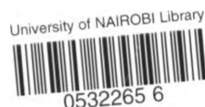


**LIVESTOCK PRESERVATION STRATEGIES IN DROUGHT PRONE
AREAS: A CASE STUDY OF OLDONYO NYEKIE COMMUNITY
(MAGADI DIVISION OF KAJIADO NORTH DISTRICT)¹**

BY

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DECLARATION

This project paper is my original work and it has not been submitted to any other university for the award of a degree.


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ACRONYMS

DMCN – Drought Monitoring Centre

FAO – Food and Agriculture Organization

GOK – Government of Kenya

ODI – Overseas Development Institute

UN – United Nations

UNCCD – United Nations Convention to Combat Desertification

UNDP – United Nations Development Program

UNFAO – Food & Agriculture Organization of the United Nations

WMO – World Meteorological Organization

IWMI – International Water Management Institute.

ECOA – Economic Commission for Africa

DSG – District steering group

KFSSG- Kenya Food Security Steering Group

KFSM- Kenya Food Security Meeting

NOC – National Disaster Operation Centre.

ISDR- International strategy for Disaster Reduction.

ABSTRACT

Periodic droughts affect both developing and developed countries, with direct impacts on agriculture and on other productive sectors reliant on water, such as hydroelectricity. It is in developing countries; however, where drought is highly correlated with the performance of the overall economy, as a result of heavy reliance on rain fed agriculture. The 2009 Red Cross Drought Operations Update indicated that pastoralists cluster around a few areas in central parts of Kajiado in such of pasture. The most affected divisions are Ewaso, Central, Magadi and Mashuru.

The aim of the study was to investigate the livestock preservation strategies deployed by pastoralist communities before the occurrence of a drought. The study was conducted in Kajiado district, Magadi division among the Oldonyo Onyokie community. The targeted respondents included the key informants (people residing in the district and have extensive knowledge about the district due to their line of duty in managing droughts and other natural disasters they include Government line ministries and Non Governmental Organizations . Focus group and house hold members. The sample size for this study consisted of 5 key informants, 6 focus group discussions consisting of 6- 12 members and 139 household heads.

Primary data from 139 households' heads was collected using questionnaires and an interview schedule. Focus group discussion consisted of 6-12 men and women who are community opinion leaders and well knowledgeable on issues confronting community of Oldonyo onyokie. Data was analyzed both qualitative and quantitatively. The study identified disabilities group, the children and adults as the vulnerable group, since they are unable to migrate with the livestock and the sick group. The strategies pursued by pastoralists in the face of drought include: movement, migration in search of work by some household members, water and land conservation, sale of livestock for income and breeding management. In institution framework analysis, the study confirmed the government, the NGO's and CBOs involvement in mitigation measures such as; early warning system, support for activities like marketing and livestock off-take, water development, livestock health, public-works schemes, food aid, and initiatives to promote post-drought recovery and key recommendations.

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CHAPTER ONE: INTRODUCTION.

1.0. Definition of key terms

Disaster: A disaster is a serious disruption of the functioning of a community or society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community/society to cope using its own resources.

Drought: Can be described as the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels causing a serious hydrological imbalance that adversely affects land resource production systems

Hazard: A hazard is a dangerous phenomenon, substance, human activity or condition that may cause the loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Climate: pattern or cycle of weather conditions such as temperature, wind, rainfall, snow fall, humidity, clouds including extreme or occasional ones over a large area

Desertification: The process of becoming a desert (as from land mismanagement or climate change).

Environmental degradation: deterioration in the quality of land, its top soils, vegetation, water resources, caused by excessive or inappropriate exploitation.

Early Warning systems: A system of data collection and analysis to monitor peoples well-being (including security) in order to provide timely notice when an emergency threatens and thus to elicit an appropriate response (Buchanan) 2001.

Vulnerability: Vulnerability refers to a set of conditions resulting from physical, social, economic and environmental factors, which increase the susceptibility of a community to the impact of disasters. Vulnerability also refers to the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard.

Mitigation : Short and long-term actions, programmes or policies implemented in advance of a natural hazard or in its early stages, to reduce the degree of risk to the people, property, and productivity capacity.

Preparedness: Pre-disaster activities designed to increase the level of readiness or improve operational capabilities for responding to an emergency.

Response: Actions taken immediately before, during or directly after a disaster to reduce impacts and improve recovery

1.2. Background of the study.

Drought is a slow-onset, creeping natural hazard that is a normal part of climate for virtually all regions of the world. Importantly, drought results in serious economic, social, and environmental impacts (Wilhite, 2000). Drought onset and its end result are often difficult phenomenon to determine and so is its severity. Drought severity is dependent not only on the duration, intensity and spatial extent of a specific drought episode, but also on the demands made by human activities and vegetation on a specific region's water supply. The impacts of drought are largely non - structural and spread over a larger geographical area than are damages from other natural hazards.

The underlying cause of most droughts can be related to changing weather patterns manifested through the excessive build up of heat on the earth's surface, meteorological changes which result in a reduction of rainfall, and reduced cloud cover, all of which results in greater evaporation rates. The resultant effects of drought are exacerbated by human activities such as deforestation, overgrazing and poor cropping methods, which reduce water retention of the soil, and improper soil conservation techniques, which lead to soil degradation. (IWMI) 2009.

(Wilhite) 2005 points out that drought continue to have significant impacts in both developed and developing countries. The latter still suffer from droughts the most. Ever

increasing exploitation of water resources and associated water scarcity coupled with the growing concern that future climate change will exacerbate the frequency, severity, and duration of drought events and associated impacts explains the increasing attention that individual countries are paying to drought-related issues.

The nonstructural characteristic of drought impacts has certainly hindered the development of accurate, reliable, and timely estimates of severity and, ultimately, the formulation of drought preparedness plans by most governments. During the last forty years, the two natural disasters that posed the greatest threat to peoples' livelihoods and socio-economic development in Africa have been droughts and floods.

Periodic droughts affect both developing and developed countries, with direct impacts on agriculture and on other productive sectors reliant on water, such as hydroelectricity. It is in developing countries; however, where drought is highly correlated with the performance of the overall economy, as a result of heavy reliance on rain fed agriculture. Not only does water variability significantly reduce projected rates of economic growth in vulnerable countries, but it has a dramatic effect on poverty rates. At the same time, poor transport infrastructure exacerbates the inability of local economies to adjust to localized crop failures, as it hinders food surpluses from reaching areas with food deficits (Clay, Bohn, Blanco, de Armas and Tchale, 2003). Pastoral communities in arid and semi-arid regions of Africa live with the expectation of drought. They continue to suffer, and arguably increasingly suffer, catastrophic losses of livestock (capital and savings) during drought.

The impact of drought is particularly acute for poorer members of communities with smaller livestock holdings and less developed social support networks. Pressures on resources in arid and semi-arid areas have been increasing in recent years as a result of human and livestock population growth and at the same time loss of land and water resources to other uses (agriculture, forestry, wildlife reserves). The mortality rates for small stock tend to be similar, or even slightly higher, than for cattle in droughts, with mortality rates of 43% compared to 35% but their advantage is that populations are able

to recover quickly during post drought periods. Camels are better able to cope with droughts, with an estimated mortality rate of 18% and populations have essentially remained the same over the past thirty years. Camels are now accepted by traditional cattle keeping pastoralists in Moyale and Samburu districts and have even been introduced into the drier parts of Kajiado District.

1.1.1 Drought coping strategies among pastoralists of Africa

The production of livestock remains a crucial element in the economies of African countries with substantial semi-arid regions.

Pastoralism has traditionally been oriented around camels and sheep, with sheep becoming predominant in recent times due to their greater marketability. The movement of water and feed resources to arid areas has been practiced since before ethnographers began to describe pastoral nomads (notably through the carriage of large water-skins on camel-back). Today pastoralists throughout the North Africa and Southwest Asia have relatively sophisticated trucking systems of water, feed resources and the animals themselves that allow them to exploit areas that in Sub-Saharan Africa would be unavailable (Blench, 1998).

Although ranching is a significant element in the economies of Kenya, Botswana, Namibia, Zimbabwe and South Africa, throughout much of the continent traditional-sector pastoralism or agro-pastoralism is the dominant form of production. Where rainfall is extremely patchy and pasture resources must be exploited opportunistically, the producer with a high level of mobility can maintain a herd in land that is almost unusable for fixed territory or ranch production. Moreover, mobile pastoralists do not have to pay any of the fixed costs associated with fenced pastures, and grazing is thus essentially a free resource (ODI) 1999.

In parts of North Africa and the Southwest Asia, rangelands have been reduced in size, in part because the widespread use of irrigation technologies, both in traditional and more recently in hi-tech forms, has allowed agriculture to colonize much larger regions of the rangelands. As a result, what rangelands remain are considerably more arid than those exploited by pastoralists in Sub-Saharan Africa. Indeed, 'drought' conditions may be said to obtain most of the year. Responses to this have long since been developed, both in terms of species and the movement of resources.

Sub-Saharan Africa and the western Maghreb have a very distinctive production system, oriented towards cattle and still dependent on the movement of herds to grazing and water-points. The constraints imposed by the physical environment account for many of the distinctive features of African livestock production; the flexibility of the pastoralists is in inverse relation to the resources on which they depend. The downside of this is that services and infrastructure for livestock producers in semi-arid regions are correspondingly poorly resourced.

Veterinary services are often of limited value, supplementary feeds are rarely available, and the forward planning associated with drought and emergency feed-supplies is only sporadically taken on board. The consequence is that in the face of a climatic anomaly such as drought, or a fast-spreading epizootic such as Rinderpest, the impact on livestock producers in the semi-arid and arid zones is often severe ODI (1999).

The reasons for this are not far to seek the contribution made by traditional-sector livestock production to national economies is often not very visible and correspondingly hard to quantify. Sahelian countries export the greatest proportion of their slaughter stock to urban centers in the coastal countries of West Africa.

In eastern and southern Africa, the trade is less transnational, with most producers supplying the internal urban market, and countries such as Botswana exporting direct to the European Union. Much livestock is traded and slaughtered outside official routes and collection points, and therefore does not show up on national statistics, even where these are collated. As a result, civil servants and politicians consistently underestimate

the contribution to the national economies (UNDP) 2008. Understanding of drought and its impact on livestock producers in semi-arid regions has advanced substantially in recent decades; unfortunately, the incidence and impact of such droughts also seems to have increased.

The response strategies of humanitarian and development agencies have begun to absorb and adapt this new understanding, but nonetheless the situation of Africa's livestock producers hardly seems to improve. In part this is because pastoralists do not exist in a vacuum, but in a complex matrix of national priorities and regional trends that can cross-cut the subtle local appreciation of a situation that makes humanitarian work effective.

Climate is often conceptualized as a series of shock events punctuating a background of acceptable variation. Shocks, such as floods, high winds and drought, are discontinuities that are sufficiently anomalous within the lifetime of observers as to be classified as unpredictable and life-threatening. The nature of the discontinuity is framed by the region's ability to cope. Thus a rainfall deficit over a month in a sparsely populated region is natural variation; but a similar deficit in a heavily populated zone is an event with defined boundaries that can become a drought if the population is ill-prepared to manage it. (ISDR) 2008.

Vulnerability to weather is a function of preparedness as well as of the event in itself. Improvement in weather-prediction services, as has occurred in Southern Africa, means that an understanding of the probabilistic forecasting potentially allows for greater preparedness in terms of migration patterns chosen, herd diversification and management, off-take levels and marketing.

Since the mid-1970s drought in Africa has been associated with starving people, refugee camps and grim-faced aid workers speaking to the television cameras. Rock concerts, appeals and aero planes pounding the landscape with mysterious packages of essential foodstuffs have become part of the visual currency of the West. The key element is

emergency response, and the appeal is the image of instant satisfaction allowed by logistical intervention.

Once immediate survival is assured and the journalists go home, livestock producers face the long-term problem of household viability. Long-term rainfall deficits affect their essential capital, their herds, in a manner that can only be rectified over a number of years and cannot be the subject of some 'instant fix'. Following a drought, herds can take up to 10 years to regain their pre-drought reproduction capacity, due to depleted numbers and ill-health (Heffernan, 1995). Thébaud (1998), who studied pastoralists in Burkina Faso, suggests that some never do rebuild their herds and simply remain permanently in the agro pastoral sector. The longer harsh conditions obtain, the greater the herd recovery time, thereby lessening herders' capacity to cope. There is now a fairly well-recognized sequence that occurs when herders are faced with extended rainfall deficits and they include the following.

Herds and herders scatter in search of water and pasture. Some herders push (usually southwards) into higher-rainfall areas, where they risk not only conflict with settled peoples but also characteristic pathologies such as dermatophilosis and trypanosomiasis. Other herds head towards fixed water-points such as boreholes, where the pasture may become exhausted and trampled in its hinterland and the animals die of starvation.

Drought causes the terms of trade to turn against producers. The price of essential grains rises markedly while the sale value of their stock falls dramatically, since many other producers are also trying to sell their animals in order to eat. This is accompanied by deterioration in the quality and size of the animals on sale. Herders may also sell classes of animals, such as pregnant females, which they would normally retain.

Some animals are sold for slaughter, but many go cheaply as live animals to urban Entrepreneurs who buy them as an investment. Such individuals have the funds to buy

emergency feeds to keep the stock alive. When conditions improve, they often return the animals to the pastoralists to manage them.

As a consequence, many herders are gradually transformed from herder-owners to hired herders, with the predictable consequences of uncommitted management.

At the same time, the herders' desperation makes them relatively unreliable with stock they manage for village populations. Villagers then remove the stock from the pastoralists' care and set themselves up as herders, eventually creating further competition for grazing resources.

When the rainfall levels rise again, the price of domestic stock rises as producers try to restock. Since their capital is limited, the consequence is a large number of producers with non-viable herds (i.e. herds which cannot support their household). These household herds are then even more vulnerable in the next climatic anomaly.

Some pastoralists conclude that the species or breeds they herd are unsuitable for the ecozone in which they are trying to operate. Cattle people switch to camels and goats, or try to swap their dominant breed for one with a greater ability to digest browse or tolerate drought.

Other pastoralists must leave the system permanently and set up as agro - pastoral cultivators with small herds that generally do not need to go on transhumance.

1.1.2 Draught in Kajiado.

The 2009 Red Cross Drought Operations Update indicated that pastoralists cluster around a few areas in central parts of Kajiado in search of pasture. Long rains in Kajiado Central, Kajiado North and Loitokitok districts in 2009 were below normal and did not result in much pasture regeneration or improve the water situation. The most affected divisions are Ewaso, Central, Magadi and Mashuru. The condition in pastoral areas of Kimana, Lenkisim, Mbirikani, Rombo and Lower Kuku in Loitokitok is worsening. South and Central Keekonyokie in Ngong and Isinya are equally bad. Parts of Ngong and Namanga have also been severely affected by drought.

Temporary water sources are dry and boreholes are the main source of water. Cattle body condition in Kajiado Central and Kajiado North (Ewaso, Magadi, Namanga and Central divisions), and Loitokitok has deteriorated. In June 2009, cattle sold at Kiserian, Bisseli and Ewaso Kedong markets fetched between Ksh2, 000 to Ksh3, 000. Cases of tick-borne diseases especially East Coast Fever, *Anaplasmosis* and *Babesiosis* were evident in dry season grazing areas, attributed to inadequate water for spraying and movement of livestock into areas with high prevalence of ticks. Trypanosomiasis was reported in cattle that moved to Coast Province, Makindu, Chyullu Hills and along Ewaso Ngiro River in Magadi. In small stock, cases of sheep and goat pox and contagious CCPP were recorded in pastoral areas of the district. Foot and Mouth Disease, Malignant Catarrhal Fever and black quarter were reported in Central and Isinya divisions.

By June 2009, close to 70% of pastoralists had migrated with their livestock out of the district to areas such as Nairobi (suburbs), Makueni, Tsavo East and West National Parks and around Lake Chyalla, Kiambu, Nakuru, Naivasha, Nyahururu, Coast Province (Maungu, Kinango, Voi) and Thika. Cross border migration in search of pasture is quite evident along Loitokitok/Taveta-Tanzania border. Livestock also move within Kajiado to dry season grazing areas including Chyulu hills, Namanga and Nguruman escarpment. Resource based conflicts were among farmers relying on irrigation and pastoralists, attribute to over-abstraction of water upstream. Conflicts were reported between pastoralists who migrated to Makueni, Machakos and Maungu, as well as those grazing in Tsavo Parks, as KWS rangers denied pastoralists access to the park.

Human-wildlife conflict involved farmers struggling to drive away elephants, gazelles and zebras from Amboseli Park who invade their farms along the upper zone of Loitokitok (Sompot, Ntonet, Njoro, Murtot and Nkama).

1.2 Problem statement

The national policy for sustainable development of Arid and Semi arid lands of Kenya March (2004) pointed out that the drought cycle in Kenya dates back to more than three

decades ago. In 1975, alone drought affected 16 000 people followed by the 1977 where 20 000 people and their livestock were affected. In 1980, 40 000 people suffered the effects of drought, and in 1983/84 it hit over 200 000 people and their livestock. In 1991/92 in Arid and Semi-Arid Districts of North Eastern Kenya, the Rift Valley, Eastern and Coastal Provinces, 1.5 million people were affected by drought. Widespread drought affected 1.4 million people in 1995/96 and in 1999/2000, famine affected close to 4.4 million people. In 2004, 3 million people were in dire need of relief aid for eight months from August 2004-March 2005 due to widespread drought. The drought in 2008 affected 1.4 million people. In the late 2009 and early 2010, 10 million people were at risk of hunger after harvests failed due to drought. Notably the arid lands communities in the past had devised their own drought coping and adaptation strategies. Those strategies are no longer effective enough to cope and adapt to drought. (Republic of Kenya) 2009.

Florian Sommer (1998) points out that many drought mitigation activities have been tried over the years in the arid regions in Kenya beginning in the colonial era when destocking (purchase) of vulnerable stock took place on a large scale through the activities of the Livestock Marketing Division (LMD). More recently this approach has been replaced by smaller piecemeal responses (often by NGOs) attempting to mitigate the impact of drought by the provision of assistance in the form of marketing, water, veterinary services etc (Caldwel, 2000). Rarely have attempts to mitigate been well coordinated at local or national level and the major response over the past 2 decades has been one of 'last resort provision' of food relief to affected communities. Few efforts have been made to improve the self-sufficiency of pastoral communities and to assist the development of community-managed drought mitigation activities. A number of factors now combine to make possible a more comprehensive approach to integration of drought management into pastoral development. Pastoral area support projects such as the Dutch-funded Drought Preparedness Intervention and Recovery Programme (DPIRP) and the World Bank-funded Arid Lands Resource Management Project (ALRMP) in Kenya have succeeded in institutionalizing to a degree responses to drought in Kenya.

Currently, the drought management strategies in place include a unified system in which preparation, early warning (EW), response and rehabilitation are closely linked to each other and are under the same control

Despite the extensive strategies implemented by the government to intervene during droughts, particularly to preserve livestock and minimize human casualties; there still persists an unprecedented level of vulnerability of a significant proportion of the country's pastoralist communities to the vagaries of weather. The major challenge of these interventions is that they are "post facto". This study intends to investigate the strategies deployed by pastoralist communities in drought prone regions to preserve livestock before the occurrence of a drought.

Pastoralist communities have mechanisms of coping with impacts of droughts and they include livestock mobility , herd splitting / sharing , household livelihood diversification , trade and other linkages to the wider economy and understanding of these strategies and practices is essential for the development infrastructure and support services that enhance their ability to cope with drought and therefore Government and donors should focus on developing policies that supports drought resilience , early warning and drought contingency planning (Barton, David, Morton, John and Hendy, Carry : 2001).

During the drought of 2008/ 2009 Government agencies , Nongovernmental organization , international organizations including United nations Agencies embarked an array of drought interventions to ward off adverse effects of droughts among pastoralist communities , such interventions included provision of relief food , supplementary feeding for children under the ages 5 years , support to animal health through provision of veterinary drugs , provision of emergency water for domestic use , livestock marketing through facilitation of emergency livestock off take . although formal drought mitigation interventions blends well with traditional drought coping mechanisms gaps exists in terms of timing and appropriateness of formal drought mitigation interventions (International livestock research institute) 2009.

1.3 General objectives

To investigate the livestock preservation strategies deployed by pastoralist communities before the occurrence of a drought.

1.3 .1. Research Questions

In order to investigate the livestock preservation strategies deployed by pastoralist communities before the occurrence of a drought the study asked the following questions

1. What are the drought trends in the community?
2. To what extent has drought mitigation structures been formalized?
3. How effective are traditional drought mitigation mechanisms?
4. To what extent do the traditional methods blend with formal?

1.4. Specific objectives

1. To determine the drought trends in the community.
2. To determine the extent to which drought mitigation structures have been formalized.
3. To assess the effectiveness of traditional drought mitigation mechanism

1.5 Rationale of the study.

Most past studies on drought and drought management have focused on the effects of drought on the population and ecosystem. However, those past studies failed to fully address the role of pastoral communities in managing drought. In view of the economic effects of drought on populations, especially pastoral populace and agro – pastoral systems by essentially reducing the amount of forage available hence cause livestock death. Drought may also increase vulnerability of livestock to a range of animal diseases.

In addition to the above, there is also the ever-increasing problem of poverty caused by drought especially among pastoral communities. Poverty, if not properly addressed, has the potential to squeeze out pastoral communities from their ancestral rural areas to

urban centers in search of alternative means of livelihoods. Since approximately 80% of Kenya's populations live in rural areas, such an influx to urban centers caused by severe droughts will have serious socio – economic ramification for the whole nation. Proactive measures of preparing for droughts that lead to livestock decimation in communities must therefore be sought now if a “too late scenario” is to be evaded.

The socio–economic effects of drought in pastoral areas of Kenya and Africa in general are enormous, ranging from widespread malnutrition, famine, loss of life, migration and social conflicts. This study is intended to document critical drought preparedness strategies and to establish drought coping mechanisms employed by the Oldonyo Nyekei communities of Magadi Division.

1.6 Scope and Limitations

In order to examine the characteristics of the district administration drought preparedness strategy the study focused on vulnerability assessment, Contingency planning, institutional framework, resource base, information systems, warning systems, response mechanisms and public education. This study was conducted in Kajiado district, Magadi division among the Oldonyo Onyekie community.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction.

This chapter deals with the review of the related literature on drought preparedness strategies by pastoral communities. The review dwells on the factors identified for investigation in the study namely drought effects, famine relief, drought mitigation and early warning signs.

The last part of this chapter gives the theoretical basis upon which this study is anchored. Disaster crunch model, the Disaster release model are discussed in relation to the topic at hand.

2.2. A review of World Drought trends

According to international water management institute (2009) South-eastern China, Thailand, East Africa, Australia, Southwest and Central Asia, North Africa, Northern China, Mongolia, southern Africa, western United States, Latin America and southern American countries such as Argentina and Paraguay are prone to climate-driven water Scarcity being in arid or semi-arid environments.

2.3. A Review of Droughts in Africa

According to the international development institute report of 1999, pointed out that Drought and desertification are at the core of serious challenges and threats facing Sustainable development in Africa. These problems have far reaching adverse impacts on Human health, food security, economic activity, physical infrastructure, and natural resources environment, national and global security. According to their report overseas development institute went a head to assert that two thirds of Africa is classified as deserts or dry lands. These are concentrated in the Sahelian region, the Horn of Africa and the Kalahari in the South Africa are especially susceptible to land degradation and bears the greatest impact of drought and desertification. It is estimated that two-thirds of African land is already degraded to some degree and land Degradation affects at least 485 million people or sixty-five percent of the entire African Population. Desertification

especially around the Sahara has been pointed out as one of the Potent symbols in Africa of the global environment crisis (ODI) 1999.

Climate change is set to increase the area susceptible to drought, land degradation and desertification in the region. Under a range of climate scenarios, it is projected that there will be an increase of 5-8% of arid and semi Arid lands in Africa.

With regard to drought, the continent has witnessed a high frequency of occurrence and severity of drought over the last two decades. Drought is one of the most important climate-related disasters in Africa. Climate change is set to exacerbate occurrence of climate related disasters including drought. For example a study from Bristol University projects that areas of western Africa were at most risk from dwindling freshwater supplies and droughts as a result of rising temperatures.

Current climate scenarios predict that the driest regions of the world will become even drier, signaling a risk of persistence of drought in many parts of Africa (arid, semi-arid and dry sub humid areas) which will therefore bear greater and sustained negative impacts.

The impacts of drought are among the most costly events and processes in Africa. The widespread poverty, the fact that a large share of Africa's economies depend on climate-sensitive sectors mainly rain fed agriculture, poor infrastructure, heavy disease burdens, high dependence on and unsustainable exploitation of natural resources, and conflicts render the continent especially vulnerable to impacts of droughts.

Economic commission for Africa in their annual report of 2007 pointed out that, the consequences are mostly borne by the poorest people. In Africa, women and children in particular, bear the greatest burden when land resources are degraded and when drought sets in. As result of the frequent droughts, Africa has continued to witness food

insecurity including devastating famines, water scarcity, poor health, economic hardship and social and political unrest pointed out (Economic Commission for Africa) 2007.

Drought and floods account for 80 percent of loss of life and 70 percent of economic losses linked to natural hazards in Sub-Saharan Africa. For example the drought of 1990/1991 in Zimbabwe resulted in a 45 percent drop in agricultural production but also a 62 percent decline in the value of the stock market, a 9 percent drop in manufacturing output and a GDP drop of 11 percent. Similarly, in Kenya, the drought of 1999-2001 cost the economy some 2.5 billion dollars. As a proportion of the national economy this is a very significant loss hinted Economic Commission for Africa (2007).

The loss of natural resources, environmental degradation and desertification affects food security. The poor households that are affected by drought and desertification do not have adequate resources to deal with food shortages leading to food insecurity and hunger that affects millions of people (Van Crowder et al., 1998).

If land degradation continues unabated, it is projected that more than a half of cultivated agricultural area in Africa could be unusable by the year 2050 and the region may be able to feed just 25 percent of its population by 2025. (UNCCD) 2004.

The most severe consequence of drought is famine. Food aid to the subcontinent Accounts for approximately 50 percent of the yearly budget of the World Food Programme. The consecutive droughts that have occurred in southern Africa since 2001 have led to serious food shortages.

United Nations food Agriculture organization (FAO) report of 2009 sited that the drought of 2002–03 resulted in a food deficit of 3.3 million tones, with an estimated 14.4 million people in need of assistance. At the height of the Horn of Africa's drought in 2000, 3.2 million Kenyans were dependent on food aid, and malnutrition reached 40 percent of the population, more than 3 times the normal level.

In the year 2005, World wide Concern, in partnership with the Diocese of Malindi, Kenya, provided seed and technical support to 2,129 farm households who were severely affected by drought. During the same year 2005 many other African countries faced food shortages because of the combined effects of severe droughts (Nhambura, 2006; Radford and Vidal, 2005) and Desertification that could become semi-permanent under climate change.

The worst affected countries included Ethiopia, Zimbabwe, Malawi, Eritrea and Zambia, a group of countries where at least 15 million people would go hungry without aid (FAO, 2005). The situation in Niger, Djibouti and Sudan also deteriorated rapidly. Many of these countries had their worst harvests in more than 10 years and were experiencing their third or fourth consecutive severe drought.

2.3.A review of Droughts in Kenya

According to the Kenya food security steering group (KFSSG) report on long rains assessment (2004) Drought is the most prevalent natural hazard in Kenya affecting mainly Eastern, North Eastern, parts of Rift Valley and coast Provinces. Floods seasonally affect various parts of the country especially along the flood plains in the Lake Victoria basin and in Tana River while landslides are experienced during the long rains season running from March to May especially in Murang'a district and areas surrounding the Mount Kenya region. Drought affects mostly Eastern, Coast, North Eastern and parts of Rift Valley, Provinces of Kenya. The specific districts include Baringo, Laikipia, Turkana, Samburu, Narok and Kajiado in Rift Valley, Marsabit and Isiolo in Eastern province, Mandera, Garissa and Wajir in North Eastern and Tana River, Kilifi, Kwale and Taita-Taveta in Coast Province. Most of these districts experience dry weather conditions causing pressure on the existing pastures and water resources on which the communities depend for survival.

2.4. An Analysis of Factors Influencing the Impact of Drought among Pastoralists

This is often expressed as the increased vulnerability of pastoralists to drought. The ecological impact of climatic conditions over a year or run of years is dependent on features of the pastoral production system: these include the mix of grazing and water resources accessible to the pastoral system.

Drought impacts, therefore, depend on the severity of drought in meteorological and ecological terms, the recent history of drought events, and the underlying resilience of the pastoral system. The correct diagnosis of the origins of drought impacts is still essential for effective planning to support drought resilience and promote drought management (Pratt et al., 1997). Proper diagnosis will thus require the monitoring of a number of key indicators of the status of the pastoral system as well as climate variables, hence the importance of community-based early warning systems (see Swift, 2001; Sommer, 1998).

2.4.1. Analysis of Coping and Adaptive Strategies

Pastoralism has traditionally been oriented around camels and sheep, with sheep becoming predominant in recent times due to their greater marketability. The movement of water and feed resources to arid areas has been practiced since before ethnographers began to describe pastoral nomads (notably through the carriage of large water-skins on camel-back). Today pastoralists throughout the North Africa and Southwest Asia have relatively sophisticated trucking systems of water, feed resources and the animals themselves that allow them to exploit areas that in Sub-Saharan Africa would be unavailable (Blench, 1998).

A wide range of responses to drought may occur in pastoral systems, including changes in livestock and grazing management, and changes in household economy and subsistence. Responses are generally progressive as drought conditions persist, and are dependent on the severity of drought and the 'health' of the system as discussed elsewhere in this work. In the fluctuating pastoral environment, responses are also

variable between years with apparently similar climatic conditions, depending on a wide range of additional factors as noted earlier in this dissertation. Responses are thus not predictable or consistent and drought policy and services must be able to accommodate and support this flexibility.

2.4.2. Mobility

A major common element in response to drought is the long-distance movements of livestock and people. Such movements occur across district and sometimes international borders. In Kenya at least, drought-time movement is most often to fairly well defined (amongst pastoralists) refuge grazing areas and water sources, particularly if movements are within district or ethnic group territories.

2.4.3. Sale of Livestock

Livestock sales as a short-term coping strategy need to be understood within this context, but while regular adaptive livestock sales concentrate on surplus males and cull females, drought-time livestock sales may, as drought impact worsens, include breeding females, thus eroding households' core assets.

2.4.4. Herd Splitting and Exchange

Sharing of livestock within kinship networks, where animals are borrowed for subsistence purposes and reproduction is common in many pastoral societies and acts as a form of insurance for poorer households, as well as a way for wealthier households to spread risks and ensure a supply of herding labour.

2.4.5. Food Sharing

If other coping strategies do not work, even more direct ways of sharing resources between households may come into play. For example, the social norms of the Turkana in Northern Kenya stress that families that can afford to share food with poorer relatives

should do so. Large herd owners, therefore, often support dependent relatives. However, as with livestock loans, this sharing is insufficient during a prolonged and widespread drought.

2.4.6. Changing Species Composition of Herds

Longer-term strategies for coping with drought include changing the species composition of herds. There has been a shift in northern Kenya towards keeping camels as opposed to cattle. Small stock (sheep and goats) may also have replaced cattle in some communities as Camels are seen to be more drought tolerant than others traditionally preferred species

2.4.7. Diversifying Income Sources

Opportunities may be limited; some households diversify their income-earning activities and become involved in the collection of firewood, charcoal burning or collection of gum Arabic.

2.5. Famine Relief Interventions

These interventions take two forms: first, through national development policies which have resulted in limiting the access of pastoralists to grazing; and second, through the interventions applied when severe drought hits. The most frequent form of intervention following drought is through food-aid as famine relief.

2.5.1. Food-for-work

Food-for-work (FFW) is seen as the solution to the 'problem' of dependency. FFW projects involve recipients giving labour to provide some form of infrastructure such as road repair, reforestation, or terracing in return for a food ration. They are a form of 'make-work' scheme, based on the assumption that the recipients are not doing productive work. In most cases this assumption is wrong.

2.5.2. Free Distribution of Food Aid

The other major type of relief programme is the free distribution of food aid. These programmes are usually short-term, for the period of the drought only, and involve providing food for people in need, from camps or distribution centers. The amount of food provided is typically based on assessments of the food available to individuals and, from these estimates are made of numbers in need. It is seldom that a family's requirements are fully met.

2.6 A Review of drought management coordination structures in Kenya.

Under the Kenya national disaster policy draft of February 2009 which is waiting legislation, the following are the disaster management structure in place:

2.6.1. The Kenya Food security Meeting and Kenya Food security steering Group (KFSM & KFSSG)

The Government, in conjunction with the UN Agencies, developed a drought management system that is coordinated by a Kenya Food Security Meeting (KFSM); and its secretariat, the Kenya Food security steering Group.

2.6.2. The Kenya Food Security Steering Group (KFSSG)

The activities of the KFSSG include the early warning monthly bulletins, the declaration of warning stages (i.e., Normal, Alert, Alarm, and Emergency), and preparation of detailed contingency plans. There are five sector working groups, namely: the Food Security/ Aid, the Water and Sanitation, the Agriculture and Livestock Sector, Health and Nutrition and Coordination Sector.

These Sectoral Working Groups undertake planning and coordination of activities implemented under their respective sectors. This policy seeks to entrench the work of the KFSM and of the Arid Lands Resource Management Project (under the Ministry of Northern Kenya and Other Arid Lands), into Government structures. This means that the KFSM and the ALRMP will continue to play their roles in coordinating "food security

related" emergency activities, but will now be working in Partnership with the Response directorate.

2.6.3. The National Disaster Operations Centre (NDOC).

National Disaster Operations Centre (NDOC) is currently based in the Ministry of State for Provincial Administration and Internal Security (PA& IS). Its main functions are search and rescue in the event of a disaster including undertaking rapid assessments, collection and dissemination of data. NDOC also monitors disaster events on a 24-hours, 7-days a week basis.

This policy now provides that the National Disaster Operations Centre will focus on Coordinating rapid-onset disasters and will work under the Response Directorate in the new Disaster Management structure.

NDOC will also serve as a useful collaborative link between MOSSP, on the one hand, and Provincial Administration and Internal Security (PA & IS) on the other, during disaster response and implementation of this Policy. However NDOC has limited capacity and, therefore needs strengthening to make it effective.

2.6.4. The Sectoral Ministries

Sectoral Ministries have been directly involved in disaster management that all levels, though in an ad-hoc manner. Their expertise is required in disaster management planning. The Ministries will be required to mainstream disaster management into their sectoral activities, and will appoint disaster liaison focal point at the National level. The relevant Departmental Heads at the District level will participate in the District Disaster Management Committees. They will provide technical support and capacity-building to community-level disaster Management structures. The sectoral ministries will play the leading role for those Disasters that are specific to their functions.

2.6.5. The District Disaster Management Committees

In order to build on existing structures, capacity-building for the District Disaster Management Committees will be enhanced. Their responsibilities will include the following:

1. Appointing one of its members to be responsible for coordinating emergency response in the respective Districts, under the direction of the Permanent Secretary of the Ministry of Special Programmes.
2. Operating the District Early Warning System (EWS).
3. Formulation, compilation and coordination of District Disaster Contingency Plans.
4. Administering district disaster and contingency funds.
5. Appointing lead agencies, through memoranda of understanding, to be responsible for coordinating emergency responses in their respective districts.
6. Conducting and documenting an inventory on the response capacity for the emergency services.
7. Working with other committees to support community institution- building, for disaster Management.
8. Organizing and participating in disaster management training and needs assessment, in conjunction with local experts, volunteers, trained personnel and other stakeholders.
9. Monitoring, analysis and evaluating the data for disaster management activities in the Districts.
10. Coordinating, training and public awareness programmes and activities.
11. Promoting advocacy for and co-ordination of Disaster Management and DRR programmes and activities, including, especially, the mainstreaming of Disaster Management, Disaster Risk Reduction and Climate Change in Education, Development Planning and management.

2.7. The Drought Early Warning Signs

An Early Warning System (EWS) can be defined as a system of data collection to monitor people's access to food, in order to provide timely notice when a food crisis threatens and thus to elicit an appropriate response (Davies et al. 1991). Whether it succeeds in its goal of eliciting an appropriate response is dependent on numerous factors, most of which are beyond the control of the EWS. How key decision makers use Early Warning (EW) information is one of the most important factors.

It is of little use to look at EWS in isolation. To be effective, it must be able to trigger a timely Response, intervening before the point of destitution is reached, to protect livelihoods before lives are threatened. In other words, the EW/response system must be geared to protect Future capacity to subsist as well as able to ensure current consumption. Thus, the EWS must be Sensitive to changes in food security status before famine threatens and able to detect localized Pockets of acute food stress.

To achieve this implies a number of assumptions about the EWS and how it is used. It assumes That EW information is reliable, timely, and consistent; that there are clear processes for feeding the information into decisions about how and when to respond; and that there are clear and rapid response mechanisms in place. In reality, this is rarely the case. Buchanan and Davies (1995). Kajiado district operates a community based drought early warning systems under the Arid Lands resource Management project and it had been in operation since 2004.

It involves the use of household information gathered through the use of locally recruited and trained drought monitors based within the sampled communities all across the district.

Information gathered from households' interviews and focused group discussions is rerouted to the district headquarters in Kajiado where analysis is done at the ALRMP office and a drought monitoring bulletin. The drought bulletin is produced on monthly

basis, in the bulletin trend assessment on the drought situation is provided and with a corresponding warning stage ranging from NORMAL, ALERT, ALARM, EMERGENCY. The bulletin also provided recommendations on the actions to be taken to reverse the negative trends.

2.7.1. Interpreting Early Warning Information

The predominant response to drought- induced food crisis continues to be food aid, however unimaginative and blunt this may be as an instrument. The challenge is how to translate early warning data into food aid requirements. There are a number of crude and broadly accepted methods around, of which the food balance sheet is the most traditional and widely used.

2.7.2. The 2008 - 2009 droughts in Kajiado

Kenya experiences a Bimodal type of rainfall pattern with the long rains expected in March - April paving way for the long dry spell from May - October. Short rains are experienced in Mid October - November .The poor performance of 2008- 2009 Long and short rains led to prolonged , severe and devastating drought in most parts of the country but most noticeably in the Arid and Semi Arid lands of Kenya. Following such extreme weather events The Kenya food security meeting conducted 2008 long rains assessments in the following cluster districts.

- 1 Northern Pastoral Cluster (Turkana, Moyale, Marsabit and Samburu Districts).
- 2 Eastern Pastoral Cluster (Mandera, Wajir, Garissa, Isiolo and Tana River Districts).
- 3 Agro-Pastoral Cluster (Baringo, West Pokot, Laikipia and Kajiado Districts).
- 4 Eastern Marginal Agricultural Cluster (Tharaka, Mbeere, Makueni, Mwingi, and Kitui Districts).
- 5 Coastal Marginal Agricultural (Taita Taveta, Malindi, Kilifi and Kwale Districts).

6 North Rift and Western Mixed Farming (Nakuru, Uasin Gishu, Trans Nzoia, Kericho and Mt. Elgon Districts). KFSSG (2008).

Under the KFSSG 2008 long rains assessment Kajiado district was assessed under the Agro pastoral cluster.

The agro pastoral livelihood zone includes Kajiado, Narok, West Pokot, Laikipia and Baringo. Livestock production remains the main source of income in the agro-pastoral livelihood, accounting for over 50 percent of total household income while crop production contributes about 30 percent. On-farm crop production accounts for just over 30 percent of food needs, unlike pastoralists where own farm crop production is marginal at best.

The assessment mission found out that the rains had been generally good in the agro pastoral areas of the cluster, despite unusual breaks in April, in Laikipia, Kajiado and West Pokot. In contrast, poor rains in the pastoral areas of the cluster, such as in Kajiado and Baringo could result in a rapid deterioration in the food security situation in next two to three months if the onset of short rains is not timely. One key factor that might trigger widespread food insecurity includes the continued upward trend of staple food prices.

The staple food prices are 60 to 120 percent higher than normal, in key markets of the livelihood zone. In their long rains assessment report of 2009 KFSSG pointed out that the Onset of long rains was late by up to three weeks. The rains were poorly distributed both temporally and spatially and averaged 50-80 percent of normal except in Mashuru and Namanga divisions of Kajiado which received the lowest average range of 10-20 percent of normal rains.

In Kajiado district, there is low recharge of water sources due to the poor rains has resulted into acute water shortages in some parts, including, Magadi Division. Over 50 percent of water pans and earth dams have dried and the remaining ones are expected to last the next two to three months.

Water usage has reduced significantly with over 85 percent of population using less than 15 litres per person per day. The situation is worse in Kajiado district where a person uses an average of 3-4 litres per day against the normal 8-10 litres. Similarly, in West Pokot, a person uses 5-7 litres per day compared to the normal 10 litres. Cost of water has also gone up due to scarcity, for example, in Laikipia district, 20 litre of water is selling for Ksh 10 from the normal Ksh two. LRA (2009). Distances to water for both domestic and livestock have increased by 100-150 percent from 4-5 to 8-10 kilometers in Baringo, and from 10-15 to over 30 kilometers in Chyulu area of Loitokitok.

Widespread crop failure has been reported throughout the district. The only recorded harvest within the district was of beans, in the northern parts of Kajiado district. For instance, in Narok maize yields have dropped from normal 10-15 bags to about 2-5 bags per acre. At the same time, long rain maize harvest in Loitokitok are much below normal with only 9,770 bags, 44 percent below normal of 22,251 bags. KFSSG (2009).

During droughts pastoralist depends entirely on the sale of livestock to purchase most needed cereals when livestock products such as milk are in short supply. If the markets are functioning normal and when if cereal prices decline or remain stable with an increase or stable livestock prices then herding households will be able to access cereals from the market .

If livestock prices takes a downward trend accompanied with increased cereal prices, then livestock dependent households economy will be undermined through erosion of purchasing power. For instance during the peak of drought a household requires an average of four goats to purchase a 90 kilogram bag of dry maize compared to the normal two goats . The terms of trade are worst in West Pokot where about six goats are required to purchase a bag of maize compared to Kajiado where three goats are necessary instead of normal two. On average, terms of trade within the cluster, has deteriorated by over 100 percent. KFSSG (2009).

Severe and devastating drought progressed into the last quarter of 2009; it was only during the commencement of 2009 short rains that signs of the end of two year severe drought started to emerge.

During the 2009 - 2010 short rains assessment, KFSSG reported that the onset of the short rains was timely, in October 2009, across the agro - pastoralist cluster .The report pointed out that the amount received ranged from 80-300 percent of the normal short rains in most parts. However, in parts of Narok district, only 50-80 percent of normal short rains were received. Also, significantly below normal short rains were received in parts of Kajiado and Laikipia district, which received rainfall ranging between 20-80 percent of normal. The spatial and temporal distribution of the rains was fair. The cessation delayed as off-season rains continue to be experienced across the cluster.

The 2010 long-rains season began earlier than anticipated, with the onset ranging from mid-February to early March in many areas, where rains would normally begin in mid-March. The rains have been widespread and mostly above normal with several areas reporting over 160 percent of seasonal averages. Areas reporting the highest rainfall deviations, in excess of 300 percent of normal, are situated in the eastern pastoral areas.

Forecasts from the Kenya Meteorological Department suggest that rains will continue through June especially in the western and Rift Valley highlands, as well as along the coastal strip. Continuation of rains through June should not only strengthen prospects for a favorable long rains crop output but will also minimize the need for pastoralists to migrate to dry season grazing areas, since the previous short rains also continued well beyond their normal period in several pastoral areas, strengthening recovery prospects. However, rains are required to continue beyond June and into August, in key maize growing areas, if current optimistic crop output projections are to be sustained (KFSSG) 2010 .

2.7.3 The 2008 /2009 Drought response in Kajiado District

The objectives of drought emergency interventions are twin fold, saving lives and saving livelihoods. In saving , it mean that people are well nourished to with stand the ravages of famine while saving livelihoods means protection peoples main sources of livelihoods so that after drought period households can still resume their “normal” livelihood activities .

Because such twin objectives in the delivery of relief supplies two categories relief items became essential for the success of the emergency operations. Under the emergency operations (EMPOP) the UNWFP and the Kenya Government provided food items for distribution to targeted beneficiaries through partner agencies based in the district, food items includes cereal s, pulses and edible cooking oil given based on WFP standard ration requirements. Other than the , based on the severity of drought , other relief food distribution, targeted supplementary feeding is given to more vulnerable population groups such as children under the ages of 5 years, pregnant and lactating women and the elderly .

In saving Livelihoods, the main focus was on the livestock sector were majority of the district population and in of the particular the study area (Magadi Division) are Livestock dependent, a ray of interventions aimed at reducing drought related stress in the livestock sector were undertaken and they included

2.7.4. Water trucking or tankering:

This intervention described as ‘the delivery of water by wheeled transport to communities or institutions’. While this activity largely supports humanitarian activities and provides water for human beings primarily, the water occasionally also benefits livestock.

2.7.5. Boreholes development and maintenance:

This category includes borehole development as well as operational support in the form of provision of diesel, spare parts and pumping equipment and emergency repair of boreholes support to rapid maintenance units and capacity building of users associations.

2.7.6. Other water-related interventions:

This category includes distribution of tanks, maintenance and/or construction of shallow wells and pan construction/de-silting, and watershed management interventions.

2.7.7. Commercial de-stocking

This activity builds on existing marketing structures and is designed to improve access to markets. This can be done in a number of ways such as transport subsidy or through direct purchase of livestock at points where livestock is bought mainly for immediate transport and slaughter Kenya Meat Commission (KMC. In this case, the trader/producer has to deliver the livestock at the final collection point.

The second method, also used by KMC was that livestock is bought directly from producers in the affected districts and transported for slaughter at the risk of KMC.

2.7.8. Slaughter off-take.

This activity was first piloted in Kenya in Samburu District by OXFAM during the 1984 drought. For some time it was used as a 'last-resort' intervention whereby livestock, mainly shoats which are already in poor condition is bought by agencies and is then slaughtered and in most cases the resultant fresh meat is distributed to needy families. An earlier variant was that meat was dried and subsequently stored and distributed. This is seldom used now due to added complexities caused by logistics and need for suitable storage (European Union) 2010.

2.7.9. Animal health

The main activities in this category include vaccination, control of ecto/endo parasites, and provision of drugs and associated trainings.

2.8.1. Animal Feed.

Interventions include provision of hay, supplements and some pasture related interventions.

2.9. Theoretical framework

The study will be carried out within the broader guidance of theoretical frameworks of the disaster crunch model, the disaster release model and resilience theory.

2.9.1. Resilience Theory

Resilience can have multiple levels of meaning (Carpenter et al. 2001). Although it has been used mainly as a metaphorical description of systems, now it is possible to define and illustrate a system's resilience using mathematical models and plots (e.g. Moritz et al 2005, Bolte et al. 2007), and conduct measurement and assessment given adequate understanding of the system in question and sufficient data (e.g. Martin 2004), although the cases of actual measurement of resilience are limited in number.

2.9.2. Ecological Resilience

Ecological resilience is measured by how much disturbance can be absorbed by a system before it is restructured with different variables and processes (Gunderson and Pritchard 2002). In the study of complicated ecological-socioeconomic systems, researchers are often challenged with the task of examining which kinds of disturbance may occur and how well can the system cope with these disturbances without changing its key structures and functions.

Pastoralist men and women who are involved in pastoral activities are very aggressive and determined to ensure that everything within their reach is done to cope with

drought effects. In some cases men travel long and too far away areas from their homestead to look for adequate pastures and water in an act commonly referred to in Borana dialect as 'abburu'. During this time men resiliently struggle to go without food and water for some days while trekking for long distance. It is therefore important to note that fasting on such missions as mentioned above portrays the employment of resilience theory during severe drought times

2.9.3. The Disaster Crunch Model.

The Crunch model shows that a disaster happens only if a hazard meets a vulnerable situation. A hazard is an event that could lead to danger, loss or injury. One example is a drought and famine. Droughts and famine in one part of the world can lead to the loss of many lives. However, Drought and famines of the same strength in another country may cause much less devastation. This may be because communities are well prepared. A hazard by itself is therefore not a disaster. Only when the hazard meets a vulnerable situation does a disaster happen.

2.9.4. How the Disaster Crunch Model informs this study.

People are vulnerable when they are unable to adequately anticipate, withstand and recover from hazards. Poverty contributes to vulnerability that is why droughts and famines may cause a disaster in less prepared communities, while droughts and famine to a well prepared community may have little impact. A hazard can cause disaster for poor households, while richer households may not be affected to the same extent though living in the same environment.

People's lives rely on a number of different 'elements'. These elements include water supplies, social groups and networks, crops, livestock, savings, jobs, and the natural environment. If these elements are vulnerable, the hazard is more likely to cause damage to them. They are called 'elements at risk'. From the disaster crunch model view point the focus of preparedness should focused on identification and pinpointing elements at risk to drought shocks.

Some elements are at risk because they are unable to withstand the impact of a hazard.

This vulnerability might be as a result of

- Fragile livelihoods; no credit and savings facilities among pastoralist communities
- Dependence on very few natural resources such water and pastures
- Lack of skills or knowledge; lacking opportunity due to gender disparity
- Being old or very young or living with HIV or AIDS.
- A disorganized or fragmented society hence bad leadership.

Communities, households and individuals are not all affected in the same way by a hazard.

One community may be vulnerable in a different way to another community, due to its location or wealth. Households may be affected differently due to their income or land ownership. Gender is an important issue. Women are often more vulnerable than men because they are given lower status in some societies. For example, women may receive less information about hazards than men, or they may be unable to read the information due to higher illiteracy levels.

2.9.5. The Disaster Release Model

While the disaster crunch models emphasizes the interaction between a hazard and Vulnerability for a disaster to occur , the release model focuses on reducing the risk of disaster, the factors that cause risk should be addressed. This means working against all the components of the Crunch model. Action may be necessary at local, national and even international levels.

2.9.6. How the Disaster Release Model informs this study.

The release model will inform the study through recommendations aimed to reduce the occurrence, frequency or strength of various hazards. For example, livelihood diversification could be adopted to reduce food insecurity. Trees could be planted to

help stop landslides after heavy rain. Advocacy could be used to influence policies that limit climate change, which is increasing the frequency and severity of some natural hazards such as droughts and famines, Vulnerable groups should be encouraged to take part in decision-making to ensure that conditions do not worsen for the poorest and most vulnerable people in the community.

In order to ensure safe conditions are created it should be appreciated that that all vulnerable people have strengths. These can be used to lessen the impact of a disaster. These strengths (capacities) which are often not fully understood by outsiders should be explored and utilized for example Elderly people are generally thought to be weak with a lack of mobility and are often seen as being vulnerable. However, by considering their capacities, we may find that elderly people have a wealth of traditional knowledge and a good understanding of what solutions have worked well, or have failed, in the past. They may be vulnerable compared with others in the community, but they also have capacities which others may not have.

If a disaster happens, not only should immediate needs be met but capacities should be recognized and strengthened. Before a disaster happens, disaster risk can be reduced by discovering and supporting such capacities. Structures and process are may work in a negative or positive way that creates or Increases vulnerability. Some, such as a Government department in the district NGO, the church, a good local leader, or a popular politician, may be working to strengthen the community and could be an important source of support in times of disaster. These groups could help to do effective advocacy work in order to release negative pressures that increase vulnerability. A drought preparedness measure including: water trucking and tinkering, borehole development interventions, commercial de-stocking, animal health and animal feed strategies as discussed earlier in this paper are some of the drought preparedness strategies that may be used by the community in question.

2.9.7. The Drought trends at the Community level.

The drought trends in Oldonyo Onyokie in this paper refer to the times and frequencies of the occurrence of drought. It helps to inform the researcher the awareness of the trends by the communities to help tell whether there are preparations done before the occurrence of a drought. It is only possible to prepare to protect the livestock from the impacts of drought if one can tell when the drought is likely to occur by borrowing from the past trends.

2.9.8. The mitigation measures employed by the community

In this study the mitigation measures employed by the community are the drought management strategies that are in use today by the community, included are the improvement of the strategies that were traditionally (indigenous knowledge) used in conservation of livestock by the community members and those strategies that have been brought on board by the government and other development agencies.

2.9.9. The drought Early warning systems at community level.

The early warning systems in this paper are the systems that are in place, well designed to help tell the community members the likelihood of occurrence of drought, further enabling the fore-telling of the sovereignty of the drought when it occurs. Traditionally, from the trends the community members could tell when the next drought would occur and measures taken which in most cases was moving from one location to another in search of pasture. Today, however, due to recent developments such as global warming, the trends are not as reliable as they were before

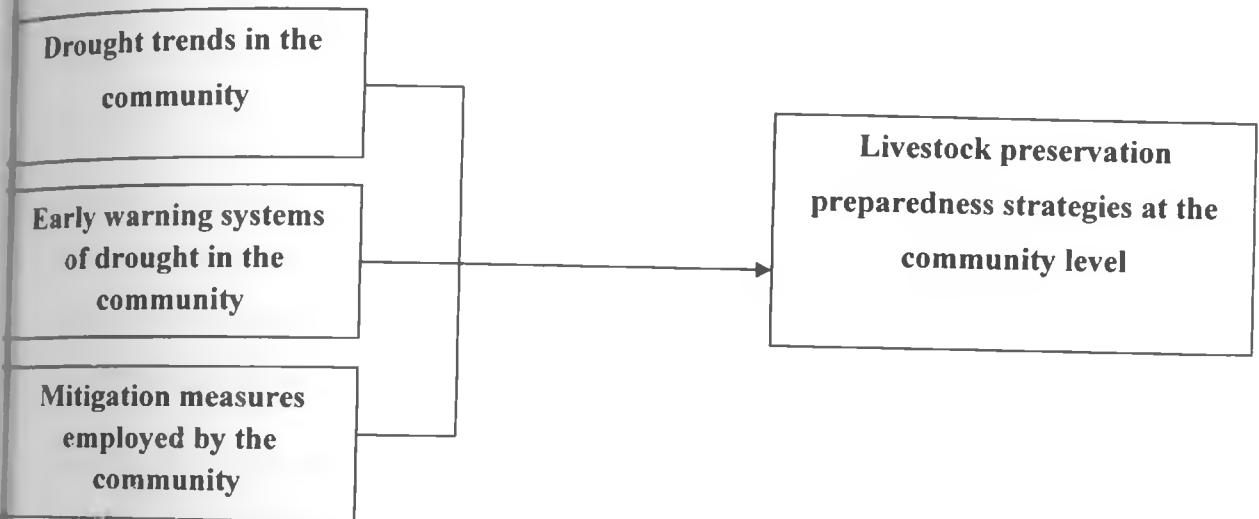
2.9.10. Livestock preservation.

Livestock preservation in this study includes herd management strategies employed by community members to ensure that there is a viable herd today and the future and how those strategies change overtime in terms of effectiveness and acceptability by community.

2.9.11. Drought Preparedness at community level.

Preparedness strategies in this study are directed to those preparedness measures that are put in place by communities to institute an effective readiness to enable communities to prepare for, cope with and recover from the impacts of drought.

Figure 1: Conceptual framework



Independent Variable

Dependent Variable

Source: (Author 2010)

CHAPTER THREE: RESEARCH METHODOLOGY

3.0. Introduction

This chapter contains the research methodology; the methodology is classified into the following classes, research design, population studies, sampling techniques and sample size, data collection and data analysis. It shows how the researcher obtained the target population and the manner in which data is collected. It also shows the systematic way in which the researcher gathered his sample population for the study and the way information was accessed from the population. It also shows the obstacles that may be encountered by the researcher during the course of data collection and mitigation strategies to be adopted in order to achieve the desired results of the research.

3.1 Site description

The general topography of the district is characterized by plains and occasional volcanic hills. The land rises from about 500 meters above sea level around Lake Magadi to about 2,500 meters above sea level in the Ngong Hills area.

The district can be divided into four topographic areas: The Rift Valley, Athi Kapiti Plains, Central *Broken Ground* and the Amboseli Plains. The Rift Valley is a low depression on the west side of the district which runs from north to south. The depression has important features such as Mount Suswa and Lakes Magadi and Natron. Both lakes have substantial deposits of soda ash but commercial exploitation is going on in Magadi only. On the far western Nguruman Escarpment, there are three main rivers namely, Oloibortoto, Entasopia and Sampu which support significant irrigation agriculture. The Athi Kapiti Plains consist mostly of open rolling land. The area also includes the Athi Kapiti Plains consist mostly of open rolling land. The area also includes the Ngong Hills with an altitude of 2,460 meters above the sea level and is the source of Athi River. The river is fed by its major tributaries Mbagathi and Kiserian both of which are permanent rivers.

The Central Broken Ground comprises a 20 to 70- kilometer wide stretch from the North-eastern boarder across the district to the south west. There are permanent water

sources draining this area. This area is also criss-crossed by many dry river beds which are important sources of sand for building and construction industry in Nairobi and the district itself. The Amboseli Plains are characterized by gently undulating plains with deep reddish brown clay loamy soils and flat sedimentary plains with poorly drained cotton soils.

Kajiado has a bimodal rainfall pattern. The long rains fall between March and May while the short rains fall between October and December. The rainfall pattern is strongly influenced by altitude with the high areas around Loitokitok receiving high averages of 1,250mm while the low areas around Magadi and Lake Amboseli receive an average of about 500mm per annum. The temperatures also vary with altitude and the low lying areas record high temperatures of about 30 degrees Centigrade and the high altitude areas on the slopes of Mt. Kilimanjaro experience lowest mean temperatures of 10 degrees Centigrade (Kajiado strategic development) 2005 – 2015.

Kajiado is one of 18 districts that make up the Rift Valley Province. It borders the Republic of Tanzania to the southwest, Taita-Taveta district to the southeast, Machakos and Makueni districts to the east, Nairobi Province to the northeast, Kiambu district to the north and Narok district to the west. It lies between longitudes 36° 5' and 37° 5' east and 1° 0' and 3° 0' south. It covers an area approximately 21,909.9 square kilometers and is divided into seven administrative divisions (PWH) 2005.

Kajiado district is prone to climatic shocks and in particular droughts. Droughts affect the livelihood sustainability of the people through livestock deaths and crops failure. Further droughts have the effect of exacerbating range degradation. A combination of human and herd population increase has led to declining range quality.

Humans are encroaching on land traditionally used for livestock for farming while increasing herd numbers are stressing available grazing resources through overuse. Weakening traditional management structures have also contributed to a great extent to the quality of the range. Most of the Division receives less than 400mm of rainfall per annum while potential.

The pastoral Maasai occupy the Narok and Kajiado districts of Kenya, and share the *Olmaa* language from which their name derives within Kenya with the Samburu and Ilchamus, and across the border in Tanzania with the Arusha and Baraguyu.

A fusion of Nilotic and Cushitic people, effected perhaps a millennium ago north-west of Lake Turkana, the Masai ascended the escarpment out of the Kerio Valley to spread in the ensuing centuries across the fertile grasslands of the Rift Valley. A century ago, they had established a reputation as powerful and ferocious people; their warrior bands raided hundreds of miles into neighbouring territories to capture the cattle they coveted and to demand tribute from the trade caravans. In the closing years of the 19th Century, however, the Masai herds were decimated by Rinderpest and drought, and the once united people devastated by smallpox and inter-section strife. Through treaties in 1904 and 1911, the European Government moved the Masai out of their northern grazing lands of Laikipia. The basic economic and social unit is the *enkang*, a semi-permanent settlement of several families pasturing their stock together, perhaps ten to twenty huts surrounded by a thorn or *leleshua* fence into which the livestock are driven at night.

The Masai comprises five (some claim seven) clans; *ilmakesen*, *il-laiser*, *il-molelian*, *il-taarrosero* and *il-ikumai*. Each is divided into a number of divisions, distinguished by the characteristic cattle brands. These clans are spread throughout Masailand.

Authority derives from the age-group and the age-set. Prior to circumcision a natural leader or *olaiguenani* is selected; he leads his age-group through a series of rituals until old age, sharing responsibility with a select few, of whom the ritual expert (*oloiboni*) is the ultimate authority.

Masai youths are not circumcised until they are mature, and a new age-set is initiated together at regular intervals of twelve to fifteen years. The young warriors (*ilmurran*) remain initiates for some time, using blunt arrows to hunt small birds which are stuffed and tied to a frame to form a head-dress.

Eventually, in their turn, the warrior age-set gives way to its juniors and graduates in a special ceremony (*eunoto*) to senior status. A warrior of repute endowed with the qualities of leadership is selected to open the way for the others of his age-set to be initiated. Once the new age-group leader (*olotuno*) is approved by the *oloiboni*, a bullock is slaughtered and the leader is the first to drink the blood from the animal's neck.

The enclosure and ceremonial hut built specifically for the eunoto ceremony is known as *enkang o sinkira*, and it is here that the four days of rites are staged. Sitting on the same cowhide on which he was circumcised, each warrior has his head shaved by his mother.

The freshly-shaved head is decorated with a mixture of ochre and fat. At the close of the ceremony the *olotuno* is invited to select any girl he chooses for a wife. - signaling the next phase for the newly graduated senior warriors, who are henceforth permitted to marry.

As for centuries past, the life of the Masai is conditioned by the constant quest for water and grazing. In the more arid areas of Masailand, livestock are moved seasonally, often several hundred miles, to take advantage of under grazed areas or new growth generated by localized rain.

Masai remain reluctant to reduce their herds to the carrying capacity of the land. Is not cattle wealth given to them by *Enkai* (God)? Group ranching schemes and division of former communal land into private holdings with titles deeds is resulting in the permanent settlement of increasing numbers of Masai. In Narok, fertile wheat lands on the slopes of the Mau are now being exploited as inevitably, change, long resisted are now reluctantly accepted.

The study covered Oldonyo Nyekei community that is in the larger Kajiado district. Most of the district is a flat, low lying plain. The district is hot and dry for most of the year. The major economic activities for the people in the district are livestock-based,

subsistence farming, and petty trade. The main animals kept are cattle, sheep, goats, camels and donkeys. Pastoralists are very vulnerable to drought, which can be traced back to the shifta wars and to the subsequent insecurity that led to further loss of livestock.

3.2. Research Methodology.

According to Mugenda and Mugenda, there are three types of research design. One is causal study that involves controls of the study variable for observation purpose, which is carried in controlled environment that can be a laboratory. The second is exploratory which are studies done for the first time in which the research seeks to explore. The third is descriptive study which are scientific studies done in order to describe phenomenon or an object. Descriptive was applied for the purpose of this study. Mugenda views descriptive statistics as indices that describe a given sample and relationships (correlation) this is most suitable when studying large population by selecting small samples for observation and analysis of the universe or the whole.

3.3. Target Population.

Nachmias, David point out that population is the aggregate of all cases that conforms to some designated sets of specification .The targeted respondents included the key informants (Heads of Government line ministries and Non Governmental organizations working in the field of food security), focus group discussions consisting 6 -12 men and women who are opinion leaders and represents various interest groups at the community level and house hold members.

3.4. Sampling of units of study

Choosing a study sample is an important step in any research project since it is rarely practical, efficient or ethical to study whole populations. The aim of all quantitative sampling approaches is to draw a representative sample from the population, so that the results of studying the sample can then be generalized back to the population. The selection of an appropriate method depends upon the aim of the study, the most

common approach is to use random, or probability samples. In a random sample, the nature of the population is defined and all members have an equal chance of selection Oxford University press (1996).

a) Sub-sites.

Stratified random sampling was applied during the selection of areas of study within the district. Stratified random sampling and area sampling are variants of random sampling, which allow subgroups to be studied in detail. Stratified sampling was applied during sampling to ensure that different groups of population are adequately represented in the sample so as to increase their level of accuracy when estimating parameters. The aim is to use available information on the population to divide into groups such that the elements within each group are more alike than are the elements in a population as a whole that means one has to create homogeneous groups based on the variable the researcher is interested in studying.

b) Sampling frame

A sampling frame is a list or map that identifies units within the target population. (Missing units are referred to as under coverage.) That is, all of the target population are included. The full range of dimensions, and information needed to inform the sample selection, are covered. This is because sections of society missing from the frame may have different characteristics and indeed different behaviours, opinions and attitudes from those covered by it. This under coverage may affect the results if associated with the subject of enquiry. The sample size for this study consisted of 5 key informants, 12 focus group members and 139 household heads. This is summarised in table 3.1 below.

Table 3.1: Sample size

Sample category	Population frequency
Household heads	139
Focus group members	6
Key informants	5
Total	139

(Source Author: 2011)

c) Types of frame

There are two types of frame (or list) available for social research practice. These are existing lists that can be used as frames, perhaps after some manipulation, or frames that need to be constructed. The researcher explored the existence and availability of existing frames and evaluated its relevance to the study and where such frames do not exist, the researcher opted for constructed frames. Sampling may then take place directly from the constructed frame or indirect methods of obtaining a sample may be used either to construct or to supplement the frame. The actual sampling and recruitment may take place in the field, as potential respondents fulfil the sample criteria and the overall sampling strategy.

3.5. Data Collection Procedures

a) Household heads

Primary data from 139 households head was collected using questionnaires and an interview schedule. Interviewing as a research method involves the researcher asking questions and, hopefully, receiving answers from the people being interviewed. Semi-structured interview has predetermined questions.

Based on the data provided above the researcher picked the first 4 villages for purely practical considerations being the distances from the chiefs office which is the centre

point to specific villages and for such considerations Oldonyo onyekie , Nesimiti , Naserian and Laramatak villages were picked for the selection of households for inclusion in the research study. Upon the interviewer’s perception of what seems most appropriate. Before selection of households for interviews the researcher had earlier visited the Oldonyo onyekie Location Chief(Samuel Inchilalo) at his office and after introduction and discussion on the aim of the visit an appropriate date was set by the chief to give him more time to inform community members of the researchers objectives and the need for cooperation during the study period , it was resolved that the researcher visit the Chiefs office at Oldonyo onyekie on Tuesday May 3rd 2011 .During the meeting the chief provided the researcher on the demographic data of the location which guided the researcher on household selection as shown in the table below.

Table 3.2: Population distribution by village

Village	Distance (km) from Chiefs Office	Population	Number of Households
Oldonyo Onyekie	5	287	101
Laramatak	5	526	110
Nesimiti	2	255	55
Naserian	5	518	109
			Total. = 375

b) Key informants

The researcher visited Kajiado District head-quarters and collected primary data from key informants using an interview guide and the following organizations participated during the interview process conducted at their work place District Agricultural Officer Kajiado(DAO) , District drought management officer (DDMO) , District Livestock production Officer (DLPO) , Project coordinator German Agro Action (G.A.A) and

project Manager Neighbors Initiative alliance (NIA) all are active members of the district steering group (DSG) and resident in the District for more than five years.

c) Community leaders

Focus group discussions were conducted in four communities of Oldonyo onyekie , Nesimiti , Naserian and Laramatak respectfully focus group members comprised of 6 – 12 men and women who are community opinion leaders and represent various interest groups in the community and were interviewed using an interview guide.

The total population for the four selected villages was 1586 people in 375 households. the next step was to select household for interviews in the four selected villages considering proportionality where by the DESIRED sample size (139) is divided by the total number of households in the four villages times the number of household in the village and after such calculation the number of households for monitoring assigned to the four villages as shown below.

Table 3.3: Respondents distribution by village

Village	Total number of household in a village	Number of household sampled
Oldonyo Onyokie	101	38
Laramatak	110	41
Nesimiti	55	20
Naserian	109	40
TOTAL	375	139

N= 139.

d) Community members

A total of 150 respondents constituted this group. Focus group discussion consisted of 6-12 men and women who are community opinion leaders and well knowledgeable on issues confronting community of Oldonyo onyekie

3.6. Response rate

This section seeks to show the actual number of respondents who respond in the study against the targeted sample size.

3.7. Data collection

The researcher collected both secondary and primary data and hence developed instruments for collecting the necessary information. The research used questionnaires; interviews both telephone and face to face to obtain primary data. These instruments of data collection were well designed to ensure that the salient issues are captured appropriately.

3.7.1 Data Collection Instruments and Procedure

Data was collected using a questionnaire administered by the researcher in the form of structured questions. This tool is considered appropriate especially when dealing with respondents with low education level and language barrier. The researcher designed a questionnaire comprising of both open and closed ended questions. Open-ended questions enabled respondents to respond freely unrestricted. Closed ended questions on the other hand provide a list of all possible alternatives from which the respondents select the answers that best described their situation.

3.7.2. Data Analysis and Presentation

The questionnaires were collected and analyzed; a code sheet was prepared for use in analyzing the data. Data was analyzed both qualitative and quantitatively. Quantitative data was presented through the use of simple histogram, pie charts; bar graphs, line graphs.

3.8. Ethical Issues

The research upheld some ethical issues in the processes of the study .The researcher assured the respondents that all information given would be treated with confidentiality and not to be revealed or exposed to unauthorized third parties. The researcher

obtained authorization from the area chief and liaised with community opinion leaders during the data collection period.

CHAPTER FOUR: DATA PRESENTATION AND ANALYSIS.

4.1. Introduction

This chapter presents the data that was found on an investigation into the livestock preservation strategies in drought prone areas. It was a Case Study of Oldonyo Onyokie Community in Magadi Division of Kajiado District. The research targeted a sample of 139 household heads from 4 villages in Oldonyo Nyakei which are Nesimiti, Naserian, Laramatak and Oldonyo Onyokie. To elicit usefulness the people's knowledge experiences and examination the respondent's thoughts the study also focused on Focus group discussion of 6-12 leaders in the community. In addition, in order to extract the information from the affected Oldonyo Onyokie community, the researcher conducted an interview with key informants (Heads of government line ministries and NGO managers based in the district headquarters in Kajiado

The study on targeting 139 household heads from Magadi Division realised 100% response rate, since the researcher used an interview method of data collection which ensures effectiveness and thoroughness in operation. Mugenda and Mugenda (1999) stated that a response rate of 50% and above is a good response rate. This commendable response rate was made possible after the researcher personally administered the questionnaires and interview guides.

This study made use of percentages and frequencies (absolute and relative) on single response questions. On multiple response questions, the study used Likert scale in collecting and analyzing the data whereby a scale of 5 points were used in computing the means and standard deviations. These were then presented in tables, graphs and charts as appropriate with explanations being given in prose. Findings from open-ended questions were also presented in prose.

4.1. DEMOGRAPHIC INFORMATION.

Table 4.1 . Gender of household heads.

Male Headed household	109
Female Headed Households	30
Total	139

Table 4.1 presents the findings on the distribution of the respondent by gender. From the findings, 109 households (78.42%) of the respondents were male headed while 30 (21.58%) were female headed. The study findings indicate that majority of household heads for the pastoralist of Oldonyo Onyokie of Magadi Division of Kajiado District are male meaning male headed households are predominant.

The Maasai community are patriarchal and hence the male is regarded as the head of the household and in decision making including access and control of resources at the household level and at the community males enjoy undue advantage over women and in this scenario women are more vulnerable to shocks , for example during drought period when food shortages are a common episode , women procure , prepare , distribute food at the household level and they are last to partake the food and when food is not enough for the household members indeed , its women who are the first to miss food in a hierarchical manner .

Although women may have access over household resources , control of such resources are is vested on male heads of households even in the female headed households the elder son is the one with control over household resources indeed women never own livestock and those who own , own them on behalf of their sons

Figure 4.2. Distribution of respondents by village (cluster).

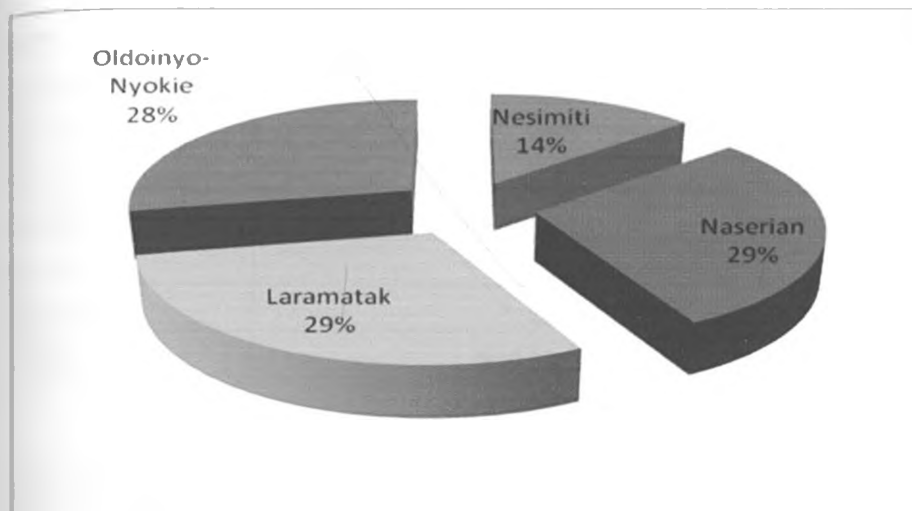


Figure 4.2 presents the distribution of the respondents by village (cluster). From the figure above 29% of household respondents interviewed were from Laramatak, which was the same percentage as those from Naserian village, 28% were from Oldoinyo Nyokie while 14% were from Nesimiti village. The study findings therefore indicate that most of the respondents of Oldoinyo Nyokie sub location of Magadi Division of Kajiado District were from Laramatak and Naserian villages based on the sampling procedure employed by the researcher.

Because the researcher employed multi-stage cluster sampling where the district was selected, division, location and villages, selection of households was done by applying proportional sampling where households were selected in proportion to cluster (village household population) whereby the cluster the desired sample size which is 139 households divided by the total number of households in the four clusters(375) and multiply the outcome with the number of households in the specific cluster to get proportion of households to be included in the sample per cluster.

Table 4.1: Distribution of the Respondents (Pastoralist) by Age.

Age bracket.	Frequency	Percentage (%)
below 29 years	15	10.79
30 -39	28	20.14
40 -49	25	17.99
50 -59	30	21.58
60 -69	19	13.67
Above 70	22	15.83
Total	N=139	100.00

Table .4.1 above presents the distribution of the respondents by age. From the findings, 21.58% of the respondents were of age category of 50-59. 20.14% of the respondents belonged to an age category of 30-39. 17.99% of the respondents belonged to an age category of 40-49. 15.83% were over 70 years old, and 13.67% belonged to an age category of 60-69. 10.79% belonged to an age category of below 29 years.

These findings indicate that most of the respondents from the pastoralist of Oldonyo onyeki of Magadi Division of Kajiado District are of an age category of 50-59. It should be noted that most households heads were of the age bracket of 50- 59 which is are fairly older people meaning that decisions at the household level are taken by older people.

Decision making by older people Implies that there are less younger households heads and this can be attributed to the fact that the Maasai community space age groups with wider margins between one age group and the other to the fact that one age group is initiated to adult hood and subsequent to marriage life at a specific time creating gaps between age groups and as the other age group retires from active Moran hood a new age group is initiated to take over roles plaid by previous age groups and the older age group assumes new roles in the society.

Figure 4.3: Distribution of the Respondents by the level of Education

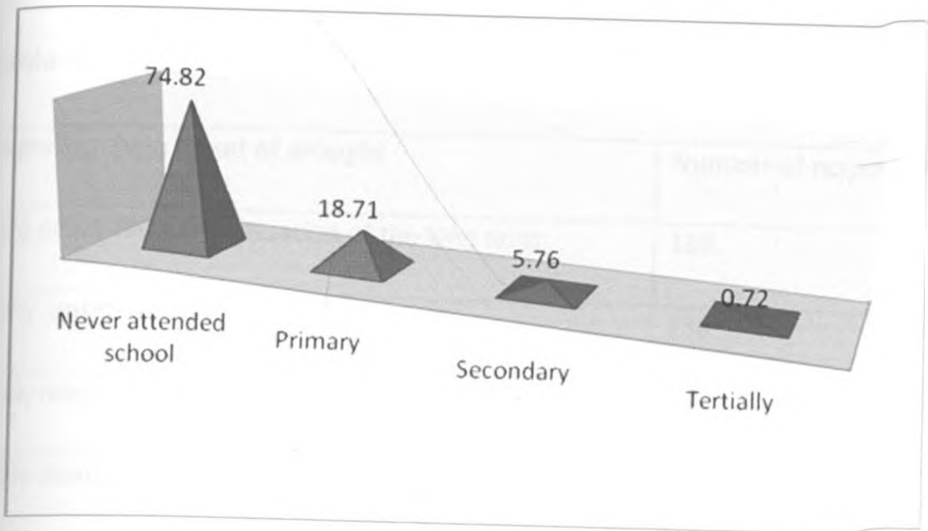


Figure 4.3 presents the findings on distribution of the respondents by the level of Education. From the figure, 74.82% of the respondents said that they never attended school. 18.71% had primary education. 5.76% had secondary education while 0.72% had tertiary level of education. From the findings, it is clear that majority of the livestock pastoralist from the Magadi Division of Kajiado District have never attended school and hence levels of illiteracy are high but it can still be compared with the other communities pursuing the same lifestyle such as the Samburu, Turkana, Borana, Gabra and the Somali.

The mobile nature of pastoralist communities in pursuit of livelihood strategies have in one way or the other impacted negatively on literacy levels however it is worth considering that the respondents were supposed to be students of yesteryears when access to education was difficult but hopefully this trend may be reversed or is already reversing after the introduction of free primary school and this could be a subject of investigation in future.

The implication of high illiteracy levels in the community is that this could be contributing significantly to the increased vulnerability because of that inability to acquire skills and access to information in a conventional manner especially the information accessed from print and electronic media.

4.2.0. MAIN FINDINGS.

Table 4.2: Signs signaling the onset of drought.

Signs Signaling Onset of drought	Number of respondents	%
Late onset and early cessation of the long rains	139	100
Early onset of dusty southern winds	130	93.5
Early migration of wildlife away from village vicinity	122	87.7
Early disappearance of the southern star	118	84.8
Early withering of vegetation cover	135	97.1
Total Cell Rep	644	463

N=139.

From the table above, 100% of the respondents pointed late onset and early cessation of the long rains is a clear indicator that the long rains will be below expected amounts hence the succeeding long dry season from May to October will be severe .

Out of 139 respondents interviewed, 135 representing 97.1% of the respondents identified that early withering of vegetation cover following a poor rains is a clear indicator that the rains never had enough impact on the regeneration of pastures and recharge of streams and dams hence quick withering of vegetation cover is also an indicator of water and pasture shortages during succeeding months.

From a sample of 139 respondents , 130 representing 93.5% of the respondents reported that when the long rains are poor meaning of low intensity , poorly distributed and stops early than expected , it always followed by dusty southern winds signalling the onset of the long dry spell.

Out of 139 respondents interviewed , 122 translating to 87.7% of respondents pointed out that early migration of wildlife from the village vicinities to the forested areas is an indicator that because pasture and water availability is poor on the plains hence wildlife migrate to forested areas where there is good vegetation cover and water resource but when the long rains are good resulting to good ample water supply and good pasture regeneration process , wildlife (grazers) under normal circumstances will prefer grazing on the plains rather than the dense forest its only when there is shortage of pastures and water that they migrate to the forested and mountain areas.

A further 122 respondents interviewed from a sample of 139 representing 84.8% of respondents indentified early disappearance of the Sothern Star as an indicator of a bad season a head, respondents have pointed out that the appearance and disappearance of the southern star form the Galaxy can be interpreted as good or bad season a head and when the southern star disappears early than expected, it means the dry season a head will be prolonged.

Table 4.3: The effects of drought

Drought Effect	Number of responses	%
lack of water and pasture	139	100
Livestock mortality	138	99.3
Increased walking distances from villages to watering points	135	97.1
Decreased food availability at the household level	130	93.5
Low livestock prices	130	93.5
Migration of household members in search of labour	120	86.3
Livestock diseases outbreak	80	57.5
increased school dropouts	50	35.9
Disappearance of certain grass species	125	89.9
Human wildlife conflicts	48	34.5
Total	139	100

N= 139

Among natural disasters, droughts are the once with the greatest social and economic impacts and affects greater number of people. Droughts are a common pattern of the

nature but its frequency and severity varies from one region and the other. Communities over the years have developed means of detecting the impending droughts mostly by scanning the seasons of the year, observation of cloud cover, arrangements of stars (constellation) flowering of certain tree species, migration certain species of wildlife, butterfly movements, direction of the wind, dust and behavior of certain livestock species livestock (ILRI 2004).

Kenya experiences drought on a cyclic basis. The major ones coming every ten years and the minor ones happen almost every three to four years. The 2004 drought is a replica of the previous cycle of severe droughts that affect the country every decade as experienced in 1974, 1984 and 1994. Kenya has in the past recorded deficits of food due to drought resulting from a shortfall in rainfall in 1928, 1933-34, 1937, 1939, 1942-44, 1947, 1951, 1952-55, 1957-58, 1984-85, and 1999-2000. The 1983-84 drought and the 1999-2000 ones are recorded as the most severe resulting in loss of human life and livestock, heavy government expenditure to facilitate response and general high economic losses of unprecedented levels. After the El Nino induced

From the table above lack of water and pasture for livestock was reported by 100% by respondents as the main effect main effect of drought , indeed droughts effects occur on a cause e effect relationship and since the respondents are livestock dependent , the effect of drought on livestock has greater direct impact on the household members , livestock mortality reported by 99.3% of respondents as one of severe effects of droughts as it has direct impact on the household economy and food security in general.

Increased walking distance from villages to the watering points for both livestock and human being was reported by 93.5% of the respondents , the implication of long walking distance are that for livestock it contributes to stress and deteriorating livestock body conditions due to long distances trekked by livestock to watering points .

In most instances watering points for livestock and wildlife are the same meaning that women in particular are affected negatively during the dry season as they are the ones charged fetching water to meet the needs of the household and increased walking distances will increase workload and time spent on water fetching.

Decreased food availability at the household level was reported by 93.5% of respondents, decreased food availability at the household level undermine household food access since households will react either by reducing food intake or switching to less desirable food stuffs such as wild fruits and berries , hunting and gathering to meet daily dietary needs.

From a sample of 139 respondents representing 93.5% of respondents also reported low livestock prices as one of the effects of drought , low livestock prices for livestock dependent population undermines households purchasing power during drought as when livestock prices takes a downward trend and prices of commodities at the market remain constant or takes an upward trend , livestock dependent households will need to sell more to access the same amount of commodities and the more the sell their core productive assets the more likely they will deplete their stocks before the drought period is over .

Disappearance of certain species of grasses was pointed out by 89.9% of the respondents as one of the major effects of drought that has long term impact on the environment and on pasture availability after drought period. when drought is prolonged and severe , certain grass seeds die before the next rainy season comes and once the seed bank for specific grasses is exhausted then there is more likelihood that such grass species may disappear for example in oldonyo onyekie have pointed out certain grass species have disappeared such grasses included Enkaru, Orkujita Onyokie, Oloiseu, Olkiramatian and Emurwua.

The long term effects associated with the disappearance of such indigenous grass species will include pasture scarcity and may fuel inter clan conflict over grazing resources among various Maasai clan in the years to come. Migration of household members in search of labour was considered to be one of the effects of drought by 86.3% of the respondents , when food shortages increases at the household level , household members will disperse as part of risk spreading strategy to urban centers to look for employment but because of low levels of literacy attracting good paying jobs is almost impossible and they end up undertaking low paying jobs because of lack of skills but when rains comes and herds start to rebuild household members will return back to their original villages.

Livestock diseases was identified by 57.5% of the respondents as one of the adverse effects drought. When livestock dieses outbreaks coincides with a severe drought , livestock mortalities will be accelerated upwards as livestock body conditions were already poor and any opportunistic diseases will lower down livestock body immunity hence succumbing to the burden of drought and disease .

Among adverse effects of droughts are increased school drop-outs which was reported by 50 respondents out 139 representing 35.9% of the respondents, pointed out that when drought is severe and prolonged, and as the households members migrate with their livestock to distant grazing fields, they migrate with school going children disrupting education calendar for their children, it's only the length of the drought period that will determine how long the children will miss classes and also if the same households will return to the same area or they completely relocate to other areas, this scenario is more common in areas where there are no boarding schools around, in areas where there are boarding schools with good boarding facilities, school going children will be left behind to continue with education for long periods without meeting with their parents and when droughts are prolonged, children that are left behind in boarding schools end up making school their homes sometimes making children get detached from their parents because that of long separation.

Human wildlife conflicts increase during drought period and out of 139 respondents, 48 representing 34.5% of respondents reported human wildlife conflict as one the effects of drought. As drought intensifies and water and pasture scarcity takes an upward trend, human wildlife conflict escalates particularly over watering resources as both man and the beast compete for the same resources and in the process of that completion attacks occur either by wildlife attacking human beings or human being kill wildlife in the process of repulsing them from the watering points also in the process of such interaction diseases can be easily passed from wildlife to livestock and from livestock to human beings

4.4. Common Challenges During drought.

Livestock to livestock dependent households means a lot it encompasses source of pride, social status, and economic status and a household that loses its entire herd loses very thing from social status, insurance and economic independence. Pastoralist had pointed out that although drought comes with a lot of negative effects the single most devastating is livestock mortalities. High livestock mortalities of the preferred livestock species (cattle, Sheep and Goats) means both social and economic decline to affected households and the higher the levels of livestock mortalities the slower the recovery process . The table below gives an illustration of livestock numbers fluctuations across non drought and drought seasons.

Table 4.4. Average Size of Stock Ownership during Non-drought and Drought seasons.

Stock	Non drought season response (frequency)	Drought season(frequency)	% response frequency during non drought year	% response frequency during drought year
below 20	1	21	0.7	17.4
21 to 40	14	24	10	17.4
41 to 60	20	15	14.3	10.7
61-80	13	17	9.3	12.2
81-100	17	14	12.2	10.7
101-120	13	5	9.3	3.5
120-140	9	13	6.4	9.3
141-160	8	12	5.7	8.6
161-180	6	7	4.3	5.0
181-200	9	5	6.4	3.5
201-220	16	4	11.5	3.5
Above 221	13	2	9.3	1.7
Total	139	139	100	100

Table 4.4 during non-drought season, only 1 respondent indicated an average stock size of below 20. Conversely, 21 respondents indicated a stock size of below 20 animals during drought season. Most respondents, 20 out of 139 indicated a stock size of 41-60 animals during non-drought season. On the other hand, most respondents indicated a stock size of 21-40 animals during severe drought seasons.

The findings indicate that during non-drought season, pastoralist from Magadi Division of Kajiado District have a optimum stock size, while during drought season, the stock size decreases to up to half. The findings from this research supports assertions alluded by previous researchers that among all the natural disasters, droughts are the once with the greatest impacts, affects wider area and its impacts linger for along periods of time after the drought period is over. Indeed drought is the single most contributor of livestock mortalities although when drought coincides with livestock epidemics indeed it becomes a total disaster for livestock dependent population.

4.5. Drought Mitigation Measures

Table 4.5: drought mitigation measures distribution of respondents

Mitigation measure	Number of respondents	%
Fencing of (Olokere) a portion of land to conserve pasture	122	87.7
Livestock migration	130	93.5
Sale of livestock and banking proceeds	70	50.3
Construction of shallow wells, digging dams for water storage	134	96.4
Controlled breeding by use of Ram harness and separating males from females	115	82.7
Total Cell Rep	571	402.6

N=139

The table above presents mitigation measures adopted by community members to reduce the impacts of drought, out of a sample 139 households

4.6. Construction of shallow Wells as drought mitigation measure

96.4% indicated that they construct shallow wells and dig dams to conserve water for the dry season, shallow well are normally constructed along dry river beds and they are the main sources of water during the dry season while dams will function for the first mouths of the dry season as the dams are small in size and only hold water for a limited period of time.

The implication for this response is that, this activity is a labour intensive and sometimes households are forced to hire labour from skilled people how mainly come from Tanzania and labour cost strains household financial capacity and only well-off members of the community can afford such kind of labour hence reducing access of such services to poor households, elderly and disabled.

4.7. Migration – Enkaroni Concept

Livestock migration as a drought coping measure was reported by 93.5% of the total respondent. The Enkaroni concept pursued by the Maasai pastoralists of Oldonyo Onyokie Location of Magadi division involves outward migration of livestock to distant grazing field to make use of grazing resources in the far flung parts of the division. The concept of Enkaroni means regulating watering regimes to ensure that conserved pastures in the distant grazing fields are utilized effectively and efficiently during the times of scarcity .

The implication for this intervention is that during migration pastoralist encounter a lot of challenges such as livestock disease outbreaks, Livestock predators by wild animals and conflict between various resource users such as farmers and pastoralist, livestock and wild animals and human beings and animals last but not least conflict between various herding groups.

4.8. Pasture and Water Conservation the Olokere Concept as Mitigation Measure.

Pasture conservation through fencing of small enclosures (Olokere) was cited by 87.7% of respondents. Land conservation would go along preparation of hay and supply of commercial forage supplements. Fencing (Olokere) a portion of land to conserve grass was a mitigation measure stated by the pastoralist in the area. In order to conserve water, pastoralist from the four villages adopted the technique Pan Construction strategy to ensure that there is sufficient water for human and livestock during the long dry spells.

The implication for this intervention is that only households who have big tracts of land can succeed in conserving pasture for the long dry spell but not withstanding the labour involved in fencing and since fencing materials are sourced from the forest it means cutting down more tree branches for fencing hence destroying the environment through cutting down of matured trees.

4.9. Breeding Management.

Breeding management continues to be one of the most practiced form of drought coping strategy and it was reported by 82.7%. By maintaining a particular species, herders can reduce the risk they face from any particular event. Controlled breeding through the use of Ram harness and separation of breeding females from males ensures that the breeding cycle of sheep and goats are synchronized with the wet and dry seasons the main objective is to ensure that sheep and goats do not breed (kidding and Lambing) during pasture and water scarce period as that will endanger the lives of the mothers. Ram harness is leather strap tied around the belly of the Ram and Buck to ensure during mating the semen will not reach the genitals of the female sheep/ Goat and pastoralist still view this practice as an effective breeding control measure.

The implication for this response strategy is that breeding cycle for sheep and goats is interfered with hence slowing down breeding rates and subsequent herd recovery

4.10. Sale of Livestock.

Sale of livestock to finance household food requirements is one of the most reliable means of food access during drought period and 50.3% of respondents reported sale of livestock as drought mitigation measure, It has been widely remarked that a major strategy by which herd-owners attempt to protect themselves against the worst ravages of droughts and epidemics is that of selling their core productive assets (Livestock). This was confirmed by the pastoralist in Nesimiti, Naserian, Laramatak and Oldonyo Onyokie villages. During severe and prolonged droughts , livestock related products (milk , meat) runs into short supply and to bridge the shortfall, livestock dependent populations will

switch to consumption cereals (maize , rice and wheat flours) and other food stuffs such as tea and sugar financed from the proceeds from livestock sales.

The implication of this strategy is that although cash reserves are accumulated for food purchases and later for restocking , the main problem arises when after drought all most households would want to restock their herds and there are few livestock in the market forcing pricing to go up hence the money saved from livestock sales will not buy the same number of livestock as the once sold because of price variations , indeed this phenomenon contributes significantly to cattle rustling in northern Kenya as communities that lost livestock during drought resort to raiding neighbouring communities.

Rating of Mitigation Measurements.

Table 4.6: Effectiveness of Mitigation Measures When Drought Set In

Measures	Poor	Fair	Good	Excellent	Not Sure
Fencing (Olokere) a portion of land to conserve pasture	0.0	92	47	0.0	0.0
Livestock Migration	0.0	88	51	0.0	0.0
Sale of livestock	0.0	75	64	0.0	0.0
Construct a shallow well, digging dam for water storage	0.0	94	45	0.0	0.0
Control breeding by using ram harness and separate females from rams	0.0	93	46	0.0	0.0
Total Cell Rep	0.0	442(63.5%)	253(36.5%)	0.0	0.0

N= 139

Table 4.6 presents data findings on effectiveness of various mitigation measures used by pastoralists when drought sets it. The responses indicates that 92 of the respondents representing 66% considered fencing (Olokere) a portion of land to conserve grass as a

fair mitigation measure for livestock preservation against drought while 47 of respondents (34%) considered the same good.

Out 139 respondents 88 (63.3%) indicated livestock migration fair in mitigating drought effects and 51(36.7%) rated migration to be a good drought mitigation measure. 75 respondents(54%) of sampled household rated sale of livestock during drought to be fair mitigation measure while 64 (46%) rated good.

Ninety four respondents (67.6%) considered constructing shallow wells, digging dam for water storage as fair mitigation measure while 45(32.3%) rated the same as a good drought mitigation measure.

Out 139 respondents 94 (67.6%) considered control breeding by using ram harness and separate females from ram as a fair drought mitigation measure for livestock preservation during drought while 45 respondents(32.3%) rated the same as a good mitigation measure

These findings indicates that fencing (Olokere) a portion of land to conserve grass as the most effective mitigation measure used by pastoralists followed by controlling breeding and construction of a well or digging borehole for water conservation.

Pasture conservation through fencing of a portion of land is the most preferred method of ensuring that during drought months pasture is available for mall stock calves lambs and Kidds that are left behind when the main dry herds migrate away to distant grazing fields. This ensures that the household the milking stock to ensure that there is continued supply of milk to the household for the vulnerable groups such as young children, the elderly, pregnant and lactating women and the disabled.

Livestock migration during drought period is one of the most efficient means of utilizing scarce range resources in fragile environments occupied by pastoralists, that mobile nature of household core productive assets (Livestock) ensures easy accessibility to

water and pasture and as a risk spreading strategy where different livestock species are herded in different directions depending on forage needs and labour availability.

During drought period, when water and pasture become scarce and milk production declines, pastoralist will switch from heavy reliance on consumption of livestock related products to consumption of cereals that are acquired commercially but finance from the proceeds from livestock sales. The number of livestock sales sent to the market and frequency of sales will depend on the household food requirement, size of household herd and livestock prices trends.

Construction of shallow wells along the dry river bed and digging of small dams ensures that, as the seasonal streams dries up during drought months water is still available for domestic use and for the milking herd that had been left behind when the main herds migrate in search of water and pasture in the distant grazing fields.

Application of controlled breeding for sheep and goats is aimed at ensuring that breeding of sheep and goats is synchronized with the wet and the dry seasons of the year with primary objective being that timing of breeding in a such way that Lambing and kidding will take place when there is plenty of pastures and water that will support good milk production that will be sufficient for the young animals and at the same time for household consumption. Indeed when lambing and kidding takes place during a drought period the chances of survival for the young ones and their mothers are very low and in this scenario pastoralists will choose to slaughter the young lambs and Kidds to save the mother's for future breeding.

Table 4.7 Types of drought interventions measures.

Type of assistance	Number of respondents	%
Vaccination of Livestock by GoK as disease control measure	120	86.3
Supply of water for domestic use by Magadi Soda company	130	93.5
Distribution of relief food by GoK and NGOs	80	57.5
Total	139	100

N= 139

From the table above 86.3% of the respondents reported water supply for domestic use by Magadi Soda Company as a form of assistance during drought period, Magadi Soda Company provides water for domestic use during drought period as part of the social responsibility programme.

86.3% of the respondent identified livestock vaccination by GoK as a disease control measure during drought period mostly undertaken by the ministry of livestock department of veterinary services.

Among the respondents 57.5% identified distribution relief food by GoK as the form of assistance given during drought period

Table 4.8: Effectiveness of types of Assistance and Discussions

Form of assistance	Poor	Fair	Good	Excellent	Not Sure
G.O.K vaccinate the livestock to avoid outbreak of diseases	0.0	93	46	0.0	0.0
Magadi soda supply water during drought period	0.0	85	54	0.0	0.0
GoK and NG'Os supplies relief food to the community in drought period	0.0	94	45	0.0	0.0
Total Cell Rep	0.0	272	145	0.0	0.0

Effectiveness of assistance depends mostly on the timeliness and appropriateness of relief supplies. Table 4.8 above presents the findings on the effectiveness of the various forms of assistance provided. From the findings, pastoralist received assistance in form of G.O.K vaccinate livestock to avoid outbreak of diseases, together with NGOs provide relief food supplies to the community in drought period and Magadi soda supply water during drought period.

From Table 4.8, 94 of the respondents (67.6%) were of the opinion that 'GoK and NG'Os supplying relief food to the community in drought period' was fairly effective while 45 respondents (32.3%) that the assistance was good in terms of effectiveness.

Out 139 respondents 94(67.6%) viewed G.O.K vaccination to the livestock to avoid outbreak of diseases as fairly effective while 45 of the respondents (32.3%) viewed the same intervention to good in terms of effectiveness.

Supply of domestic water by Magadi soda company was rated by 85 respondents (61%) as fairly effective intervention while 55 respondents (39.5%) rated the same intervention to good and this the most effective intervention during drought period followed by supply of relief by GoK and NGOs and livestock vaccinations to prevent livestock disease outbreaks.

One of the worst effects of droughts to pastoralists is the decimation of core -productive household assets of which livestock is central. Livestock mortalities arises due to starvation brought about by lack of pasture and water during the height of the drought however livestock mortalities becomes even worst when drought coincides with livestock epidemics and to ensure that livestock survives the impact of drought . Government and development partners provide animal health services to the pastoralists through livestock vaccination and provision of dewormers to ensure that livestock do not die due to the combination of drought and opportunistic diseases this activity was mainly conducted by the ministry of livestock development Department of veterinary services in collaboration with a local non Governmental organization

neighbors initiative alliance (NIA) pastoralist pointed out that this intervention can contribute immensely if timing and coverage is improved .

During drought period , water scarcity becomes the norm for both domestic use and livestock and to mitigate on this water scarcity Magadi Soda company which is situated adjacent to Oldonyo onyekie community , under its social responsibility programme provide water for domestic use by delivering water by the use of water boozers to the adjacent communities and because water is trucked it can serve many residents far away from Magadi Soda , indeed without water for domestic use even food rations provided by humanitarian organization and government will be of little use .

When drought is severe to the extent that communities can no longer cope with their own resources, Government and Humanitarian organizations intervene to save lives and livelihoods and the most common intervention implemented by Government in conjunction with United Nations World Food Program is the supply of relief food.

Relief food plays an important role during drought emergencies by ensuring that people are well nourished to survive the impacts of drought but the timing and appropriateness of relief commodities has always been of concern for instance during field discussions food relief recipients have pointed out that although relief food assistance play an important role during drought emergencies by ensuring that people stay alive , relief commodities have not been of the appropriate type and fall far below the household food consumption requirements during the drought period because they come very late at the drought cycle and very little mainly because of poor targeting .

The main relief commodities supplied are whole maize, beans or pulses and edible cooking oil. Whole maize combine with beans to require a lot of water and energy to prepare and can be ready in a minimum of 3 hours and because it requires a lot of energy, more fire wood for wood fuel is required during preparation and it not attractive to young children and elderly men and women.

4.11. Suggestions for improvements of mitigation measures.

The proponents of food security are that, a household and individuals can be said to be food secure if they can produce food by themselves or through exchanges and the failure of one of the determinants will precipitate food insecurity.

Pastoralists core productive assets are livestock and a decline or increase of household livestock numbers will indicate either an increase or decrease in the levels of vulnerability to food insecurity therefore by protecting peoples core productive assets during drought by means of livestock preservation will ensure that when the drought is over and the first rains are experienced then households will begin to rebuild their herds and improve food security.

Pastoralists can improve their food security situation through enhancement of livelihoods through diversification or expandability option. Diversification ensures that household pursue different income earning activities other than heavy reliance on livestock sales while expandability ensures that the same income earning activity can be pursued by increasing volumes or increasing value through value addition strategy to ensure that pastoralist can earn more through livestock sales by developing an organized marketing strategy and improving accessibility to markets and market information.

1. Clear policies to support the above proposals will be an enabler for achieving sustainable food security through effective and efficient livestock preservation techniques.
2. Government to develop clear policy guidelines on the management of both natural and technological hazard to ensure that prediction, preparedness and response are well coordinated on proactive basis.
3. Interventions during drought emergencies should be based on accurate situation and needs assessment to avoid the culture of too late too little.

4. Selection of relief commodities should take into consideration population dynamics of particular communities, preparation process including water and fuel to ensure that intervention do not contribute to environmental degradation through depletion of vegetation cover.
5. Timing intervention should be guided by credible information that is based on monitoring to ensure that there is a clear strategy on when to in and when to come out without compromising traditional coping mechanisms.
6. The size of food rations should be based on the household size and household food consumption requirements rather than rather than food available.

4.9 Formal Early Warning Systems.

During key informants interviews, types of early warning systems in the county to monitor and signal the onset of drought was discussed. In the county of Kajiado 5 key informants were interviewed at the county headquarters in Kajiado and comprising District livestock production officer (DLPO), District Agricultural Officer (DAO), Drought management Officer for Arid Lands resource Management project, Neighbors initiative alliance (NIA) and Africa Medical Research foundation (AMREF).

All the five key informants are active members of the District steering Group(DSG) which is drought management coordination structure at the county level all the respondents indicated that they rely on the drought early warning system operated by the AridLands project, four out of five of respondents reported that they rely on weather forecast reports from the department of meteorology, while two out five reported on using the famine early warning food security forecast and monthly reports by the ministry of livestock and Agriculture.

Challenges of Early warning systems in triggering early action

During discussions with the key informants, all the respondents (key informants) pointed out that inadequate funds for funding contingency interventions is one of the

main challenges in triggering early intervention hence creating a disconnect between linking information to action in timely manner, although the county generates contingency plans by AridLands resource management project, funds to operationalize contingency plans are hardly available when required.

They also pointed out that, because there is lack of coordination in planning and budgeting contingency interventions slows the implementation process of early action interventions since funds are held by different organization with different objectives in the approaches of drought interventions.

Lack of clear guidelines on when to implement emergency and development interventions pointed out by most respondents as a challenge and sometimes brings conflict with donors as some donors will only prefer to fund emergency interventions while others prefer funding development interventions.

Lack of clear guidelines on the use of contingency funds when available was pointed out by four out of five respondents as this sometimes results in the abuse of the fund, when there are no clear guidelines on when and how to access contingency funds sometimes jeopardizes the quick response capacity which is needed during emergency period.

According to UNISDR, Early Warning is the provision of timely and effective information, through identified institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risk and prepare for effective response.

In other words, Early Warning can be defined as the set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss.

A complete and effective early warning system comprises four elements, spanning knowledge of the risks faced through to preparedness to act on early warning. Failure in any one part can mean failure of the whole system. The “four elements of effective

early warning systems”, the Early Warning Chain, include the development and operation of early warning systems in regard to: (a) knowledge of risks; (b) monitoring and warning services; (c) warning dissemination and communication; and (d) emergency response.

4.11.1. Knowledge of the Risk

To effectively plan on risk reduction measures one must understand the risk that are common in particular area or zones by ensuring that data is collected in a systematic manner and all hazards and vulnerabilities are identified and patterns or trends are developed and data on risks and maps are available .

4.11.2. Monitoring and warning service

Monitoring and warning service is one the four elements of early warning.

Monitoring and warning service ensures that the right parameters are monitored, and there is sound scientific basis for making forecasts and a timely and accurate warning can be generated.

4.11.3. Dissemination and communication.

Once risk knowledge had been developed and monitoring and warning service is in place then the next step is to disseminate and communicate risk information and early warning to ensure warning reach all those at risk and risks and warnings are well understood and warning information is clear and usable.

4.11.4. Response Capability.

The fourth element in the early warning chain is response capacity building at national and community levels with objective of ensuring response plans are developed, tested and update but ensuring that local knowledge and capacities are made use and ultimately communities are prepared and ready to hid warning signs.

These four elements of an Early Warning System imply that early warning is based on the assessment of risk and vulnerability. Moreover, early warning should be communicated appropriately and ensure response capability of the people at risk, taking into account short and long-term measures.

4.12. Challenges for formal Early Warning Systems.

Early warning systems are designed to serve purposes they were intended for and the levels they operate at. Buchanan smith (2004).

Early Warning Systems are established to alert people at risk about imminent, threatening events. Besides reliability and scientific soundness, Early Warning strives to reach the right decision maker at the right place with the appropriate message, in a timely way.

This principle is valid for sudden onset events such as hurricanes or tsunamis as well as for long-term, gradual events or trends, such as droughts or sea-level rises. What changes is mainly the response action.

Diverse groups and numerous levels of decision makers usually require warning information to act upon, with often the individual household decision maker who decides about changes in livelihood, being the most difficult to reach. Too often, households do not get the information that is available elsewhere, and could save their livelihoods.

Interpreting early warning information

One of the challenges of early warning systems is Interpreting Early Warning Information the predominant response to drought – induced food crisis continued to be food aid, however the challenge is how to translate early warning data into food aid requirements.

Donor bureaucracies and the use of early warning information.

Early Warning is an Art, not a science. A EWS makes prediction based on analysis of available information, inevitably tinged with an element of judgement. The data are never comprehensive and accurate as the EW practitioners would like and the earlier the warning the less certain it will be.

Down vs. Upward stream events in early warning.

Most donor agencies tend to seek for quantifiable proof that an emergency is imminent or already exist; there is a tendency for donor decision making to be driven by downstream rather than upstream events, to be motivated by hard evidence rather than prediction. How many times have those advocating an Emergency response found that the most influential indicators are indicators of human stress, usually expressed as high rates of malnutrition and increased mortality?, This can be a fundamental flaw in the EW/Response process- waiting for signs of outcome of failure to respond .

This wait –and- see attitude is most acute in situations where political relations are least conducive to an early response, this situation is also expected when there is strong competition for relief resources from a number of major emergencies around the world.

The danger of this scenario is that it encourages Early Warning practitioners to bid up the severity of crisis to attract attention which may eventually backfire if the situation does not deteriorate to the catastrophic levels predicted. This can undermine the credibility of Early Warning.

4.13. Governments Response to Drought.

It is the responsibility of any democratically elected government to ensure that its citizenry are protected from hunger and starvation. Over the last two decades Kenya Government with development partners have developed structures for drought management at the national, district and community level.

Kenya is a drought prone country. Drought affects not only its economic performance but also its attempts to achieve the millennium development goals. Droughts directly impact on the household food security of over 10 million people living in drought-prone areas. Droughts erode the assets of poor communities and undermine their livelihood strategies, culminating in a downward spiral of increasing poverty and food insecurity.

Although Drought affects the country as a whole, its effects are felt most dramatically by the Livestock based economies and livelihoods in the Kenyan Arid and Semi-Arid Lands (ASAL).

The Government of Kenya (GoK), aware of the need for effective response, focuses resources to reduce the negative impacts of droughts. Since 1996 the Office of the President, supported by the World Bank (WB), has been implementing the Arid Lands Resource Management Project (ALRMP1) with the objective of enhancing food security and reducing livelihood vulnerability in drought-prone and marginalized communities.

The ALRMP, further supported by the European Union (EU) funded Drought Management Initiative (DMI), consolidated a national drought management system, with drought management structures at the national (KFSM, KFSSG), district (DSG's) and community levels.

This drought management system includes policies and strategies, an early warning system, a funded contingency plan and an overall drought coordination and response structure. Main stakeholders involved in drought management in Kenya include the GoK and its line ministries, various development partners and non-governmental organizations (NGO's).

An effective drought management system must be backed an effective and efficient early warning systems while a good early warning indicator detects anomalies in a system at

certain period before the more critical parts of the system respond. The length of this period between the early warning and the response of the system is the delay time between the indicator and the response. A good early warning system has a reasonable delay time to allow society to respond. We need this delay time for example to order food from abroad and upscale relief operations.

At the national level there are two structures focused on drought management and food security name the Kenya Food security steering group and the Kenya and at the district level the District steering group.

District Steering group (DSG).

The role of district steering group is to deliberate and approve development projects including review of drought situation in the district and forward recommendations to the KFSSG

To guide districts on the drought situation there is drought early warning system operated by the prime minister's office under ministry of state for the development of Northern Kenya and other Arid and Semi Arid Lands , it's the contents of this drought bulletin that are deliberated at the district level and its recommendations sent to KFSSG

Kenya Food security Steering group (KFSSG).

The main functions of KFSSG is to act as a secretariat for the Kenya Food security meeting (KFSM)

Kenya food security steering group main role is to gather information on food security from the district and deliberate on the scope and the severity of drought and other natural hazards such as floods and make recommendation to KFSM.

KFSSG Comprises of government line ministries, united nations agencies and international NGO s and its operation are on sector based approach mainly Agriculture, Livestock, water and sanitation and health and Education sectors .

Kenya Food Security meeting (KFSM).

Another key function of KFSSG is to plan and conduct long and short rains assessments and provide its findings and recommendations to the Kenya Food security meeting which is composed of the permanent secretaries from line ministries and senior UN representatives from the UNDP WFP UNICEF and UNOCHA.

The role of this committee is to deliberate on recommendations from KFSSG and based on the adoption of the recommendations plays key role in resource mobilization.

Government response to drought in Kajiado 2008/2009.

During the drought of 2008/ 2009 of which Kajiado was rated as one of the worst hit district, the Government spent 35 million Kenya shilling in the livestock related interventions this does not include the cost of delivering food relief .

Table 4.9. Government response to drought in Kajiado 2008/2009.

Intervention type	Cost in Kenya Shillings
Water trucking	1,000000
Borehole rehabilitation	5,000000
Water works	2,000000
Destocking/ slaughter for distribution and relief	3,000000
Destocking commercial	3,000000
Animal health (vaccination and deworming)	12,000000
Animal feeds	3,000000
Peace building	1,000000
Others	3,000000
Total	35,000000

Source: EU (2010) Drought Assessment report

The table presented above are only response measures by government aimed at livestock preservation or livelihood support responses and do not include interventions aimed at saving lives through provision of relief food. other the government Responses

nongovernmental organizations and community based organizations did provide some assistances to communities during drought and this area can be open for further debates and research in field of research.

4.14. Suggestions for improvements.

The draft national policy on disaster management and ASAL policy which have been lying in parliament for the last 3 years need to be passed into law and implementation begins, this will strengthen the management of drought and other natural and technological hazards through the establishment of the national disaster management authority (NADIMA) which will be charged in coordination disasters in the country.

Since droughts are cyclical in nature and its frequencies and intensity have been on the increase, government should come with clear policy guidelines on managing droughts and other natural and technological hazard.

There is need to develop an efficient and effective people centered early warning systems for both cataclysmic and continuing disasters, the system will assist in generation of timely and accurate warnings that will trigger appropriate and timely responses.

Funding for disaster preparedness be bolstered to reduce costly emergency responses, indeed the concept of contingency planning be emphasized at national, county and community levels in order to institute and effective readiness.

Current disaster coordination structures such as National disaster operation centre (NDOC) KFSSG, KFSM and DSG are not backed by any legislation hence their roles and responsibilities are not binding and their independence and effectiveness are hard to determine hence the need for formalization and institutionalization of these structures to give them more clout.

Since a number of organizations are generating early warning information it's of paramount importance that this systems are harmonized and information sharing streamlined including disaster alert declaration and communication.

4.15. The extent of formalization of traditional coping mechanisms

Migration or rotational grazing practised by pastoralist over centuries have been proved by range management experts as the most effective way of utilizing scarce range resources in fragile ecosystems such as the ASALs of Kenya.

Pasture conservation either by household members through the concept of fencing (Olokere) or through deferred grazing where a whole area is set aside and grazing restricted for a certain period of time are both best practises by communities but backed by scientific knowledge.

Livestock off-take or distress sales serves two purposes , one is to reduce pressure on the land by offloading livestock through slaughter , the second objectives is to ensure livestock are sold when they are still in fairly body condition and can fetch good prices at the market and households will accumulate cash reserves where by communities will have money to buy cereals which become increasingly important during the drought period this were community initiatives which have know found themselves in the government drought interventions budget items.

Livestock off-take slaughter was meant to utilize livestock under drought emergency by ensuring that instead of livestock being left to die because of lack of water and pasture, government comes in to buy weak livestock and slaughter onsite and distribute meat to the local residents as part of the famine relief rations.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents conclusion and recommendations of a study, which was conducted on Oldonyo Onyokie Community in Magadi Division of Kajiado District. The main aim was to investigate the livestock preservation strategies deployed by pastoralist communities before the occurrence of a drought; and specifically the study aimed at determining the drought trends in the community, the extent at which drought mitigation structures have been formalized and assesses the effectiveness of traditional drought mitigation mechanism. Conclusions have been made based on the research findings presented in chapter four.

5.2. Summary of findings.

1. Among natural disasters droughts are the most common and most frequent in Kenya compared to other natural disasters such as floods and Landslides and volcanic eruptions
2. From the findings, the trend of the drought was identified as cyclic with increasing frequency and severity and backdates to turn of the 19th century.
3. Drought frequency increased from 10 years to 5 year period to even 2- 3 years and the trend is worrying as human population continues to increase exerting pressure on arable land leading to decline in land available for crop production.
4. The worst devastating droughts occurred in 1999/2000, 2004/2005 and 2008/2009 affecting Northern Kenya, Eastern, parts of Rift Valley and Coast
5. The study found various effects of drought in the community. Drought would be accompanied by increased temperatures during the day and extreme fall in the nighttime some of the effects of droughts includes, declining availability and

accessibility of water and pasture, deteriorating livestock body condition leading to loss of weight and reduced milk production and poor livestock pricing

6. Sudden fluctuation in day and night temperatures would lead to outbreak of diseases to both the livestock and human. Lack of water would force the residents to walk for long distances in search of it. Declining livestock prices due to emaciated and weight loss leading to decrease in household incomes. In extreme cases, pastoralist in Nesimiti, Naserian, Laramatak and Oldonyo Onyokie would experience high livestock mortalities to the effects of drought.
7. Drought has negative impacts on community social and economic life such as Pastoralist from Nesimiti, Naserian, Laramatak and Oldonyo Onyokie would have to walk for long distance for pasture and water, reduced livestock prices, increased cost of living standards. Times of resting would be less in drought period compared in rainy seasons. Overworking was another challenge due to long walking distances in search of water and pastures and this would result to fatigue to both the livestock and human.
8. During drought years pastoralists lose up to 60% of their livestock making recovery process slow and prolonged.
9. The most affected group are the women who walk long distances to fetch water for human beings and livestock especially for the kids and the lambs. The challenge of obtaining clean water was stated by the pastoralist.
10. During drought period the youth engage themselves in menial jobs because of low level of literacy.
11. Poor quality of pastures, Livestock/Wild life conflict over water and pasture, Livestock disease outbreak due to Livestock –Wildlife interactions, long distance migration under the scorching heat of the sun.

12. In order to ward off effects of droughts pastoralists combine a number of strategies for both saving lives and livelihoods and among them are early migration to pasture and water plenty areas , pasture conservation in form of standing hay for feeding the milking herds during dry spells , livestock splitting depending on the forage needs of specific livestock species , breeding management through use of Ram Harness and sale of livestock when in good body condition and banking of cash proceeds to enable ease access of cereals and other households needs during drought periods .
13. Community members still combine both conventional and traditional prediction ability to predict , prepare for , cope with and recover from adverse effects of drought both observable weather patterns such as stars , direction of wind , flowering of certain species of trees and listening to radio messages from the meteorological department.

5.3. Conclusion

Droughts severity and frequency have increased over the last two decades and continue to affect most parts of the country.

Increased human population and decreased natural resource base continues to increase peoples vulnerability to drought and that unbalance between human population and livestock with low ecological potential combine to create chronic vulnerability to food insecurity.

From the findings the study conclude that lack of rain in April and November of every calendar, daytime wind, and stars at nighttime (mostly observed in southern and northern parts of the sky) with dry cloud, and shortage of water and pastures are the major observable patterns, which interpret the probability of drought year

The study also concludes that the first response to drought by the pastoralist in Nesimiti, Naserian, Laramatak and Oldonyo Onyokie is to move the animals to areas where there is still pasture and water. The migration to areas of higher productivity

Alleviates stress on less productive or exhausted land. The study also concludes that pastoralist in the region conserve a certain portion of land for grazing during the drought period.

Pasture conservation in form of standing hay Fencing (Olokere) a portion of land to conserve grass was a mitigation measure stated by the pastoralist in the area.

In order to conserve water, pastoralist from the four villages adopted dam construction strategy to ensure sufficient water sustainability for the livestock. It has been widely remarked that a major strategy by which herd-owners attempt to protect themselves against the worst ravages of droughts and epidemics is that of selling the animals. This was confirmed by the pastoralist in Nesimiti, Naserian, Laramatak and Oldonyo Onyokie villages.

In conclusion, by maintaining a particular species, herders can reduce the risk they face from any particular event. Control breeding by using rams harness and the pastoralist stated separating sheep females with the rams as another major mitigation factor to avoid increase in the stock size during the drought period.

The study further concludes government is involved in vaccination of livestock to avoid outbreak of diseases in the four villages i.e. Nesimiti, Naserian, Laramatak and Oldonyo Onyokie villages. The government and the NGO's are concerned in supplying relief food in the drought period. It can also be noted that the community-based organizations (CBOs) are involved supplying providing assistance to communities during drought period of such a case is the Magadi Soda company that supplies water to the adjacent communities as part of its social responsibility.. In addition, the pastoralist also indicated that the government and NGO's train the community on issues related to health and also on climate change which relates to drought.

5.4 Policy recommendations.

Recommendations to Governments.

1. Government should make concerted efforts to strengthen drought management structures and decentralize in accordance to the devolved Government.
2. Current drought management structures need improvement to ensure that they are effective well coordinated and responsive of the needs of the drought victims
3. Government to come with an appropriate legislation to enable to manage disasters in an effective and efficient manner
4. In order to minimize livestock losses during drought, Government response mechanism should be structured to be well coordinated and flexible to ensure timely response to drought shocks.
5. Government should explore adoption of alternative livelihood to reduce pastoralist vulnerability to drought by building resilience.
6. Government should put in place appropriate and effective land use planning platform to enable pastoralist to use land in a more efficient manner

Recommendations' to Non Governmental Organizations and community based Organizations.

1. Non Governmental organizations operating in Kajiado to focus investment in vulnerability reduction initiatives such as community based contingency planning, early warning and public education.
2. Development and disaster management go hand in hand and therefore interventions should be structured in away that ensures communities preparedness, response and recovery initiative are interlinked and synchronized.

3. Community level drought management planning be made a priority if meaning gains in drought management can be attained

Recommendations to pastoralists

1. Due to increasing frequency and severity of droughts pastoralist need to diversify livelihood support activities
2. Pastoralist should put an elaborate migration plans to minimize conflict over resources during long dry spells
3. Pastoralist should view their livestock as an enterprise other than a source of prestige by ensuring off takes are made when prices are favourable and proceeds are kept as savings or invested in other income generating activities.
4. Pastoralist to integrate traditional and conventional early warning systems to make them more effective in providing timely and accurate signals.

Future Areas for Research

1. **Integrating Traditional early warning Indicator with Conventional early warning indicators.**

Traditional early warning indicators are based on cultural practises and believe systems which are difficult to quantify scientifically hence to blend traditional early warning indicators and the conventional early warning indicators had been a big problem and this will be another good field for future research.

2. **The relationship between drought frequencies and climate change.**

Drought frequencies and severity have increased over the recent past as well as the concept of climate takes centre stage in the many forums across the globe, a fertile ground for future research would in understanding of the relationship between the two

3. Role of food aid in supporting or undermining traditional drought coping mechanisms.

Food Aid in form relief supplies have become the most common drought intervention during drought and non drought years it will be imperative to understand the role plaid by food aid in strengthening or weakening of the traditional drought coping mechanisms.

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LIST OF ANNEXES.

- 1. QUESTIONNAIRE FOR HOUSEHOLD HEADS.**
- 2. QUESTIONNAIRE FOR KEY INFORMANTS FROM THE DISTRICT ADMINISTRATION AND OTHER RELEVANT FORMAL DROUGHT MANAGEMEN ORGANS**
- 3. INTERVIEW GUIDE FOR FOCUS GROUP DISCUSSIONS**

ANNEX: 1. QUESTIONNAIRE FOR HOUSEHOLD HEADS.

Part A: Respondents Background

1. Residence of respondent _____
2. Age _____
3. Sex _____
4. Level of education _____
5. Occupation _____
6. Average size of stock ownership during non drought seasons _____
7. Average size of stock ownership during intensive drought seasons _____

Part B: Drought trends and Livestock preservation strategies deployed by pastoralist communities before the occurrence of a drought

8. Could you mention any signs from the weather that usually signal the onset of drought? (E.g observing weather patterns, at what point would say that drought has set in?)

9. What are the effects of drought in your community?

10. In your opinion, when drought has already set in, what are the common challenges you are faced with in relation to livestock?

11. When you observe that drought is setting in, what mitigation measures do you put in place?

12. Please rate the mitigation measures you stated above in terms of their effectiveness from poor to excellence?

Mitigation Measures	Poor	fair	good	excellent	Not sure

13. What has been the form of assistance you have been receiving from government, NGOs and CBOs?

14. Rate the effectiveness of the assistance?

Form of Assistance	Poor	fair	good	excellent	Not sure

15. What could you suggest to improve on mitigation measures to the following stake holders?

Community

Government

Nongovernmental organizations

Others

ANNEX: 2. QUESTIONNAIRE FOR KEY INFORMANTS FROM THE DISTRICT ADMINISTRATION AND OTHER RELEVANT FORMAL DROUGHT MANAGEMENT ORGANIZATIONS

- 1. Respondents Occupation: _____
- 2. Agency: _____
- 3. Length of service: _____
- 4. Level of education: _____
- 5. Sex: _____
- 6. Age: _____

7. Please mention some of the Early Warning Systems that are in place to signal the onset of drought (particularly focusing on the pastoralists from Oldonyo Nyekei community in the larger Kajiado County)?

8. What are some of the early warning challenges that are faced with regard to triggering interventions to preserve human life and secure livestock before the occurrence of a drought?

9. What suggestions do you offer, that if implemented, could drastically increase the effectiveness of these Early Warning Systems?

10. When you observe that drought is setting in (based on the Early Warning Systems), what steps does the government take and other stakeholders to ensure that your livestock survive the drought?

11. When drought has already set in, what are the common livestock related challenges that the community is faced with?

12. Are there any mitigation measures that the government has put in place in relation to these challenges?

13. What could you suggest to improve on mitigation measures to the following stake holders?

Community

Government

Nongovernmental organizations

Others

ANNEX 3: INTERVIEW GUIDE FOR FOCUS GROUP DISCUSSIONS

1. What is your understanding of drought?

2. What is the effect of drought in your community?

3. What is your understanding of vulnerability in relation to drought?

4. Who in the community is vulnerable to drought effects?

5. What are the drought trends in your community?

6. State the periods of the year when you experience drought in your community.

7. What suggestions do you offer, that if implemented, could drastically reduce vulnerability to drought?

8. What could you suggest to improve on mitigation measures to the following stake Holders?

Community

Government

Nongovernmental organizations

Others
