

FACTORS INFLUENCING HOUSEHOLD ACCESSIBILITY TO WATER  
SUPPLY IN A SEMI-ARID AREA: A STUDY OF MUTITO DIVISION, KITUI  
DISTRICT KENYA

Joyfillah  
BY  
WAMBUA KALUNDA JOYFILLAH  
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Wambua, Joyfillah  
*Factors influencing  
household*



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## DECLARATION

This thesis is my original work and has never been presented for an award in any other institution.



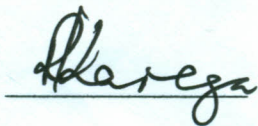
29/11/08

**Wambua Kalunda Joyfillah**

Date

**C50/7255/01**

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



01-12-08

**Dr Regina G. M. Karega**  
**DEPARTMENT OF SOCIOLOGY.**  
**KENYATTA UNIVERSITY**

Date



29/11/08

**Dr Caleb Mireri**  
**DEPARTMENT OF ENVIRONMENTAL**  
**PLANNING AND MANAGEMENT,**  
**KENYATTA UNIVERSITY**

Date

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**DEDICATION**

To my late Parents Ann and James Wambua and my late Daughter Precious Ruth Kingola.

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## ACKNOWLEDGMENTS

All the Glory Honor and Majesty to the Lord God Almighty for granting me Devine health and grace to undertake this research

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## ABBREVIATIONS AND DEFINATION OF TERMS

ASALs –Arid and Semi-Arid Lands

CBS – Central Bureau of Statistics

CIDA – Canadian international Development Agency

DANIDA – Danish International Development Agency

NEAP – National Environmental Action Plan

NGOs – Non- Governmental Organizations U.N- United Nations

SIDA - Swedish International Development Agency

UNEP – United Nations Environmental Programme

UNICEF – United Nations Children’s Education Fund

W.B – Word Bank

HOUSEHOLD – in this context; it is homestead where all members share water harvesting, transportation and demand management activities.

HOUSEHOLD HEAD – The chief decision-maker in any given household.

WRMA – water Resources Management Authority

WRUAs – Water resource users association

## ABSTRACT

The purpose of the study was to determine the factors influencing household access to water supply in Mutito Division, Kitui District Kenya. The objectives of the study were a) To identify main water supply sources in Mutito Division. b) To analyze the factors influencing household accessibility to potable water in the area, and c) To determine gender roles in water harvesting, transportation and demand management. Both qualitative and quantitative techniques of data collection were used. The questionnaire and a case study guide were the main instruments of data collection and this was supported by secondary data from reviewed literature.

Using survey data the study formulated chi-square analysis to estimate relationships between the socio-economic and physical factors that influence household water access in the study area. Pearson correlation coefficient was used to determine the relationship between socio-economic factors and household access to water. Further, the study conducted a T-test to compare actual amount of water available for the household and the amount they would have spend if there was enough water at their disposal.

The study findings showed that female headed households were poorer than their male counterparts and therefore, this impacted on their ability to invest in water transporting implements reducing the amount of water transported home. The results of Chi-Square test of significance ( $X^2 = 28.92$ ;  $df = 2$ ;  $p = 0.000$ ) indicated that there was a significant relationship between family size and access to water supply at probability of error = 0.05. Pearson's correlation coefficient indicated that larger families were less likely to have access to adequate water ( $r = -0.25$ ,  $p = 0.05$ ,  $n = 150$ ).

The highest proportion of households with inadequate access to water supply was among households headed by those aged 51 years and above followed by 41 to 50 years, 31-40 years, and less than 30 years in that order. Pearson's correlation coefficient confirmed this as families headed by older house heads were more likely to have inadequate water ( $r = -0.11$ ,  $p = 0.05$ ,  $n = 150$ ).

. There was a slight increase in access to water supply as the level of education increased. Poor households lacked resources to invest in water harvesting and transportation implements. Therefore, families headed by higher income house heads were more likely to have adequate water ( $r = 0.41$ ,  $p = 0.05$ ,  $n = 150$ ).

There was an acute water shortage in the study area. Water for household use during the dry season was fetched from shallow wells dug on dry river channels. These wells went up to a depth of 5 meters. This water was transported back home using; beasts of burden, human labour (head/back loading) and even bicycles. The wells were dug and owned by men owing to patriarchal land ownership structures. This impacted on the ability of poor female headed households to access water at the source. At the national level in the spirit of the Vision 2030, the study proposes, sinking of boreholes, harvesting of run-off water through communal water tanks and subsurface dams. Further, at an individual level the study proposes investing in water cans, donkeys and animal drawn carts to increase amount of water ferried home and quality time for farm work and family care.

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background

There is an acute shortage of water in semi-arid areas, which are characterized by low amount of rainfall ranging between 500mm and 760mm per year. This situation is aggravated by increasing populations in semi-arid areas. This is because semi-arid areas are recipients of migrants from densely populated areas who are currently moving to less densely populated areas due to population pressure.

World over, water shortage remains a serious challenge to development especially in developing countries. Access to safe drinking water remains an urgent human need in many countries. With the world population tripled in the 20<sup>th</sup> Century, use of renewable fresh water resources has grown six fold. Within the next 50 years, the world population is projected to increase by 40-50%. This growth coupled with industrialization and urbanization challenges will result in increased demand for water. This demand will be more serious in ASALs where the resource is scarce.

For instance, by 2000, 50% of people living in developing countries lacked access to water (UNICEF 2002). 1.1 billion People live without access to clean water 3900 children die everyday of water borne ailments and 70% of East-African hospital visits are caused by contaminated water (WHO & UNICEF 2004).

Kenya is a water scarce country with a renewable fresh water per-capita of 647m<sup>3</sup> against the United Nations recommended minimum of 1000m<sup>3</sup> (Republic of Kenya 2007). This condition is worse in Semi-Arid areas where rainfall is low.

Kenya's fresh water per-capita has been declining and is projected to reach 235m<sup>3</sup> by 2025(Republic of Kenya 2007).

The Millennium Development Goal no 7 aims at halving the population of people without access to clean water worldwide by 2015.. In Kenya, the national water Master Plan launched in 1974 and subsequently updated in 1992 was an effort meant to ensure access to potable water for all by 2000. Further the water policy of 1999 and the Water Act 2002 are examples of national efforts to ensure water access and adequacy to Kenyans. The Ministry of Water resources poverty reduction targets are to give all households access to safe potable water systems within 2 kilometers by the year 2010 (Republic of Kenya 1999), the National Development plan aims at reaching 90% water access coverage in urban areas and 70% access in rural areas.

The current First Medium Term Plan aims at attaining 90% safe water access in urban areas and 70% access coverage in rural areas by the year 2012. Kenya's main target no 10 for the Millennium Development Goal 7 on environmental sustainability aims at halving the proportion of people without sustainable access to safe drinking water by 2015 this is in line with the overall aim of the currently launched Vision 2030 being safe water access and availability to all by the year 2030.

World over, access to safe water supplies varies from region to region and with considerable disparities within regions. This determines the daily water per capita requirements in these regions. For example in N. America and Japan, the daily water per capita is 350 liters, in Europe, it is 200 liters and in sub-Saharan Africa it is 10-20 liters and the situation is worse in ASALs (Internet). The Arid and Semi-Arid lands of Kenya have a poor coverage of safe water supplies with below 22% of the

people in North-Eastern Kenya able to access a safe water source within 15 minutes. Over the last 30 years, there has been inadequate funding for rehabilitation, upgrading and expansion of water supply facilities. Declining allocations from the exchequer compounded the situation leading to rapid deterioration (Internet). To reverse this trend, the government has initiated reforms for the entire water sector. These reforms are based on the globally accepted principles of decentralization, participation and sustainability of these sources (Republic of Kenya 2005). However there seems to be severe challenges to improving access to adequate and reliable supply of clean water which is critical to public health especially for low income groups (Oxfam).

In the 1995, Participatory Poverty Assessment report, poverty and lack of water were often linked. A poor person was sometimes defined as someone lacking access to water (Republic of Kenya 1999). Deborah Katina a community development agent in West Pokot District of Kenya, says “access to water is a key to women rights” (Internet). A household’s inadequate access to water can have major adverse consequences on the length and hardship of a poor woman’s working day. In the dry areas and especially during the dry seasons, women may have to travel half the day in search for water. This time could be spent travelling and queuing for water as water sources dry up with persistent drought. Water collection involves predominantly women’s labour and it affects their priorities for families care (Oxfam International, Internet). This is the reason why gender issues are mainstream concerns when studying water access situations especially in rural areas where the proportion of households living in poverty is 82% and the bigger percentage of these are female headed because of rural to urban migration. This situation is worse in rural Semi-Arid

areas which face a complexity of development challenges. For example, In 1999 the Welfare Monitoring Survey report II, documented Makueni, Homabay and Kitui districts as reporting a scarcity of safe water at rates in excess of 80% (Republic of Kenya 1999).

Kitui district is a semi-arid zone registering aridity levels of 85 –100% Of the total area (internet) Drought and aridity cause water access problems. Water scarcity is classified, as the most serious constraint to development initiatives (Republic of Kenya 2002). Therefore the district was ideal for this study. Current statistics show that the average distance traveled by any household to the nearest water source is 5-6 kilometers, but instances of families travelling for 30 kilometers in Mutito division have been recorded indicating serious water access issues (Kitui District Development Plan; 1994-96, 2002-2008). The district is classified as entirely hot and dry with very unreliable rainfall. Furthermore, most rivers and streams run dry for much of the year turning to dry sand beds. There is severe water pressure during the dry season and a large proportion of the population depended on hand-dug wells on these dry sand beds. Water scarcity in the district has affected all spheres of development including; agriculture and livestock production, and industrial development, improvement of health, education and market center development. With increasing population and land pressure, the gravity of water inadequacy situation is becoming more severe (Republic of Kenya 2002).

Further, government legislation has not been favourable in ensuring expansion and development of water supply projects. Some projects have completely stalled and

others non-operational due to lack of funds for rehabilitation. As a result, people in these zones face a severe accessibility problem.

## **1.2 Statement of the Problem**

Water is a basic resource not only in supporting life but also in sustaining economic activities in various development facets and industrial growth worldwide. Kenya's scarce fresh water resources are constantly threatened by increasing populations. As a result demand surpasses supply of water requirements for various activities. This is the reason why Water resources in Kenya and especially in Semi-Arid lands need to be managed and developed in a sustainable and integrated manner.

Lots of studies have been done targeting various aspects of water accessibility. Majorities of these studies have included; water harvesting, water pollution, water resource management, water project management, and water infrastructure development research. Examples of such studies are; 'Kenya in search of water', 'water resources of arid areas', and 'socioeconomic aspects of water management', all by Oxfam international. A.O Opere too has written a paper on 'rainfall characteristics of the Arid Kitui District of Kenya'. These and many more are examples of scholarly works on water issues in Kenya. However, much of these studies have dwelt on the engineering and technical aspect of water accessibility. Water pollution and ecological damage resulting from the same have also received considerable attention. In addition, most of the studies only give general figures of those who have access to water in a certain region. Unfortunately, very few studies examine the socioeconomic factors that influence accessibility of water for

households in semi-arid areas. Even scarce are studies examining how these factors affect the semi-arid households' ability in improving water harvesting and transportation which dictates the amount of water available for household's use.

Another equally ignored but important aspect of water is the gender component yet women play a key role in water issues. Women are the domestic water managers owing to gender division of labour which assigns them the responsibility of domestic water provision. Women are the ones who fetch water . in the arid and semi-arid areas they take between 5-8 hours. The time spent fetching water disrupts women's participation in productive work however it is not clear which work suffers and by how much. It is also not understood how water in the household is distributed, in what quantities and what sources of water are available. Further intra-household relations arising from gender division of labour and patriarchal structures discriminate against women in resource ownership and decision-making. These have denied women equal chances in water harvesting and transportation, which imperatively have an impact on the amount of water available for their household use. Economic hardships have forced many men to move to urban centers in search of paid labour to supplement their family income. The female headed households have nobody to supplement their incomes. As a result, purchasing a donkey, animal drawn carts, or a bicycle for transporting water may not be possible. Some of them have to transport water using head/back loading and this limits the amount they can take home. Carrying water on their backs may also result in severe fatigue which impacts on the woman's ability to indulge in farm work which is the main economic activity in the rural areas.

Thus, the aim of this study was to investigate the socioeconomic and gender factors that influence water accessibility in semi arid areas and further find out if the female-headed households are more disadvantaged than their male headed households in accessing water for their households use. This is because men dig the wells and own land where water sources are found. Male-headed households could also have a higher hand in water transportation because of traditional resource ownership patterns, which are biased in favour of men.

#### **1.4 Research Objectives**

The study sought to:

1. Identify main water supply sources in Mutito – division.
2. Analyze the factors influencing household accessibility to potable water in semi – arid areas.
3. Determine gender roles in water harvesting, transportation and demand management.

#### **1.3 Research hypothesis;**

*H<sub>1</sub>: Household socioeconomic status does not influence access to a household's water supply.*

*H<sub>2</sub>: Distance from the household to water source does not influence access to water supply for the household.*

*H<sub>3</sub>: Gender of the household-head does not influence access to water for a household.*

## 1.5 Study Rationale

There were four respects to justify the need for this study. To begin with, approximately 80 % of Kenya's land is classified as Arid and Semi Arid. This is home to 30% of the country's human population, 60% and 65% livestock and wildlife population respectively ( KARI-Internet). Arid and Semi Arid Lands (ASALs) suffer severe droughts and water shortages causing immense sufferings to people, livestock and wildlife. This impacts on the amount of water available for household's use in the said regions. Kitui district was ideal for this study because it experiences semi-arid Characteristics with 85-100% of the total area being classified as arid or semi-arid (A.O.Opere-Internet). This is manifested in unreliable rainfall and high rates of evaporation ranging between 1800-2000mm/year (Internet) As a result, the District faces acute water shortages.

Secondly, the findings from this study will be useful to Government policy makers and water related organizations like Action Aid, DANIDA, CIDA, SIDA and other stakeholders in policy formulation and implementation of the water sector reforms proposed by the water Act document 2002, and the Vision 2030. This will help improve on the household water accessibility situation in semi-arid areas.

Further, the study made a useful contribution to conceptual and theoretical propositions concerning accessibility to water for household use in semi-arid areas. More so, the study is useful in methodological issues, this is because it made use of both qualitative and quantitative methods. Such combination of techniques is supplementary in enriching of research work.

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In addition, the study will also add to the existing body of knowledge especially on gender studies, rural sociology, and community development. Finally, the study made recommendations on how the problem of water accessibility in ASALs can be alleviated and provided a springboard for further research in water accessibility problem.

### **1.6 Study's Scope, Setting and Organization**

The study scope was limited to household water accessibility in semi-arid Mutito Division of Kitui District. The main focus was on accessibility to water source from the household. Indicators like; the distance explained this from the household to the water source, the physical appearance of the water source, the water fetching implements and the mode of transportation used.

On a global and national scale, statistics have been offered from reviewed literature. At a local level, statistics from reviewed literature are supported by primary data from the field. The researcher has been able to show how by moving from a general problem to a specific one, access to scarce national resources can be studied by focusing on water access in the semi-arid households. The study can be replicated in other semi-arid areas to study challenges semi-arid households face in accessing water supply sources, how this impacts on amount of water available for household use and further implications of the same on water demand management at household level.

The main data collection instrument was the questionnaire although a case study guide and a key informant questionnaire were used to supplement survey data

and collect qualitative information. Patriarchal structures discriminate against women in resource ownership. As a result the study also gave consideration to the disadvantages female-headed households may have in water accessibility compared to the male headed households. This is because women face challenges related to resource endowment to invest in water transportation implements and ownership of wells.

The study has six more chapters, covering the following important themes,

- The literature reviewed
- Theoretical perspectives
- The research methodology
- The main water supply sources in Mutito Division.
- Statistical analysis of factors influencing household access to adequate water supply.
- Gender related challenges in household water accessibility.
- Summary, conclusions, recommendations and areas for further research.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

This chapter is an attempt to understand the theoretical and conceptual issues concerning accessibility of community resources, especially water. To achieve this, the chapter is divided into seven sub-sections that are intended to document water resource accessibility situation in rural semi-arid areas. These sub-sections include:

- The role of communities in resource management
- Water sources
- The water access situation
- Gender relations in water access.
- Socio-economic status and water accessibility.
- Policy issues.
- Theoretical and conceptual framework.

#### 2.2 The role of Communities in resource management

There is need for recognition of the primary role of communities as partners with the government as natural resource managers. It is in this regard that it's critically important to encourage communities to take greater responsibility of their resources, including water as Briscoe and De Ferranti puts it:

*“Community itself must be the primary decision maker, the primary investor, primary maintainer, primary organizer and primary overseer of its resources (Briscoe and Ferranti in Jeffery 1995.)”*

From the excerpt it is clear that when dealing with shared natural resource like water, the entire community is involved in its management. However, due to the multiplicity of communal links and competing claims over the use of common resources entrenched in these communities, the state should be left to perform the role of the overseer. Although De Ferranti's arguments are authentic, competition for scarce resources will always interfere with the community ability to be rational when exploiting scarce resources. In the 1992 world bank development Report, the poor are said to be Victims of environmental degradation and at the same time poverty is seen to be the major cause of environmental degradation. This is because the poor scavenge the environment in search for livelihood, they burn charcoal, they cut down trees, they use primitive farming methods, in the process they destroy the livelihoods support systems that they are struggling to stabilize. The argument here is that the communities can not be overseers in their own activities.

Deborah Katina a community development agent working for a church funded water project in West Pokot says that access to water empowers communities and it is a key to women's rights (Internet). This is because water is a basic need for survival. The people living within these fragile ecosystems only need to be facilitated to take charge in managing their local resources. According to the Water Act 2002, Katrina says 'all the waters belong to the Government' (Internet). But on the contrary, the state should only be a facilitator. And ownership should be left in the hands of the local communities, which interacts with the water system on day to day basis and even have access to local resources like land.

However I agree with Katrina's argument that the communities who depend on these natural water supply systems also have their own traditional mechanisms of managing these resources. They have their indigenous knowledge on how these resources can be harnessed cheaply and using locally available resources. She gives a good example of sub-surface Dams they have done in West Pokot where they trap water from seasonal rivers during the rainy season and use sand as the reservoir since if the dam is left bare, all the water will evaporate under the scorching sun. The projects are also located closer to the people because Pokots are nomads. This reduces the distance women have to travel to fetch water. This is because as Katrina puts it, pokot women used to travel upto 12 Kilometers to fetch water.

It is in recognition of this critical role of communities in resource management that the Government of Kenya has initiated water sector reforms that provide for Water Resource Users Associations (WRUAs). These WRUAs work under the Water Resources management Authority (WRMA). The WRUAS do the actual management and WRMA plays the coordination (Water Act 2002).

### **2.3 Water Sources in Kenya**

Kenya is a water scarce country with a renewable fresh water per capita of  $647\text{m}^3$  against the United Nations recommended  $1000\text{m}^3$  (Republic of Kenya 2007). Kenya's fresh water potential has been declining and is projected to reach  $235\text{m}^3$  by 2025 if the trend is not reversed. The annual ground water potential in Kenya has been estimated to be 619 million cubic meters. Of this, 31% is in deep-seated aquifers exploitable through boreholes and 69% located in shallow aquifers exploitable

through shallow wells ((Republic of Kenya 2007)). Because 69% of this water resource is in shallow aquifers, much of it can be harnessed cheaply. However, current statistics show that majority of Kenyans have no access to safe water sources. More specifically, 40% of the urban residents and 60% of the rural population do not access water from; boreholes, protected spring, rivers, pans, dams and piped water sources (The National Water Policy Paper no.1 of 1999, National Development Plan 1997-2001, Republic of Kenya 2007).

However, the distribution of these sources in Kenya varies from one drainage basin to another. More so, the sources are highly influenced by variation in rainfall intensity, soil types, vegetation cover and presence or absence of wetlands. As a matter of fact, these factors are instrumental in explaining water shortages in Kenya. Importantly, they impact on the availability of water for socio-economic and ecological demands. Water withdrawal by different sector also overwhelms the recharge levels, which are 3% and 17 % for ground resources and surface water respectively. The Agricultural sector withdraws 76%, the domestic sector 20% and the industrial sector 4% annually (Internet)

According to the National Development Plan (1997-2001:125) the country's water supply is done through 330-gazetted outlets, accounting for 80% of the served population countrywide. Given the fact that Kenya has a population of 30 million people then the question is how accessible are these sources? In addition, the remaining 20% of the population is served by non-gazetted sources. Whether these sources are clean, reliable or accessible is unknown. However the government has

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embarked on turning around the country's water sector and the following are some of the major accomplishments in the water sector for the period 2003-2007.

- ❖ Water and sewerage schemes in Garrissa, Eldoret and Nyeri and Phase 1 of the Kisumu water and sanitation programme.
- ❖ 759 dams and pans in ASAL areas
- ❖ 209 community water projects completed through the water services trust fund (WSTF)
- ❖ 203 rural water schemes rehabilitated.
- ❖ 586 boreholes drilled and equipped
- ❖ Construction of dykes and canals, gabions and river training along rivers Nyando, Nzoia and Tana.
- ❖ Rehabilitation of Yatta and njoro Kubwa canals.

(source: First medium Term Plan 2008-2012)

All these efforts are geared towards increasing water sources so as to improve on accessibility but inadequacies of water supply sources still persist impacting on accessibility especially in ASALs.

At another level, water sources in Kitui district are classified into Natural and Manmade. The natural supply sources include: - rivers, ponds, streams and a few springs. The manmade supply sources include: dams, boreholes and roof catchments (Household Monitoring and Evaluation Survey Kitui District 1992). However, these various sources are not reliable. More precisely, 70% of the population depends on seasonal rivers whose recharge depends on unreliable rainfall (Kitui District Development Plan 2002-2008). The reason behind this is that the district experiences

semi-arid climatic conditions, making water searching a preoccupation of everyone in the district.

The other available sources of water are earthen dams, subsurface dams, roof and rock catchments and water-pans. However, most of these sources run dry during the dry season causing severe water shortages. As mentioned earlier, the district has springs, which are found in the hilly areas such as Mumoni hills to the North, Mutito hill to the East (shown in map fig.3.1), Endau hills and Mutha hill. Like the other sources the springs run dry during the dry spells, making water accessibility to their users a problem.

Despite all these alternatives therefore, there is no sufficient water to meet local water needs, especially during the dry season. As a result, water scarcity causes seasonal mobility of people and animals. Herdsmen migrate closer to the only available sources of water during the season to reduce incidences of their animals dying due to long distances and lack of water. But homesteads cannot be relocated as a result the water fetchers walk distances under the scorching sun to the water source. These sources become increasingly distant with persistent drought, making such sources inaccessible to many people.

In places like Voo, Mutomo and Endau for example, people walk for more than 30 kilometers in search of water (Kitui district development plan 1994 -96, 2002-2008). After walking to overcome the long distances, women are faced with other challenges related to the physical appearance of the water source. Some of the wells are too deep, and water recharge in some sources is very low. This means that water fetchers

who are mostly women end up spending more time at the source either filling their cans or queuing to fetch the water in turns. Water harvesting is chiefly men's affair as a result the men end up watering the animals before women are allowed to fetch water. Ownership of the wells is dictated by patriarchal land ownership structures, which are biased in favour of men. Further this condition is compounded by the fact that resource ownership and decision making is also in favour of men as a result female headed households may be disadvantaged when it comes to resources to invest in water transportation implements like draughts animals, animal drawn carts, bicycles and water cans. In this kind of a scenario, female headed households could be disadvantaged in terms of ownership of water sources and resources to invest in water transportation.

#### **2.4 Water Access Situation**

Water accessibility is a problem worldwide. More specifically, water related ailments kill many people each day especially in sub-saharan Africa. The U.N and the W.H.O estimate that 80% of third world diseases are water-borne (SIDA 1995). By 2000 82% of the global populations had access to potable water but in the developing world 50% of the people had no access to potable water (UNICEF 2002).

In Kenya, the year 2006 estimates of water supply situation indicated that 60% of urban populations had access to clean water. However, 60% of the country's rural populations had no access to clean water (Republic of Kenya 2007). These statistics compared indicate that the countries water access situation is on the decline.

As a result, the government through its development plans has been committed to improving the water access situation since independence. However, efforts to implement these plans have been thwarted by lack of funds and mismanagement. For this reason, the water access situation in most rural zones of the country has not improved. The situation is desperate in rural semi-arid areas.

It is in this recognition that the country initiated water sector reforms through the Water Act 2002 to improve on the water access situation. These reforms were to be addressed through reducing water access challenges facing different sectors as stipulated in the Kenya's Vision 2030.

The first challenge is related to uneven distribution of the limited water sources in the country. This is related to the fact that the renewable freshwater per capita stands at 647 m<sup>3</sup> against the UN's 1000m<sup>3</sup> (Internet). This keeps on declining threatening the country's water accessibility potential and increasing scarcity of the resource. This challenge is a threat to stable livelihoods especially in ASALs.

The second challenge is improving water security, this regards the inconsistencies and the unreliability of the countries water supplies as dictated by climate changes. Inadequate water harvesting has caused floods during the rainy seasons and little or no water at all during the dry spells. The country needs to improve on the storage infrastructure to avoid water-related catastrophes related to too much water or none at all. Improved water harvesting will also improve opportunities for ASAL communities to improve on food security since most of their time is spend in water searching (Republic of Kenya 2007)

To address the above challenges, the government of Kenya in the has propped for the strengthening of decentralised water sector institutions and increasing involvement of communities in the management of water affairs. The national Water management strategy was launched in 2007 and the Water Appeal board Operationalized to streamline management of water resources in the Country. This also streamlined roles of different water sectors e.g. borehole drilling shifted to National Water Conservation and Pipeline co-operation (National Economic Survey 2008).

The Government also devised a catchment management strategy to reduce degradation of water resources arising from poor land management. Human activities need to be controlled to prevent destruction of natural vegetation the catchment areas. The mau Forest Example is a case in point where human activities around the catchment area have affected other water users including wildlife even in Asal Districts as far as Masai Mara game reserve. This is a complex challenge, which may require an integrated approach by all stakeholders and ministries to attain the desired levels of management. This is why Water Resource Users Associations (WRUAs) have to collaborate with all stakeholders in water use and management to ensure that the people downstream are not severely affected by the irresponsibility of those living upstream.

There are also challenges related to increasing demand by all water extracting sectors, increasing pollution levels especially in natural water systems and underdeveloped water infrastructure. These and many more are the hurdles that the country needs to overcome to improve on her water accessibility situation.

In Kitui district for example, availability of safe drinking water is very limited with only 30% of households having access to safe drinking water (Kitui District Development Plan 1994-96, 2002-2008). This means that majority (70%) of the people living in the district do not access clean water. The 1999 Welfare Monitoring Survey report documented Kitui, Makueni and Homa-bay all semi arid districts as recording water scarcity at rates in excess of 80%. The implication here is that, most people in semi-arid areas have a problem accessing water for household use.

Finally, in Mutito division (the study site) only 21.3% of the total households have access to safe water sources. This means that 78.7% of the population has no access to safe water sources. The situation is worse during the dry season. Evidently, people in the division walk an average of 4 kilometers to fetch water (Republic of Kenya 2002, Kitui district, Household Monitoring and Evaluation Survey 1992). The question then is what factors influence accessibility to water for household use in the area? The present study has tried to explore and analyze such factors.

## **2.5 Gender Relations in Water Access**

Water is a precious and limited resource in the world's dry lands. Thus, its scarcity causes competition for its use (Oygaard et al 1999). In Kenya for example, the goal of providing safe drinking water for the citizens has remained a mirage (Water Policy Paper of 1999, national Poverty Eradication Plan 1999-2015, Water Act 2002, MDG status report for Kenya 2005, Vision 2030 document of 2007). Accordingly, access to safe drinking water has been the preoccupation of all communities countrywide, especially in semi-arid areas.

It is worth noting that gender mainstreaming in development means equal opportunities for all to have equal access to livelihood resources. This is why gender mainstreaming ought to ensure both men and women get equal access to water for their households (WB 2002). However, due to societal structures that discriminate against women in resource ownership and decision making, the female headed households are more disadvantaged than their male counterparts in accessing resources including water. In this case, some of the direct obstacles to accessing water supplies like scarcity and contamination should be handled directly by various stakeholders. This can be done by investing directly in rural water supplies to reduce wastage of time in searching for water, especially by women and children.

In this view, affirmative action in gender mainstreaming may remain potentially important not only for development in other areas, but also in water related concerns. Deborah Katrina says the burden of women's marginal status is increased by cultural attitudes placing low value to female education. These traditional values doom women to a life of hard labour, shutting their doors to Improvement of their economic status (Internet). In fact, gender equity is an aspect of development effectiveness and not just a matter of political correctness or kindness to women (World Bank 2002). This is because the culturally based expectations of the roles and behaviors of males and females define clearly gender responsibilities. Apparently, this is the case in water access where culturally and traditionally women are marginalised and female headed households disadvantaged (internet).

On the other hand, men own water sources owing to patriarchal land ownership structures this gives male headed households an upper hand in accessing

these water sources. Water harvesting is also a labour intensive activity which is done by men and due to feminization of poverty, female headed households have fewer resources to invest in water transporting equipment like water cans, animal drawn carts and even draughts animals.

As a consequence, this has implications on female headed households ability to access enough water supplies for their households since societal structures regarding land and resource ownership are biased in favour of men. This is because men own the land where water sources are located and they also own more resources to invest in water transportation.

## **2.6 Socio - Economic Status and Accessibility Water supply**

According to the economic theory of scarcity and choice people have to make rational choices on how to spend scarce resources (Craib 1992). When a resource is scarce demand automatically increases and the cost goes up. In semi-arid areas for instance, water infrastructure is underdeveloped due to political and economic marginalization (Oxfam-Internet). As a result, there is an acute water shortage and therefore its accessibility is problematic. In this case, water in these zones may be very costly in terms of money and opportunity cost of time and efforts spend to acquire the resource.

In this kind of a scenario, the variable cost can be conceptualized in many ways. First, cost can be seen in terms of the distance traveled to fetch water this includes the terrain of the path trodden that can make accessing a certain water source difficult or impossible by certain categories of people. In most ASAL areas, people

walk very long distances to fetch water, like in West Pokot District, women Walk for over 12KM in search for water (Internet). In Mutito division for example, people have to walk an average distance of 4Kms to fetch water (Kitui District Household Monitoring and Evaluation Survey). During the dry season water access situation is even more problematical.

The second way cost comes into interplay in water access relates to time expended. In this one, we have in mind the opportunity cost of time lost by both men and women in search of and queuing at times for the commodity. Simply put, time spend looking for water could be utilized in doing other productive work. This means that a lot of time therefore, is used in water searching instead of people getting involved in their daily economic, political and social activities.

Further, cost can be seen in terms of the effort people exert in looking for and carrying the commodity from far places, especially during the dry season. For instance, paths to springs and other sources are in most cases not clear and smooth. Indeed, some of the paths have thorny shrubs due to the semi-arid vegetation and some are hilly and traversed by gullies. Given the fact that some people carry very heavy containers balanced on their heads or strapped to their backs, such paths therefore become treacherous (Rodda 1994, Sontheimer 1991, Jeffery 1995). More so, people also use a lot of effort to access water in very deep sunken wells. This is sometimes both difficult and dangerous.

Following this discussion, it is therefore rational to argue that those with purchasing power can probably access this product by buying it easily from the vendors. Importantly, this results in unequal water access based on status. In fact,

many people living in semi-arid environments are poor and hence they cannot afford to buy water. This therefore means that they are the ones hit severely by water accessibility problems. However, the problem is even worse among women owing to patriarchal system, which segregates them from productive employment. Resource endowment makes it possible for people to invest in water transporting implements and transportation modes like beasts of burden, draughts animals, bicycles, animal drawn carts and even water cans. Due to feminization of poverty, female-headed households have fewer resources to invest in water transportation implements and they are disadvantaged in accessing enough quantities of water for household use.

The variable socio-economic status can take different dimensions. First, educational level can define ones status. This is because education improves one's ability of making rational choices. To be sure, educated people are more informed and tend to make wise choices than the ignorant. It thus follows that; the educated will always sacrifice their resources to access adequate and if possible safe water supplies since they are well aware of the consequences of using contaminated water. Secondly income can define ones socio-economic status. When a person's income is high then he has enough to spend and can access adequate water because he has the purchasing power. Further, income and education can define ones occupational status. More specifically, People with high education tend to have occupations that generate high income. This therefore implies that such people are able to make informed choices on how to access adequate and safe water since they can meet the cost involved.

Finally, when dealing with shared resources like water it becomes imperative to look into the relationship between socio-economic status and its impact on accessibility of such resources. In this kind of analysis it will be more meaningful therefore if socio-economic and cultural constructs with regard to males and females having unequal rights, resources and privileges in accessing such resources are looked into. This study attempted to look into some of the socio-economic and cultural factors influencing household water access and provision in Mutito division, Kitui District.

## **2.7 Policy Issues in Water Accessibility**

Although the government of Kenya has put a lot of efforts in developing water supply countrywide, the coverage is not satisfactory. Indeed, current water supply situation in Kenya indicates that access to safe water varies from a high of 92.6% in Nairobi to as low as 13.5% in Bondo District of western Kenya. Ten years ago, 25% of the urban population and 50% of rural population had no access to clean water supplies (Republic of Kenya 1997, Water Policy paper 1999). To date the numbers accessing safe drinking water in the country have not improved. Current statistics show that access to safe water in urban areas has declined to 60% and in rural areas access has gone down to 40% (Republic of Kenya 2007). This is because over the last thirty years, there has been inadequate funding for rehabilitation, upgrading and expansion of water supply facilities. Most of the existing water supply systems were constructed 20-40 years ago. Declining allocations from the exchequer worsened the situation leading to their rapid deterioration (Republic of Kenya 2005).

More specifically, there were 2000 water projects countrywide by 1999.

Ownership of these water projects in the country are presented in Table 2.1: **Table**

**2.1: Number of Water Projects by ownership**

<b>Ownership of Water Projects</b>	<b>Number of Water Projects</b>
Ministry of Water Resources	600
National Water Conservation and Pipeline Corporation	200
Local Authorities	200
Non-Governmental Organizations	300
Community Based organizations	400
Self-Help Groups	300
Total	2000

Source: Sessional Paper No. 1 of 1999(water policy paper)

From the above data we can conclude that community based organizations (C.B.O.s) and Self-help groups led in the ownership of water projects by 35% followed by the ministry of water resources by 30% and then followed by non-governmental Organizations by 15 %. The National Water Conservation and Pipeline Company and the Local authorities trailed by owning only 10%. This is a clear indication that communities are leading in water management and should be considered chief stakeholders in any water management initiative.

Further it is ironical that although the local councils were the ones mandated to provide water for domestic use and especially at the grassroots level, they were trailing by owning only 10% of the total water projects countrywide.

The water policy paper of 1999 is unclear on who is mandated to ensure water access and adequacy in the rural areas including semi arid areas. It is also non-committal regarding the issue of water quality for the rural folk. The Water Act Cap 372 chiefly addresses issues related to urban water provision delivered through metered

connections at a price of twenty shillings per cubic meter and disregards issues of rural water supplies especially the natural water systems managed by local communities. The act does not provide clear guidance on how natural water systems need to be tapped and utilized to ensure clean water for the rural people of Kenya. For example it does not stipulate who is responsible for treating water used by rural people. This becomes a challenge to the rural folk who have to use contaminated and untreated water, which at times is more expensive than the treated water. A good example is where a 20 liter can untreated water sales for KShs 20.00 the same amount that the urban folk are spending on a whole cubic meter of treated water.

The inadequacies facing the water sector resulted from political and economic marginalization which denies many Kenyans effective and appropriate development. This situation is worse in ASALs where drought related crisis have attracted international attention (Internet). The Water Act 2002 which calls for privatization of urban water supply services so as to ease revenue collection but it does not consider providing a legal provision and guidance as to who is responsible for ensuring water access in semi arid communities where metered connections are few or non-existent. The Act however has provided for establishment of Water Resource Users Association (WRUAs) which bring together community members to manage their water supply systems effectively. These Associations however depend on societal bylaws and face limitations in legal framework for punishing members who don't comply with the bylaws.

However, the importance of water as a resource cannot be underestimated. This is because water is important for survival and therefore it is essential that quality

adequate supplies be developed to sustain life. This is because its contamination can be disastrous for human and animal survival as it causes ill health. It is in recognition of this fact that the government of Kenya instituted water supply and sanitation projects in various parts of the country, with a view of bringing water closer to the people. These efforts were aimed at fighting disease, which was one of the three major problems bedeviling this country at independence.

Since independence there has been many efforts to improve the water sector, the launching of the National Water Master Plan in 1974 was aimed at ensuring availability of potable water to all households by the year 2000. This goal was to be achieved through; establishment of water supply schemes, sinking of boreholes, construction of dams and conveyance of infrastructure in form of pipes and furrows. However, this goal has not been achieved. There are several reasons explaining why this goal has not been realized to date.

First, the public sector played a major role in water provision and almost overshadowed the private sector. This was believed to be the best way in managing water resources. Apparently, owing to the budgetary constraints the financial burden was too high for the public sector to cope in implementing its water provision expansion programmes. The user charges and water tariffs that are a supplementary resource to the budgetary allocation were very minimal to support the budget shortfall. Though many donors came in to support such programmes, their resources were invested in developing new schemes at the detriment of the operational and maintenance of the existing water projects.

Further, NGOs operation increased mainly in support of community based water supplies. Individual and private initiatives were also increased. With so many actors involved in the water supply sector there was lack of a comprehensive policy to guide water provision, development and maintenance. More so, institutional and legal frameworks were lacking. These policy weaknesses were further compounded by the Water Act, which is also wanting. More precisely, the act does not provide legally binding environmental requirements to be complied with in water development activities (National Environmental Action Plan 1994, Sessional Paper no.1 of 1999).

However, in recognition of the past neglect and to reverse the current situation, the Government has initiated a process of reforms for the entire water sector. The reforms involve developing autonomous institutional framework solely responsible for the management of the scarce water resource to ensure sustained development. The Water Policy 1999, Water Act 2002, MDGs as analyzed by MDGs status report for Kenya 2005. Other efforts are documented in the Goal 2012 as stipulated in the National Development plan 2007-2012, the Goal 2015 as documented in the National Poverty Eradication Plan Document (1999-2015) and the Vision 2030.. The reforms are in line with the globally accepted principles of decentralization, participation and resource sustainability.

In sum, policy issues may have a negative impact on the water access situation in a country. . However, despite all these challenges the ongoing reforms in the water sector are expected to reverse the current declining trend in the water access situation in the country with an aim of having safe water access to all Kenyans by the year 2030.

## **2.8 THEORETICAL FRAMEWORK**

### **2.8.1. The Theory of Socialization**

Culture is defined as social heritage. The ideas, techniques and habits passed from generation to generation. Emile Dulkheim and Talcott Parsons played a great role in developing the idea behind culture and socialization. Socialization is defined as the process of acquiring social characteristics and learning ways of thoughts and behaviors considered appropriate as well as inappropriate in society.

This process in the early stages is informal, unintended and a product of social interaction, close physical and emotional contacts. Societal norms and values are internalized through this process and societal sanctions are designed to ensure compliance (Bilton et al 1987)

This learning process is done through observation and experience for example men and women are taught how society expects them to behave, the roles society expects them to undertake and pressure for conformity is ensured through societal sanctions including stereotyping and labeling. This process commences at birth and terminates upon death.

This theory has been used to explain how water roles are designated in the rural semi-arid areas following the principles of gender division of labour. Women are designated the role of ensuring enough water reserves for household use. It automatically goes without saying that they are therefore responsible for fetching water and managing how water is used at the household level. Men dig the wells, they are responsible for water harvesting, and they own the wells owing to patriarchal land

ownership structures in society. Men own more resources than women owing to patriarchy therefore, they may have more resources to invest in water fetching implements. This means that male-headed households may have an advantage in accessing enough water for their households as compared to the female-headed households.

### **2.8.2. The Rational Choice Theory**

The conception of society as made up of individuals acting rationally has been most explicitly developed by economists, in the view behind a free market. Competition operating in the laws of supply and demand is adjusted by choices and preferences of the buyers. According to economist Adam Smith (in Ian Craib 1992), the stability is as a result of 'hidden hand' or 'unintended consequences'. Rational choice theory assumes that an individual's desires and beliefs are the reasons for their actions. Further the theory accentuates that there are also causes for the individuals' actions. Alan Carling first introduced the notion of scarcity and choice into the Rational Choice Theory in 1986 (Ian Craib 1992 p.73). From scarcity and choice, we can develop a very elementary theory that rationality is at work 'indirectly' in the choice of prioritizing access to and provision of scarce resources.

This theory has been used to explain why cost of water is very high in the semi-arid areas especially because of its scarcity. Scarcity increases the opportunity cost of bringing water to the household because of the long distances traveled. Water becomes expensive as a result. The willing buyers do not have many options from which to choose. It is either they travel to overcome the long distance to the water

source or buy water from water vendors at very exaggerated prices. This in turn affects access, which subsequently affects household water provision.

### **2.8.3 The Theory of Economic Underdevelopment and Dependency**

The early debates of this school were inspired by the Marxian conviction that the capitalistic rich west took economic advantage of the poor underdeveloped nations. A.G. Frank first introduced this debate to the English-speaking world in the late 1960's. Frank first came up with the view that economic development and underdevelopment were opposite faces of the same coin. He argued that capitalism continued to generate economic development and structural underdevelopment.

Frank realized that the metropolitan centers of developed countries were linked with peripheral satellite countries. This exploitative relationship was also found within the developing poor nations' regions i.e., between their towns, industrial centers and their declining agricultural districts. According to Frank, the periphery was losing some of its economic surplus to the metropolis. Similarly, the regional, local or sectoral metropolis of the satellite country find the limitations of their development multiplied by the capitalist structures rendering them dependent on a whole chain of metropolis above them. This global capitalist structure renders peripheral countries, regions, localities and sectors condemned to underdevelopment.

Gunnar Myrdal, a Swedish social democrat's analysis stressed the importance of attitudes, institutions and policies. The course of economic development was largely determined by conscious choices and decisions made by the governments. Myrdal was aware of the cumulative nature of regional disparities that led him to

formulate his analysis of backwash effects. It is worth noting that the centers of economic activity could attract resource of people and capital from retarded or depressed areas leaving the latter trapped in mess of low expectations and which undue burden of dependants.

The state intervention to address the disparities will make great claims of public funds, which are only likely to be sanctioned in response to the threat of the depressed peasants and unemployed workers vote. In many marginal areas of the developing world, international trade and the effects of the structural adjustment programmes of the early 1980's had strong backwash effects undercutting traditional crafts and economies. Corruption has had a negative impact on infrastructural growth and has introduced irrationality into situations where individual and collective decisions and plans concerning community development are made. This has hampered growth and infrastructural development and has contributed greatly to inequality in accessing resources by different regions.

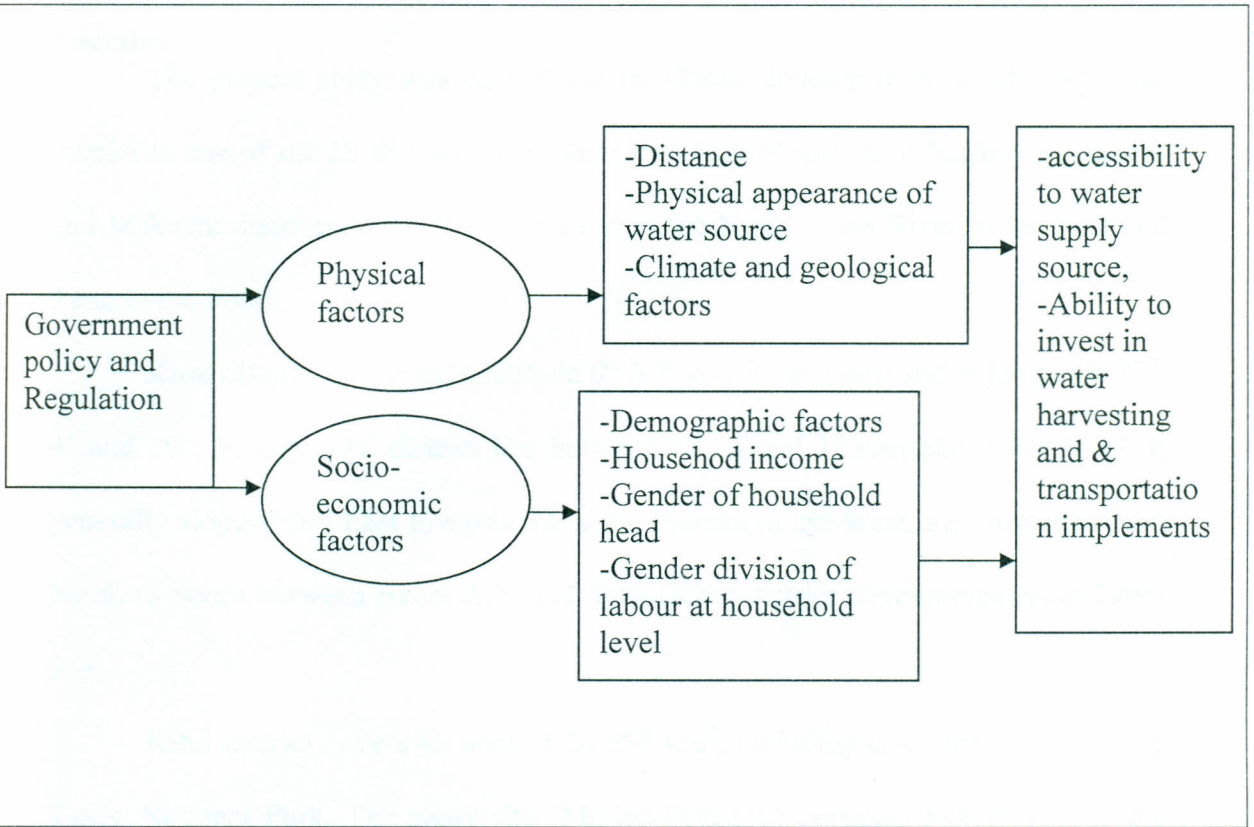
Collin Leys in his book 'the Rise and Fall of development theory', argues that neglect of indigenous economics and marginal zones by colonialists had not been corrected by many African countries after independence. Instead this neglecting attitude has taken hold of the modern African governments and their economic advisors. The structures of colonial economy were not conducive for the efficient distribution or use of national resources. Most post independent African states faced general, social and political crisis. This was aggravated by military coups. This resulted in most states having military and quasi-military governments. Recruiting forces to counter these coups and stay in power took more state spending. In Kenya

for example, the state seemed largely preoccupied with use of economic resources to buttress political power of the president and his allies (Collins Leys 1996 p 144). This resulted in corruption and extortion by state officials causing severe inefficiency and misappropriation. Forty years after independence most roads and rail infrastructure are products of the colonialists who mainly capitalized on highly potential zones for their economic benefits.

Further investing in semi-arid rural infrastructure including water supply has been made difficult by the high costs involved due to the long connection pipes required to provide metered water to individual homesteads scattered in vast distances because of the low population density in ASALs. This has led to poor access of amenities and services especially water supply services in marginal areas especially ASALS.

In sum, the theory of economic dependency and underdevelopment complemented by the theory of scarcity and choice, best explains why development of water supply systems has been neglected in rural ASALs in favor of highly potential zones and urban centers. Neglect, inefficiency, misappropriation, and high poverty levels compounded by water scarcity in ASALs have led to poor water supply systems development.

**Figure 2.1: Correlates of Household Access, Use and Management of Water**



## CHAPTER 3

### RESEARCH METHODOLOGY

#### 3.0 Study Area

##### Location

The present study was carried out in Mutito division in Kitui District. This district is one of the 13 districts in Eastern Province of Kenya. It borders Machakos and Makueni districts to the West, Mwingi to the North, Tana River to the East and Taita to the South.

Kitui district is located at latitude  $0^{\circ} 3.7'$  and  $3^{\circ} 0'$  south and at longitude  $37^{\circ} 4'$  and  $39^{\circ} 0'$  east. The district lies between 400m and 1830m above sea level. It generally slopes from East towards the Yatta Plateau in the West, and stretches from North to South between rivers Athi and Tiva (Kitui district development plan 1994-96).

Kitui district covers an area of 20,556 km<sup>2</sup>, including 6369 km<sup>2</sup> occupied by Tsavo National Park. The study site (Mutito Division) occupies 614.45 km<sup>2</sup> to the East (Republic of Kenya 2002). The highest points in the district are Kitui central, Mutito hills and Yatta Plateau. Due to their altitude, these areas receive greater rainfall than other parts of the district. The climate of the district is hot and dry. More specifically, Kitui experiences ASAL climatic conditions with unreliable rainfall between 500 mm and 760mm in a year. The temperatures range between 18° and 30° (Kitui District development plan 1994 - 96).

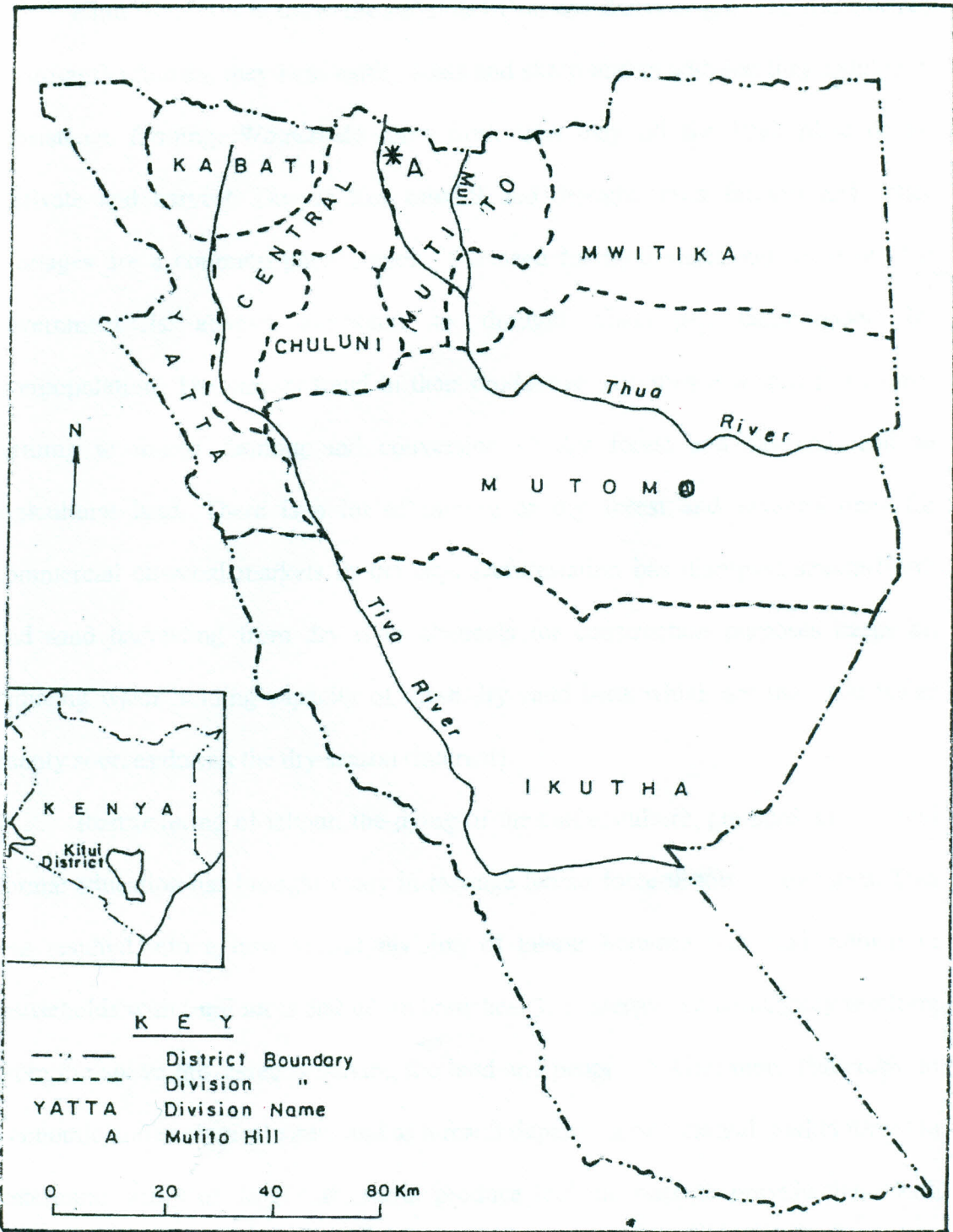
There are many seasonal rivers and streams in Mutito division. These include; Mui, Ikoo and Thua. These rivers flood during the rainy seasons. During the dry season they turn into dry sand-beds. These sand-beds are important sources of water

for many households throughout the dry season with 78% of the division population depending on them (Kitui district household monitoring and evaluation survey 1992).

The division is highlighted in map figure 3.1



figure 3.1 map of study area



## **Human environment and economic activities**

Kitui District is home to the Akamba of eastern Bantu origin. The Akamba are pastro-agriculturists, they herd cattle, goats and sheep and in addition they indulge in subsistence farming. Women do farm work thus they till the land, plant crops, cultivate and harvest. Due to low rainfall and drought, crop failures and water shortages are a common phenomenon. The need for food relief supplies from the government is always attributed to drought challenges compounded by overpopulation. The current trend in their productive activities is a shift from agro-farming to mixed farming and conversion of dry forest and savanna land to agricultural land. There is a lot of mining of dry forest and savanna trees for commercial charcoal markets in the city. Deforestation has disrupted stream-flows and sand harvesting from dry river channels for construction purposes keeps on reducing water holding capacity of these dry sand beds which are the main water supply sources during the dry season (internet).

Restructuring of labour, the dying of the cattle, culture, pressure on land and formal education has brought many in to wage labour force in towns and cities. This has resulted into a new spatial division of labour between men and women in households with rural roots and urban branches. The intertwined complexity resulting from the above processes is making the land and people of Kitui more vulnerable to economic and ecological stress and as a result depending on external market forces to determine prices of their agricultural produce and the state to provide them with famine relief supplies (internet).

## **Physical environment**

The District lies between the coastal plains and the highlands to the west Hills of gneiss and schist rise above a dry rolling eastward sloping plain of red lateritic soils covered with thorn bushes. The District has no permanent stream and it is drained by sand rivers Tiva and Thua and are tributaries of River Tana (internet).

The soils are of low fertility and highly erodible ultisols and alfisols susceptible to capping and sealing. This condition increases rate of run-off and minimizes percolation rates owing to a development of hard pan on the soil surface which is hard for water to penetrate. In hillier wetter zones, there are deep friable red, black and brown clays of reliable fertility but less than 20% well drained. On steep slopes, there are shallow, stony soils of low fertility.

The general vegetation throughout the district is dry bushes, shrub land with occasional garnish of tall acacia trees. There are also higher savannas with scattered trees on hilltops once forested but currently cleared by shift and burn cultivation method leaving corridors of forests along ranges, rivers, ravines and hilltops as well as dry forests in large expanses of grazing land. These cultivation methods leads to enviromental degradation ans as a result the topography of the area is characterised by deep gullies a result of wind and water erosion and a plain ground dotted by occasional hilly gronds and huge rocks.

## **3.2 Study Population**

According to Mugenda 1999, a population is a complete set of individuals, cases or objects with some common observable characteristics. The population of

Kitui district is 517, 000, while the total household population is 97,196. In Mutito division (the study site) there are 23,860 people and 4988 households. Of the total households 70% have no access to quality water supply (Republic of Kenya 1999). The total households of the sampled Sub-Locations were 1079.

### **3.3 Unit of Investigation**

The individual cases from which explanations are to be sourced are the units of analysis or investigation. It can also be termed as the unit of observation targeted for analysis. The unit of analysis for this study was the household. In this case, the respondents were adults' male or female household heads.

### **3.4. Sample Size**

The purpose of research is to obtain findings that represent a defined population. When the target population is large, it becomes necessary to obtain a sample that must be obtained in such a way as to represent the intended population. A sample is a sub-group of the targeted population, which has the desired characteristics to represent the entire population. Statistically, a sample comprising units greater than 30 can be used to represent a population. The higher the samples number the greater the representativeness of the population. A sample of 150 household heads individuals was used for data collection.

### **3.5. Sampling procedure**

This is the procedure of selecting the subjects or cases to be included in the sample. This study used both probability and non-probability sampling procedures.

This is because probability sampling allows us to capture in a small group the disparities or heterogeneity that exist in the entire target population. Non-probability sampling was used because it includes special cases and provides in-depth information about some specific cases the researcher had interest in. The reason for combination of techniques was to increase efficiency and precision in the sampling process. More so, the designs were utilized because the research intended to generate both qualitative and quantitative data.

### 3.6 Sampling of households in Mutito division

division has 3 Locations that include Mutito, Zombe and Kaliku. The study focused on one Sub-Location from each Location. The rationale being the Sub-Location is Kenya's smallest administrative unit and focusing on a smaller population would increase chances of making generalizations with a higher degree of confidence level. Therefore from each Location, simple random sampling was used to choose a Sub-Location from which the sample would be drawn. As shown below;

**Table 3.1: Sub-Locations Sampled**

<i>Location</i>	<i>Total Population per Location</i>	<i>Total sampled</i>	<i>Sub-Location chosen</i>
Zombe	1971	59	Malatani
Kaliku	1093	33	Kavutei
Mutito	1924	58	Masasini

Source: samples drawn from secondary Data

In this study, stratified random sampling with proportions was used to draw a representative sample from all the aforementioned three sub-locations. The technique was used because it increased the precision with which sampling was done, especially where there was need for representativeness. Practically, the proportions were calculated as shown below;

**Table 3.2 No of households in each sub-location**

<b>Sub-Location</b>	<b>Number of Households</b>	<b>Number of Households Sampled</b>
Masasini	230	58
Malatani	660	59
Kavutei	189	33
Total	1079	150

Source: Secondary Data

The rationale for the chosen sample is that it is more than 10% of the total population and can therefore be a representative sample of the entire population.

### **3.7 Sampling Frame**

Using simple random sampling which involves writing the names of each individual Sub-Location on a piece of paper, folding the papers, putting them in a basket and shaking vigorously then picking one, the researcher chose one Sub-Location from each Location. For Kaliku Location Kavutei Sub-location with a total population of 189 households was chosen. For Zombe Location Malatani Sub-location with a total population of 660 households was chosen. For Mutito Location, Masasini sub-location with a total population of 230 households was chosen. Then systematic random sampling was applied by listing down all households from the chosen Sub-location and choosing the  $n^{\text{th}}$  household (the  $n^{\text{th}}$  cases for each Sub-

Location are calculated below) until the required number of households was obtained. The total household population in each chosen Sub-location acted as the sampling frame. This procedure was applied because the phenomenon being studied was universal and all households' heads had equal chances of being selected. The  $n^{\text{th}}$  case for each Sub-location was calculated as shown below.

For Kavutei Sub-location in Kaliku Location

The  $n^{\text{th}}$  case was;  $189/33 = 5.7$

Therefore the 5<sup>th</sup> case was chosen until the researcher got the required no of households, which are 33.

For Malatani Sub-location in Zombe Location,

The  $n^{\text{th}}$  case was;  $660/59 = 11.2$

Therefore the 11<sup>th</sup> case was chosen until the researcher got the required no of households, which are 59.

For Masasini Sub-location in Mutito Location,

The  $n^{\text{th}}$  case was;  $230/58 = 3.9$

Therefore each 3<sup>rd</sup> case was chosen until the required no of households was acquired thus 58.

### **3.8 The Primary Methods of Data Collection**

Data was collected using the following instruments,

- Semi-Structured interview schedule

- Key informant questionnaire
- A case study guide

### **3.8.1 Semi-Structured Interview Schedule/Questionnaire**

An interview is an orally administered questionnaire. Therefore a semi-structured interview schedule refers to an orally administered questionnaire that has some of the questions structured and others open-ended.

This instrument was used for soliciting information from 150 respondents. The use of a face-to-face interview schedule was appropriate in this study because it allowed the researcher to probe for specific information regarding access to adequate water supply in the area. The face-to-face encounters with the respondents also allowed the researcher to follow up answers so as to obtain greater depth of information regarding water access issues. In this schedule both qualitative and quantitative data were collected.

However, most of the information collected from this schedule was quantitative and forms the basis of the statistically analyzed data presented in chapter 6. The qualitative data collected from this instrument is documented in chapter 5 as people's voices, exclamations, researcher's observations and notes from extra probing for more information and explanations.

### **3.8.2 Key Informants Questionnaire**

Three primary school heads and three representatives of local self-help groups that had organized themselves for drilling shallow wells sponsored by AMREF in

Kaliku Location were interviewed. The self-help groups are Kyeni, Kavutei and Kaliku Center self help groups. The main rationale behind use of this technique was to supplement both survey data.

### **3.8.3 Case Study Guide**

This technique was used to help the researcher to document qualitatively the water access situation in specific households. Two case studies were done in each Sub-location. This was to allow the researcher to assess the real problems faced by the water fetchers in their efforts to provide water for their households. Data from this instrument was purely qualitative and is used to support different arguments found in different chapters.

## **3.9 Data Analysis Techniques**

This research generated both quantitative and qualitative data. In this case, both descriptive and inferential statistics were utilized for analysis. More specifically, using Statistical Package for Social Sciences (SPSS) descriptive statistics like measures of central tendency, factor analysis, frequencies, and contingency tables were generated.

### **3.9.1 Chi-square ( $X^2$ ) Analysis**

This is the sum squared difference between observed and expected observations divided by expected data in all possible categories. It is used to compare observed data with what we would expect to obtain according to a specific

hypothesis. e.g if 20 women are expectant, the probability that they will give birth to male children is  $\frac{1}{2}$  i.e 10 of the births may be male. However, the male births may turn out to be 8. then you might want to know the goodness to fit between the expected and observed, whether the deviations are a result of chance or other factors. This technique is used to test null hypothesis which states there is no significance difference between the expected and the observed observations.

The formula of Chi-Square  $(\chi^2) = (o-e)^2/e$

(where (o) is observed data

(e) is expected data

This technique is only suitable when the number of observations is more than five. As a result since the data generated was cartegorical and the number of observations were more than five the technique was appropriate for analysing the data generated.

### **3.9.2 The pearson's Correlation Coefficient**

The Pearson's Correlation coefficient, which is a stronger measure of significance was used to determine strength of the linnear relationships between Variables. A -ve 1 indicates a perfect negative corelation whereas a +ve 1 portrays a perfect positive correlation. Therefore this was used to determine wether relationships were positive or negative. This technique assume both variables are interval/ratio and approximately normally distributed and a low value is evidence to reject null hypothesis. The analysis was also supplemented with qualitative data and photos.

## CHAPTER FOUR

### SOCIO-ECONOMIC FACTORS IN RELATION TO HOUSEHOLD WATER ACCESS IN SEMI-ARID AREAS

#### 4.0 Introduction

This chapter discusses the background characteristics of the studied population paying close attention to how they affect access to water. Descriptive statistics are further supplemented by statistical analysis to test and establish the strength of relationships between socio-economic variables and water access.

#### 4.1 Socioeconomic Factors and Water Access

The socioeconomic attributes assessed in this study included; family size, age of household head, gender of household head, education level of household head, family's occupation and income.

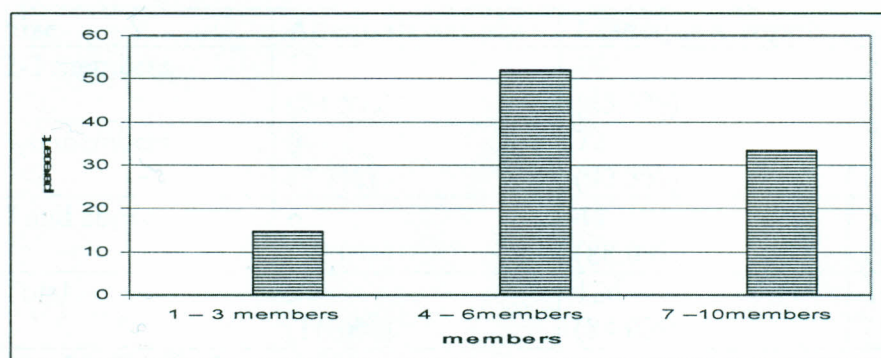
##### 4.1.1 Family size and water access

In this particular research family size refers to the number of members in a homestead who were sharing the water brought to that household by whichever means from whatever source. In this study, the number of family members ranged from two to ten. They have been categorized in to three broad categories, from two to three members, from four to six members and from seven to ten members. Data on family size showed that majority of the families (52%) had between four and six members as shown in the figure 4.1 below, this confirms the results of the 2008 economic survey which show that the mean family size among the poor range

between 4.4-6.2 members. Poor families could have a challenge in accessing water since they do not have enough resources to invest in water harvesting and this could explain why this category had a lower level of access than those with 1-3 and 7-10 family members. 32% of households had between 7-10 members and only 15% had between 1-3 family members.

The results in Table 4.1 indicate that households with 2 to 3 members had the highest proportion of those with access to adequate water supply. This could be attributed to fewer people sharing the water resource that is ferried home such that there will be sufficient reserve for everyone. The economic survey 2008 states that among the non-poor families, the family sizes range between 3 or less as a result families in this category could have better access to water since the non-poor have more resources to invest in water harvesting and transportation. Another explanation would be restructuring of labour, which has resulted in a new spatial division of households with roots at the village and branches in cities and towns (internet). The family members living in towns could also be sending back to their relatives in the villages some resources to invest in water harvesting and transportation.

**Fig 4.1 Distribution of households by family size**



Source survey data 2004

Surprisingly, access to water for families with large numbers (above 7) was largely adequate. This could be attributed to the fact that there were many family members who could visit the river in turns and this increased the amount of water being brought to that particular household. However, bigger family sizes could also be an indication of more established and older families with more resources to invest in water harvesting and transportation, implements like water cans and even donkeys. Further, larger families had the advantages of families in other towns who send some of their earnings back home and these could be spent hiring labour to fetch water.

Further analysis showed that family size accounts for 40 percent of the observed variations in access to water supply. The results of Chi-Square test of significance ( $X^2 = 28.92$ ;  $df = 2$ ;  $p = 0.000$ ) indicated that there is a significant relationship between family size and access to water supply at probability of error = 0.05. Pearson's correlation coefficient indicated that larger families were less likely to have access to adequate water ( $r = -0.25$ ,  $p = 0.05$ ,  $n = 150$ ). This was largely due to the fact that water needs for larger families were also high.

**Table 4.1: Household size and water access**

Size	Adequate supply	Inadequate supply	Total
2-3 members	12 (54.5%)	10 (45.5%)	22 (100.0%)
4-6 members	6 (7.7%)	72 (92.3%)	78 (100.0%)
7 and above	6 (12.0%)	44 (88.0%)	50 (100.0)
Total	24 (16.0%)	126 (84.0%)	150 (100.0%)

$X^2 = 28.92$ ;  $df = 2$ ;  $p = 0.000$

#### 4.1.2 Age of Household Head and Water Access

The variable age of the household-head ranged from 20 –80 years was clustered in to 4 categories of ten years each as shown in the figure 4.2 below.

*Fig 4.2 Age of household head*



Source survey data 2004

Age is an important demographic variable that influences an individual's pattern of behaviour. In Table 4.2 the results indicate that the highest proportion of households with inadequate access to water supply was among households headed by those aged 51 years and above followed by 41 to 50 years, 31-40 years, and less than 30 years in that order. Pearson's correlation coefficient confirmed this as families headed by older house heads were more likely to have inadequate water ( $r=-0.11$ ,  $p=0.05$ ,  $n=150$ )

Further, it was established that families headed by older persons had more chances of owning a well than younger families. This is due to cultural practices on the process of well ownership where the dry river channel is subdivided in to well portion areas. During the wet season the wells are filled with sand by flowing stream waters. When the dry spell sets in, the villagers come back and de-silt the wells. Each

family digs their well at the designated portion for that family; nobody can dig a well where another family's well exists because each family knows the location of their well. The older patrons have demarcated such well zones for themselves and these are inherited by their offspring such that some upcoming families own no wells and are only able to request to be allowed to use somebody's well. This is why age can determine access through ownership of wells and water points. However, the results of chi-square test of significance ( $X^2=2.189$ ;  $df=3$ ;  $p=0.534$ ) indicated that there is no significant relationship between age of household head and access to water supply at 0.05 probability of error. Consequently, the observed variations could have occurred as a result of other factors. The contingency coefficient indicated that age of household head could be attributed to 12 percent of the variations, which is equally low. Age is therefore not a factor influencing household access to water supply in the study area

**Table 4.2: Age of household head and water access**

Age	Adequate supply	Inadequate supply	Total
30 years and below	5 (26.3%)	14 (73.7%)	19 (100.0%)
31-40 years	8 (16.3%)	41 (83.7%)	49 (100.0%)
41-50 years	5 (16.1%)	26 (83.9%)	31 (100.0%)
51 and above years	6 (11.8%)	45 (88.2%)	51 (100.0%)
Total	24 (16.0%)	126 (84.0%)	150 (100.0%)

$X^2=2.189$ ;  $df=3$ ;  $p=0.534$

### **4.1.3 Gender of Household Heads and Access to Water**

Gender, which is a nominal variable, was used to shed some light on some of the socio-cultural issues related to water supply. Some of the homesteads were extended families living in the same compound and sharing in water searching activities. However due to the patriarchal nature of the community, the male founder of the homestead who might be a grandfather was regarded the head of the homestead. Even in cases where the men were working away from home, in the urban centers for example to supplement their family income, they were regarded as the heads of the family in their absence and no important family decision could be passed without their consent. Headship in this community was about decision-making and men make most of the important family decision.

In this community a woman was the head of the household if she was a widow or a single parent owning her own homestead. This meant that if a single woman with children was living in her father's compound, her father was considered the head even if she was economically independent. Also if a widowed woman was living in her father in-law's compound with her children, then her father in-law was regarded as the head of the household. This was the reason why male headed households were more than the female headed households. This is confirms the findings of the 2008 economic survey that indicate that majority of households in Kenya are male headed (Republic of Kenya 2008)

*Table 4.3:gender of household head*

Gender of household head	Frequency	Percentage
Female	38	25.3
Male	112	74.7
TOTAL	150	100

Source: Survey data 2004

Water harvesting is labour intensive activity and designated to men by the Akamba social cultural systems and gender division of labour. Men dig the wells and they also help desilt them. In addition, owing to patriarchal nature of land ownership which is skewed in favour of men, each well especially the deep wells going down to a depth of 5 meters have a male patriarch who makes decision on who is welcome to use the well and who is not.

The study also established that people who don't take part in de-silting the wells are denied water or have to wait for all well owners to draw water before they can get a chance to fetch water. This is common in areas where water is scarce, the wells are deep (some in the neighbouring Mwitika Division go to a depth of more than 10 meters), the well recharge rate is very low and sometimes the animals are watered first, Since wells are owned by male household heads, then women and children from households where the patriarch owns the well are the first to fetch water. This means that class factor influences which women draw water first. Owing to patriarchal land ownership structures, many female household heads do not own wells. This is to their disadvantage because they may not have access to the wells as the well owners' wives or children. This was confirmed by Pearson's correlation

coefficient which indicated that female-headed households were less likely to have adequate water ( $r=-0.84$ ,  $p=0.05$ ,  $n= 150$ ).

Female households-heads with no male relatives to help them do the de-silting have to hire someone to do it for them, in the event they have no resources to hire a labourer they have to request one of these patriarchs to allow them use his well. Occasionally, they are allowed but on condition that they wait for the well owners to water their animals and draw water for their household use first. This could be the reason why female household owners had a lower percentage (10.5) of members accessing water than their male counterparts (17.8%).

Another explanation for male headed households having a slightly higher access than the female headed households is the fact that owing to patriarchy, resource ownership and inheritance is biased to the favour of men. This could impacts on the ability of women to own resources. They don't own land, they don't inherit from their parents and they earn no dowry from their sisters or daughters like their male counterparts. Even when they get dowry from their daughters, it belongs to their male sons and they cannot decide to use it without the consent of the other senior male members of the extended family. They may even deny her the permission to use these resources claiming it is supposed to be used by her own sons to pay dowry.

The results presented in Table 6.1 indicate that female-headed households had slightly higher proportion of households with inadequate water supply. The results of Chi-Square test of significance ( $X^2=1.13$ ;  $df= 1$ ;  $p= 0.287$ ) indicated that there is no significant difference between access and gender of the household head at 0.05 probability of error. However, the contingency coefficient measure of association

showed that 9 percent of the variation in access to water supply could be attributed to gender. Therefore although gender factor plays a critical role to determine access to a water supply behind the scenes, the contingency coefficient is low and the ( $X^2=1.13$ ;  $df = 1$ ;  $p= 0.287$ ) is equally low to portray a significant relationship. As a result, the null hypothesis,

*H<sub>1</sub>: Gender of the household-head does not influence access to adequate water for a household* is accepted

**Table 4.4: Access to water by Gender**

gender	Adequate supply	Inadequate supply	Total
Male	20 (17.9%)	92 (82.1%)	112 (100.0%)
Female	4 (10.5%)	34 (89.5%)	38 (100.0%)
Total	24 (16.0%)	126 (84.0%)	150 (100.0%)

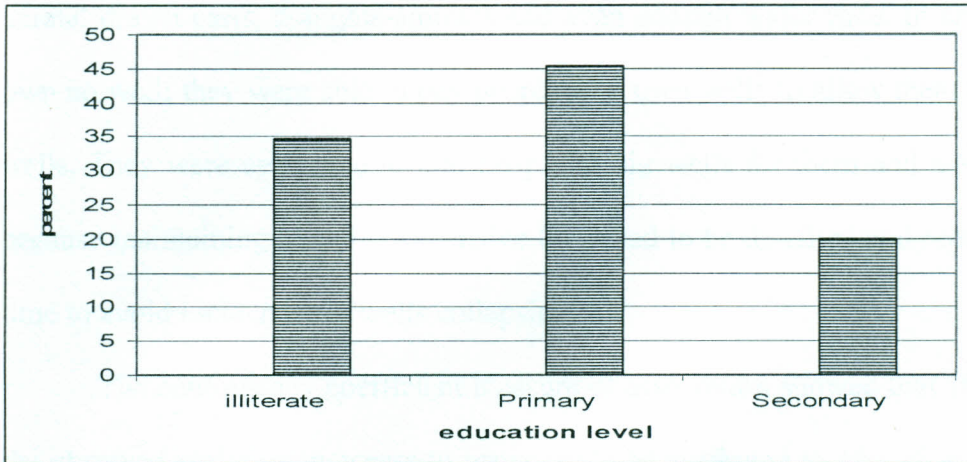
$X^2=1.13$ ;  $df = 1$ ;  $p= 0.287$

#### 4.1.4 Educational level and water access

The variable education was operationalized in to four categories as per the Kenyan levels of education. However there was no single household head with university education living in the study area. This does not imply that there were no persons with University education. This could be attributed to rural urban migration and the fact that people with higher education migrate to urban areas to seek employment and better social amenities. The fact that they live in towns and cities doesn't mean that they lose contacts with their relatives in the villages. But this produces a pattern of homes with rural roots and urban branches. The town dwellers send some of their income back home to support the livelihood of their rural relatives.

This is why house heads with university education are conspicuously absent from the graph as fig 4.3 indicates below.

*Fig 4.3 Educational level of household head*



Source survey data 2004

The data in the figure above shows that literacy levels are very low in the study area. 39% had no education at all, 44% had primary education, 20% had secondary education while none had higher education.

The study further established that, the largest proportion of those with adequate access to water supply was in households where the heads had secondary education followed by primary and non-formal education respectively. Thus there was a slight increase in access to water supply as the level of education increased. This was confirmed by Pearson's correlation coefficient which indicated that families headed by more educated house heads were more likely to have adequate water ( $r=0.52$ ,  $p=0.05$ ,  $n=150$ ). This is because education improves one's ability of making rational choices. Further, with higher education, opportunities for employment gave people ability to invest in water harvesting and transportation.

With improved educational level one was able to get a good job that allows him to have resources for investing in water harvesting and transportation. They were able to hire people to fetch water for them; they are able to buy beasts of burdens, animal drawn carts, draughts-animals and even enough water cans. In an event they own no well; they were able to pay people who own wells to allow them access their wells. They were even able to hire people to dig wells for them and maintain them because maintaining a well is expensive for it had to be de-silted and repaired all the time to avoid incidences of wells collapsing.

The contingency coefficient measure of association showed that 10 percent of the observed variation in access to water could be attributed to education level of the household head. However, the results of Chi-Square test of significance ( $X^2=1.534$ ;  $df = 2$ ;  $p= 0.464$ ) revealed that there is no significant relationship between level of education of the household head and access to water supply at probability of error=0.05. The observed pattern in access to water supply could be a result of other attributes.

**Table4.5: Level of education of household head and water access**

Level of education	Adequate supply	Inadequate supply	Total
None formal education	7 (13.5%)	45 (86.5%)	52 (100.0%)
Primary	10 (14.7%)	58 (85.3%)	68 (100.0%)
Secondary	7 (23.3%)	23 (76.7%)	30 (100.0%)
Total	24 (16.0%)	126 (84.0%)	150 (100.0%)

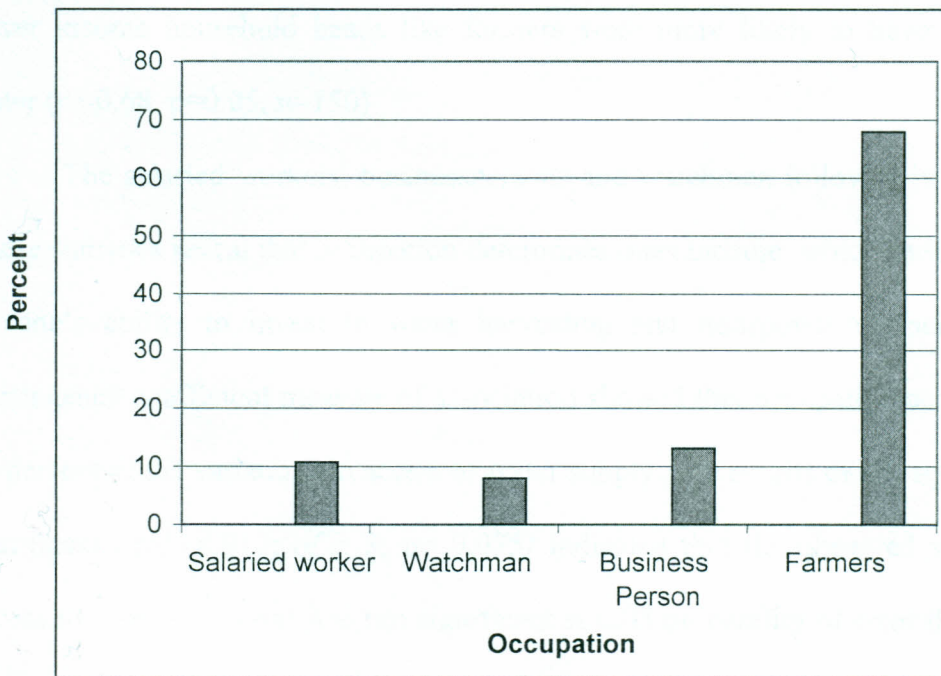
$X^2=1.534$ ;  $df = 2$ ;  $p= 0.464$

#### 4.1.5 Occupation of Household Head and water access

The data below shows that the main economic activity in the area studied was poor resource subsistence farming with a modal frequency of 68.0%. The statistics also show that only 18.7% are salaried workers including watchmen, businesspersons constituted 13.3%.

These statistics support the view that more than 80% of the rural populations are supported by subsistence agriculture as their only means of livelihood (NEAP 1994), this could be a good explanation why poverty levels are very high in the rural semi-arid areas (Oygard 1999). Their low-income occupations could be another explanation why they have no savings to invest in water supply technologies.

**Fig 4.4 Occupation of household head**



Source survey data 2004

The study further established that, households headed by farmers had the highest proportion of those with inadequate supply of water. This is because poor resource subsistence farming practiced in this area does not have any viable economic benefits, first because of droughts and crop failures compounded by poor farming techniques and low soil fertility. This means that the yield gotten from this mode of occupation is not even enough to feed the family to the other season considering the region records crop failures at the rate of 4-6 out of every 10 planting seasons. As a result farmers here refer to those poor villagers who practice poor resource farming. Some of them own very tiny plots of less than one acre and have used them over a very long time degrading them to very low level of economic viability. As a result these poor peasants lack resources to invest in water harvesting and transportation implements. Pearson's correlation coefficient indicated that households headed by lower income household heads like farmers were more likely to have inadequate water ( $r=-0.68$ ,  $p=0.05$ ,  $n=150$ )

The salaried workers, businesspersons and watchmen followed in that order. These statistics reveal that occupation determines ones income, which further impacts on one's ability to invest in water harvesting and transportation facilities. The contingency coefficient measure of association showed that occupation accounted for 21 percent of the variations in access to water supply. The results of chi-square test of significance ( $X^2=6.917$ ;  $df = 3$ ;  $p= 0.075$ ) indicated that the observed variation in access to supply of water was not significant at 0.05 probability of error though very close.

**Table 4.6: Occupation and Water Access**

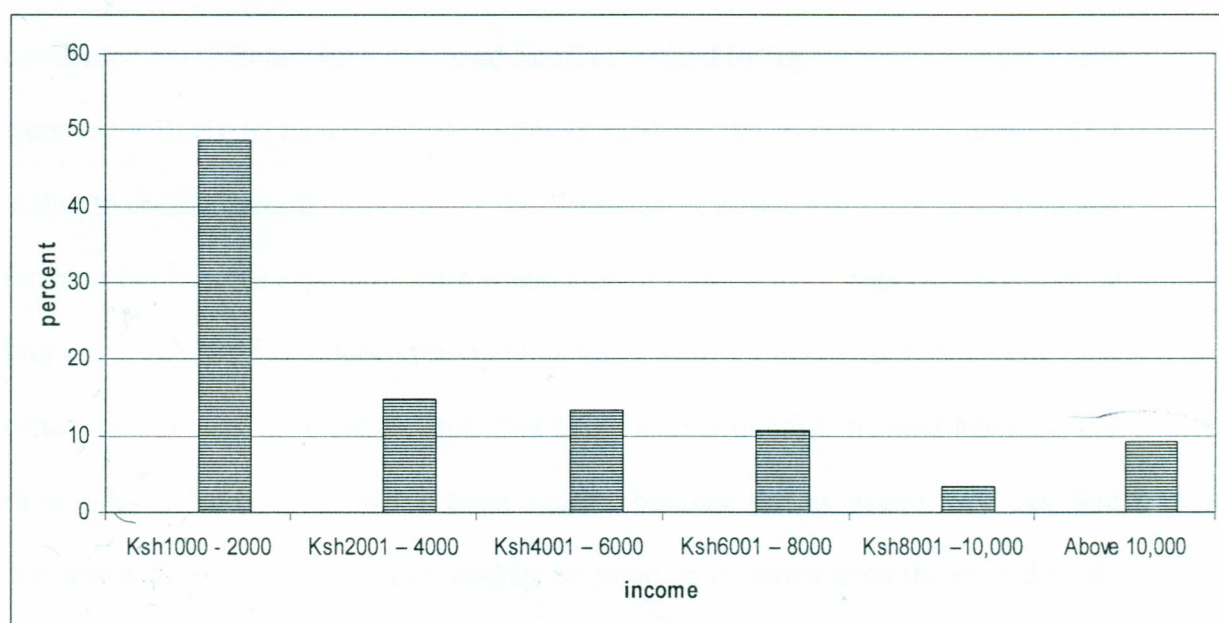
Occupation	Adequate supply	Inadequate supply	Total
Salaried worker	4 (25.0%)	12 (75.0%)	16 (100.0%)
Watchman	4 (33.3%)	8 (66.7%)	12 (100.0%)
Business person	5 (25.0%)	15 (75.0%)	20 (100.0%)
Farmer	11 (10.8%)	91 (89.2%)	102 (100.0%)
Total	24 (16.0%)	126 (84.0%)	150 (100.0%)

$\chi^2=6.917$ ;  $df=3$ ;  $p=0.075$

#### 4.1.6 Family Monthly income and access to water supply

Due to extremely low incomes level of these households, the income was operationalized into categories of Kshs. 2000.00 differences ranging from Kshs. 1000.00 –2000.00 for poor resource farmers to just above Kshs. 10,000.00 for salaried workers and business persons. The categories are shown in the figure below.

**Fig 4.5 Family monthly income**



Source survey data 2004

From the above figure majority of the households (63.3%) live on less than a dollar a day. This further supports the view that poverty levels are very high in the study area. One measure of access is ones ability to afford the cost of a commodity. Cost can be in monetary terms or even in terms of effort expended to acquire water. Ones income determines their ability to invest in buying donkeys, water cans, draughts animals like oxen, animal drawn carts, hiring people to fetch water and even owning a well which requires some substantial effort to maintain or pay somebody to maintain it for you. This is the reason why ones income is very important variable to be considered when studying issues of water access.

The study established that households whose heads had a monthly income of below KShs. 2000 had the highest proportion of those with inadequate access to water supply. The results further indicate the higher the income the higher the possibility of accessing water for the household. This relationship was supported by Pearson's correlation coefficient which indicated families headed by higher income house heads were more likely to have adequate water ( $r=0.41, p=0.05, n=150$ ). An household's ability to access water is impacted by their purchasing power for water harvesting and fetching implements especially here where cost of water is very high (KShs20 per 20 liter can). The residents depend on natural water supply systems and they walk long distances to access the river channel. Not many people indulge in water hawking and those who do only do it in the town centers because this is where they can find customers. So much of the water used by households is drawn from the river directly

by family members. Therefore, many donkeys, animal drawn carts, oxen, and water cans are required to for the family to be able to fetch enough water to last them to the next water fetching trip. These trips are normally daily for those living near the river channels and 3-4 times a week for those living at an average distance of 5 Kilometers and above. Investing in water transportation implements requires money and this is why people with lower incomes experienced poor accessibility levels.

The contingency coefficient indicated that 29 percent of the observed variation in access to water can be attributed to income of the household head. The results of Chi-Square test of significance ( $X^2=13.524$ ;  $df= 5$ ;  $p= 0.019$ ) indicated that the observed differences are significant at 0.05 probability of error. Thus higher income levels are associated with an increased access to water supply. This is expected since the households could afford to hire services for supply of the needed water with minimal strain in cases of shortage.

**Table 4.7: Income and access to water supply**

<b>Income (KShs)</b>	<b>Adequate supply</b>	<b>Inadequate supply</b>	<b>Total</b>
2000 and less	6 (8.2%)	67 (91.8%)	73 (100.0%)
2001-4000	3 (13.6%)	19 (86.4%)	22 (100.0%)
4001-6000	5 (25.0%)	15 (75.0%)	20 (100.0%)
6001-8000	3 (18.8%)	13 (81.3%)	16 (100.0%)
8001-10000	3 (60.0%)	2 (40.0%)	5 (100.0%)
10,000 and above	4 (28.6%)	10 (71.4%)	14 (100.0%)

$$X^2=13.524; df= 5; p= 0.019$$

#### 4.2. The physical factors affecting water access

The physical attributes assessed in this study included, location of the administrative Locations in relation to the natural water sources and distance traveled from the household to the water source. Though both factors are related, it was critical to compare water access levels of different administrative Locations within the same Division to be able to know which location recorded lower water access level and also try to explain why. Distance from the household to the water source was also a critical factor since it impacted on the time spend, the trips made to the river and even the mode of transportation used to carry water home.

The modes of transportation and the amount of water transported using the same are presented in table 4.8 below:

*Table 4.8 different modes of water transport from source to the household*

Mode of transport	Amount ferried	Approximate distance covered	Time taken
Don key	Female donkey -60 liters Male donkey - 80 liters	Upto 8KM	4 -5 Hrs (walking only, donkeys walk slower when carrying heavy loads, their walking rate is almost halved when they carry a heavy load)
Carrying on the back or head	20 liters	Upto 2KM	30-45 minutes (depending on individual speed)
Bicycle	20-60 liters	Upto 6KM	Approximately 1hr depending on land terrain

According to table 4.8, Donkeys, bicycles and human beings were the main modes of transporting water to the household. Water fetching was chiefly a women and girls work as shown in picture 1 and picture 2.



*Picture 1: loading water on to a donkey's back*

Carrying from the back (human labour) is another common method used especially by people within a radius of less than two kilometers from the water source. Some of the people living close to the water source use just small cans to fetch water because they can make as many trips to the stream as they wish. This mode is used by small children and old women as shown in picture 2 below. The challenge of this method is that not much water is carried home



*Picture 2: An elderly woman going to fetch water from a nearby stream*

#### **4.2.1 The effect of distance on water access**

Mutito division has 3 administrative locations as earlier mentioned. Water access in these individual Locations is different owing to factors like the natural water sources available. The river Mui pass through all the Locations in the Division but recharge levels are different at different Locations. The results in Table 4.8 indicate that Kaliku location had the highest proportion (97.0%) of households with poor access to water followed by Malatani, and Masasini in that order. Most people especially from Masasini sub-Location had the greatest number of respondents claiming to access water with 36.8% having access to water for household use. This

was mainly because they drew water from a dry sand bed whose recharge was higher as compared to the other sand beds. Also, the water table is not very low owing to the ground terrain and the flood plain characteristics the river has adopted at this zone. Therefore wells dug around this zone are not very deep and they produce plenty of water. Malatani sub-location followed with 3.3% having access to water and Kavutei trailed by only 3% accessing water. This means that in Masasini sublocation, 63.2% did not have access to water, in Malatani, 96.7 did not have access to water and in Kaliku, 97% of the respondents did not have access to water for their household needs.

**Table 4.9 Access to Water Supply by Administrative locations**

Location	Adequate Supply	Inadequate Supply	Total
Kaliku	1 (3.0%)	32 (97.0%)	33 (100.0%)
Malatani	2 (3.3%)	58 (96.7%)	60 (100.0%)
Masasini	21 (36.8%)	36 (63.2%)	57 (100.0%)
Total	24 (16.0%)	126 (84.0%)	150 (100.0%)

$$X^2 = 29.7; df = 2; p = 0.000$$

The Contingency coefficient indicated that location accounted for 41 percent of the variations in access to water supply. The results of Chi-Square test of significance ( $X^2 = 29.7; df = 2; p = 0.000$ ) indicated that the observed variation is significant at 0.05 probability of error. Thus there was wide variation in access to water supply in the locations. This is could be attributed to the high dependence on

the natural sources of water. Location adjacent to rivers had relatively better access to water supply this confirms in the study area, development of water supply projects lags behind and there is a severe dependence of natural water supply sources.

#### **4.2.2 Distance and water access**

Distance was considered one of the factors that affected access and adequacy of water supply. According to the UN, for water to be accessible it has to be at a distance of 1 KM within reach (UNICEF 2002). However the government of Kenya in its National Poverty Eradication Strategy Document aims at reducing the distance travelled by women and girls in rural areas to fetch water to 2 KM by 2015. This means that since most people 93.3% in Mutito travel more than 1-2km, then they have no access to water as prescribed by both UNICEF and the Government of Kenya. These statistics indicate that Kenya is not likely to achieve the MDGs goal 7 target 10: Of halving the proportion of people without access to water by 2015, and the Vision 2030's aim of water access for all by the year 2030 may not be realized. This study established that Distances travelled to fetch water are extremely long covering upto 5-6 KM. further the journey takes an average of 6-7 hours as illustrated in box 1 in the case of Mali on pg72 (Paragraph 1 and 2)

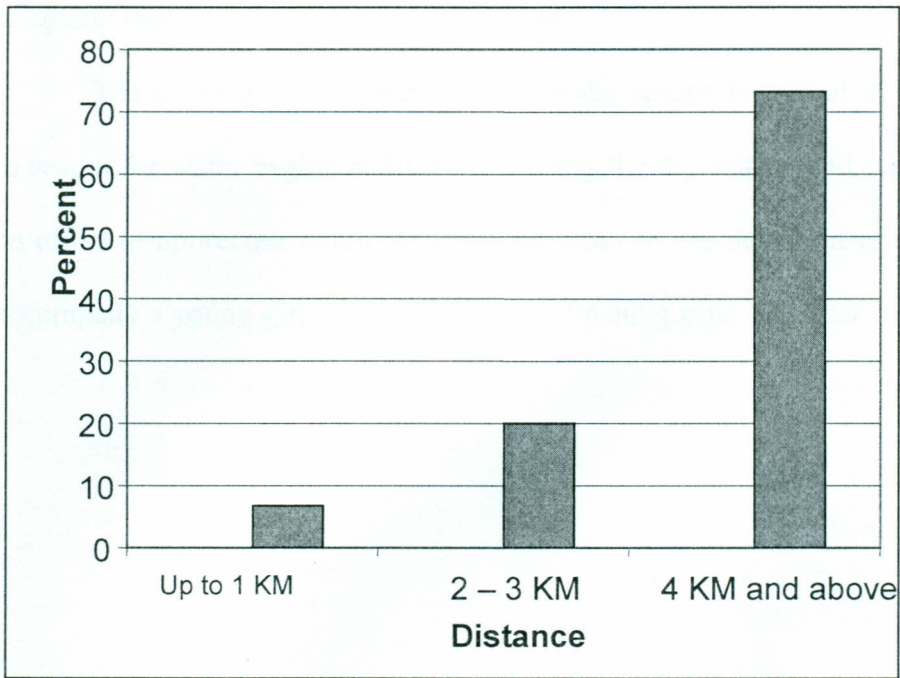
#### **Water distribution at the household**

It was important to establish how water is accessed by different members of the household once it arrives at the household. In the case of Mali, her grandfather received 20 litres first for watering his goat-kids and for bathing. Then the remaining

amount of water was divided equally between Mali's mother and her aunt. The goat kids were given first priority by the old man before he could even take a bath. He even confirmed that they gave first priority to animals because it was their tradition, secondly it had a gender dimension because men dug the wells and they owned the animals and lastly that the animals needed time to graze (paragraph 4, &5). This still stresses how this community values livestock which is an important economic activity among the Akamba who are agro-pastoralist. The animals are considered very important in many ways. First they are a source of prestige or wealth, they are used for paying bride wealth, and this is one community where you cannot claim to have paid any bride wealth however much money you give unless you give the in-laws animals. Animals are also considered sacred for they are sacrificed to ancestors and replenish the earth with their manure. Animals and animal products are also sold to supplement their income and especially pay school fees for their children and oxen are very important in pulling the ox drawn plough for the small-scale subsistence farmers.

The impact of distance on the other household chores can not be overlooked. In Mali's case, when we arrived from the water fetching trip, all the family members were sitting waiting for their share of water. They had not taken breakfast and could be they had not been working in their farms owing to hunger and thirst (paragraph 3,5). Further the impact of Distance is clearly seen where the family goes without breakfast, take Lunch at 5P.M and the grandfather says they will only have tea for supper (paragraph 6)

**Fig 4.5: Distance travelled by families to fetch water**



Source: Survey Data 2004

**Table 4.10 Distance and water access**

Distance	Adequate supply	Inadequate supply	Total
Up to 1 kilometer	6 (60.0%)	4 (40.0%)	10 (100.0%)
2-3 kilometers	13 (43.3%)	17 (56.7%)	30 (100.0%)
4 and above kilometers	5 (4.5%)	105 (95.5%)	110 (100.0%)
Total	24 (16.0%)	126 (84.0%)	150 (100.0%)

$\chi^2=41.82; df=2; p=0.000$

The chi-square results ( $\chi^2=41.82; df=2; p=0.000$ ) depicts that there is a strong relationship between distance and access of adequate water supply at 0.05 probability of error. And therefore the null hypothesis

*H<sub>03</sub> which states that distance to the water source, does not affect access to adequate water supply is therefore rejected.*

The importance of distance to the water source is critical in that, the journey in search for water begins at 5.00 a.m. during the dry season and takes 6-7 hours. In an effort to appreciate actual distance travelled by residents, an effort was made to accompany a young girl in one of the water fetching trips. The case below illustrates.

### *MALI IN SEARCH FOR WATER*

*The trip to the water point starts very early in the morning, sometimes before 5a.m. this is because the journey to and from the water point will take an average of 6 and 7 hours and the sun will be very hot by the time we arrive from the river channel with two donkeys each carrying 60-liter water cans. Mali is the name of the village girl I accompanied to the river channel on this particular trip. She got pregnant while in std seven and could not finish her primary education, now she has a baby girl named Ruth and assists her mother with household chores as she waits for an appropriate suitor to come around.*

*I arrived at their homestead before six o'clock in the morning and she had the donkeys saddled ready for the trip. She apologized that we could not have tea because there was no single drop of water in the whole homestead then we hurriedly set off for our trip. The narrow path we traveled was quite steep and treacherous often traversed by very deep gullies a clear evidence of wind and water erosion. We walked for two and half hours to the dry sand bed (Ikoo) where the villagers have dug shallow wells. Here we took another one hour washing the cans, filling them with water, watering the donkeys, and saddling them again with the water cans. Then we set off for the journey back, which took us three hours because now the donkeys were carrying water upslope and could not walk fast.*

*We arrived at their homestead at a quarter to one o'clock. All the family members were there. They were waiting to get their share of water. Mali's mother took 40 liters her uncle's wife took 40 liters and the grandfather took the remaining 20 liters for watering his goats. We sat down to rest with Mali as her mother prepared us strong tea, which was to be served as our breakfast. We took the tea at half past one and then it was time to prepare lunch I decided to stay and find out when this family took lunch.*

*As we waited for lunch I was talking to the head of the homestead, he told me that her grand daughter was lucky to come home early because it was just two months in to the dry season and the sand bed had not dried up completely so there was plenty of water. "This is February and there is plenty of water", said the old man. "The months of August and September will be drier and people will be spending the whole day at the river channel waiting for the animals to be watered so that they can fetch water." I enquired from him why they had to water the animals first before fetching water for the household. Said the old man, "I am not sure I know exactly why, it is our tradition after all it is the men who dig the wells. The animals also need time to feed in the afternoon because in the morning they have to be taken to the river channel before the sun becomes very hot and there is no time for the herdsmen to take them to the fields to graze".*

*As we talked the old man was watering his goats one by one. He used only 10 liters of water to water his 20 goats, he explained to me that he would use the remaining 5liters to water the goats' kids and 5more liters were his for personal hygiene and drinking for two days. This was because the donkeys had to rest the following day and the women also needed time to prepare their fields before the onset of the long rains. When I asked whether the water was adequate for the needs of his homestead, the old man stretched his frail figure and looked at me desperately then answered. "My child in this world we will never have enough we always thank God for the little we receive, we hear over the radio sometimes that flood water is killing people, the very heavy rains (referring to the elnino) were here with us the other day, I have never in my lifetime seen so many waters, there was water all over this place and we thought we will never visit the river again. Now the place is so dry and I keep on wondering what happened to all that water. God gave us little water and gave others so much water it is killing them, we are contented after all, who cares whether we have little or no water at all, even our chief doesn't speak about it at the barazas. But I feel talking to you is a sure sign of good things to come."*

*Lunch was ready by 5p.m; we had ugali served with cowpea stew. As we took our meal I asked the old man whether they were going to have supper now that they had taken lunch so late. His answer was definite 'No' said the old man firmly, "we don't have so much water to misuse, after all we are lucky today the goats were watered and we are going to have some milk so we can have good tea for supper". I thanked the old man and his entire homestead then excused myself to leave.*

Mali's household is a typical example of several other households in Mutito division where water-searching activities are allocated more time than any other undertaking in the whole homestead. For all the sampled households water searching was allocated first priority before any other household chores, poverty levels in the area are very high and there are few families with employees. Water is carried home by donkeys; in this community most homesteads own at least a donkey or several. These people travel an average of 5-6 kilometers the river channel.

The donkeys can only carry a certain capacity. The male donkey carries the heaviest capacity (80 liters) while the female donkey ferries the least capacity of (60 liters). After a trip to the well, the donkeys have to rest for a day before they can recover enough strength to overcome that distance carrying heavy loads. Therefore the arduous task is carried out three or four times a week. A family must at least own a donkey but the number of donkeys owned by different families depends on the families' ability to purchase them and the water demand mostly dictated by family size. Donkeys are expensive because they fetch the same amount of money fetched by the local breed of cattle, in fact one can directly exchange a female donkey for a cow or a male donkey for a bull.

#### **4.2.3 Water access compared to household water requirements**

The study went further and measured adequacy of water access by the locals, first using the W.H.O category of adequacy which standardizes adequate water as 27 liters per person per day (Ford Foundation in UNICEF 2002)

The results in the table 6.9 indicate that water consumption in the study area was far much below their demand. As is shown the mean consumption was only 87.87, which was far much less than the mean household water requirement (demand) of 183.28 liters per day. Thus the households in the sample indicated that what they consume is far much less than half what they need for their daily use.

**Table 5.1 water consumption as compared to demand**

<b>Type of Consumption</b>	<b>N</b>	<b>Mean</b>	<b>Std. Deviation</b>
Amount of water residents spent per day (Litres)	150	87.87	57.18
Amount they would have spend if they had enough water at their disposal	150	183.28	108.90

Source, survey data 2004

When a paired t-test was carried out the results ( $t=11.553$ ;  $df= 149$ ;  $p=0.00$ ) depicted that there was a significant difference between the amount of water used and the mean amount required in households. This therefore means that in the study area there is a serious shortage of water.

Water demand management and prioritization at the household level is the work of women. This could be because they are the ones who are allocated the household chores owing to sexual division of labour. Once water is brought home it is the responsibility of the woman of that house to ensure it is well managed to take care of household water needs until they can get more supplies from another water fetching trip.

Water is allocated according to priority household needs. Water with little suspended matter is considered best for drinking. Hard water is not good for drinking, cooking or washing but is used for watering goat kids. There is no wastage of this resource and they even recycle it. For example water that has been used for rinsing clothes or utensils can be used for watering goat's kids. It is the duty of the woman of the house to ensure there is enough supplies of drinking water for the family and this is normally stored separate from the other waters for normal household use like cooking and washing utensils.

#### **4.2.4 Rainfall**

The distribution of water sources in Kenya varies from one drainage basin to another. More so, the sources are highly influenced by variation in rainfall intensity, soil types, vegetation cover and presence or absence of wetlands. As a matter of fact, these factors are instrumental in explaining water shortages in Kenya. Importantly, they impact on the availability of water for socio-economic and ecological demands. Water demands are influenced by distribution of the resource. These therefore explain partly the inadequacy of the resource, especially in semi-arid areas.

Kitui experiences semi-arid climatic conditions with unreliable rainfall between 500 mm and 1050mm in a year with 40 per cent reliability. The temperatures range between 18° and 30° (Internet). The climate of the district is semi arid with very erratic and unreliable rainfall. Most of the areas are generally hot and dry leading to high rate of evaporation. The long rains come in April/May and short rains in November/December. The short rains are more reliable while long rains are usually

unreliable. The periods falling between June to September and January to March are usually dry. As a result the surface run-off resulting from rainfall is very little and rivers receive very little recharge from rain causing seasonal variations in water level. The variations are so notable such that these rivers flood during the rainy season, and turn in to dry sand beds during dry seasons. This situation is compounded by high evaporation rates and the capping/sealing property of the soil that reduces rate of percolation in to the ground impacting negatively on ground water recharge levels. The soils are also loose and of poor water retention capacity, in addition to some being shallow and stony.

The altitude of the district ranges between 400m and 1800m above sea level. The Central part of the district is characterized by hilly ridges separated by wide, low-lying areas and has slightly lower elevation of between 600m and 900m above sea level. To the eastern side of the district, the main relief feature is the Yatta Plateau, which stretches from the north to the south between rivers Athi and Tana. The plateau is almost plain with wide shallow spaced valleys. The highest areas in the district are Kitui Central, Mutito Hills, Endau hill and Yatta Plateau (Kitui District development plan 2002-2008)

The topography of the landscape influences the amount of rainfall received. The high land areas of Mumoni Hills in Kitui Central and Mutito in the eastern parts of the district receive between 500-760mm of rainfall per year. The Endau Hills to the east receive 500-1050mm per year, while the drier eastern and southern areas receive less than 500mm.

Due to limited rainfall received, surface water sources are very scarce. The major sources of surface water are seasonal rivers that form during the rainy seasons and dry up immediately after the rains. The District has no perennial river and no lake, but has several dams and pans that play a significant role in providing water. Most of the dams dry up during the dry season due to the high evaporation rates of between 1800 – 2000mm/year. Spring water is generally found in the hilly areas of the District namely Mutitu Hills, Endau hills, mumoni hills and Mutha hills. The springs vary in their flow regimes especially during drought periods. Underground water sources supplement the scarce surface water sources through drilling boreholes especially around Kitui central where the altitude is higher and the ground water level not too low. But in Mutito division the altitude is low and therefore the ground water level too low making sinking of boreholes very expensive as reported in the study there were only three boreholes in the whole of Mutito division and the one in Kaliku is not operational.

However climatic factors have been discussed here because they cause water scarcity and shortages, impacting on access. The main factors discussed in the study are family size, age, gender, education, occupation, income, and rainfall which affects ground and surface recharge. The discussions on this chapter have focused on the factors that influence water access to the water supply in semi-arid areas and specifically in Mutito division of Kitui District.

## CHAPTER 5

### MAIN WATER SUPPLY SOURCES IN MUTITO DIVISION

#### 5.1 Introduction.

This section, documents the identified main water supply sources in the division especially those relied upon by the local residents of Mutito during the dry season. The main reason of concentrating only on the dry season was because there are many sources of water during the wet season and water scarcity increases with persistent drought. Although the quality of the water from these sources is questionable, all the sampled individuals seemed to agree that there was enough water for both animals and humans during the wet season regardless of the quality, which was rated differently by different individuals.

This study concentrated on household accessibility to water and gave little emphasis to the water quality because the quality seemed to be unfit according to the researcher. First, because there are no measures put in place to ensure safety of the water quality. At the same time the authorities also agree that most households in the district (78.2%) acquired water from unsafe sources (Kitui District Development Plan 1994-96)

During the wet season, people get water from all kinds of sources. These include River, springs, shallow wells, Ponds, Dams, Bore hole, Jabias/Tank and temporary roof catchments. Water from most of these sources except the borehole, tanks and temporary roof catchments is muddy and contains a lot of suspended matter. These water sources are further classified in to man-made and natural water sources.

## **5.2 The Man Made Water Sources**

The man-made water sources have not been developed well and do not produce significant amounts of water for the rural residents of Mutito Division. This could be due to neglect of water supply projects owing to poor policies. This condition could be compounded by poverty. This means that they don't have enough resources to invest in water supply projects. This situation compounded by crop failures at rates of 4-6 out of every 10 seasons owing to occasional drought (internet). The food insecurity condition translates their most immediate need to bread and butter.

The man-made water sources include the small dams, Jabias/tanks the shallow wells and temporary roof catchments.

### **5.2.1 Jabias/tanks and temporary roof catchments**

According to the local residents of Mutito, rainwater from Jabias/tanks and temporary roof catchments is considered good for drinking and washing clothes. However, due to the limited capacity of these temporary catchments, this water only lasts a few days and cannot be considered as a permanent water source. Most of the water tanks/jabias are communally owned and are only found in market places and administrative centers, in Kaliku Location such tanks are found at the chief's office, at the health center and at the secondary and primary schools. These provide water for a short period. This water from the chiefs tank is sold for Kshs 10.00 per 20liter can. The money goes to the Locational development committee kitty.

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### **5.2.2 Shallow Wells**

Shallow wells go to a depth of about 30-35 meters. Some are communally owned others are private. Most communally owned shallow wells were dug through sponsorship of AMREF. However, all the five communal shallow well projects that AMREF had initiated have stalled because the community members were not able to fulfill their obligations as per the agreement with the sponsor. A key informant told the researcher that the community members were to contribute 10% and the sponsor 90% so as to have the project completed to allow them access water for a better part of the dry season. However the uncompleted shallow wells provide water during the wet season but when the water level goes down with persistent drought they also dry up. A few of the private shallow wells offer sufficient water for the owners during the wet season. With increased drought the water level goes down and the wells dry up. As a result, the owners have to turn to the river so as to supplement the little water gotten from the wells.

### **5.2.3 The Borehole**

They are three in the whole Division. One in each location. These go down to a depth of over 60 meters, depending on the water table level. There were only two functional boreholes in the whole division, one in Masasini Sub-location in Mutito Location and another in Malatani Sub-location in Zombe Location the borehole in Kaliku Location is neglected and non-functional.. The government of Kenya dug these boreholes in the early nineties. Their state is deplorable because of lack of maintenance by the state and local people. Only the borehole in Masasini produces

water during the dry season but only to families living at a radius of two kilometers. However this borehole produces water which the residents claimed was unfavorable for either drinking or washing. As a result, families had to use the river for their water needs. Other families though close to the borehole considered the source time consuming because of the waiting spans since they draw water at first come first served basis and the borehole doesn't produce a lot of water. The elderly and the children preferred the river because the pump, which is poorly maintained and rarely lubricated, needs a lot of force and hence can only be used with ease by strong people.

The borehole in Kaliku location was out of order and therefore no one uses it. At the same time it was dug at a riverbank. This reduced its importance because people prefer drawing water from the river channel close by. The borehole in Malatani has a very low recharge and therefore the residents consider it time consuming and not many people bother with it. It is often used by travelers to quench their thirst and sometimes by monkeys.

The boreholes cannot be considered a major source of water for household use since their recharge rate is very low and are therefore time consuming and at times non-operational. The taste of their water also is not favourable for drinking nor for washing because the water is hard and salty and can only be used when there is no alternative. Therefore many people even those living around the boreholes prefer travelling to the river channel about 4 kilometers away to draw water and water their animals.

### 5.3 The Natural Water Sources

All the people in this Division depend on the rivers, ponds, streams and small springs directly either for domestic water needs or for watering their animals. During the wet season, rivers, ponds, streams and small springs act as a good source of water supply for people and livestock. This water is also of questionable quality because these sources derive their water from surface runoff. It is possible that this water is contaminated because of poor human excreta disposal i.e. from the researchers direct observation most of the families visited did not have a pit latrine.

Most of the natural water supply sources mentioned above only provide water during the wet season. In the dry season, they dry up and the residents turn to the river for all their water requirements. There are only two rivers in the whole division (Mui and Thua). These are the main sources of water for the residents of Mutito division over the dry spell. However these rivers are seasonal and they run dry during the dry season turning in to dry sand beds. These sand beds act as the only reliable water sources during dry periods. However, despite the fact that sand harvesting is a serious challenge impacting on water sources especially rivers in Ukambani region, here it is not a challenge. This is because people who harvest sand in Ukambani mostly target the market facilitated by construction industry in the City of Nairobi. Transporting sand from here to Nairobi may not be economically viable because of long distances.

From the survey data, water fetchers travelled an average distance of 5-6 KM to reach the water channel. Though distances travelled by different water fetchers ranged from less than 1km to 8km to the river channel. Precisely, only 6.7% travelled

upto 1kilometer and below. 20% travelled between 2 and 3 kilometers and 73.3% travelled more than 4kilometers to reach the dry sand beds to draw water for their households.

### **5.3.1 Water harvesting and maintenance of the river**

Strong gender relations exist in relation to guarding and running of the water sources although, nobody is denied entry in to the river. There are strong unwritten conventions governing the use of the river and preserving its good condition. Wells are dug in the middle of the river channel where, water is flowing fastest and the sand is clean. Sometimes wells are dug on the riverbank to minimize incidences of collapse. There was no explicit partitioning of the river but everyone knows the exact place where his family well was located. No one can dig a new well in a position where a family well has existed before without prior permission from the particular patriarch of the family that owns that particular well. Normally paying a courtesy call on the patriarch does this. The borrower takes with him a small gourd containing a traditional brew locally referred to as *kaluvu*. If the patriarch accepts your gourd (*kamee*) then he will inform his family of the development and for that particular season you can use their family well. This is only done if the borrower of the well has a herd of cattle to be watered. The work of ensuring the animals have somewhere to be watered during the dry season is the work of the male family head. This means that female family heads can not conduct this ceremony and so the possibility of accessing waterthrough this arrangement are non-existent.

Male adult members of the family participate in digging and de-silting wells. Female family heads normally find their male relatives to do this work for them or hire someone to do the de-silting. In most cases women are the ones who fill the troughs for the animals to drink although male employees also do it. After the animals are watered, the herdsman take them to the fields for grazing, the owner of the well gets first priority to draw water, this means that females from the homestead where the well is owned get first priority to draw water. This implies a social differentiation even among the same gender in access to water.

### **5.3.2 Gender roles in water source management**

The whole community owns the river. The old women (*muamba*) hold it in trust for the whole community. They settle conflicts arising from people fighting over water shortages; they sacrifice to the river spirits whom the community believes have the power to make the channel to dry up if they are not appeased. There are community by-laws, which ensure the river is kept clean, safe and to minimize conflicts and incidences of people fighting over whom accesses water first. The old village women (*muamba*) are responsible for ensuring compliance with such by-laws. First, it is a taboo to fight in the river channel. Those who do and are caught must be fined. The fine is goat which the old women of the village come together and perform a cleansing ritual to appease the river spirits so that they don't make the channel to dry up.

There are also rules that enforce hygiene and courtesy, for example no one can wash himself near a well; water is carried to a safe distance behind bushes at the river

bank where there are places designated for this purpose. Soap and other detergents are used at a distance from the well so that they do not interfere with the taste and quality of the water. There are many small rules and sub-rules governing the use of the river. Nobody in particular is responsible for enforcing this system of management but there is little noncompliance. However if there is enough evidence that somebody has done anything that may be contrary to the expectation of the river users (villagers) the old women must come together and decide the penalty that particular individual deserves. Fighting within the river channel is especially a serious offense and if any two people are caught fighting, they must produce a goat for a cleansing ritual to be performed. This is because fighting for water is termed as lack of gratitude to the river spirits, which might make the channel to dry unless they are appeased. The river spirits are believed to be children of the greater spirit living in a particular hill that channel originates from. This hill spirit is believed to control the rain and the old women (muamba) sacrifice to it when there is a drought. The hill spirit also controls the spring where the river originates from and is also believed to control the spring regime and flow. It is believed that if it is unhappy the spring might dry up.

There are different spirits for each hill and spring eg for Mutito hill there is Lala and the spring is called Kwa Lala, for Endau hill there is Syosili and the spring is termed as Ndiani kwa Syosili, and many more hills with different spirits. It is the responsibility of these old women (muamba) to ensure these spirits are sacrificed to. The sacrifice is normally a black bullock, which they get by coming together and working in peoples farms or the great spirit may decide whom among the villagers should produce the bull.

It seems male patriarchs own the wells, they facilitate the digging and de-silting and the women are custodians of the river channel on behalf of the community. They ensure cleanliness of the river channel and manage conflicts and incidences of people fighting over the scarce water, by use of societal sanctions and fines. This could be an indigenous method of avoiding conflicts arising from scrambling for scarce resources in this case water.

### **5.3.3 Water harvesting, transportation and demand management**

From the data collected it was evident that men, employees and male children were responsible for grazing and watering animals. On the other hand, women, children of both sexes, and employees were responsible for drawing water for household use. At the river channel the animals are watered first. Though the herders trample on the water and add suspended matter making it unfit for drinking, the community appreciates animals to the extent that they are given first priority.

Water is transported home using a donkey. Many household own a donkey or several for transporting water from the source. The journey is an arduous one entailing walking through treacherous paths uphill through steep gullies a result of wind and water erosion and under the scorching heat of the sun. The donkeys have to rest for a day to regain strength and to have time to feed before they can go back for another water fetching trip. Findings show that water fetching affects all other productive and reproductive spheres of the residents of Mutito Division.

## **CHAPTER SIX**

### **SUMMARY, RECCOMENDATIONS AND CONCLUSION**

#### **6.0 Introduction**

In this section, major study findings are documented and their implications and conclusions made. This chapter demonstrates the extent to which study objectives have been realized and the hypotheses tested to answer the research questions. The study recommendations based on the research findings and areas of further research are offered. Most of the findings are related to the main factors impacting on water access.

#### **6.1 SUMMARY OF FINDINGS**

##### **6.1.1 The main water supply sources**

the study covered 150 households . it was established that water sources are differentiated by seasons. The main water supply source during the dry season is the dry sand bed where the residents of Mutito do sand scooping and dig shallow wells to draw water from. The other sources are only available for a short while during the rain seasons and therefore are not reliable. Study findings show that the 84% of residents in Mutito division do not have access to water for their household water needs during the dry season. Poor access was reported at the household level affecting both the cleanliness and hygiene of the families including water needs for general household use. This was as a result of long distances traveled to reach the water source, and poor access at the water source causing delays as people waited to fetch water in turns.

Many homesteads are located very far from the water source and therefore women and children who are the main water fetchers have to walk an average of 5-6 KM to the river channel. At the water source, water is not sufficient and therefore people and animals have to access water in turns. The animals are watered first and then the well owners family, after that, othe people draw water on first-come-first served basis. The study established that the river (dry sand beds) are the main water supply source during the dry season.

### **6.1.2 Socio-economic, physical factors and water access**

#### *(a) Water scarcity and shortage*

This was the first reason why residents of Mutito could not access enough water for their household needs. This is because the area recieves very low rainfall between 250 and 750mm. Mutito division has ASAL climatic characteristics and the underground water table level is very low this makes water harvesting an expensive undertaking. Due to this scarcity, water in this zone is very costly.

#### *(i) Distance*

Distance from the household to the water source was another chief factor impacting negatively on water access. This is because most households are located away from the dry sand beds, which act as the only source of water during the dry season when water is very scarce. The United Nations standards for potable water are that it should be 1 kilometer within reach or 15 minutes walk to water supply point. This acted as the operational definition for accessible distance to the water source.

Therefore the study findings indicate that 84% of the respondents had no access to adequate water owing to long distances. Further the average distance traveled by people in this area to and from the river channel is 11 –12 kilometers. The results of the chi-square test of significance ( $X^2=41.82$ ;  $df = 2$ ;  $p= 0.000$ ) indicated that there was a strong relationship between distance and water access at 0.05 probability error.

Walking an average distance of 5-6 kilometers to the river in search for water four times a week is an arduous task. In a week the water fetcher (normally women who are only assisted by children during school holidays) has to walk a mandatory distance of between 40 – 48 kilometers through very steep, rough and treacherous paths to the river alone, this includes lifting very heavy loads to saddle the donkeys. The severe fatigue arising from this could seriously affect ones ability to embark on other productive and reproductive chores. Further women headed households are disadvantaged in water access since they have no right to resource and land ownership. This impacts on their ability to invest in water transporting implements as a resulting reducing the amount of water they transport home..

#### *(ii) Location*

Locations adjacent to rivers had relatively better access to water supply. This is attributed to high dependency on the natural sources of water in this case the dry river channel. Kaliku location had the highest proportion of people with poor access to water followed by Zombe and Mutito in that order. The results of the chi-square test of significance ( $X^2=29.7$ ;  $df = 2$ ;  $p= 0.000$ ) indicated that the variations were

significant at 0.05 probability of error. The contingency coefficient indicated that location accounted for 41% of variations in access to water.

*(b) The socio-economic factors(income)*

The study found out that most of the people living in the rural semi-arid setting of Mutito division are of low-income brackets. Most of them were poor resource farmers and their mean monthly income ranged between Kshs 1000.00 and Kshs 4000.00 with 62 % of the population within this range. This income range was expected to support family sizes of between 4 – 10 members with over 80% of all the households within this range. The median of the family size range is 7, and the median of the income range is Kshs 2500.00 this means that a family of seven members is expected to depend on a mean monthly income of Kshs 2500.00. Therefore the mean monthly income per head in this area is Kshs 357.00. This means that in a day a person from this region is expected to spend Kshs 12.00 this is very much far below the poverty levels recommended by the United Nations of one U.S dollar, which is the equivalent of Kshs 67 current exchange rates.

From the above statistics then one can conclude that poverty could be one of the major reasons why they have not been able to invest in modern water supply technologies. Since they cannot afford costs involved they are all depending solely on natural water sources for all their water needs.

Study findings show that families whose mean monthly income was below Kshs 2000 had the highest proportion of those experiencing poor access to water

followed by Kshs 2001-4000 income group, up to above Kshs 10,000 in ascending order. The contingency coefficient indicated that 29 % of the observed variations were explained by family's monthly income. The results of the chi-square test of significance ( $X^2=13.524$ ;  $df = 5$ ;  $p= 0.019$ ) indicated that the observed differences were significant at 0.05 probability of error.

*(ii) Family size*

Fewer members in a household were found to improve access to water supply this could be because the fewer the members the lower the water demand in that particular household. Surprisingly, larger numbers of family members' above 7 also improved access. This could be attributed to the fact that there are many water fetchers who can visit the river in turns. This could also be attributed to the fact that bigger families could be an indication of more established and older families with more resources to invest in water harvesting and transportation to the household.

The contingency coefficient indicated that family size accounted for 40% of the observed variations in water access. The chi-square test of significance ( $X^2 = 28.92$ ;  $df = 2$ ;  $p= 0.000$ ) indicated that the observed differences were significant at 0.000 probability of error..

### **6.1.3 Gender issues in water resource management.**

Water fetching in the household is the work of, women children of both sexes and employees. Men are responsible for watering animals or employing people to do that.

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At the water source, men owned the wells and did the de-silting and digging of shallow wells that means that men were responsible for water harvesting and maintaining wells. Women were responsible for, ensuring the river was kept clean, transporting water home and managing the water at the household level. Older women were entrusted with the spiritual role of appeasing and sacrificing to the river spirits who ensured the channel kept providing water for the community and that of conflict resolution.

## 6.2 CONCLUSION

In sum the study was intended to identify and analyze the factors that influence household access to water supply in semi arid areas. The case of semi arid Mutito division gave an opportunity to do so. The main objectives of the study were to analyze the factors influencing household water access, to document the main water supply sources, and to find out the gender roles in water supply and management. The main water supply source in the study area during the dry season when water is very scarce is the dry sand-bed where the residents do sand-scooped ditches to draw water from.

In order to address the problem of water scarcity in the said region, the study recommends rainwater harvesting through communal water tanks and construction of dams. At an individual level the study proposes investing in water fetching implements and beasts of burden to increase the amount of water transported home. Further the study gives a springboard for further research in the area of the food insecurity resulting from water searching activities.

### **6.3.0 STUDY RECOMMENDATIONS**

This dissertation has made recommendations related to how water problems can be addressed in the study area and offered areas of further research. Firstly, there is a need to realize the socio-economic and the health benefits of improving water access. Since water sources are limited, the first step should entail improving or increasing the water sources. This would bring water closer to the people and it would minimize the distance people have to walk to reach the water sources.

The government ought to come in to address water access disparities in the ASAL zones. Funds need to be allocated to rehabilitation and development of more water projects to improve access. Communal water tanks could be constructed using funds like the CDF (constituency development fund). These tanks can be constructed at market centers and schools to trap rain water that is collected by the roofs in such centers. This would ensure clean water that can easily be treated to conform to safety standards.

People could be encouraged to construct communal dams to take care of water needs for animals and people because during rainy seasons a lot of water goes to waste through percolation and run-off. This water can be preserved for use during dry seasons. These measures will make storing rainwater the best and most appropriate and sustainable source of water for the region available for use even during dry seasons. Sub-surface dams can be constructed by trapping stream waters in sandy zones of the streams would ensure the water is protected from evaporating under the scorching heat of the equatorial sun.

Due to their low-income levels, it might be hard to develop individual water harvesting systems. But since it is easier to facilitate development projects through groups, it would be wise to take advantage of the social ability of the women and youth to organize them in to groups working together to construct communal water tanks for water harvesting at market centers and at schools. They could take advantage of the recently established youth and women funds to access loans and invest in developing storage facilities for rainwater. Run-off water stored in dams can be used for watering animals and storage tanks for harvesting rain water from market and school roof catchments, which would be useful for drinking, cooking and washing.

They would also sell this water to the community members at reduced prices. Since the Water Act 2002 provides for water users association, then communal water harvesting technologies could provide a long-term solution to their water requirements. They can also take advantage of their indigenous methods of river protection to protect their water dams and storage tanks. Water collected in tanks or dams can easily be treated and this will help them access sufficient and safe water supply sources.

With water closer to their households, they will be able to devote extra time to other productive activities this will improve their health and socio-economic dimensions. Children can also fetch water for their mothers if it is closer to the household and this will increase water available for household use. However, at an individual level, the problem of water access can be minimized if individual

homesteads would invest in water transportation implements and donkeys or oxen to help carry more water from the water source to their households.

#### 6.4.0 Recommendations for further research

Investigate the food insecurity resulting from water searching.

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## APPENDIX I

### INTERVIEW SCHEDULE

#### A. HOUSEHOLD CHARACTERISTICS

Q1. Schedule Number \_\_\_\_\_

Q2. Gender of household head \_\_\_\_\_

Q3. Location \_\_\_\_\_

Q4.

S/NO	Household member	Age	Gender	Education	Occupation
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

#### Household Monthly Income Range

1000 – 2000

2001 – 4000

4001 – 6000

6001 – 8000

8001 – 10000

10001 - 12000

12001 - 15000

above 15000

Q5.

Source	Owner	Season	Uses			Cost Kshs	Reliability	Distance	Time	Quality	Adequacy
			1	2	3						
River											
Spring											
Well											
Pond											
Dam											
Bore hole											
Piped											
Jabias/ Tank											

KEY: 1. Drinking 2. Watering animals 3. Other household uses e.g  
Washing, cooking

Q6. Which of the above sources is your main source of water for all your water needs thorough out the dry seasons?  
.....

Q7. Does this source offer adequate water for both domestic and livestock needs?

Yes

No

Q8. If no in 7 above is there competition for water between the herdsmen and the domestic water suppliers?

Yes

No

Q9. If yes in 8 above explain how this situation is handled to ensure each group (water fetchers and herdsmen and herdsmen) accesses water.

.....  
.....  
.....  
.....  
.....

Q10. Who collects water for domestic use?

Wife

Husband

Children

Employee

Q11. How is water transported from the source to the household?

Use of beast of burden

Use of female human labour

Use of male human labour

Q12. Are there other roles that compete with drawing water?

Yes

No

Q13. If yes which ones?

.....  
.....  
.....

Q14. How do you handle these? E.g. do you draw water or do you choose to do the others?

.....  
.....  
.....

Q15. How often is the task undertaken per week?

Daily

Twice

Thrice

Four times

Q16. What is the role of local men in protecting and managing the water supply sources/points?

Digging and managing wells

Identifying and punishing those interfering with natural water systems

Ensuring family members have access to a water point

Q17. What is the role of local women in protecting and managing the water supply source/points?

Identifying and punishing those who break the rules governing the water sources

Ensuring family members have access to a water point

Digging and managing wells

Q18. Who is responsible for watering the livestock?

Men

Women

Children

Employee

Q19. How much water do you spend in a day for whole household. ....Litres.

Q20. How much water would you spend per day if you had adequate water at your disposal?

Drinking ..... liters.

Watering animals ..... liters.

Washing clothes ..... liters.

Other household uses, e.g. cooking ..... liters.

Q21. What is the main reason why you cannot access enough water for your household?

Water shortage

Distance

Cost

Q22. Is there any water available for sale?

Yes

No

Q23. If yes to Q22 above, how much does this cost in Kshs? .....

Q24. How would you rate the cost of water?

Low

Moderate

High

Q25. According to you, is the water you access safe for your family's consumption?

Yes

No

Q26. If no to 25 above, explain why you consider it unsafe?

.....  
.....  
.....  
.....  
.....  
.....

Q27. If yes to 25 above, explain why you consider it safe?

.....  
.....

**APPENDIX II**

**KEY INFORMANT QUESTIONNAIRE**

Q1. Name of informant \_\_\_\_\_ Gender \_\_\_\_\_  
Designation \_\_\_\_\_ Location \_\_\_\_\_

Q2. What are the main water supply sources in this location?

Q3. Which of these (in Question 2) are reliable and why?

Q4. Which of these (in question 2) are unreliable and why?

Q5. According to you what is the average distance travelled by people in this location to the nearest permanent water supply source? \_\_\_\_\_ Km

Q6. Do livestock and wildlife access water from the same point?

Yes

No

Q7. Are there any water supply systems managed by the state in the location?

Yes

No

If yes, state which ones and who accesses them

\_\_\_\_\_  
\_\_\_\_\_

Q8. Are there any water supply systems managed by NGOs in the location?

Yes

No

If yes, state which ones and who accesses them

\_\_\_\_\_  
\_\_\_\_\_

Q9. Are there any water supply systems managed by the local community in the location?

Yes

No

If yes, state which ones and who accesses them

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Q10. Are there households that experience severe water accessibility problems than others

Yes

No

Explain \_\_\_\_\_

Q11. Do you think water-searching activities have any significant impact on other productive activities in this location?

Yes  No

Explain \_\_\_\_\_

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## APPENDIX III

### CASE STUDY GUIDE

Name of informant \_\_\_\_\_

Gender \_\_\_\_\_ Location \_\_\_\_\_

1. Do you experience water accessibility problems in your household?
2. Explain how you obtain water for your household (whether you have tapped water or any water storage facility). Does this facility provide water for your household and livestock needs for the whole season (dry and wet)?
3. If you don't have a water storage facility or tapped water, narrate your experience from the time you leave the homestead to the water source, any other activity in between, the waiting spans at the water point, any competition experienced at the source with fellow water fetchers, livestock or wild animals, any problems related to the water point (e.g. deep wells, heavy pumps etc).
4. How is water transported from the source to the household?
5. When do you arrive home?
6. What other duties have you to undertake? Are these duties affected in any way by your water searching activities?
7. How much water do you bring home?
8. How many people are in your household?
9. How is this water used?
10. How long do you stay before you go back to the water source for more water?

11. How does this affect your production e.g. in the farm, small scale business, etc?

12. How does this affect your reproductive duties e.g. childcare, homecare etc?

13. How does it affect your individuality (e.g. stress, fatigue, double day etc)?

## APPENDIX IV

### RESEARCH BUDGET

Activity	Duration in months	From - To
Coursework	12 months	September 2002 - September 2003
Proposal writing, Departmental defense & making corrections	3 months	October 2003 - December 2003
School defense & making corrections	1 months	January 2004
Field-work	2 months	February 2004 - March 2004
Data analysis	2 months	April 2004 - May 2004
Thesis writing, examination & submission	4 months	June 2004 - September 2004

**APPENDIX V**

Specific Research Tasks	Facility Required	Human Resources	Other Services	Total Cost Kshs
Proposal Writing	<ul style="list-style-type: none"> <li>• Diskettes and Stationery</li> <li>• Typing and photocopying</li> </ul>	Researcher	Computer	25,000.00
Data Collection Field Study Traveling Subsistence Research Assistants	<ul style="list-style-type: none"> <li>• Stationery</li> </ul>	<ul style="list-style-type: none"> <li>• Researcher</li> <li>• Research Assistant</li> </ul>	Accommodation	70,000.00
Data Analysis	<ul style="list-style-type: none"> <li>• Stationery</li> </ul>	<ul style="list-style-type: none"> <li>• Researcher</li> </ul>	Computer	35,000.00
TOTAL COST (KSHS)				130,000.00