COMMUNITY INDIGENOUS KNOWLEDGE AND ITS ROLE ON PREDICTION OF NATURAL DISASTERS OF PUBLIC HEALTH IMPORTANCE: A CASE OF CENTRAL DIVISION OF ISIOLO DISTRICT, KENYA.

BY

FAYO GALGALO HABANE (Bsc-BMED) Hons.

REG. NO. 157/11043/04

A RESEARCH THESIS SUBMITTED IN PARTIAL FULFILLMENT OF REQUIRMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF PUBLIC HEALTH (DISASTER MANAGEMENT AND ENVIRONMENTAL HEALTH) OF THE SCHOOL OF HEALTH SCIENCES OF KENYATTA UNIVERSITY

SEPTEMBER 2010

DECLARATION

This thesis is my original work and has not been presented for a degree award in any other university.

Signature _____ Date _____

Fayo Galgalo Habane (BSc-BMED) Hons
Department of Public Health
Kenyatta University

This thesis has been submitted for review with our approval as university supervisors.

Signature _____ Date _____

Prof. Ephantus Kabiru
Department of Pathology
Kenyatta University

Signature _____ Date _____

Dr. Augustine Afullo
Department of Public Health
Kenyatta University

DEDICATION

This study is dedicated to my wife Mumina, and my lovely children: Abdijabar, Farhiya, Abubakar, Yassin, Najma, Hafsa and my parents for their encouragement, endurance and moral support during my study period at Kenyatta University.

ACKNOWLEDGEMENT

My candid appreciation goes to Prof. Kabiru and Dr. Afullo who were my kind hearted supervisors whom I constantly consult whenever need arises. The chairman of the Public Health Department Dr. Mwanzo for his words of wisdom during proposal and thesis defenses session by postgraduate students and to my students colleagues for the time we spent struggling together and giving each other moral support and in particular my closest friend Lotukoi.

I would also like to convey my gratitude to my friends and well wishers who gave me words of encouragement to pursue this course. My special thanks goes to my employer, Min. of Health for granting me study leave for two years with pay hence this is really an encouragement at my personal level in terms of financial support. I do also appreciate the kind gesture from Hon. Mokku who organized funds drive for me to meet my study expenses especially from his political supporters in Isiolo and to mention in particular brothers; Abdikadir Doyo, Ibrahim Huqa and Jirma Waqo to represent the large crowd who turned up during funds raising day. I salute also the staffs and lecturers of the Public Health Department who worked tirelessly to make sure that we excel in our exams and field reports.

May God bless all of you and many others who are not mentioned here.

TABLE OF CONTENTS

APPENDICES

LISTS OF TABLES

LISTS OF FIGURES

DEFINITION OF OPERATIONAL TERMS

Indigenous Knowledge: This refers to the unique, traditional local knowledge existing within and developed around the specific conditions of a community indigenous to a particular geographical area, covering all aspects of life including management of the natural environment upon which their livelihoods and survival depend.

Disaster: A disaster is the impact of a natural or man-made hazard that negatively affects society or environment.

Disaster Management: Is the discipline of dealing with and avoiding risks. It involves preparing for disaster before it happens.

Response: This is the mobilization of the necessary emergency services in the disaster area.

Preparedness: This is the development of plans of action by emergency managers before the disaster strikes.

Mitigation: These are efforts that attempt to prevent hazards from developing into disasters altogether, or to reduce the effects of disasters when they occur.

Prediction: This is the forecasting of a future occurrence/event which may or may not take place.

Recovery: These are efforts that are primarily concerned with actions that involve rebuilding destroyed property, re-employment, and the repair of other essential infrastructure.

ACRONYMS AND ABBREVIATIONS

ALRMP	-	Arid Lands Resource Management Program
AAK	-	Action aid Kenya
CBO	-	Community Based Organization
DALEO	-	District Agricultural and Livestock Station Officer
EWS	-	Early Warning Systems
FONI	-	Friends of Nomads International
FGD	-	Focused Group Discussion
IK	-	Indigenous Knowledge
IGAD	-	Intergovernmental Authority on Development
IDRC	-	International Development Research Centre
KRCS	-	Kenya Red Cross Society
KII	-	Key informant interview
LK	-	Local Knowledge
MOH	-	Ministry of Health
NGO	-	Non Governmental Organization
PI	-	Principal Investigator
RA	-	Research Assistant
SDN	-	Sustainable Development Network
SIDS	-	Small Island Development States
TK	-	Traditional Knowledge
UNEP	-	United Nations Environmental Program
UNDP	-	United Nations Development Program
UNCED	-	United Nations Conference on Environment and Development.
UN	-	United Nations
WHO	-	World Health Organization

ABSTRACT

Indigenous knowledge is the local knowledge that is unique to a given culture or society. It is the basis for local-level decision-making in agriculture, health care, food preparation, education, natural resource management, and a host of other activities. This study was to establish the existence of the indigenous knowledge in the community of central division in Isiolo District and its role in the prediction of natural disasters. The research design used in the study was survey. This design helps in seeking information for decision making and improvement of certain areas of weaknesses. Opinions are the major features in survey research. The study population was derived from the 10 settlements within Central location of Central division in the district and systematic sampling design was employed in selecting house holds in the settlements. Questionnaires, interview guides and focus group discussions were used to get the data from the respondents. Data from the questionnaires were analyzed using the statistical packages for social sciences (SPSS) soft ware. Inferential statistics by use of chi-square was used to determine the significance of relationship between variables and non-parametric inferential statistics used in analyzing the data were percentages and frequencies where the findings were presented in tables, bar- charts, pie-charts and line graphs. All the tests on the relationship was done and level of significance determined. The role of IK technique in the predictions was that 77.3% can be used to predict floods, Drought at 94.3%, Famine at 83.9% among others. Correlation analysis was done using chi-square (χ^2) between different variables such us age, gender, educational level, marital and employment status. In the determination of the correlation between age and knowledge on the frequency of occurrence of disasters; the results was that χ^2 =15.745, p=0.399, df 15. The study found that there was no significant relationship between the age of the respondents and the knowledge on the frequency of occurrence of the disasters. Regarding the aspects of formal disaster management by the government with correlation to age, gender, marital status, and level of education, the study found that there was no significant relationship between the variables. Finally the null hypothesis for the study was rejected and it was therefore concluded that the communities living in Central division of Isiolo District uses IK in the prediction of natural occurrences. The study concluded that the major disasters in Isiolo include: famine, drought, floods and epidemic diseases. It was also concluded that the government was successful in managing disasters in Isiolo District. The study finally concluded that some of the indigenous knowledge used included the use of animal intestines, stars, clouds, crescent shape and croaking of the frogs. The study recommended that indigenous knowledge should be promoted through keeping of records, be recognized and policy framework instituted to safeguard and preserve it so that it can be an additional resource base in supplementing the formal Government techniques in natural disaster management and predictions. The researcher finally recommended that another study should be carried out in the study area to find out the use of IK on environmental sustainability and management.

CHAPTER ONE: INTRODUCTION

1.1 Background Information

Over the course of history, and up to this day, traditional local communities have continued to rely heavily on indigenous knowledge to conserve the environment and deal with natural disasters. The communities, particularly those in hazard-prone areas, have generated a vast body of indigenous knowledge on disaster prevention and mitigation, early warning, preparedness and response and post-disaster recovery. This knowledge is the sum of facts that are known or learned from experience or acquired through observation and study and handed down from generation to generation. According to IGAD, (2006), indigenous knowledge can be summed up as the knowledge of an indigenous community accumulated over generations of living in a particular environment. It is a broad concept that covers all forms of knowledge, technologies, know-how, skills, practices and beliefs that enable the community to achieve stable livelihoods in their environment. Communities identify themselves easily with indigenous knowledge systems which have enabled them to live in harmony with their environments for generations. The systems are important tools in environmental conservation and natural disaster management.

The global scientific community acknowledged the relevance of indigenous knowledge and endorsed it at the World Conference on Science held in Budapest, Hungary, in 1999 by recommending that scientific and traditional knowledge should be integrated particularly in the field of environment and development. The United Nations Environmental Program (UNEP) recognizes the role of indigenous knowledge in the conservation of natural resources and management of natural disasters. Indigenous knowledge is still intact among indigenous or local communities in many parts of Africa. However, this knowledge is not well documented and it stands in danger of being lost as its custodians are passing away (UNEP, 2006). The role of indigenous knowledge that communities in Kenya, South Africa, Swaziland and Tanzania draw on to deal with natural disasters is enormous. The stock of knowledge includes technologies, know-how, experiences, observations, beliefs and rituals. These range from the simple to the

complex, such as relying on the water beetle to identify potable water in streams and ponds, using beanstalk ashes to preserve grain, reading signs on goat intestines to divine drought and famine, and immunizing cattle against rinderpest outbreak by smearing blood from infected animals in their nostrils (Owiro, 1996).

According to the study done in Kenya, the signs could be complicated and required the interpretation of the elders and experts. Some of the interpretations "were known to engender major conflicts in opinion depending on the decisions that had to be made," (IGAD, 2006). The culture and belief system of a community influenced its responses to a disaster. The people of Mfangano Island in Lake Victoria, for example, strongly believed that disasters only came when one was not at peace with God and the spirits. They knew they could not stop the disasters once they were triggered by certain causes but they could mitigate their effects as every event, physical or spiritual, has a cause. The mitigation could take the form of measures that are preventive or remedial. The attitudes to natural disasters by the people of Mfangano are typical among other communities. Among the people of South Africa, for example, there is also widespread belief that hydrological hazards are released by specific deities and God in response to human misbehavior. Consequently, mitigation is sought in acts of repentance "to restore the divine balance" (IGAD, 2006)

1.2 Statement of Problem

Relying on indigenous knowledge, the communities are able to anticipate most of the disasters that afflict them. Disaster prediction and early warning leads to preparedness and other responses, and when the disaster impacts are brought under control, recovery starts. Isiolo is a disaster prone District. It is vulnerable to disasters such as drought, wild fire, raids, occasional floods along Ewaso Nyiro River and both livestock and human disease epidemics (Isiolo District Development Plan, 2002-2008). Pastoralists living in Isiolo therefore have to eke a living out of some of the most unstable environments in the world.

According to Isiolo District Development Plan, (2002-2008), drought and floods are considered as the most prevalent disasters in the district as they recur every other year. It also reports that as a result of the drought in the area, there has been loss of life of both human and livestock. It has also been noted that as a result of the drought, there has been frequent migration and the enhancement of problems such as environmental degradation from one location to another due to excess competition of scarce resources; often resulting into clan conflicts regarding grazing rights in the district. The focus on preparedness is aimed at making pastoral communities more resilient to shocks when they come, so that the negative impact of subsequent shocks is minimized. More capacity is thereby reserved for the next crisis thus perpetrating a sustainable relay mechanism. However, little information is available on the types of appropriate mechanisms to prepare pastoral communities to better cope with these shocks (Louise, 1998). This study is therefore to establish the community indigenous knowledge on the prediction of natural occurrences of these disasters in Central Division of Isiolo District.

1.3 Justification of the Study

The results of the study will be beneficial to NGOs dealing with disaster management as it provides information on the prediction of the disasters and the aspects of disaster preparedness and mitigation.

The communities living in Isiolo will benefit from this study as they will get to know more about how they can strengthen the level of indigenous knowledge in the community and also documentation of the same for posterity.

1.4 Hypothesis

The hypotheses for the study were as follows:

1.4.1 Null Hypothesis (Ho)

The communities living in Central division of Isiolo District do not use the indigenous knowledge to predict the natural occurrences.

1.5 Research Questions

i) What is the role of indigenous knowledge in prediction of natural occurrence of public health importance?

ii) What obstacles impede the use of indigenous knowledge in disaster prediction and preparedness?

iii) How can indigenous knowledge be incorporated in disaster prediction and preparedness?

1.6 Main Objective of the Study

The main objective of the study was to establish community indigenous knowledge used in the prediction of natural occurrences of public health importance in Central Division of Isiolo District.

1.6.1 Specific Objectives

The specific objectives of the study were:

1. To establish the history and status of Disasters in Central Division of Isiolo District.
2. Establish the formal disaster management techniques (by government, organizations and their levels of success) in Isiolo District.
3. To determine the various forms of indigenous knowledge used to predict natural occurrences by communities living in central division of Isiolo district.

1.7 Limitations of the Study

One limitation was issues pertaining to complete disclosure in the sensitive area of traditional medicine. Some informants may "Censure" information given to researchers in an apparent effort to guard intellectual property rights or the stealing of secrets.

Another limitation was linked to the educational level of the respondents. The researcher mostly used personal interviews as most of the respondents were not able to infill the questionnaires by themselves; hence it was time consuming.

1.8 Conceptual Framework

A conceptual framework is a model of presentation where a researcher represents the relationships between variables in the study and shows the relationship graphically or diagrammatically (Orodho, 2004). This will give an overview of the relationship between the variables to be tested and indigenous knowledge. In this study the independent variable is indigenous knowledge and the dependent variables are famine, drought, floods, and epidemic diseases. The Framework was as shown in Figure 1.1

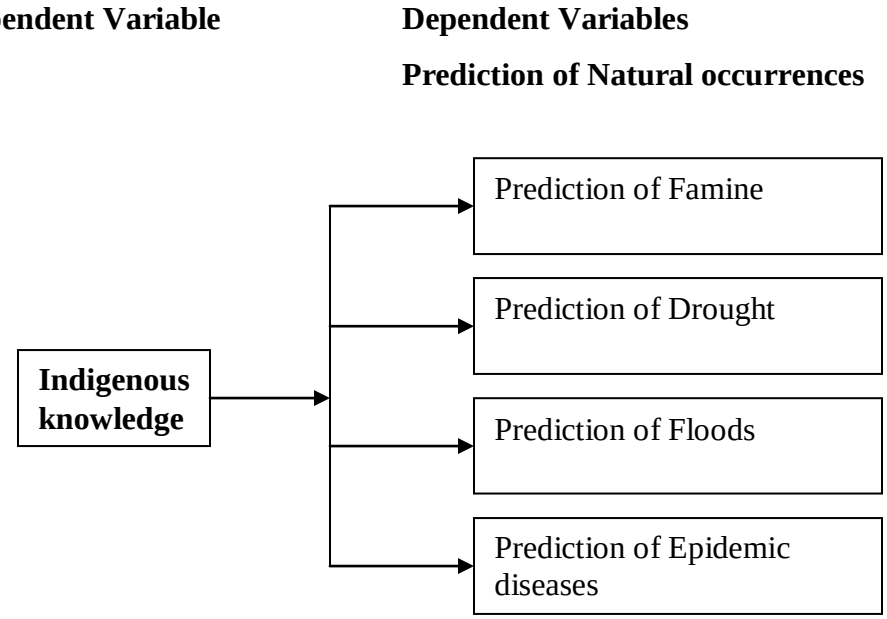


Figure 1.1: Conceptual Framework

CHAPTER TWO: LITERATURE REVIEW

2.1 Indigenous Knowledge

Indigenous knowledge can be defined as a body of knowledge built up by a group of people through generations of living in close contact with nature (Johnson, 1992). Indigenous Knowledge (IK) can also refers to the unique, traditional local knowledge existing within and developed around the specific conditions of a community indigenous to a particular geographical area, covering all aspects of life including management of the natural environment upon which their livelihoods and survival depend. Indigenous Knowledge is based on, and is deeply embedded in local experience and historical reality of a community. It develops over centuries of observation on how to adapt to local conditions. It therefore represents all the skills and innovations of a people, and embodies the collective wisdom and resourcefulness of a community. Indigenous knowledge is unique to a specific culture and plays an important role in defining the identity of a community (Belshaw, 1980).

According to Venek (1989), interest in indigenous knowledge has been expressed in a growing number of academic disciplines. Ten years ago most of the academics working in the area of indigenous knowledge represented anthropology, development sociology and geography. Today one finds important contributions to our understanding of indigenous knowledge and decision-making also being made in the fields of ecology, soil science, veterinary medicine, forestry, human health, aquatic resource management, botany, zoology, agronomy, agricultural economics, rural sociology, mathematics, management science, agricultural education and extension, fisheries, range management, information science, wildlife management, and water resource management.

2.2 Global Concern for Indigenous Knowledge

The United Nations Conference on Environment and Development in Rio de Janeiro in June 1992 (UNCED) highlighted the urgent need to develop mechanisms to protect the earth's biodiversity. Many of the documents signed at UNCED reflect the equally urgent need to conserve the knowledge of the environment that is also being lost in many communities (Van, 1999).

In order to achieve the full potential of participatory approaches to sustainable development, it is important that there be greater recognition for the immense value of indigenous knowledge for development activities. A growing number of formally established indigenous knowledge resource centers are active. At present there are 8 such centers: in The Netherlands, the United States, Sri Lanka, Mexico, Nigeria, The Philippines, Ghana and Indonesia (Larson, 1998).

The functions of the indigenous knowledge resource centres mentioned includes: national and international networking, information exchange, documentation of the indigenous knowledge systems existing within the country in question and research on the impact of new circumstances constraining these systems, and on the role that extension could play in helping small-scale farmers move through difficult transition periods (Andre, 1993). The center's functions also include designing educational materials for use in universities and in the national institutions that train extension workers, so that more people learn how to record indigenous knowledge systems; and establishing documentation units where recorded systems are stored and made accessible for use by development workers (Ibid, 1993).

2.3 Importance of Indigenous Knowledge

Over the course of history, communities develop a culture and lifestyle that is intricately tied to nature and the local ecosystem. Indigenous knowledge is firmly incorporated into the belief systems, myths and folklore of society; it informs local practice. It shapes decisions regarding the use of resources and environmental conservation. It helps to

avoid the incidence and negative impacts of natural disasters. It provides guidance on agricultural practices and food preservation, health care and a host of other activities. It constitutes an environmental management system that is largely community led (Kihupa, 2000).

Principle 22 of the 1992 Rio Declaration on Environment and Development specifically underlines the vital role that indigenous people and their communities play in environmental management and development because of their knowledge and traditional practices (Wisner *et al*., 2004). It calls for recognition and support of their identity, culture and interests to enable their effective participation in the achievement of sustainable development. The global scientific community has acknowledged the importance of IK. It was endorsed at the World Conference on science held in Budapest, Hungary, 1999, which recommended that traditional knowledge be integrated into science, particularly in the fields of environment and development (Warren, 1999). Further, the Preamble of the United Nations Declaration on the Rights of Indigenous Peoples, adopted on 29 June 2006 by the Human Rights Council, highlights respect for IK, cultures and traditional practices, which contribute to sustainable and equitable development and management of the environment (Hum, 2006).

2.4 Categories of Local Knowledge

Local knowledge refers to a collection of facts that relate to the entire system or concepts, beliefs and perceptions that people have about the world around them. It is divided into three categories: common knowledge shared knowledge and specialized knowledge. Common knowledge is that which is held by most people in a community; for example, nearly everybody in a community may know how to roast maize. Shared knowledge, on the other hand is held by many but not all community members; for example, people who brew *busaa* (a traditional beer in Kenya) share skills other people may not have. *Specialized knowledge* is held by a few people in a community who might have had special training or apprenticeship; for example, only a few people are traditional rain predictors, healers, or midwives (Linthicum *et al*., 1999)

2.5 Exchanging indigenous knowledge

As IK is predominantly embedded in practices and experiences, it is most commonly exchanged through personal communication and demonstration, from master to apprentice, from parents to children, from neighbor to neighbor and from traditional leaders to the community (Berkes, 1999). Various communities have different ways of disseminating indigenous information. For instance, faced with an impending disaster, the clan elders in some communities in Kenya beat specific drums and sound horns to alert people to assemble at known meeting points where specific advice or instructions are communicated and appropriate preparedness and response actions are decided upon. George (1993) says that, although IK is readily shared among members of a community where the providers and recipients have the same culture and speak the same language, it is generally shared to a lesser degree across communities. This is because, in most cases, the exchange of IK is ingrained in cultural values, which cannot easily be recognized by an external observer. For instance, various messages can be communicated through drumming, understood only by members of a particular community.

2.6 Indigenous Knowledge in Disaster Management

Indigenous communities know that a well-conserved environment helps reduce risks associated with natural disasters and have the knowledge and administrative structures to cope with disasters. In Africa, in particular, local communities have well-developed traditional systems and coping strategies that make them more resilient to environmental changes (Alensio, 1998). Further, IK is used to help local people cope with day-to-day challenges, detect early warning systems of change and know how to respond to challenges, including knowing which plants to conserve and protect, which medicines to use, where to find food or water in times of crisis, which signs signal oncoming natural catastrophe and which plants and animals are best avoided. Indigenous knowledge is also a life raft that, in the event of a disaster, keeps communities afloat before external aid arrives (Ophelia and Veit, 1995)

2.6.1 Disaster Early Warning

Each community has an array of early warning indicators and well-developed structures through which the wisdom of the community is applied to deal quickly and efficiently with disasters. The structures include a council of elders which has at its disposal, as a study in Kenya reported, "the speed and strength of numerous young people that could be used to investigate a particular phenomenon or to pass on urgent messages upon need." (Oba, 1982)

In Kenya, for example, the Banyala community in Budalang'i on the shores of Lake Victoria had a well-organized system for mitigating impending disasters. There were elders who dealt with rainfall prediction and early warning. Each homestead had a dug out canoe ready for transport in case of heavy flooding. Each community was also required to dig trenches to control the water around the homestead and around farmlands (Owiro *et al.*, 1996).

In Swaziland, where drought and occasional floods are common disasters, communities use various methods to predict disasters. For example, they use the height of the nests of the *emahlokohloko* bird *(Ploceus spp.)* on trees growing by river banks to predict floods. When floods are likely to occur, the nests of the *emahlokohloko* are very high up on the trees and when floods are unlikely the nests are low down. The Swazi also use the cry of certain birds to predict rain, and yields of certain wild fruit plants to predict famine. Other indigenous methods used by the Swazi to predict natural hazards include wind direction, the shape of the crescent moon and the behaviors of certain animals.

In Tanzania, animals feature prominently in prediction of drought and famine. For instance, by reading signs on goat intestines, specialized Maasai elders can divine drought and predict incoming famine or diseases. In the regions of Nenets autonomous Okrug and Kamchatka of the Russian Federation, the hunters, gatherers and herders interviewed in a UNEP study described how careful observation of the behaviors of animals, and of the appearance and color of the sky, is used as early warning of natural disasters. "When the dogs start rolling on their backs on the snow and the crows circle in flocks and then hide, a blizzard is coming," explained a hunter from Kamchatka (Sokoine, 2000).

In Indonesia, the Simeulue community (population 80,500) of farmers, fishermen and traders close to the epicenter of the 26th December 2004 tsunami survived by rushing to nearby hills in response to long held IK on the behaviors of their buffaloes. Only seven people from the community lost their lives, compared to 163,795 that died across the rest of Indonesia's northern Aceh province. In recognition of their application of IK in saving thousands of lives, the community, through their leader, was awarded the prestigious United Nations Sasakawa Award for Disaster Reduction. This brought to the fore the applicability and relevance of IK in natural disaster situations. "It was the one community that had its own traditional way of avoiding the impact of a tsunami," Nannie Hudawati, a senior official at Indonesia's national disaster management office, told the press (Lewinski *et al.*, 2003).

According to Mogege, (2005) two communities stood out in the aftermath of the 2004 tsunami for relying on IK and fleeing to safety. The sea gypsies along Thailand's southern coast and the tribal communities living on India's Andaman and Nicobar islands used their IK to flee the shore for higher ground, saving thousands of lives. These communities have an intense early warning system involving the observation of the behavior of creatures in their surrounding. The cries of the birds, the frenzy of the smaller mammals and even the change in the swimming pattern of the marine animals, all give them clues and signals of approaching natural disasters like storms and tidal waves. Those communities reportedly survived the tsunami disaster more successfully than other people in the region because of their indigenous early warning system. The community's sense of the sea provided them with an early warning before the strong waves hit the islands.

Surveys conducted by the Coast Guards confirmed that all the five of the indigenous tribes had instinctively moved to higher grounds. Prior to the onset of typhoons, communities living in the typhoon prone areas of Saigasaki and Tano districts of Japan keenly observe the quick eating habits of birds. They carefully observe the *tsubane* (swallows), which normally build their nests at the second floor of houses in the

neighborhoods; when they build their nests at the third or fourth floors, it indicates that the forthcoming typhoon would be big and strong with a high water surge. The communities also apply the same rule for honeycombs. Their predictions are known to be highly accurate (Guyton *et a.l*, 2000). In Bangladesh, local communities prepare movable cookers *(chula)* to preserve dry food, fuel, and fodder before floods. They also prepare boats and rafts for emergency rescue operations. To cope with cyclones and storm surges, the communities also apply appropriate response measures such as storing dry food and valuable seeds, stocking fuel, constructing bamboo mat based platforms ***(matchas),*** and many other measures that go a long way in saving lives and property.

2.6.3 Disaster management strategies

As disaster reduction becomes essential to sustainable development, disaster reduction policies and measures need to be developed and institutionalized at national and local levels. They should enable communities to be resilient to natural hazards while ensuring that development efforts do not increase vulnerability to those hazards.

In pursuit of the total disaster risk management approach, Decade for natural Disasters Reduction (IDNDR), (1993) recommended the following strategies for effective disaster management:

(1) Policy. A clear and comprehensive policy that defines the objectives and commitment of the government, organization, or community to disaster reduction and response efforts, is important. This may assume the form of legislation, policy guidelines, promulgated plans, or protocols. A policy developed through a strategic and consultative planning process could effectively address the identified gaps in the disaster management cycle.

(2) Structures and systems. Organizational structures and systems that facilitates and ensures coordination of stakeholders' action and contributions should be in place. This involves the establishment and strengthening of focal points and national and local coordination bodies for disaster reduction and response activities, and disaster management systems.

(3) Capacity enhancement. The enhancement of national and local capacity to establish and implement disaster reduction and response measures, especially for vulnerable

sectors and communities, should be a constant undertaking. This includes education and training in disaster reduction and related fields.

(4) Resources. The identification and provision of resource requirements, including funds and trained human resources, are important. This includes means to access and use authorized fund appropriations for disaster reduction and response.

2.7 Types of Disasters Managed Through Indigenous Knowledge in African Communities

Many countries in Africa suffer from a range of natural disasters including drought, floods, landslides, windstorms, thunderstorms, lightning strikes and epidemics. Drought, and the associated famine and poverty, is however the most ravaging of the natural disasters that afflict those countries. Floods and epidemics can also cause serious devastation and destruction but these are not as common or persistent as drought.

2.7.1 Drought as a Common Disaster in Isiolo District

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 rains of 1997 and 1998 Kenya experienced prolonged drought in many areas leading to famine and starvation (Republic of Kenya, 2004).

Kenya experiences a number of natural hazards, the most common being weather related, including floods, droughts, landslides, lightening/thunderstorms, wild fires, and strong winds (Republic of Kenya, 2004). Other hazards experienced in Kenya include HIV/AIDS, and conflict. In the recent past these hazards have increased in number, frequency and complexity. The level of destruction has also become more severe with more deaths of people and animals, loss of livelihoods, destruction of infrastructure among other effects resulting in losses of varying magnitudes.

The Arid and semi-arid lands of Kenya make up more than 80% of Kenya's landmass, support nearly half of the livestock population of the country and over 30% of the total human population (Republic of Kenya, 2004). The Arid and Semi-arid Lands (ASALs) are prone to harsh weather conditions rendering the communities within this region vulnerable to natural hazards, mainly droughts. The ASALS, due to their fragile ecosystems, unfavourable climate, poor infrastructure and historical marginalisation these areas represent a major development challenge for the affected populations, the Government of Kenya and its development.

According to Republic of Kenya (2004), 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.

Drought is one of the disasters which affect the people living in Isiolo District; it has had a devastating impact on the economy of the local community. Drought has had a devastating impact on the economy of the local community. For example, livestock die and this greatly affects the economy as cattle, Camels, Sheep and Goats are a major source of wealth in the community. Because of the persistent droughts that occur in this region from time to time, food insecurity and epidemic diseases from both human and livestock is high (Isiolo District Economic Recovery Strategy Implementation Reports 2002/03-2005/06). Disasters disrupt people's lives through displacements, deaths and injuries. They destruct livelihoods and drain years of economic gains and development. Natural disasters for instance cause loss of lives and property, displacement of people from homes, destruction of infrastructure like roads, rails and telecommunication lines, contamination of water sources causing diseases or depletion of the same altogether (Republic of Kenya, 2004).

Predicting the weather is an important aspect of indigenous knowledge. The Borana community of Central Division who were the target in this study has ways and means of predicting and foreseeing impending events, calamities and disasters as ascertained by finding in this research and discussed explicitly in the forthcoming chapters. In some communities, the role of predicting events is left to the elders, families or clans that specialize in that art (Woods and Grein, 2002). The Nganyi clan of Bunyore in western Kenya is known for their powers in predicting rain. The community, which relies largely on maize farming, uses the information to make decisions that include mixed cropping of maize, beans and millet; planting of cassava and potatoes; sending some of the livestock to friends and relatives living near the lake; drying and storing of food for use during drought periods. Makueni in Kenya suffers from frequent drought that is equally devastating for the locals. Prolonged drought can be particularly disastrous in the district. In fact, the famines that are best remembered in Kenya are associated with drought (Almazrou *et al.*, 2003).

2.8 Disaster prediction and early warning

The indigenous knowledge on disaster prediction and early warning is based on keen observation of the behaviors of animals, birds, insects, vegetation, trees, winds, air and water temperatures, clouds, earth movements and celestial bodies. However, the sets of indicators used in each community are homegrown. A brief look at the early warning systems in the different communities shows how localized the systems can be.

2.8.1 Indigenous Early Warning Systems in African Communities

In many areas of Kenya the presence of snakes and other reptiles, as well as wild animals, around homesteads in search of water and food indicated the prevalence and continuity of drought. Around Lake Victoria, the arrival of the common swallow in large numbers circling the sky was seen as an indicator of the onset of the rains, while the changing songs and cries of the robin was an indicator that it would rain on that day. If the birds delayed their immigration, it indicated the possibility of poor seasonal rainfall.

According to Matowanyika, (1994), In South Africa indigenous knowledge greatly influences the way people react to natural disasters. There is, for instance, strong belief among many communities that hydrological hazards are caused by human action. They believe that such hazards are released by specific deities in response to human misbehavior. Consequently, mitigation of disasters is sought in acts of repentance which are required to "restore the divine balance." In Swaziland, a variety of methods are used to predict the weather. Most of the indicators are based on environmental cues and the behaviors of animals. For example, the height of the nests of *the emahlokohloko* bird (Ploceus spp.) is used to predict floods. When floods are likely to occur the nesting of the *emahlokohloko* is very high up the trees next to the river and when floods are unlikely the nests are low down. (Ibid, 1999)

In Tanzania, many communities have a wealth of early warning indicators. In Tanzania animals feature prominently in prognosis. For instance, by reading signs on goat intestines specialized Maasai elders could divine drought and famine, social conflicts, diseases, childbirth, peace or war in the chiefdom, and so forth. If the small intestine was found to be empty, drought or famine or hostility and war were to be expected in the chiefdom but if it had a lot of dung this foretold plenty of rain, no famine and peace. If more goats than usual were seen mating in August-September this was seen as a sign that the season was going to have a lot of rain (Van, 1999).

2.9 Limitations of Indigenous Knowledge

As with other forms of knowledge, indigenous knowledge has its limitations or weakness, and these must be recognized if its integration with scientific knowledge is going to be worthwhile. Certain indigenous knowledge practices may also become outmoded because of rapid changes in the environment or the socio-economic and cultural scene. Not all indigenous knowledge practices are naturally in harmony with the environment (Akabogu, 2000). Indigenous knowledge is dynamic and evolves all the time. However, Thrupp, has noted how sometimes indigenous knowledge that was once well-adapted and effective for securing a livelihood in a particular environment becomes inappropriate under conditions of environmental degradation and when change is particularly rapid or

drastic, the knowledge associated with them may be rendered unsuitable and possibly damaging in the altered conditions (Ibid).

CHAPTER THREE: MATERIALS AND METHODS

3.1 Research design

The research design used in the study was survey. This design entails an extensive research on the nature of existing conditions. The design was chosen because it permits the researcher to adopt a holistic approach in the study of the chosen social institutions in attempt to use indigenous systems in early warning mechanisms.

3.2 Study Location

Isiolo is one of the thirteen districts that form Eastern Province (Appendix VI). It borders Marsabit to the North, Garissa and Wajir Districts to the South east and East respectively. It also borders Tana River, Nyambene and Meru districts to the south, Laikipia and Samburu districts to the West. The district is located between longitude 36º 60´ and 38º 50´ East and Latitude 0º 5´ and 2º North. The district covers an area of 25,605 km² (Isiolo Sistrict Development Plan 2002-2008)

Isiolo is divided into six Administrative Divisions namely Central, Garbatulla, Sericho, Merti, Oldonyiro and Kinna before Garba Tulla was carved out of it as a district. It also has twenty two locations and and fourty four sublocations. The district has two constituencies: Isiolo North and Isiolo South constituencies. Isiolo North Constituency comprises Central, Oldonyiro and Merti Divisions, while Isiolo South comprises Kinna, Garbatulla and Sericho Divisions. (Isiolo District Development Plan 2002-2008)

Central Division is therefore one of the six divisions in Isiolo District. According to Isiolo District Development Plan, (2002-2008), the division covers an area of 1,411 km². The division is divided into 4 Locations and 8 Sub-Locations. The location of the study was in central division of Isiolo District in Eastern Province of the Republic of Kenya. The researcher chose this location because of the familiarity with the social and geographical terrain of the place, hence was able to conduct the research in the area. The maps for the location of the study area that is Isiolo District and Central Division are presented in appendix VI.

3.3 Study Population

The study populations were derived from 10 settlements in Central Location of Central Division of Isiolo District, which is one of the populous administrative units in the district and mainly occupied by all the immigrants from other divisions within the district and therefore this entails that there is cross-cutting array of knowledge reservoir hence one of the selection theme. Central division has a projected population of over 20,000 people as per 2005/2006 Isiolo district Economic recovery strategy implementation progress report.

3.4 Inclusion Criteria

i) Couples in each selected household were sampled systematically. The whole household was considered as a study participants but only the head of the household participated in the study.

ii) Provided one is the head of the household, and is above 18 years can participate in the study

iii) Known community indigenous knowledge talented persons or predictors are considered as key informants in the selected settlement.

iv) Head of Government department, NGOs, CBOs, FBOs, opinion leaders and religious leaders are selected as FGDs for the study.

3.5 Exclusion Criteria

i) Children (minors) were not included in the study.

ii) Mentally unstable persons in the selected household were not included in the study

3.6 Sampling Procedure

When conducting research, it is often impossible, impractical or too expensive to collect data from all the potential units of analysis included in the research problem. Hence smaller number of units, a sample, is often chosen to represent the relevant attributes of

the whole set of units, the population (Cooper and Schindler, 2001). The researcher used convenience sampling due to researcher's familiarity of the social and geographical terrain of the study area.

3.7 Sample Size

The total sample size was 384 which were distributed proportionately to the number of households in each selected settlements. The sample size determination was done as per Kothari (2004).

$$n=\frac{Z2pq}{e2}$$ (Kothari, 2003)

Where

n = desired sample size

Z = normal standard deviation at required confidence level (1.962)

p = we use p as 0.5 when we cannot predict the percentage of the population with the desired characteristics.

q= 1-p (proportion of the target population with no having desired characteristics hence 0.5)

e= error margin = 0.05

$$n=\frac{1.962x0.5x0.5}{0.05 \times 0.05}$$

n = 384

3.8 Data collection Instruments

The main type of research instrument used in the study was structured questionnaire as shown in the Appendix II. Above all other Data collection methods are; key informants interview (KI I), focus group discussion (FGDs) and Desk study to review documentary and historical analysis of the disasters in the study area.

3.8.1 Focus Group Discussion

Focused Group Discussions are special type of group interviews composed of 12-16 participants. The researcher had held four focus group discussions at different times in the course of his survey, each FGDs held were facilitated by the Principal Investigator

using prescribed interview guide as attached in (Appendix I). The FGD's participants include opinion leaders, heads of CBO's, NGO', religious groups and Government departmental heads as shown in attached (Appendix V) while Key informants are selected resourceful villagers in each selected settlements as shown in attached (Appendix V) too. The facilitation in each series of the meeting with Focus group discussions and Key informants was done by the Principal investigator assisted by his two research assistants.

3.8.2 Desk review

A desk study, including a review of the relevant literature available on indigenous knowledge, methods used in disaster prediction, mitigation and preparedness were derived from existing Government and organizational records found in Isiolo district, this actually describe the form of secondary data required as a back up in this research. The Arid lands Resource Management Project lately under the Ministry of the Development of Northern Kenya and other Arid lands play a vital role in containing disasters in the district, they predict disasters by relying solely on Metrological reports monitored country wide, it also monitor the drought trends in the district the so called "Drought 23 Cycle Management" which is done by collecting information from the selected clusters with in communities' settlement villages in the district; they employ drought monitors which do assessment using a prescribed questionnaire. During desk study the Researcher observed that Drought, Floods, Famine, Epidemic diseases in both human and livestock are the commonest disasters in the district. Some notable secondary data was in Dec. 2006 when floods from Meru region stroked Isiolo town and six people lost life with property of unknown value destroyed ALRMP (2006) annual report and in the same year Wasso nyiro river burst its bank and surrounding villages submerged resulting to death of 150 livestock and two people died DALEO (2006) annual report, and in the same year 80 livestock deaths report due to Rift valley fever.

3.9 Data Collection

The task of data collection begun after research problem had been defined and research design plan made. While deciding on the method of data collection to be used, the

researcher kept in mind two types of data; primary and secondary data. Primary data are those which are collected afresh for the first time from the immediate source for the purpose of the research whereas secondary data are data which have already been collected by someone else and which have already been passed through the statistical process (Kothari, 2004).

The primary data was collected by use of questionnaires which were administered to the respondents through personal interviews. This was because most of the respondents were not able to in-fill the questionnaires by themselves; this was attributed to the high level of illiteracy in the study area.

3.10 Ethical Considerations

Ethical issues are quite delicate in any research. In his endeavor to accomplish the research objectives the Principal Investigator sorted for ethical approval from all the relevant bodies which includes Kenyatta university ethical committee, Ministry of Higher Education, Science and Technology, Ministry of Culture and National Heritage in Isiolo district and finally a permit from Office of the President (Provincial administration) that is from the local chief of Central location in Central division of Isiolo district being the epicenter of the survey area.

Informed consent was also sought from the respondents through an assurance that any information they gave was to be treated with ultimate confidentiality it deserves. Above all the researcher trained his two research assistants on the vital roles Ethics plays for two days before embarking on data collections.

3.11 Data Analysis

Data was first edited to identify errors. Coding was done to translate question responses into specific categories. Code numbers were assigned to each question and from these a coding list or frame was obtained. Data were analyzed with the aid of a computer on Statistical Package for Social Sciences (SPSS). The researcher used descriptive statistics

mainly frequencies and percentages. The findings were then presented in the form of tables, pie-charts and bar-graphs.

CHAPTER FOUR: RESULTS

4.1 Demographic Profile of the respondents

In order to establish the demographic and social characteristics of the respondents, the researcher asked the respondents to indicate their settlement name, age, gender, level of education, marital status, occupation, monthly income and religious affiliation.

4.1.1 Settlement names

Table 1 shows that most of the respondents (18.0%) were from Bulla Mpya settlement and 15.9% were from Kambi Garba.. The other settlements from which most the data were extracted include: Olla Jarole 15.6% and Olla Bulle. This shows that the data was evenly collected from the settlements within central division hence increasing the accuracy of the results as it incorporates views from different people from a wide area.

Table 4.1: Settlement names

Settlements	No of respondents	Percent (%)
KAMBI GARBA	61	15.9
OLLA BULLE	50	13
MAISHA BORA	18	4.7
KAMBI SHEIKH	24	6.3
UHURU ESTATE	18	4.7
BULLA PESA	27	7
BULLA MPYA	69	18
OLLA JAROLE	60	15.6

KAMBI JUU	27	7
OLLA ODHA	30	7.8
Total	384	100

4.1.2 Distribution of the respondents by age

The findings showed that majority of the respondents (26.6%) were between 31-40 years, followed by age groups 21-30 and 41-50 having 25.5% and 20.3% respectively. The results were as presented in the figure 1 below. This indicates that the data was collected from different age groups hence giving the general understanding of every age group as far as the subject of the study was concerned. Correlation analysis was also done using chi-square between the age of the respondent and the knowledge on the frequency of occurrences of disasters. The results was that; $\chi^2=15.745$, p=0.399, df 15. This finding showed that there was no significant relationship between the age of the respondents and the knowledge on the frequency of disaster occurrence.

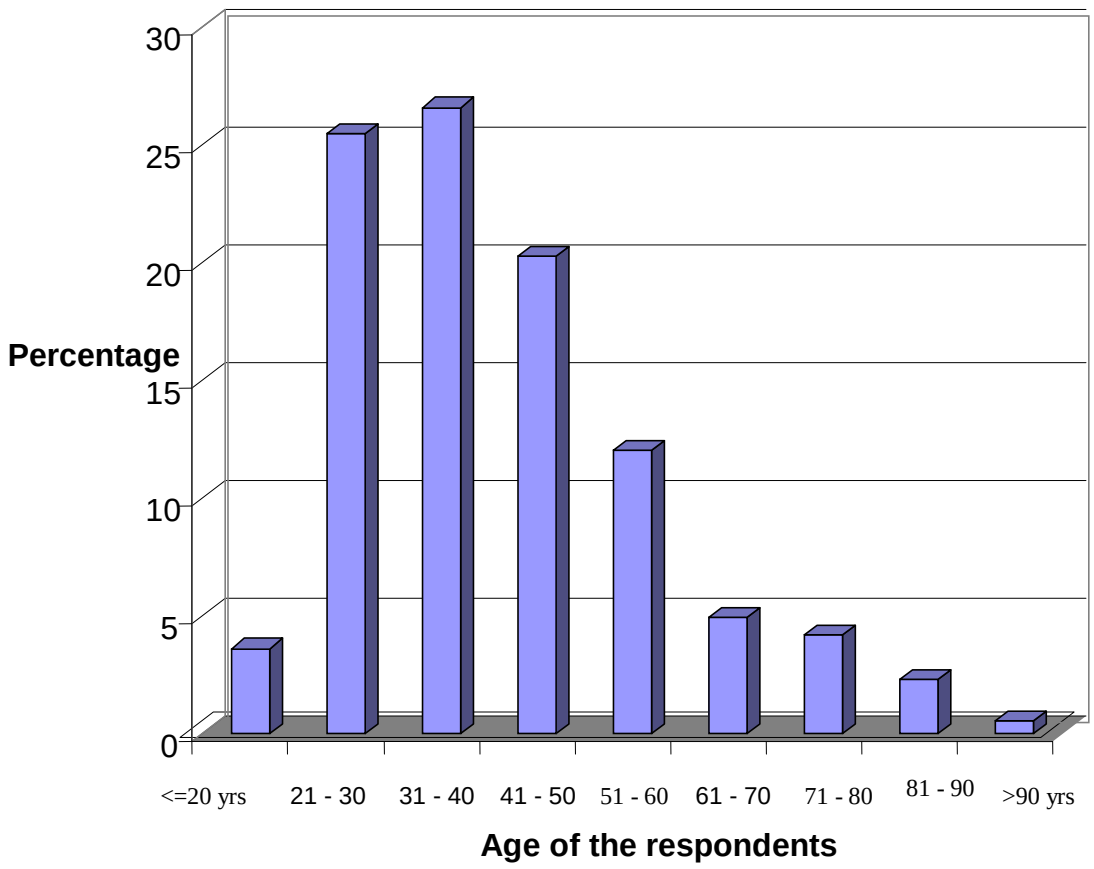


Fig 4.1: Distribution of the respondents by age

4.1.3 Distribution of the respondents by gender

To establish the distribution of the respondents by gender, it was found that female were many represented by 55.7% compared to males who were represented by 44.3% of the total respondents. This indicated a well mixed perspective of the subject matter as far as data collection was concerned. It also shows that the most available respondents in the study area were female. The results were as shown in figure 2. Correlation analysis was done between the gender of the respondents and the types of indigenous knowledge used in the prediction of disasters. The findings was that; $\chi^2 = 11.210$, $p=0.262$, df 9. This showed that there was no significant relationship between gender and the prediction of disasters using indigenous knowledge.

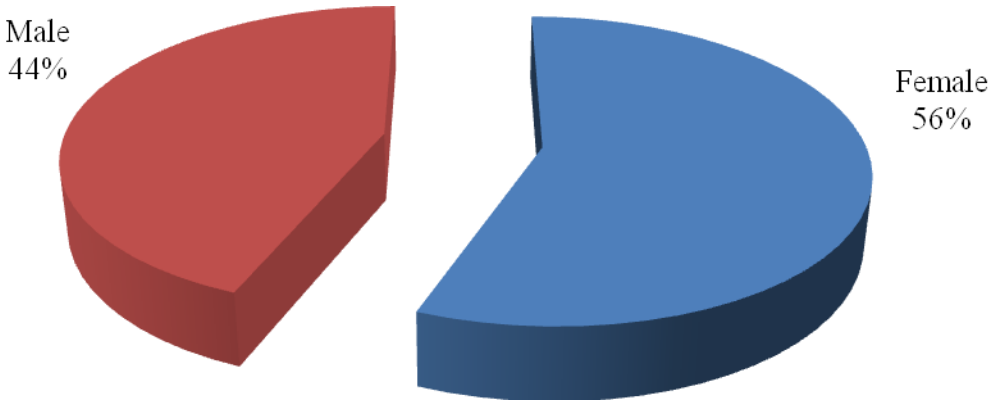


Fig.4. 2: Distribution of the respondents by gender

4.1.4 Distribution of the respondents by level of education

In response to the question pertaining to the respondents level of education; Figure 3 below shows that the majority (57.6%) of the respondents had formal education with 27.1% having had primary education and 24.5% having reached O level education. 6.0% had post secondary education. 42.4% of the respondents had indigenous knowledge (Non-formal education) only. This results showed that majority of the respondents had non-formal education background; this gave them a better ground to reason on the prediction of disaster basing their argument on indigenous knowledge. A correlation analysis was done using the chi-square between the education level of the respondents and the knowledge of frequency of disaster occurrences. The results was that; $\chi^2=15.745$ p=0.399, df 15. From this it was found that there was no significant relationship between the respondent's level of education and knowledge of the frequency of disaster occurrences.

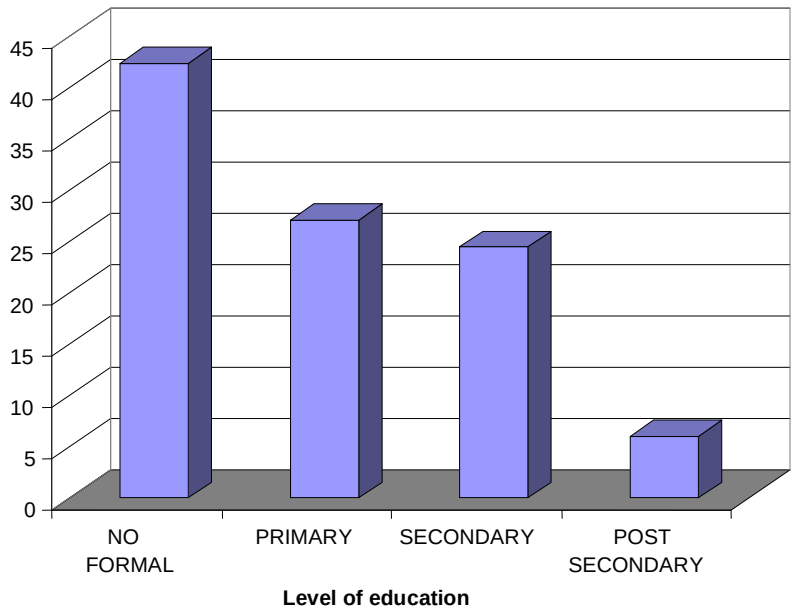


Fig 4.3: Distribution of the respondents by level of education

4.1.5 Distribution of the respondents by income

The mean monthly income for most of the respondents was 7,000 shillings with a mode of 1,000 shillings representing 9.9% of the respondents. 24.5% of the respondents earned up to 2000 shillings with 19.8% having an income of between 4,000 and 6,000 shillings a month followed by 19.0% earning between 2,000 and 4,000 shillings a month. Fig. 4: shows that 31.2% of the respondents had monthly earnings of 8,000 shillings and above. The highest earning respondent earned 70,000 shillings while the lowest earned 500 shillings.

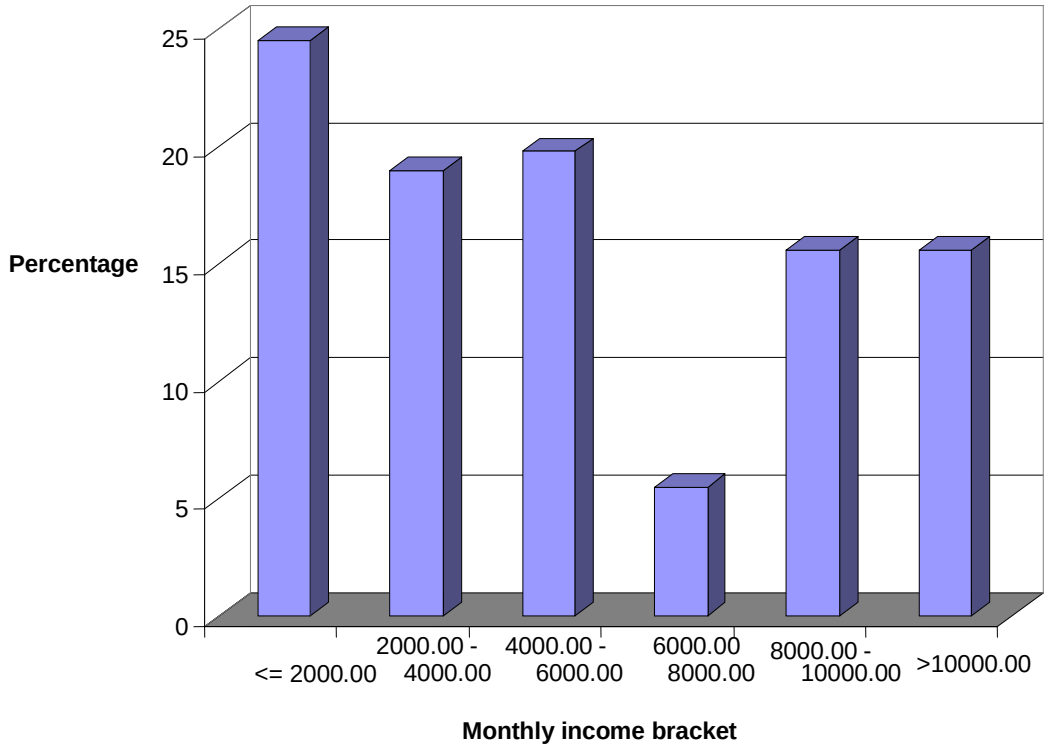


Fig. 4.4: Distribution of the respondents by income

4.1.6 Distribution of the respondents by marital status

Fig.4. 5 shows that most (62.2%) of the respondents were married while 16.7%, 6.3% and 3.4% were widowed, divorced and separated respectively. 11.5% of the respondents were single. A correlation analysis was done between the marital status of the respondents and the knowledge of the common disasters affecting people in the study area. It was noted that there was no significant relationship between the marital status of the respondents and the knowledge of the common disasters affecting the people in the study area. (χ^2=29.346, df= 24, p=0.207).

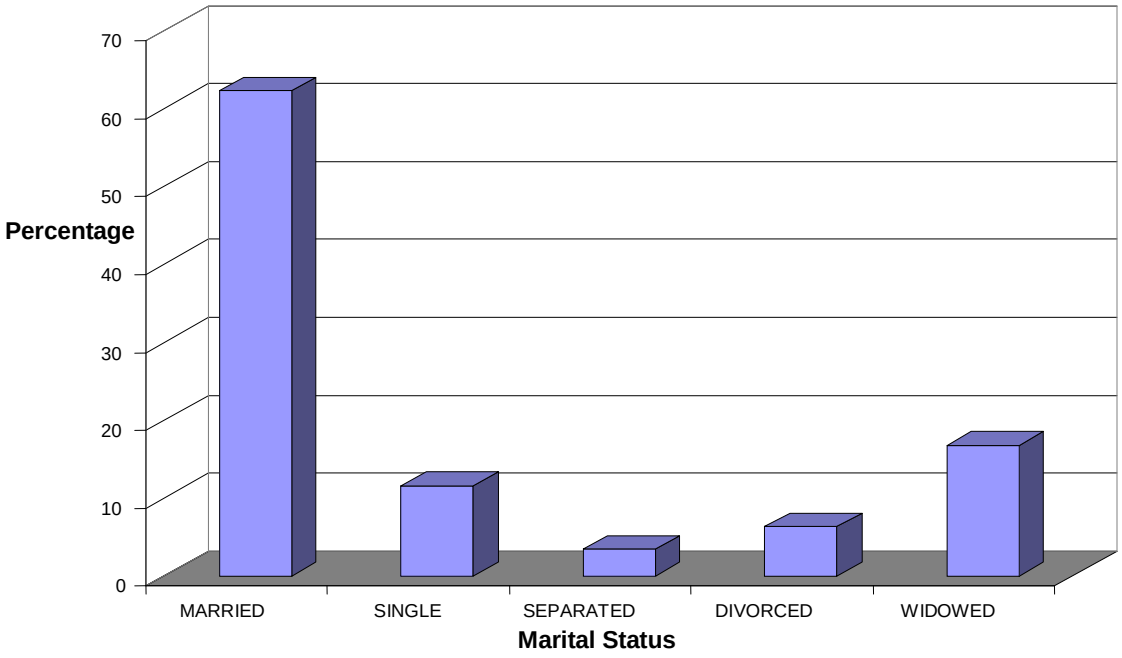


Fig.4. 5: Distribution of the respondents by marital status

4.1.7 Distribution of the respondents by occupational status

Fig. 4.6 shows that 73.4% of the respondents were unemployed compared with 26.0% in formal employment. Only 0.5% self-employed, this shows that majority of the respondents depended on other sources of income other than employment. It also reflects on the economic activity of the people living the area of study it was observed that they depend on other sources of income other than employment. A correlation analysis was done using the chi-square on the relationship between the employment status of the respondents and the types of indigenous knowledge used in the prediction of disaster. It was established that there was no significant relationship between the employment status and the types of indigenous knowledge used in the prediction of disasters. (χ^2=26.078, p=0.098, df=18).

Fig.4. 6: Distribution of the respondents by employment status

4.1.8 Distribution of the respondents by religious affiliation

Majority of the respondents (74.7%) were Muslims while 24.5% were Christians and Traditionalists accounted for 0.8%. The results were as shown in figure 4.7 below.

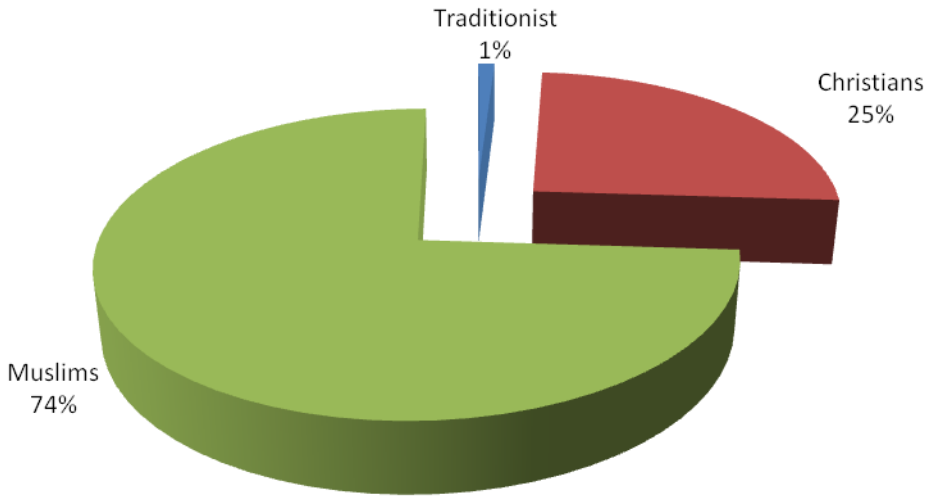


Fig.4.7: Distribution of the respondents by religious affiliation

4.2 Disasters in Isiolo

4.2.1 Common disasters affecting people of Isiolo district

Famine was found to be the common disaster affecting the people of Isiolo district with 37% followed by droughts with 31% and epidemic diseases 18%. It was also noted that 14% of the respondents indicated that floods was among the disasters which affected the people living in Isiolo district, the results were as shown in figure 4.8. A correlation analysis was done using the chi-square between the age of the respondents and the knowledge of the common disasters affecting the people of Isiolo; (χ^2=49.736, p=0.404, df =48). The result revealed that there was no significant relationship between age of the respondents and knowledge of common disasters affecting the people.

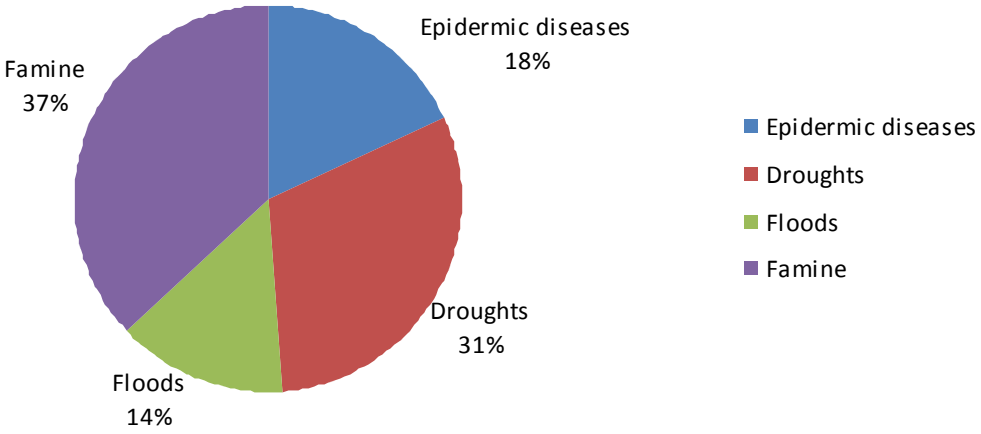


Figure 4. 8: Common disasters affecting people of Isiolo district.

4.2.2 Epidemic diseases affecting people in Isiolo district

Malaria was found to be quite a common epidemic disease (9.6%) followed by Typhoid (4.7%). Table 10 also shows that 1.8% of the respondents thought TB was a common epidemic together with Brucellosis (1.0%) and HIV/AIDS (0.8%) with 80.5% not responding to the question or unaware of the epidemics facing the community(Table 4.2)

Table4. 2: Common epidemic diseases affecting people in Isiolo district

Epidemic disease	No of respondents	Percent
TB	7	1.8
BRUCELLOSIS	4	1.0
TYPHOID	18	4.7
MALARIA	37	9.6
DIABETICS	6	1.6
HIV/AIDS	3	0.8
NO RESPONSE	309	80.5
Total	384	100

4.2.3 Common disasters affecting livestock in Isiolo district

Drought was found to be the common disaster affecting livestock in Isiolo district with 54% followed by epidemic diseases with 33.3% and floods at 12.2%. Only 0.5% of the respondents indicated that clan conflict affected livestock. The results were as shown in table 4.3.

Table 4.3: Common disasters affecting livestock in Isiolo district

Disaster	No of respondents	Percentages (%)
DROUGHT	207	54
FLOODS	47	12.2
EPIDEMIC DISEASES	128	33.3
CLAN CONFILCT	2	0.5
Total	384	100

4.2.4 Common epidemic diseases affecting livestock in Isiolo district.

Parasitic diseases were found to be common epidemic diseases (15.1%) followed by CBPP (6.8%). The results showed that 4.7% of the respondents indicated that foot and mouth disease was a common epidemic disease for livestock together with Nagana

(0.3%) and Rift valley fever (0.3%) and 72.9% not responding to the question or unaware of the epidemics facing their livestock (Table 4.4)

Table 4.4 Common epidemic diseases affecting livestock in Isiolo district

Epidemic disease	No of respondents	Percentages (%)
CBPP	26	6.8
NAGANA	1	0.3
FOOT AND MOUTH DISEASE	18	4.7
PARASITIC DISEASES	58	15.1
RIFT VALLEY FEVER	1	0.3
NO RESPONSE	280	72.9
Total	384	100

4.2.5 Commonest disasters affecting people in Isiolo district

Figure 4.9 below shows that famine was the commonest disaster (29%) affecting the people of Isiolo district followed by drought with 23% and epidemic diseases with 17.4%. Floods accounted for 4% of the respondents with poverty, clan conflict and lack of water having 2% and 1% respectively.

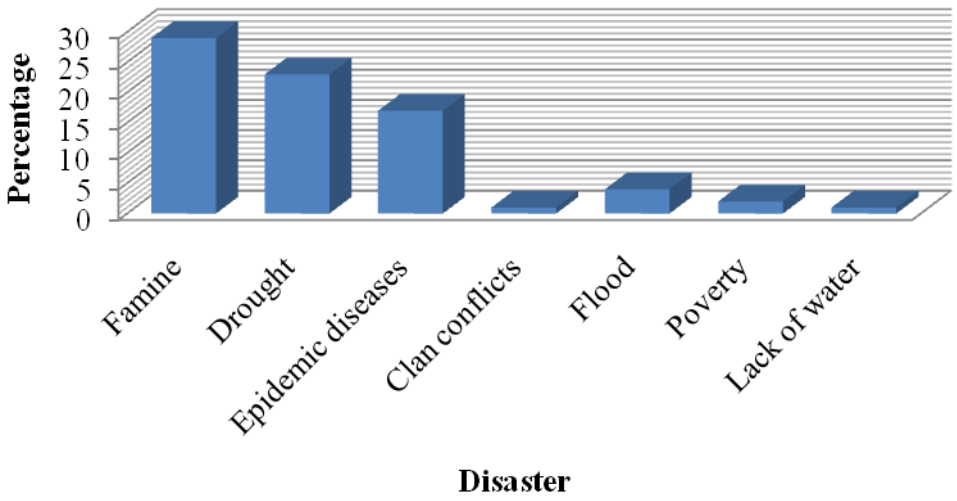


Figure 4. 9: Commonest disasters affecting people in Isiolo district

4.2.6 Commonest disasters affecting livestock in Isiolo district

Livestock in Isiolo district were mostly affected by drought (46%) and epidemic diseases (39%). Armed conflict accounted for 3% of livestock disasters while famine contributed 2%. The rest of the disasters affecting livestock like cattle rustling, Elephant attacks and Lack of water each represented by 1%; these were considered to have the least effect in livestock.(Fig 4.10)

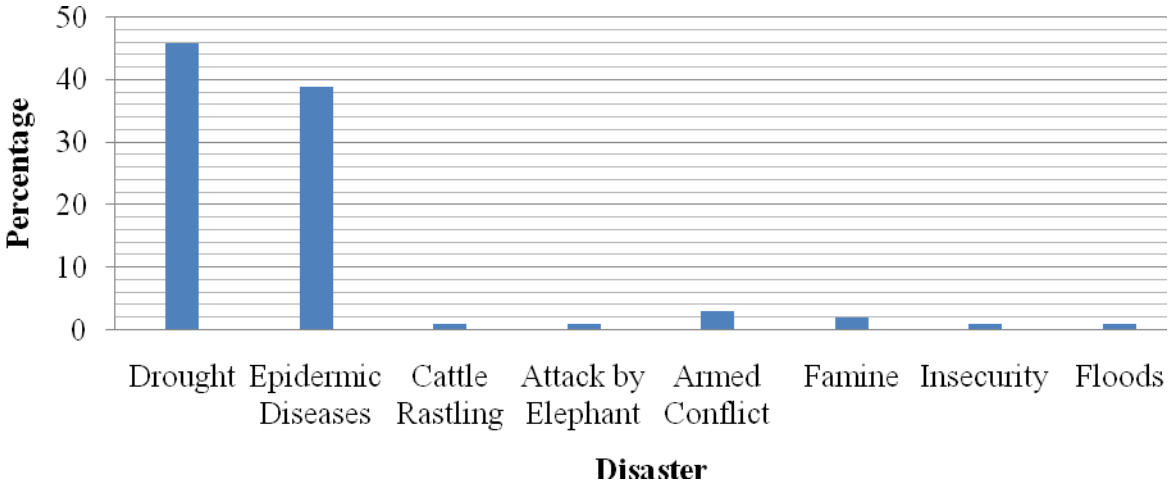


Figure 4.10: Commonest disasters affecting livestock in Isiolo district

4.2.7 Years when the mentioned disasters took place on the people of Isiolo district

Table 4.5 shows that famine is the most frequent disaster affecting the people of Isiolo district as reported by 47.6% of the respondents before 1982. Majority of the respondents (58.5%) indicated that famines occurred after 2005 while 30.1% indicated that famine occurred between 1994 and 2004. Drought was found to have occurred between 1983 and 1993 as indicated by 57.6% of the respondents. 31.4% of the respondents indicated that epidemic diseases occurred between 1994 and 2004. The results showed that in the history of disasters in Isiolo, most of the disasters appeared recently after 2005. A correlation analysis was also done using the chi-square between the age of the

respondents and the years when the disasters took place This proved that there was significant relationship between the age of the respondents and the knowledge of the years when the disasters which affected people took place(χ^2=275.651, p=0.026, df= 232)

Table 4.5: Years when the mentioned disasters took place on the people of Isiolo district

Disaster	Year disaster took place on people							
	<= 1982		1983 - 1993		1994 - 2004		>= 2005	
	N	%	N	%	N	%	N	%
FAMINE	10	47.6	8	24.2	47	30.1	48	58.5
DROUGHT	4	19.0	19	57.6	44	28.2	20	24.4
EPIDEMIC DISEASES	5	23.8	3	9.1	49	31.4	10	12.2
CLAN CONFLICT	0	0.0	0	0.0	2	1.3	0	0.0
FLOODS	0	0.0	2	6.1	12	7.7	1	1.2
POVERTY	2	9.5	1	3.0	1	0.6	2	2.4
LACK OF WATER	0	0.0	0	0.0	1	0.6	1	1.2
Total	**21**	**100**	**33**	**100**	**156**	**100**	**82**	**100**

4.2.8 Years when the mentioned disasters took place on the livestock of Isiolo district

Table 4.6 shows that drought was the common disaster which affected livestock before 1982 as indicated by 73.3% of the respondents. Epidemic diseases were the most common disasters between 1994 and 2004 as indicated by 46.8% of the respondents. Only 9.4% of the respondents indicated that armed conflict with the neighbouring communities affected livestock between 1983 and 1993.

Table4. 6: Years when the mentioned disasters took place on the livestock of Isiolo district.

Disaster	**Year disaster took place on livestock**							
	<= 1982		**1983 – 1993**		**1994 - 2004**		**>= 2005**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
DROUGHT	11	73.3	33	62.3	50	36.0	84	48.6
EPIDEMIC DISEASES	1	6.7	14	26.4	65	46.8	67	38.7
NO INFORMATION	3	20.0	1	1.9	11	7.9	10	5.8
ATTACT BY ELEPHANT	0	0.0	0	0.0	1	0.7	3	1.7
ARMEDCONFLICT	0	0.0	5	9.4	4	2.9	7	4.1
FAMINE	0	0.0	0	0.0	4	2.9	2	1.2
INSECURITY	0	0.0	0	0.0	1	0.7	0	0.0
FLOODS	0	0.0	0	0.0	3	2.1	0	0.0
Total	**15**	**100.0**	**53**	**100.0**	**139**	**100.0**	**173**	**100.0**

4.2.9 Frequency of Drought

According to the results of the findings, 40% of the respondents indicated that droughts occur every year. It was also found that 28% of the respondents indicated that drought occurred after every two years, 28% indicated that drought occurred occasionally. Only 5% respondents indicated that droughts occurred between two to four years while 1% said that the occurrences of the droughts were unpredictable (Fig 4.11). \

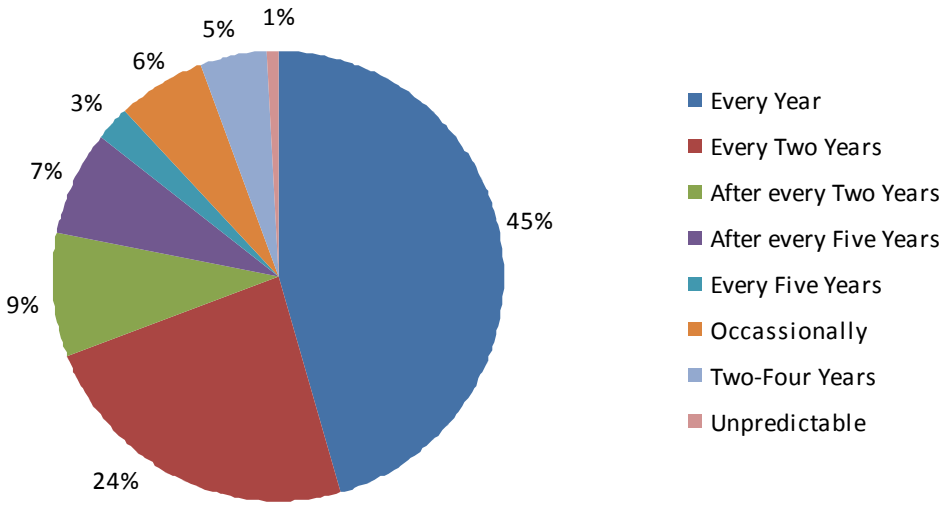


Figure4. 11: Frequency of Drought

4.2.10 Frequency of Floods

Every one year the people of isiolo experienced floods according to 24% of the respondents as shown in Figure 4.12. This shows that floods are among the frequent disasters affecting the people of Isiolo. 15% reported floods occurred every two years with 14% and 13% indicating that they occurred every five years and occasionally respectively. 8% indicated that they occur after every five years with 7 % indicating they occur every ten years. According to Isiolo District Development Plan, (2002-2008), drought and floods are considered as the most prevalent disasters in the district as they recur every other year. This shows that flood is among the frequently occurring disasters in Isiolo District.

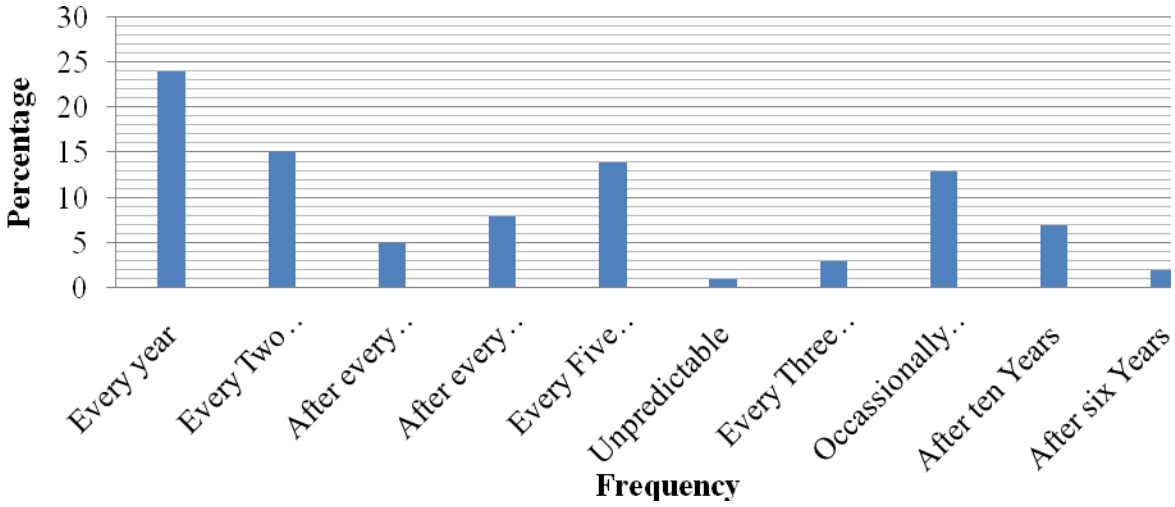


Figure 4.12: Frequency of floods

4.2.11 Frequency of Famine

Table 4.7 shows that every one year the people of Isiolo experienced famine according to 41.9% of the respondents. 10.9% reported famine occurred every two years with 8.1% and 6.0% indicating that they occurred after every one year and after every five years respectively. 17.1% were not sure when famine occurred in the district.

Table 4.7: Frequency of Famine

Frequency	**No of respondents**	**Percentages (%)**
EVERY ONE YEAR	161	41.9
EVERY TWO YEARS	42	10.9
AFTER EVERY ONE YEAR	31	8.1
AFTER EVERY FIVE YEARS	23	6
EVERY FIVE YEARS	13	3.4
OTHERS (NOT SURE)	90	17.1
SIX MONTHS	6	1.6
RARELY	14	3.6
2-3 YEARS	4	1
Total	384	100

4.2.12 Frequency of Epidemic diseases

Table 4.8 shows that epidemic diseases occurred every one to two years according to 55.5% of the respondents. 40.1% indicated that they occurred every one year while 15.4% said it was every two years. 15.4% of the respondents were not sure of the frequency of drought.

Table4. 8: Frequency of Epidemic diseases occurrence.

Frequency	**No of respondents**	**Percentages (%)**
EVERY ONE YEAR	154	40.1
EVERY TWO YEARS	59	15.4
AFTER EVERY ONE YEAR	22	5.7
AFTER EVERY FIVE YEARS	15	3.9
EVERY FIVE YEARS	9	2.3
OTHERS (NOT SURE)	59	15.4
OCCASSIONAL	28	7.3
NO INFORMATION	10	2.6
SIX MONTHS	18	4.7
EVERY MONTHS	10	2.6
Total	384	100

4.2.13 Other disasters in Isiolo

Other disasters were reported as death to livestock (5.2%), land grabbing (4.2%), lack of water (3.1%) and armed conflict (2.1%). The results were as presented in Table 9.

Table 4.9: Other disasters (Frequency)

Disaster	No of respondents	Percentages (%)
DEATH OF LIVESTOCK	20	5.2
LEVEL OF ILLITERACY	2	0.5
INCREASE OF THEFT	5	1.3
LACK OF JOB OPPORTUNITY	4	1
ARMED CONFLICT	8	2.1
LAND GRABBING	16	4.2
LACK OF WATER	12	3.1
TRIBALISM	5	1.3
CLAN CONFLICT	1	0.3
POOR DRAINAGE	3	0.8

4.2.14 Frequency of disaster occurrence on livestock

Fig. 13 shows that livestock disasters occurred every one to two years according to 58.9% of the respondents. This shows that the disaster did not only affect the residents but also the livestock. 40.1% indicated that they occurred every one year while 18.8% said it was every two years. 15.9% of the respondents reported five years while 13.8% indicated four years and 3.1% had no information on the frequency of livestock disasters.

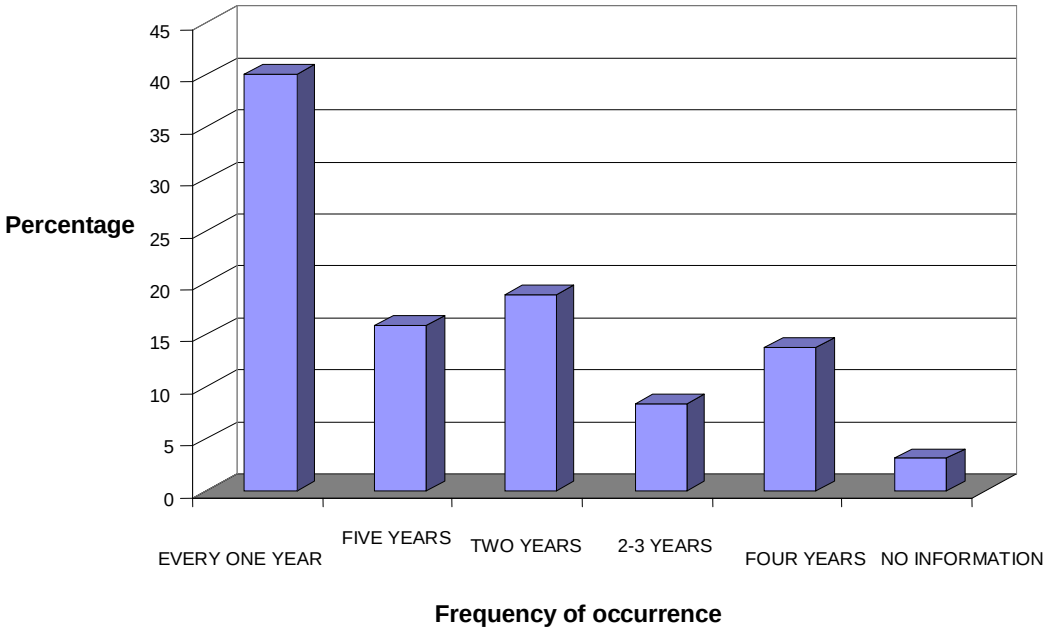


Figure 4.13: Frequency of disaster occurrence on livestock

4.2.15 Impact of disasters on the people of Isiolo district

Increase in mortality rate was indicated as the highest impact of disasters on the people of Isiolo district by 37.8% of the respondents. This showed that most of the disasters which affected the area led to loss of life. 27.6% of the respondents indicated relief supply dependency with 14.6% citing rise in school dropouts. Prostitution accounted for 10.7% of the respondents and drug abuse 1.8% as shown in Table 10 below. A correlation analysis was done using chi-square on the relationship between the level of education of the respondents and the impacts of the disasters on the people. The results was that χ^2= 57.270, p=0.014, df 36. The findings showed that there was significant relationship between the level of education of the respondents and the knowledge on the impacts of disasters on the people.

Table 4.10: Impact of disasters on the people of Isiolo district

Impact	No of respondents	Percentages (%)
RISE IN SCHOOL DROPOUTS	56	14.6
PROSTITUTION	41	10.7
RELIEF SUPPLY DEPENDENCY	106	27.6
DRUGS ABUSE	7	1.8
INCREASE IN MORTALITY RATE	145	37.8
OTHERS (NOT SURE)	3	0.8
DISPLACEMENT OF PEOPLE	1	0.3
LACK OF MONEY	1	0.3
INCREASE OF EPIDEMIC DISEASES	3	0.8
INCREASED CONFLICT	2	0.5
THEFT CASES	9	2.3
DROUGHT	10	2.6
Total	384	100

4.2.16 Impact of disasters on the livestock of Isiolo district

Death of livestock was indicated as the highest (64.8%) impact on livestock which in turn causes poverty to increase among the people (35.2%) (Figure 4.14)

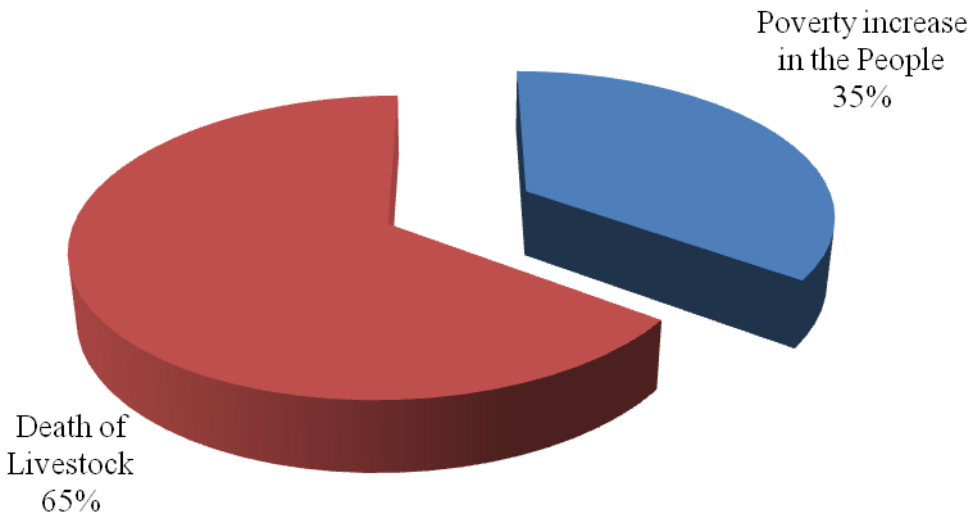


Figure 14: Impact of disasters on the livestock of Isiolo district

4.3 The role of Indigenous Knowledge on Disaster Prediction

4.3.1 Role of indigenous knowledge in the prediction of disasters

Most disasters are predictable using indigenous knowledge as shown in Fig. 4.15. Floods could be predicted this way by 77.3% of the respondents and so were drought 94.3%, famine 83.9%, armed conflict 85.2%, prediction of weather pattern 75.0%, rainfall 94.0% and 50.3% of the respondents could use the indigenous knowledge to predict epidemic diseases. This result shows that IK played a major role in the prediction of disasters in the study area.

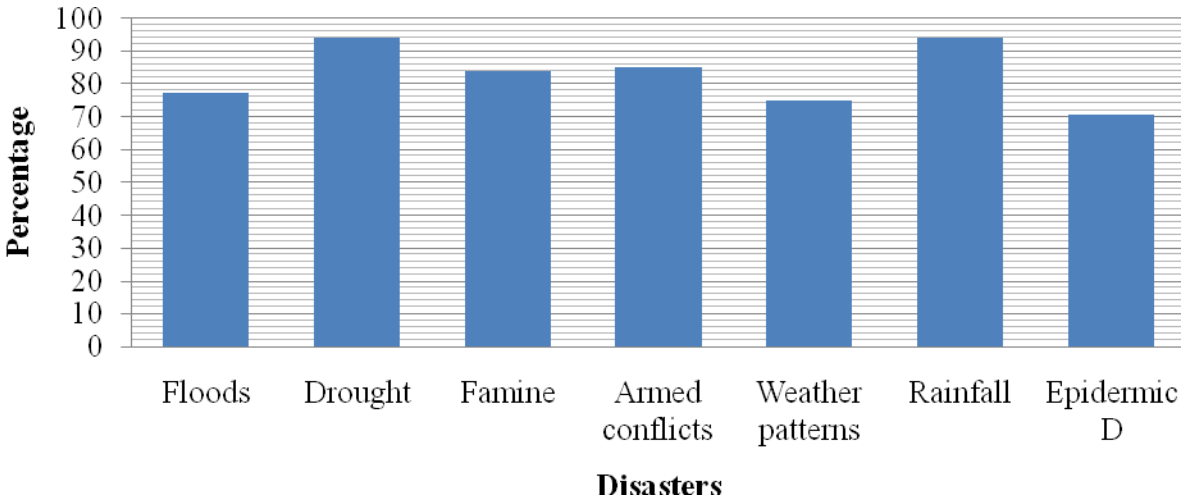


Fig. 4.15: Role of indigenous knowledge in the prediction of disasters

4.3.2 Types of indigenous knowledge used to predict natural occurrences

Table 4.11 shows that most of the respondents (38.5%) used animal intestines to predict natural occurrences while 9.9% used the stars, 9.1% used clouds same as those who used animal behavior. 8.6% and 4.4% used crescent shape and croaking of frogs respectively. 12.5% of the respondents had no information on the type of indigenous knowledge used to predict natural occurrences.

Table 4.11: Types of indigenous knowledge used to predict natural occurrences

Natural occurrence	No of respondents	Percentages (%)
ANIMAL INTESTINES	148	38.5
CRESCENT SHAPE OF THE MOON	33	8.6
STARS	38	9.9
CLOUDS	35	9.1
ANIMAL BEHAVIOUR	35	9.1
MIGRATION OF BIRDS	10	2.6
SOUND OF BIRDS	11	2.9
PRESENCE OF LOCUSTS	9	2.3
CROAKING OF FROGS	17	4.4
NO INFORMATION	48	12.5
Total	384	100

4.3.3 Type of indigenous knowledge used to predict floods

Table 4.12 shows that most of the respondents (34.1%) used animal intestines to predict floods with 18.5% using the clouds. 9.4% used the stars and 3.9% used crescent shape. 22.1% of the respondents had no information on the type of indigenous knowledge used to predict floods.

Table4.12: Types of indigenous knowledge used to predict floods

Natural occurrence	No of respondents	Percentages (%)
ANIMAL INTESTINES	131	34.1
CRESCENT SHAPE OF THE MOON	15	3.9
STARS	36	9.4
CLOUDS	71	18.5
ANIMAL BEHAVIOUR	13	3.4
MIGRATION OF BIRDS	4	1
SOUND OF BIRDS	8	2.1
PRESENCE OF LOCUSTS	4	1
CROAKING OF FROGS	17	4.4
NO INFORMATION	85	22.1
Total	384	100

4.3.4 Types of indigenous knowledge used to predict drought.

Table 4.13 shows that most of the respondents (45.8%) used animal intestines to predict drought while 12.8% used the clouds. 8.1% used the stars and 6.0% used crescent shape. 7.8% of the respondents had no information on the type of indigenous knowledge used to predict drought. This results shows that there were some specific signs or things which were considered accurate than others.

Table 4.13: Types of indigenous knowledge used to predict drought

Natural occurrence	**No of respondents**	**Percentages (%0**
ANIMAL INTESTINES	176	45.8
CRESCENT SHAPE OF THE MOON	23	6
STARS	31	8.1
CLOUDS	49	12.8
ANIMAL BEHAVIOUR	21	5.5
MIGRATION OF BIRDS	16	4.2
SOUND OF BIRDS	12	3.1
PRESENCE OF LOCUSTS	21	5.5
CROAKING OF FROGS	5	1.3
NO INFORMATION	30	7.8
Total	384	100

4.3.5 Types of indigenous knowledge used to predict epidemic diseases in livestock

Table 14 shows that most of the respondents (41.9%) used animal intestines to predict epidemic diseases in livestock while 14.6% used animal behavior. 7.6% used clouds and 3.1% used crescent shape. 24.2% of the respondents had no information on the type of indigenous knowledge used to predict epidemic diseases in livestock.

Table 4.14: Types of indigenous knowledge used to predict epidemic diseases in livestock.

Natural occurrence	**No of respondents**	**Percentages (%)**
ANIMAL INTESTINES	161	41.9
CRESCENT SHAPE THE MOON	12	3.1
STARS	10	2.6
CLOUDS	29	7.6
ANIMAL BEHAVIOUR	56	14.6
MIGRATION OF BIRDS	6	1.6
SOUND OF BIRDS	8	2.1
PRESENCE OF LOCUSTS	6	1.6
CROAKING OF FROGS	3	0.8

NO INFORMATION	93	24.2
Total	384	100

4.3.6 Types of indigenous knowledge used to predict epidemic diseases in the community.

Figure 4.16 show that most of the respondents 34% used animal intestines to predict epidemic diseases in the community. Birds sound was another common prediction as indicated by 29% of the respondents. It was also found that while 7% used the clouds and 6% used animal behavior to predict the occurrence of diseases.

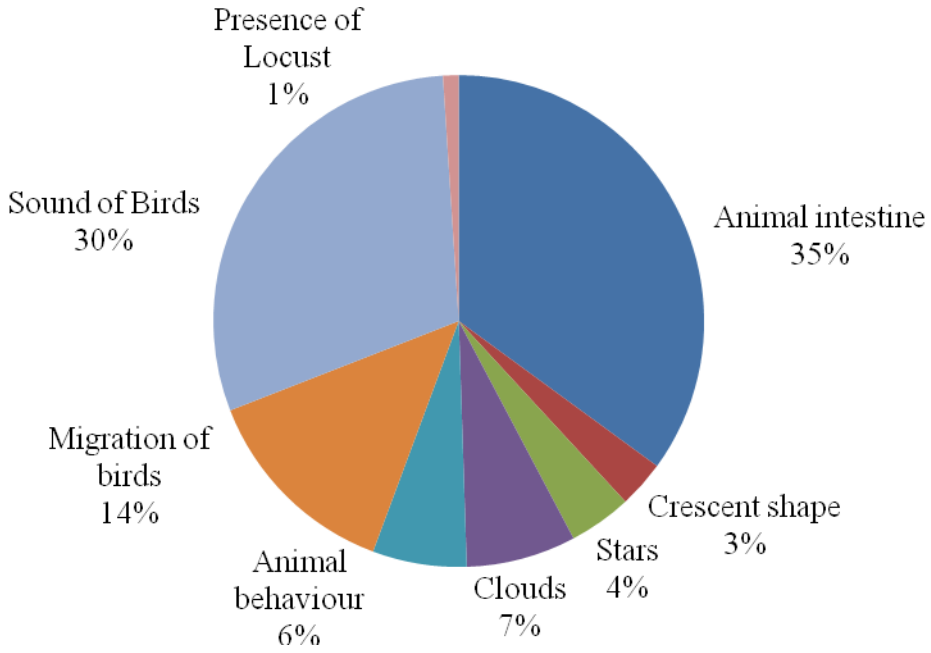


Figure 4.16: Types of indigenous knowledge used to predict epidemic diseases in the community.

4.3.7 Types of indigenous knowledge used to predict famine.

Table 15 shows that most of the respondents (29.2%) used animal intestines to predict famine while 16.1% used the clouds. 7.3% used the stars and 7.0% used migration of birds. 20.6% of the respondents had no information on the type of indigenous knowledge used to predict famine.

Table 4.15: Types of indigenous knowledge used to predict famine.

Natural occurrence	No of respondents	Percentages (%)
ANIMAL INTESTINES	112	29..2
CRESCENT SHAPE	22	5.7
STARS	28	7.3
CLOUDS	62	16.1
ANIMAL BEHAVIOUR	17	4.4
MIGRATION OF BIRDS	27	7
SOUND OF BIRDS	11	2.9
PRESENCE OF LOCUSTS	20	5.2
CROAKING OF FROGS	6	1.6
NO INFORMATION	79	20.6
Total	384	100

4.3.8 Types of indigenous knowledge used to predict armed conflict with neighboring communities in the district.

Table 4.16 shows that most of the respondents (39.6%) used animal intestines to predict armed conflict with neighboring communities in the district while 9.6% used animal behavior. 7.8% used the sound of birds while 7.3% used crescent shape. 19.8% of the respondents had no information on the type of indigenous knowledge used to predict armed conflict with neighboring communities in the district. From these results, it can be deduced that animal intestines was used in the prediction of many disasters and it seemed accurate compared to other ways of prediction. A correlation analysis was done using the chi-square between the age of the respondents and the prediction of armed conflict. The results were that; $\chi^2=14.666$, p=0.01, df= 8. From this result, it was evident that there was a significant relationship between the age of the respondents and the prediction of

armed conflict. The prediction of disasters in Isiolo District, the aged were considered to have much knowledge on the prediction of disasters in the community.

Table 4.16: Types of indigenous knowledge used to predict armed conflict with neighboring communities in the district.

Natural occurrence	No of respondents	Percentages (%)
ANIMAL INTESTINES	152	39.6
CRESCENT SHAPE	28	7.3
STARS	23	6
CLOUDS	26	6.8
ANIMAL BEHAVIOUR	37	9.6
MIGRATION OF BIRDS	9	2.3
SOUND OF BIRDS	30	7.8
PRESENCE OF LOCUSTS	1	0.3
CROAKING OF FROGS	2	0.5
NO INFORMATION	76	19.8
Total	384	100

4.3.9 Types of indigenous knowledge used to forecast weather pattern.

Figure 4.17: shows that most of the respondents (29%) used Clouds to forecast weather pattern while 16% used animal intestines. 11% used the stars and 6% used migration of birds while 4% used crescent shape.

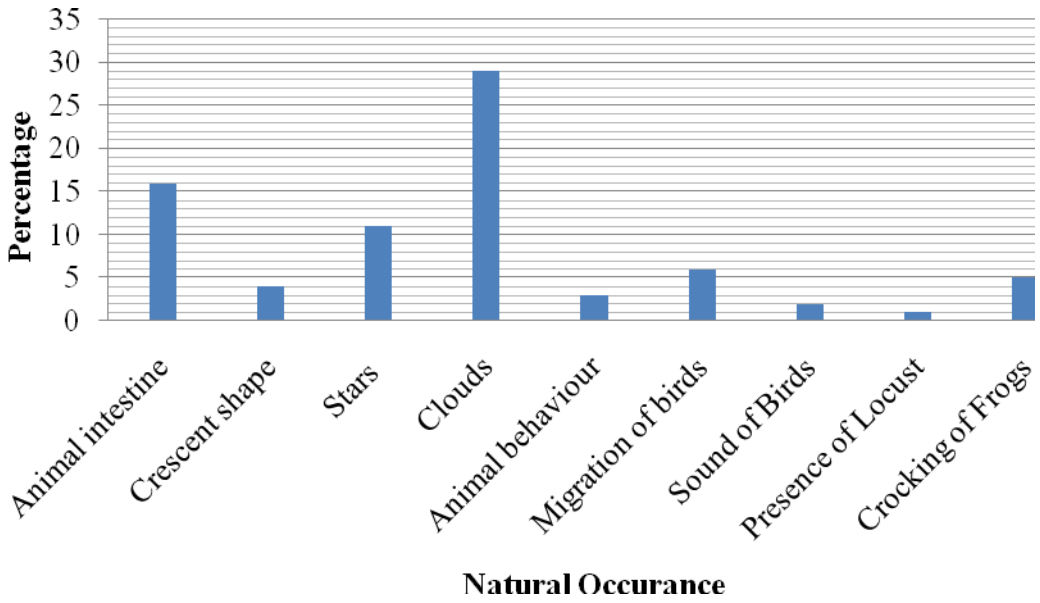


Figure 4.17: Types of indigenous knowledge used to predict rainfall occurrence

Table 4.17 shows that most of the respondents (26.8%) used clouds to predict rainfall occurrences while 22.9% used animal intestines. 10.9% used croaking of frogs while 9.9% used the stars. 9.9% of the respondents had no information on the type of indigenous knowledge used to predict rainfall occurrences.

Table 4.17: Types of indigenous knowledge used to predict rainfall occurrence

Natural occurrence	**No of respondents**	**Percentages (%)**
ANIMAL INTESTINES	88	22.9
CRESCENT SHAPE	21	5.5
STARS	38	9.9
CLOUDS	103	26.8
ANIMAL BEHAVIOUR	15	3.9
MIGRATION OF BIRDS	15	3.9
SOUND OF BIRDS	17	4.4
PRESENCE OF LOCUSTS	7	1.8
CROAKING OF FROGS	42	10.9
Total	384	100

4.4 Disaster management techniques

4.4.1 Level of Success in Management of Natural occurrences by the Government

Fig.4.18 shows that the government has been highly successful in the management of natural occurrences as cited by 51% of the respondents. 17% indicated it was very successful and 12% thought it was least successful. This shows that the government played an important role in the management of the disasters in the study area.

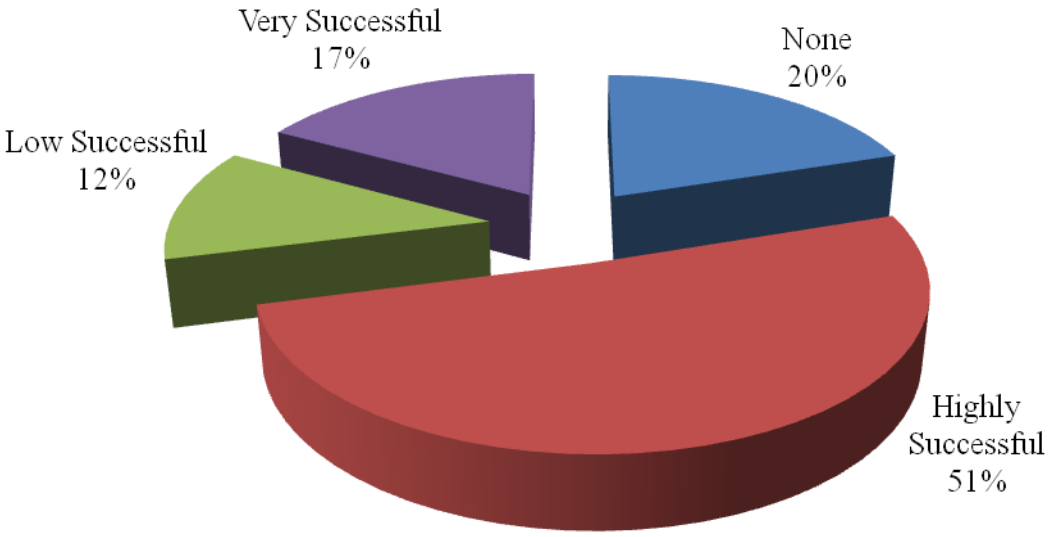


Fig. 4.18: Level of success in management of natural occurrences by the government

4.4.2 Ways in which organizations operating in the district manage various natural occurrences

Organizations operating in the district mostly used provision of relief food to manage various natural occurrences as cited by 37.2% of the respondents shown in Table 4.18. 23.7% indicated that these organizations also give clothes, blankets, mosquito nets and

drugs while 7.3% of the respondents thought these organizations offer no assistance. 5.2% indicated provision of veterinary services, 3.6% creation of a revolving fund for youth groups and 2.3% suggested restocking. 10.4% had no information on how organizations operating in the district manage various natural occurrences. The results were as shown in Table 4.18 below. The results of the correlation analysis done on gender and management of disasters showed that; $\chi^2 = 11.900$, p=0.427, df=3, this showed that there was no significant relation between gender and management of disasters.

Table 4.18: Ways in which organizations operating in the district manage various natural occurrences

Response	No of respondents	Percentages
PROVISION OF RELIEF FOOD	143	37.2
CLOTHES, BLANKETS, MOSQUITO NETS AND DRUGS	91	23.7
SEND MILITARY ASSISTANCE	5	1.3
NO ASSISTANCE PROVIDED	28	7.3
PROVISION OF GOATS, SHEEP AND CATTLE (RESTOCKING)	9	2.3
THEY EDUCATE PEOPLE ABOUT THE CAUSE OF DISASTER AS COMMON	5	1.3
REVOLVING LOAN THROUGH ARID LAND RESOURCE BUT NOT SUCCESSFUL	11	2.9
PROVISION OF VETERINARY SERVICES	20	5.2
NOT ENOUGH AID IS PROVIDED TO PEOPLE	6	1.6
TECHNICAL ADVICES	6	1.6
REVOLVING FUND THROUGH YOUTH GROUPS	14	3.6
PROVIDE WITH TENTS DURING RAINY SEASONS	6	1.6
NO INFORMATION	40	10.4

Total	384	100

4.4.3 Level of success in management of natural occurrences by the organizations.

Fig. 4.19 shows that the organizations operating in the district have been highly successful in the management of natural occurrences as cited by 47% of the respondents. 20% indicated it was very successful and 12% thought it was low successful.

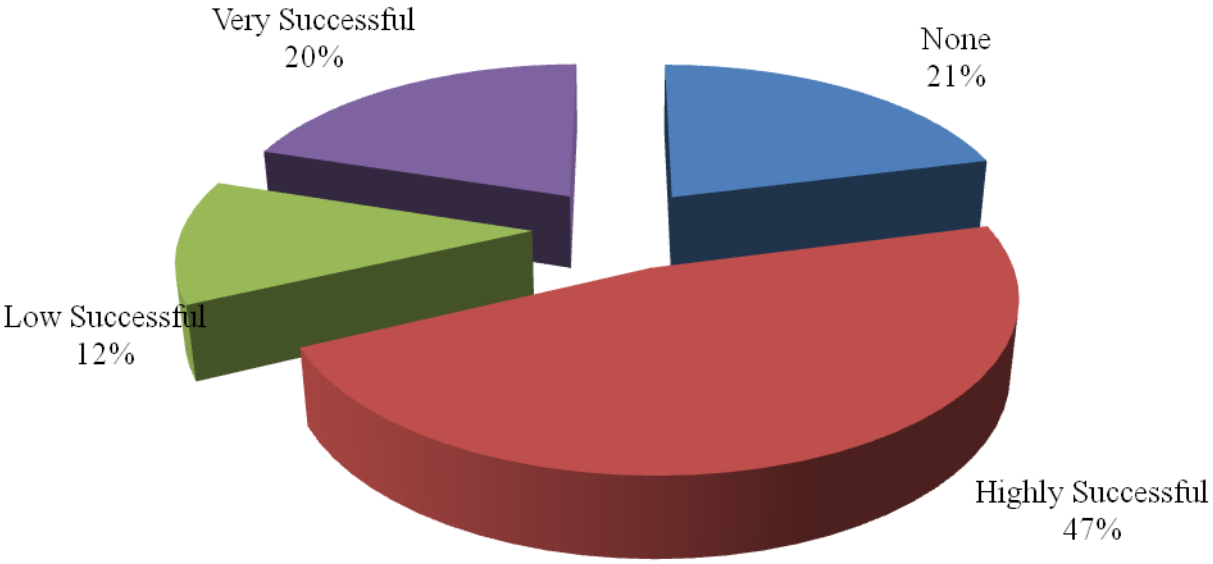


Fig. 4.19: Level of success in management of natural occurrences by the organizations

4.4.4 Ways of enhancing the indigenous knowledge to supplement the formal government techniques in disaster management and predictions.

Table 4.19 shows that 14.3% of the respondents thought that to compare and compliment the knowledge of indigenous people and formal knowledge would enhance the indigenous knowledge in supplementing the formal government techniques in disaster management and predictions while 13.5% indicated implementation of policy.

Table 4.19: Ways of enhancing the indigenous knowledge to supplement the formal government techniques in disaster management and predictions

Response	No. of respondents	Percentages (%)
COMPARE & COMPLIMENT THE KNOWLEDGE OF INDIGENEOUS PEOPLE AND FORMAL KNOWLEDGE	55	14.3
INTENSIVE COMMUNICATION BETWEEN TRADITIONAL & GOVERNMENT SYSTEMS	6	1.6
APPRECIATION OF IK IN THE COMMUNITY	15	3.9
DISCARDS OF THE OLD WAYS	12	3.1
NOT ABLE TO WORK TOGETHER BECAUSE BOTH HAVE THEIR OWN WAYS OF PREDICTION	26	6.8
IMPLEMENT POLICY TO ENHANCE IK	52	13.5
EQUITABLE USE OF THIS KNOWLEDGE	22	5.7
BOYS TAKING THE ROLE OF GUIDING THE COMMUNITY	2	0.5
TRADITIONAL ONE IS MORE APPROPRIATE THAN GOVERNMENT TECHNOLOGY	10	2.6
TOGETHERNESS SO THAT THEY WORK HARMONEOUSLY	19	4.9
INTEGRATE FORMAL EDUCATION FOR FUTURE USE	10	2.6
THROUGH PRESERVATION	6	1.6
HELPING COMMUNITY IN TIMES OF DISASTER	8	2.1
COMMUNITY AWARENESS ON DANGERS OF DISASTERS	15	3.9
PROVIDE SPECIALISTS IN A RESEARCH	7	1.8

4.4.5 Other forms of indigenous knowledge practiced by the community

Table 4. 20: Other forms of indigenous knowledge practiced by the community.

Form of knowledge	No of respondents	Percent
TRADITIONAL MEDICINE	79	20.6
STORING MAIZE BY CONSTRUCTING TRADITIONAL DEPOT	10	2.6
SLAUGHTER ANIMALS AND PRESERVE MEAT	25	6.5
TRADITIONAL SYSTEM OF WIFE INHERITANCE	50	13.0
STRONG BELIEF IN WHAT ELDERS SAY	9	2.3
NOT MARRYING FROM THE SAME CLAN	4	1
READ TIME OF DAY FROM THE POSITION OF SUN	2	0.5
PRESERVATION OF MILK	14	3.6
SOUND OF CERTAIN BIRD'S TO NOTIFY A VISITOR IS COMING	2	0.5
HUNTING OF WILD ANIMALS	4	1
USE OF STONES AS A TOOL TO EXPLOIT NATURAL RESOURCES	9	2.3
EMPOWERING THE POOR THROUGH TRADITIONAL PRACTICE	8	2.1
LEGAL SYSTEM TO SETTLE THE DISPUTES	30	7.8
THANKS GIVING CEREMONY AT ONE PLACE BY FRYING COFFEE	2	0.5
ESTABLISHMENT OF TRADITIONAL RELIGION	5	1.3
ESTABLISHMENT OF PLANTATION FOREST AS OPPOSED TO HIRING LABOUR	2	0.5
HONEY USED AS TRADITIONAL MEDICINE	2	0.5
TRADITIONAL INFORMAL EDUCATION	8	2.1
USE OF SONG TO PASS INFORMATION	2	0.5

CHAPTER FIVE: DISCUSSION, CONCLUSIONS & RECOMMENDATIONS

5.1 Summary

The overall purpose of the study was to determine the role of indigenous knowledge in the prediction of natural occurrences of public health importance in Central Division of Isiolo District. The research was based on the specific objectives: to find out the history and status of disasters in Central Division of Isiolo District, to find out the formal disaster management techniques (by government, organizations and their levels of success) and to determine the various forms of indigenous techniques and knowledge used to predict natural occurrences by communities living in central Division of Isiolo District.

A total of three hundred and eighty four (384) respondents were interviewed and out of this 170 (44.3%) were male and 214 (55.7%) female. Four group discussion sessions were held comprising of religious leaders, opinion leaders, heads of the government and non governmental organization operating in Isiolo district such as Action Aid, Kenya Red Cross society and Friends of Nomads international participated as a team. The FGDs consisted of 12-16 participants and were always moderated by the researcher with assistance from the two trained research assistants. Information was also collected from the government and organizational records to support the primary data. Key informants interviews were also done from resourceful villagers from each of the selected study settlements as shown in (Appendix V).Both Focus group discussions and Key informants were subjected to a prescribed interview guide as attached in (Appendix I) so as to probe and get more information relating to the study objectives.

5.2 Discussion

5.2.1 The history and status of Disasters in Central Division of Isiolo District

In establishing the history and the status of disasters in Central division of Isiolo District, the researcher looked on the common disasters that were affecting both livestock and people in the area, the years when the disasters that took place affected people and livestock in the area and the impacts of the disasters. In the establishment of the common disasters affecting the residents of Central division of Isiolo District, the results showed that Famine accounted for 37%, Drought 31%, Epidemic diseases 18% and Floods 14% respectively. In support to these findings, a report by Republic of Kenya (2004) found the most common weather related disasters in Kenya, including floods, droughts, landslides, lightening/thunderstorms, wild fires, and strong winds. According to Republic of Kenya (2004), drought affects mostly Eastern, Coast, North Eastern and parts of Rift Valley, Provinces of Kenya. According to the Report, Isiolo in Eastern province is categorized as one of the areas affected by drought. Thus the findings of the study are in line with other studies that had been done. From these results, a conclusion can be made that famine was the most common disaster which affected the residents of the area followed by drought. The results from correlation analysis done, showed that; $\chi^2=275.651$, p=0.026, df 232, this showed that there was no significant relationship between the age of the respondents and the knowledge of the years when the disasters which affected people took place.

To establish the common disasters which affected the livestock in the area, the results revealed that drought was indicated by (54%) of the entire respondents, Epidemic diseases 33.3%, Floods (12.2%), Clan conflicts level (0.5%) respectively. This revealed that drought was the most effective disaster which affected the livestock in the area. This was followed by Epidemic diseases. Clan conflicts were considered as least effective disaster on livestock. According to Isiolo District Economic Recovery Strategy Implementation Reports (2002/03-2005/06), it was found that drought was one of the disasters which affected the district. It was found that it caused the death of livestock and this greatly affected the economy of the people living in the area as cattle, Camels, Sheep and Goats were considered to be the major source of income in the community.

To establish the trends of occurrences of the disasters on the residents of Isiolo, the findings of the study revealed that famine occurred frequently as indicated by 47.6% of

the respondent before 1982. 58.5% of those interviewed indicated that it occurred mainly after 2005 and caused lots of the detrimental impacts to the people. Drought was also indicated by 57.6% of the respondents to have occurred between 1983 and 1993. Finally 31.4% of those interviewed reported epidemic diseases occurred between 1994 and 2004. Regarding the trends of the effect of the disasters on livestock, the findings of the study showed that most of the respondent 73.3% indicated that drought was the known frequent disaster that affected livestock in Isiolo district before 1982. It was also found that 46.8% respondent observed that epidemic diseases mainly took place between 1994 -2004. According to Warren (1999), many countries in Africa suffer from a range of natural disasters including drought, floods, landslides, windstorms, thunderstorms, lightning strikes and epidemics. Drought, and the associated famine and poverty, is however the most ravaging of the natural disasters that afflict these countries. Floods and epidemics can also cause serious devastation and destruction but these are not as common or persistent as drought. From these findings it was clear that disasters were common in the area of study and had negative effects on both the residents and the livestock.

To establish the effect of disasters on the residents of Isiolo, majority of the respondents (37.8%) indicated that death was rated to be the highest negative impact of disasters on the people of central division. Moreover 27.6% of the respondents indicated that there was tendency of relief supply dependency while 14.6% cited rise in school drop outs. It was also noted that prostitution was indicated by 10.7% of the respondents as on of the negative impacts of disasters. The impacts on the livestock revealed that majority of the respondents 64.8% indicated death as the most effective impact of the disasters on the livestock. According to Isiolo District Economic Recovery Strategy Implementation Reports (2002/03-2005/06), drought results to: food insecurity and epidemic diseases from both human and livestock are high. The findings of the study are also supported by the report by (Republic of Kenya, 2004) that disasters results to disruption of people's lives through displacements, deaths and injuries. They destruct livelihoods and drain years of economic gains and development. Natural disasters for instance cause loss of lives and property, displacement of people from homes, destruction of infrastructure like

roads, rails and telecommunication lines, contamination of water sources causing diseases or depletion of the same altogether (Republic of Kenya, 2004).

5.2.2 The formal disaster management techniques (by government, organizations and their levels of success) in Isiolo District

The results of the study showed that there were many organizations which participated in the management of disasters in the district. The findings of this research showed that supplies of the relief food especially during onset of floods and drought are common practice and this was indicated by 37.2% of the total 384 respondents who participated in this study as shown in table 18. This humanitarian supply consisted of clothes, blankets, mosquito nets and drugs. In support to these findings, IDNDR (1993) found that one of the techniques of managing disasters was through the identification and provision of resource requirements, including funds and trained human resources. This includes means to access and use authorized fund appropriations for disaster reduction and response. The study further found that 7.3% of the respondents indicated that there are no assistance provided by the mentioned organizations (FONI, AAK, and KRCS) and 5.2% confirmed that veterinary services are mainly offered during outbreak of livestock epidemic diseases. Correlation analysis done on gender and disaster management showed that there was no relationship between gender and management of disasters.

The study was also aimed at finding out the levels of success attributed to the government and the organizations managing natural occurrences in the district. Beside the government's Special Program Ministry with respect to Arid Land Resource Management Program (ALRMP) which is mandated to mitigate all kinds of disasters in 28 Arid and Semi-arid districts in Kenya, the NGO's operating in Isiolo district include; FONI (Friends of Nomad International), Action Aid International and Kenya Red Cross Society Isiolo branch were the main ones highlighted in this research by the respondents for the developmental activities they undertake in the district. IDNDR (1993) also recommended that structures and systems such as organizational structures and systems that facilitates and ensures coordination of stakeholders' action and contributions should be in place as a strategy for managing disasters. This involves the establishment and

strengthening of focal points and national and local coordination bodies for disaster reduction and response activities, and disaster management systems.

According to the results it was revealed that the Government has been highly successful in the management of natural occurrences as indicated by 197(51%) of the 384 respondents. Only 17% of the respondents indicated that there was very successful. Relatively the organizations operating in the district had been highly successful in the management of natural occurrences just like the government as indicated by 47% of the respondents as shown in figure 19.

The Principal researcher with aid of his two research assistant also interviewed the study respondents in an attempt to find out if there were some tangible evidences towards management of natural occurrences by the previously mentioned organizations in the study locality. The results obtained showed that 47% of the respondents confirmed that their work was highly successful, 20% commented that their work were very successful while 12% observed that their work was least successful. Some respondents had words of praise for the Kenya Red cross Society (Isiolo branch) for their quick response towards (2007) flash floods that caused havoc to Isiolo central business district through provision of relief supplies and in conjunction with Ministry of Special Programs for constructing drainage tunnels as a permanent mitigation measures for controlling such kind of floods in future.

5.2.3 Forms of indigenous techniques and knowledge used to predict natural occurrences by communities living in central division of Isiolo district.

In the determination of the forms of indigenous knowledge used in the prediction of disasters, the major disasters where such predictions were commonly used were: floods, drought and famine. Generally, some of the major indigenous knowledge used were: animal intestines, stars, clouds, crescent shape, and croaking of the frogs. In the Borana community, the researcher found that IK was used to predict the following disasters: greenish pigmentation on the dung meant that there was to be a lot of rain in the forth coming season, arrowing in the intestine meant that the forthcoming season, plenty of

cow dung in the intestines meant that the forthcoming season was to have plenty of rain associated with plenty of milk and that if there was no dung in the walls of the intestines meant that there was to be famine in the forthcoming season. According to Matowanyika (1994), the height of the nests of *the emahlokohloko* bird (Ploceus spp.) is used to predict floods. He added that when floods are likely to occur the nesting of the *emahlokohloko* is very high up the trees next to the river and when floods are unlikely the nests are low down. Owiro (1996) found that the use of IK in the prediction of disasters range from the simple to the complex, such as relying on the water beetle to identify potable water in streams and ponds, using beanstalk ashes to preserve grain, reading signs on goat intestines to divine drought and famine, and immunizing cattle against rinderpest outbreak by smearing blood from infected animals in their nostrils.

This shows that IK was commonly used in the prediction of disaster occurrences. The results of the correlation analysis done showed that χ^2=14.666, p=0.01, df 8, this means that in the prediction of disasters in Isiolo District, the aged were considered to have much knowledge on the prediction of disasters in the community.

Relating this to the specific disaster where the knowledge was used, it was found that various IK were used to predict floods. Most of the respondents (34.1%) indicated that animal intestines were used in the prediction of floods. 71(18.5%) mentioned clouds, 36(9.4%) indicated the stars and 15(3.9%) suggested the use of crescent shape of the moon in the prediction of floods. Woods and Grein, (2002) found that in some communities, the role of predicting events is left to the elders, families or clans that specialize in that art. This is an indication that the use of IK was encouraged in different communities and was left for specific people who were considered experts in the society.

The use of IK in the prediction of drought was found that 176(45.8%) of the respondents used animal intestines. The results also showed that 49(12.8%) of the respondents indicated that clouds can too be used, 8.1% (31) indicated the use of stars whereas 23(6%) used crescent shape. According to Van (1999) reading signs on goat intestines by specialized Maasai elders could divine drought and famine, social conflicts, diseases, childbirth, peace or war in the chiefdom. He adds that if the small intestine was found to

be empty, drought or famine or hostility and war were to be expected in the chiefdom but if it had a lot of dung this foretold plenty of rain, no famine and peace. This supports the fact that IK was used among different communities in the prediction of disasters

In the prediction of famine as it was regarded as a major disaster as reported in this survey by the communities interviewed. Famine was considered as an obstacle that prevented the communities from realizing their development dreams. Therefore, in the study communities interviewed had suggested various IK were used in the prediction famine which was a very common disaster in the areas. Out of the mentioned variables in which IK can be applied to predict famine,; animal intestines was the highest 29.2%, this was followed by the use of crescent shape at 5.7% and animal behaviors at 4.4% as shown in table 15. From these findings, a conclusion can be made that there were different form of IK used in the prediction of the common disasters in the division.

5.3 Conclusions

From the findings of the study regarding the history and the status of disasters in Isiolo District, it can be concluded that famine occurred frequently as indicated by (47.6 %) of the respondents before 1982. Other disasters which occurred in the area included: drought, floods and epidermic diseases.

Regarding the formal disaster management techniques by the Government and organizations operating in the study area, the findings showed that the Government was very successful as indicated by (51%) as compared to (47%) for organizations.

It was also concluded that indigenous knowledge played a major role in the prediction of natural occurrences of public health importance in Central Division of Isiolo District. This is supported by the fact that majority of the respondents interviewed in this study mentioned that most of the disasters were occurring in the area were predictable using indigenous knowledge technique. Generally, some of the major indigenous knowledge

used were: animal intestines, stars, clouds, crescent shape and croaking of the frogs. In the Borana community, the researcher found that IK was used to predict the following disasters: greenish pigmentation on the dung meant that there was to be a lot of rain in the forth coming season, arrowing in the intestine meant that the forthcoming season, plenty of cow dung in the intestines meant that the forthcoming season was to have plenty of rain associated with plenty of milk and that if there was no dung in the walls of the intestines meant that there was to be famine in the forthcoming season This therefore is a proof that IK is still prevalent and highly applicable in the study area particularly in the prediction of disasters.

5.4 Recommendations

From the findings of the study, it is recommended that indigenous knowledge should be promoted through keeping of records, recognized and policy framework instituted to safeguard and preserve it so that it can be an additional resource base in supplementing the formal Government techniques in natural disaster management and predictions.

Another recommendation is that indigenous knowledge from all the communities in Kenya should be documented to preserve them as they are still applicable and useful in the current time.

The study finally recommended that talented indigenous knowledge elders and specialist readers should be identified, motivated and recognized by the government so that they give accurate predictions on all the natural occurrences in tandem with conventional predictions as an intervention and preparedness strategy against any form of un-expected disaster.

5.5 Suggestions for Future Research

This study was carried out in central division of Isiolo District; the study can be replicated in other parts of Kenya which are vulnerable to natural occurrences like drought, famine, epidemic diseases to determine the role of indigenous knowledge in the prediction of such occurrences. This will give a way forward in the prediction,

preparedness and management of such occurrences in areas where they are commonly affected. This will help to improve the lives of the communities living in such areas.

The researcher also suggests that another study should be carried out in the study area on the use of IK on environmental sustainability and management. This will be helpful in giving the indigenous ways of managing natural resources in the pastoral areas.

REFERENCES

Belshaw, D. (1980)."Taking Indigenous Knowledge Seriously: The Case of Inter-Cropping Techniques in East Africa." In Indigenous Knowledge Systems and Development.

Berkes, F. (1999). "Role and Significance of 'Tradition' in Indigenous Knowledge and Development Monitor.

Dei, George J. S. (1993). "Indigenous African Knowledge Systems: Local Traditions of Sustainable Forestry" Singapore *Journal of Tropical Geography* 4: 8-4.

D.M. Warren, D. Brokensha and L.J. Slikkerveer(1984). (Eds.). Kegan Paul International, London (1993). *Economics,* 66:874-878

Drought Monitoring Center ,Nairobi (DMCN), (2004): Traditional indicators used for climate monitoring and prediction by some rural Communities in Kenya. A contribution to the harmonization of traditional and modern scientific

methods of climate prediction in Kenya. Drought Monitoring Center, Nairobi. Pilot Application Project.

Edje, O.T. and Manyatsi, A. M (1992). "Nature Conservation and Natural Disaster Management - Role of Indigenous Knowledge in Swaziland". Faculty of Agriculture, University of Swaziland

Gayton, D., and Henry M. (2000). Linking Indigenous Peoples' Knowledge and Western Science in Natural Resource Management: *Conference Proceedings*. Kamloops, Canada: Southern Interior Forest Extension and Research Partnership. (SIFERP Series, no. 4).

Grenier, Louise. (1998). Working With Indigenous Knowledge: *A Guide for Researchers*. Ottawa, Canada: International Development Research Centre (IDRC). "Indigenous knowledge systems and natural resource management in Southern Africa".

International Decade for natural Disasters Reduction (IDNDR) (1993) "Natural disasters: Protecting vulnerable communities," Proceedings of the Conference, London.

Isiolo District Economic Recovery Strategy Implementation Reports (2002/03-2005/06) Intergovernmental Authority on Development (IGAD), (2006). "Nature Conservation and Natural Disaster Management: The Role of Indigenous Knowledge in Kenya". April. IGAD Climate Prediction and Application Centre (ICPAC)

Isiolo District Development Plans (2002-2008) Ministry of Finance.

Johnson, M. (1992). *Capturing Traditional Environmental Knowledge IDRC*. Ottawa Canada. International Publishers.

Kamla-Raj, J. Hum (2006). Indigenous Technical Knowledge for Resource Monitoring in Northern Kenya. Nairobi. Kenya Agricultural Research Iinstitute

Kihupi, R. (2000). "Promotion and Integration of Indigenous knowledge in seasonal climate forecasts." *Final Report submitted to DMC Harare*. The Pilot Project Research

Kothari, C. R. (2004). *Research Methodology*: Methods and Techniques. New Delhi: New Age International Publishers

Team, (2000) Sokoine University of Agriculture Morogoro, Tanzania.

Lalondc, Andre. (1993). "African Indigenous Knowledge and its Relevance to Sustainable Development." *In Traditional Ecological Knowledge*: Concepts and Cases. Ottawa: Center for Traditional Knowledge, Canadian Museum of Nature.

Larson J., (1998). *Perspectives on Indigenous Knowledge Systems in Southern Africa*. Environment Group, Africa Group World Bank Discussion Paper No. 3. April.

Lewinski, Silke von, and Anja von Hahn eds. (2003). *Indigenous Heritage and Intellectual Property*: Genetic Resources, Traditional Knowledge, and Folklore. New York: Kluwer Law International.

Linthicum K.J, Anyamba A, Tucker C.J, Kelley P.W, Myers P.F, Peters C.J (1999). Climate and satellite indicators to forecast Rift Valley fever epidemics in Kenya, Science; 285: 397- 400.

Lalonde, Andre. (1993). "African Indigenous Knowledge and its Relevance to Sustainable Development." *In Traditional Ecological Knowledge: Concepts and Cases.* Ottawa: Center for Traditional Knowledge, Canadian Museum of Nature.

Lopez, Alencio. (1998), "Initiatives for the Protection of Holders of Traditional Knowledge, Indigenous Peoples, and Local Communities." *Biotechnology Law Report*. Management: Irrigation in Msanzi, Tanzania. Washington, DC: World Resources Institute.

Mascarenhas, Ophelia, and Peter G. Veit (1995). Indigenous Knowledge in Resource Mathias, Evelyn. "Framework for enhancing the use of indigenous knowledge

Matowanyika, J. (1994). "What are the issues on indigenous knowledge systems in southern Africa?" *Indigenous Knowledge Systems and Natural Resource Management in Southern Africa.* Report of the Southern Africa Regional Workshop, Harare, Zimbabwe,. IUCN-ROSA: Zimbabwe.

Mogege M. (2005). "National priorities in Indigenous Knowledge Systems: implications for research and curriculum development". Indilinga: *African Journal of Indigenous Knowledge Systems* (IAJIKS) Vol. 4: 3 -37

Warren, D. M. (1992). *"Indigenous Knowledge, Biodiversity Conservation and Development."* Keynote Address presented at the International Conference on Conservation of Biodiversity in Africa: Local Initiatives and Institutional Roles, Nairobi, Kenya.

Oba G. (1982): Problems of arid land rehabilitation. *Proceedings of a Leaders Seminar held at Marsabit,* 15th to 19th June and 22nd to 26thJune. UNESCO-MAS Integrated Project on Arid lands.

Owiro O., Arthur J., and Calestous J (1996). "*Property Rights, Medicinal Plants and Indigenous Knowledge*." In Land We Trust: Environment, Private Property and Constitutional Change. 79-306pp.

Orodho, A. J. (2004) Technologies of writing Research Proposals and Report in Education and Social Science. Masola Publishers, Reata Printers Nairobi.

Republic of Kenya (2004), National Policy on Disaster Management (Revised Draft) p4, Nairobi, Kenya.

Republic of Kenya (March 2004); National Policy for the sustainable Development of the Arid and Semi Arid Lands of Kenya, p 8-11. Nairobi, Kenya.

United Nations Environment Programme (UNEP), (2006): Indigenous knowledge in disaster management in Africa. Nairobi, Kenya

Vanek, E. (1989). Indigenous Knowledge Systems: Implications for Agriculture and International Development. 6 - 70pp.

Vlaenderen, H. van. (1999). "Local knowledge: What is it and why and how do we capture it?" Kauzeni A. (Ed). Selected papers from First National Workshop held in Morogoro, Tanzania. Gender, Biodiversity and Local Systems to Strengthen Agricultural and Rural Development: Links Report.

Warren, D. M. (1999). "Indigenous Knowledge, Biodiversity Conservation and Development." Keynote Address presented at the International Conference on Conservation of Biodiversity in Africa: Local Initiatives and Institutional Roles, Nairobi, Kenya.

Warren, D. M., ed. (1999). Indigenous Agricultural Knowledge Systems and Development. Gainesville, FL: Agriculture and Human Values; Volume VIII).

Warren, D.M. (1991): Using Indigenous Knowledge in Agricultural Development. *World Bank Discussion Paper No. 127.* The World Bank, Washington, D.C.

Wisner, Ben; P. Blaikie, T. Cannon, and I. Davis (2004). *At Risk - Natural hazards, people's vulnerability and disasters.* Wiltshire: Routledge. ISBN 0-415-25216-4.

Wisner, Ben; P. Blaikie, T. Cannon, and I. Davis (2004). *At Risk - Natural hazards, people's vulnerability and disasters.* Wiltshire: Routledge. ISBN 0-415-

25216-4. *Working Party on Development Assistance and the Environment*, London. October 1991.

Woods CW, and Grein T, (2002). An outbreak of Rift Valley fever in northeastern Kenya, 1997- 1998. Emerging Infect Diseases; 8:138 - 44.

APPENDIX 1 - INTERVIEW GUIDE

1. Are you able to see and predict an impending disaster?
2. Is this a natural endowment or is it knowledge that is acquired through experience?

3. What do you do in order to know that there will be drought in this area?
4. Would you consider it a premonition?
5. What role did the animals play in disaster prediction?
6. And the birds?
7. And the plants, colour of clouds, the position of the stars?
8. How was this communicated to the community?
9. Were you using any instruments (local or manufactured)?
10. How would this disaster prediction assist the community?
11. Do you think this knowledge should be shared by many?
12. Do you think this knowledge is relevant today?
13. Has technological advancement affected the use of this knowledge in any way?
14. What would be your choice – to use the modern methods to predict disaster or to use the traditional knowledge?

APPENDIX II – Questionnaires

A: Name of Research assistant / Interviewer……..

- Questionnaire no……..

- Settlement name……..
- Name of Location/ Sub location-…….
- Name of Division…….
- District…….

B: DEMOGRAPHIC PROFILE OF RESPONDENTS

1. Age (years)……

2. Gender

Male { }

Female { }

3. Indicate highest level of Education attained.

- Non-formal { }
- Primary school { }
- Secondary school { }
- Post Secondary School { }
- Others Specify. ……

4. Marital status (**Tick where appropriate**)

- Married
- Single
- Separated
- Divorced.
- Widowed.

5. Occupation

- Employed/Not employed

6. Monthly income……..

7. Religious affiliation……

- Christian
- Muslims
- Traditionist
- Others

C: INVESTIGATE HISTORY OF DISASTERS IN ISIOLO DISTRICT

1; Mention the common disasters that affect the people of Central division (Isiolo district)

(i) Drought (ii) Floods (iii) Famine (iv) Epidemic diseases (specify)……..

(v) Others……

2. Among the mentioned disasters above which is the commonest……

3. Mention the common disaster that affects livestock in Central division (Isiolo District)

(i) Drought (ii) Floods (iii)Epidemic diseases (CBPP, Foot and mouth disease, parasitic diseases, others (specify)…….

4. Among the mentioned disasters above which are the commonest to the people of central division (Isiolo district)

5. Among the mentioned disasters above which are the commonest to the livestock in central division (Isiolo district)……

6. Specify the years those mentioned disasters took place in the people central division of (Isiolo district)……

7. Specify the years those mentioned disasters took place to the central division (Isiolo district)……..

8. What are the frequency of occurrences of the mentioned disaster to the people of central division (Isiolo district)

(a) Drought (i) every one year (ii) Every two years (iii) after every one year (iv) after every five years (vi) others (specify)……

(b) Floods (i) every one year (ii) Every two years (iii) after every one year (iv) after every five years (vi) others (specify)……

© Famine (i) every one year (ii) Every two years (iii) after every one year (iv) after every five years (vi) others (specify)……

(d)Epidemic diseases (i) every one year (ii) Every two years (iii) after every one year (iv) after every five years (vi) others (specify)……

(e) Others specify (i) every one year (ii) Every two years (iii) after every one year (iv) after every five years (vi) others (specify)……

9. What are the frequency occurrences of the mentioned disaster to the livestock of central division (Isiolo district) (quote and

specify)……
…….

10. What are the impacts of the above mentioned disasters to the people of central division (Isiolo district) (i) rise in school dropouts (ii) prostitutions (iii) relief supply dependency (iv)Drugs abuse (v) increase in mortality rate (vi) others (specify)……..

11. 10. What are the impacts of the above mentioned disasters to the people of central division (Isiolo district) (i) Death of livestock (ii) poverty increases in the people (iii) others (specify)…….

D: **ROLE OF INDIGENOUS KNOWLEDGE IN DISASTER PREDICTION**

1. Is indigenous knowledge used to predict occurrences of floods in the community

(a) NO (b) Yes

2. Is indigenous knowledge used to predict occurrence of drought in the community

(a) No (b) Yes

3. Is indigenous knowledge used to predict occurrence of famine in the community

(a) No (b) Yes.

4. Is indigenous knowledge used to predict occurrence of armed conflict with the neighboring community in Isiolo district

(a) No (b) Yes.

5. Does the community living in Isiolo district use indigenous knowledge to predict the weather pattern.

(a) No (b) Yes.

6. Does the community of Isiolo district use indigenous knowledge to predict the rainfall occurrence.

(a) No (b) Yes.

7. Is indigenous knowledge used to compliment government effort in prediction of disaster?

(a) No (b) Yes.

8. Is indigenous knowledge used to compliment NGOs effort in prediction of disasters?

(a) No (b) Yes.

9. Is indigenous knowledge used to predict the occurrence of epidemic diseases in the livestock?

(a) No (b) Yes.

10. Is indigenous knowledge used to predict occurrence of epidemic diseases in the community of Isiolo district.

(a) No (b) Yes.

E: VARIOUS FORMS OF INDIGENOUS KNOWLEDGE PRACTISED BY THE PEOPLE OF CENTRAL DIVISION, ISIOLO DISTRICT IN PREDICTING NATURAL OCCURENCES:

1. Specify types of indigenous knowledge that you know are used to predict natural occurrences……

……..

2. Specify the indigenous knowledge used to predict floods in the district

……

……

3. Specify the indigenous knowledge used to predict drought……

…….

4. Specify the indigenous knowledge used to predict disease epidemics in livestock

……

……

5. Specify the indigenous knowledge used to predict disease epidemics in the people

……..

……..

6. Specify the indigenous knowledge used to predict famine

……

……

7. Specify the indigenous knowledge used to predict armed conflict with neighboring Communities in Isiolo district……..

……

8. Specify the indigenous knowledge used to forecast weather pattern in the district

……

9. Specify the indigenous knowledge used to predict the rainfall occurrence in the district

……

F: EXPLORING FORMAL DISASTER MANAGEMENT TECHNIQUES AND PREDICTIONS BY THE GOVERNMENT AND ORGANIZATIONS AND THEIR LEVEL OF SUCCESS

PART ONE (GOVT.OFFICE AND RECORDS)

1. What do the Government uses to predict natural occurrences in the district

……..

2. What do organizations operating in Isiolo district do for predicting natural occurrences

……

3. How does the government manages various disasters occurring in the district

……

PART TWO (COMMUNITY TO ANSWER)

4.What are the levels of success in management of the natural occurrences by the government as mentioned above; (i) very successful (ii) highly successful (iii) low successful (iv) none

5. How do organizations operating in the district manages various natural occurrences in the district……

6.What are the levels of success in management of natural occurrences by the organizations as mentioned above; (i) very successful (ii) highly successful (iii) low successful (iv) none

7. Specify ways of enhancing this knowledge to supplement the formal government techniques in disaster management and predictions……

……

G: <u>OTHER FORMS INDIGENOUS KNOWLEDGE IN THE COMMUNITY.</u>

What are other forms of indigenous knowledge practiced by the community living in central division of Isiolo District……

APPENDIX III - RESEARCH AUTHORIZATION

APPENDIX IV – CONSENT STATEMENT.

Consent statement to be read to each respondent is as below;

"I am a Research assistant by the name……. and on short term contract by a Postgraduate student from Kenyatta university. My mandate is to carryout interviews on selected household in the settlements within central division of Isiolo district. The questionnaires are based on issues concerning indigenous knowledge and the role it plays in the prediction of natural occurrences by the communities residing in central division of Isiolo district, aspects of formal disaster management techniques by the government and organization and the levels of success by both arm in the management of this disasters. The information that you will give shall be treated confidentially and is for academic purposes only and participation in this survey is voluntary".

Do you have any questions?, You can say "Yes" or you can say "No", it is up to you to decide.

APPENDIX V: LISTS OF SELECTED KEY INFORMANT INTERVIEWED AND FOCUS GROUP DISCUSSIONS PARTICIPANTS.

Key informants interviewed (Villagers in the selected settlements)

i. Mzee Wario Galgalo
ii. Mzee Hassan Giresa
iii. Mzee Ali Alge
iv. Osman Happi
v. Hassan Halake
vi. Isaak Buke
vii. Maalim Isaak
viii. Adan Jirma
ix. Asha Dabasso
x. Safia Galgalo
xi. Roba Abduba
xii. Maako Roba
xiii. Maalim Abdi
xiv. Abdi Hussein
xv. Mzee Maalim Mallow
xvi. Ali Surrow

Focus Group Discussions participants (Departmental Heads)

i. Drought management officer
ii. District veterinary officer
iii. District public health officer
iv. Head postmaster
v. District agriculture and livestock extension officer

vi. Chief – Central division

vii. Assistant chief- Odha sub-location

viii. Coordinator (Friends of Nomads international)

ix. Coordinator (Action aid Kenya)

x. District social services officer

xi. Cllr. Galma (Wabera ward)

xii. Cllr.Adan Tall (Bulla pesa ward)

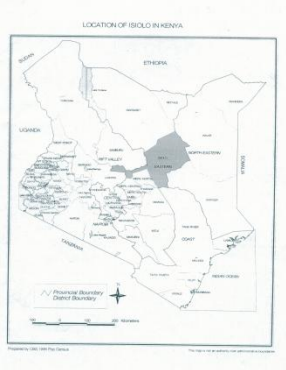
xiii. Coordinator (Kenya Red cross-Isiolo branch)

xiv. Coordinator (Alfalah centre)

xv. Peace coordinator (Isiolo district)

APPENDIX VI – MAP OF STUDY LOCATION

LOCATION OF ISIOLO DISTRICT IN KENYA



ISIOLO DISTRICT