water for

domestic and livestock use. It means that more of the funding institutions should embark on giving assistance to community members to excavate more water pans that can be used for planting fodder for their animals and reduce incidences of migrating with their animals. Five strategies were suggested to cope with conflicts in the study area (Figure 5). They included peace meetings, Government intervention, protection of boundary, migration to other areas, and fighting back. Conflicts are mainly experienced between two or more tribes or communities. They emanate from problems like scramble for the available resources which include water

and grasslands. It is also traditional for pastoralists to get livestock from different communities to enlarge their stock.

Groups of elders are the main channels of solving conflicts by holding peace talks across the conflicting groups. Government intervention comes second and is

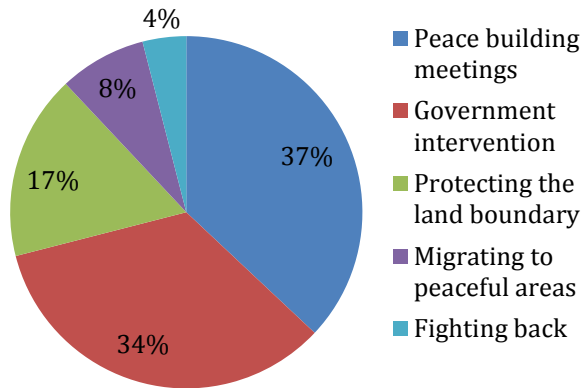


Figure 5. Coping mechanisms to conflicts.

There are those contagious diseases that cause deaths to livestock in the area like the foot and mouth. The community members usually know when these diseases are prevalent and they cope either by migrating or culling their animals. The area veterinary department takes the responsibility of quarantines which prevents infected animals from movements. Disease prevalence results in reduced milk production in livestock. Five mechanisms were suggested to cope with the problem of reduced milk production in the study area (Figure 7). They included regular pest and disease control, buying or borrowing milk, giving the animals' salts and concentrates, feeding the animals adequately, and crossbreeding.

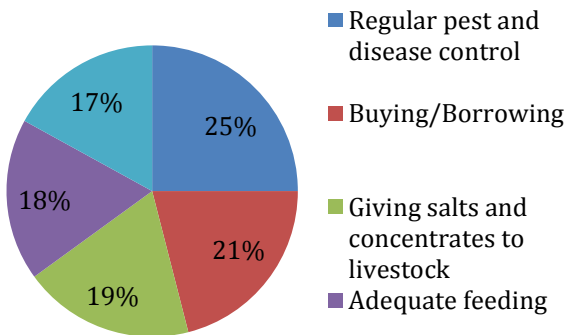


Figure 7. Coping mechanisms to low milk production Regular pest and disease control was ranked as the most

an intervention method commonly used in cases where a fight can easily erupt from the conflict. The coping mechanisms for combating increased livestock diseases were shifting the animals to other areas, culling and selling the affected animal, and quarantine for the sick animals (Figure 6).

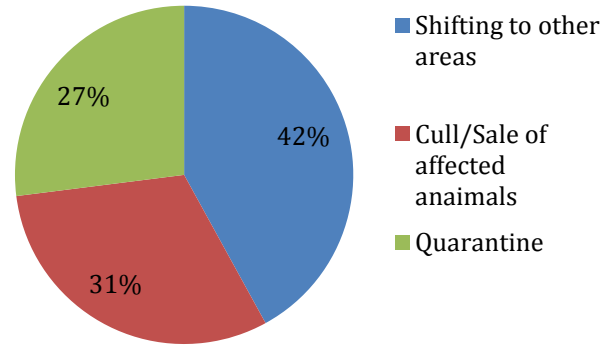


Figure 6. Coping mechanisms to livestock diseases.

preferred coping strategy to challenges leading to low milk production. Buying and/ or borrowing of milk was ranked second, adequate feeding and watering of livestock ranked third, giving salts and concentrates to livestock was ranked fourth and crossbreeding of livestock to upgrade the production capacity was ranked fifth. Milk is a minor product for the livestock in the area and is usually used for home consumption. During times of drought or disease the production gets low. This leads to unavailability of good nutrition for the children and the community. Coping with the problem of poor nutrition is important for the community because those people who take care of the livestock have to remain strong and healthy. Livestock births dictate whether the community has enough livestock to provide for food and income to the households. When there are challenges like drought, shortage of grass and water or diseases the animals loose condition and reduce their birth rates. The mechanisms suggested by the respondents to cope with the problem of reduced birth rates were proper animal treatment, adequate feeding, crossbreeding, giving salts, selling poor animals and purchasing good ones (Figure 8).

Respondents ranked various methods used to cope with reduced livestock birth rates. Proper livestock treatment was ranked highest, giving adequate feed and water to livestock was ranked second, crossbreeding of livestock to improve production was ranked third, changing of

livestock by selling the poor and buying good quality ones ranked fourth, and giving salts and concentrates to the livestock so as to improve their health condition was ranked number five. Livestock production is a major requirement for increased populations. When livestock birth rate gets low, this lowers prospects of increased livestock populations which leaves the community livelihood threatened. It means that community members have to look for various mechanisms of improving or increasing birth rates. Wildlife will always

compete for the same resources with the livestock and some wildlife feed on livestock and destroys the food and income resource for the community members. The mechanism suggested by the respondents to cope with the problem of wildlife menace was involvement of Kenya Wildlife Services (KWS) Department (100%). Whenever conflicts between livestock and wildlife are a threat, the wildlife department intervenes to ensure there is harmony.

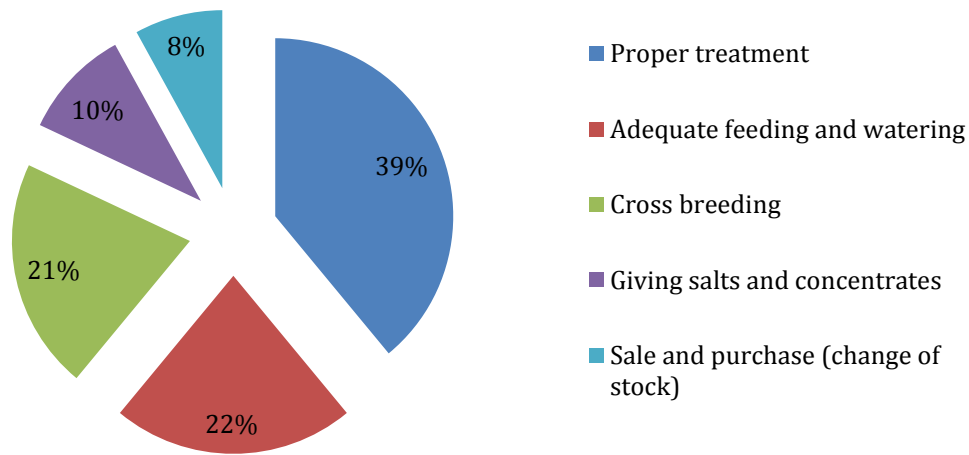


Figure 8. Coping mechanisms to reduced birth rates.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the study, it was concluded that many climate change-related challenges were experienced by pastoralists in Mukogondo and Mumunyot wards. The major ones being increase in temperatures, reduced amount of rainfall, reduced soil fertility, reduced amount of vegetation, loss of important crops and loss of important animals. Various practices to mitigate and cope with climate change-related challenges were used by pastoralists in Mukogondo and Mumunyot wards. The main ones being: migration to other areas, use of traditional fodder to feed their livestock, use of various methods of pasture conservation, renting of land to graze their animals in times of food shortage and reducing of animals to a manageable sizes, adhered to quarantine requirements to avoid spreading of contagious livestock diseases and use of regular pests and disease control methods to reduce livestock diseases. This study recommends that change agents need to increase awareness campaigns among the pastoralists on indicators of climate change related challenges. These could be done through

community forums so that pastoralists can be able to identify the indicators on time and prepare to either cope or mitigate to evade detrimental impacts on the livestock, people and the environment. The Government and other donor agencies need to put up mitigating mechanisms that can protect pastoralists in the area against extreme effects of climate change challenges. Such mechanisms can be in form of projects like dams and rock catchment for harnessing the water runoff in the area to ensure that pastoralists do not suffer from effects of climate change. Administrators need to sensitize the relevant departments on the various climate change adaptation strategies which pastoralists can be encouraged to use in order to have sustainable livelihoods.

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