MEDICINAL PLANTS SPECIES DIVERSITY AND ACCESS TO
TRADITIONAL HERBAL MEDICINE AMONG THE SAMBURU PEOPLE

BY
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DECLARATION

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

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DEDICATION

I dedicate this work to the Almighty God for His love and blessings and to my brothers Teddy Gafna and Iddoh Gafna.
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OPERATIONAL DEFINITION OF KEY CONCEPTS AND TERMS

**Abundance** - Is the number of individuals of any species per sampling unit.

**Access** - Refers to opportunity to use traditional herbal medicine.

**Knowledgeable gate keepers** – These are individuals within the villages who have a lot of information and direct links with the community.

**Perceptions** - The way traditional herbal medicine is regarded among a specific community/society.

**Species richness** - The number of different species in the corresponding species list.

**Traditional herbal medicine** – Extracts derived from a plant or plant part used to maintain health and to prevent, alleviate or cure diseases.

**Traditional medicinal knowledge** – This refers to the knowledge on the use of traditional herbal medicine.
LIST OF ABBREVIATIONS AND ACRONYMS

DMO     District Medical Officer
FGD     Focus Group Discussion
NCAPD   National Coordinating Agency for Population and Development
NEMA    National Environmental Management Authority
PHC     Primary Health Care
RA      Relative Abundance
SPSS    Statistical Package for Social Sciences
THM     Traditional Herbal Medicine
TMK     Traditional Medicinal Knowledge
WHO     World Health Organization
ABSTRACT

Traditional herbal medicine (THM) has been used since the ancient times and continues to play a great role in healthcare of many communities in Kenya especially the Samburu community. The species diversity of medicinal plants and access to traditional herbal medicine has little been evaluated in Kenya and among the Samburu people in particular. This study investigated species diversity of medicinal plants and access to THM among the Samburu people. It sought to identify the species richness, characteristics and abundance of the plants commonly used as THM and the influence of various factors like human activities, status of traditional medicinal knowledge (TMK) and perceptions, culture and spiritual beliefs on access to THM. The study used a descriptive survey design. In this study questionnaire, interviews, transect walks and Focus Group Discussions were used as the main research instruments to collect data. Data collected was coded and analyzed using descriptive and inferential statistics using Statistical Package for Social Sciences. The Pearson correlation was used to determine the relationship between the variables. The findings of this research were 19 medicinal plant species, out of which 46% were threatened, 23% were found to be presently safe, 15% were sporadic, 8% were vulnerable and 8% were not known. From the study, 56% of the household heads indicated that fire incidences highly affected access to THM, 50% were of the view that grazing of livestock moderately affected access, 46% said that building and construction activities moderately affected access, while 43% reported that firewood collection affected access, and 40% said that growing of crops affected access. From the study, 54% of the respondents reported that disappearance of TMK reduced access to THM, while 46% reported that protection of TMK promotes access to THM. Using the Pearson correlation, there was no significant relationship between human activities and access to THM at 5% level of significance; there was no significant relationship between protected status of traditional medicinal knowledge and access to traditional herbal medicine, since p=0.283; while there was a significant relationship between disappearing status and access to THM, since p=0.042; there was also no significant relationship between perceptions, culture and spiritual beliefs and access to traditional herbal medicine, since p=0.138 is significant at 5% level of significance. The study concluded that, the study area comprised of a variety of species richness, abundance and characteristics, a large number (46%) of whose existence were threatened by various human activities. The study also concluded that the protected status of TMK and perceptions, culture and spiritual beliefs promoted access to THM. The study recommended that, the youth groups should fence medicinal plants in their natural habitat to ensure they are protected; the locals through the community elders should be encouraged to document the TMK. In order to promote access to THM, the locals through the community elders should inform responsible bodies /authorities of any illegal logging or bush fires. The locals through the traditional herbalists should be encouraged to practice ex situ conservation by cultivation of some medicinal plants as live fence and in nurseries, while the younger generation through their parents should learn to embrace some of the cultures and spiritual beliefs related to the use of THM.
CHAPTER ONE
INTRODUCTION

1.1 Background of the study

The world primary means of treating diseases and fighting infections has been the use of medicinal plant species. From ancient times, plants have been rich sources of effective and safe medicines (Rusell et al., 2006). Traditional herbal medicine has been a constant source of substances for the treatment of a variety of diseases (Kunwar et al., 2010). According to Manadhar (2002), traditional herbal medicine has been used since ancient times in many parts of the world. About 85% of the traditional herbal medicines used for primary healthcare are derived from plants (Farnsworth, 2004). According to Health Canada (2001), 70% of the population in Canada use traditional herbal medicine from plants. Also, 47% of the population in England use traditional herbal medicine derived from plants (Thomas et al., 2001). Moreover, in Latin America the WHO regional office for the Americas reports that 71% of the population in Chile and 40% of the population in Colombia use traditional herbal medicine (WHO, 2008). In India, the native people exploit a variety of herbals from the plants for effective treatment of various ailments (Verma et al., 2007).

In Africa, traditional herbal medicine derived from plants forms an integral part of life in many indigenous communities as a readily available alternative to allopathic medicines (Wagate et al., 2010). Plants have been an indispensable source of both preventive and curative traditional herbal medicinal preparations for many people in Africa. Traditional herbal medicine is of great value, and more than 70% of the people
in Africa refer to traditional herbal healers concerning health issues (Tijjani et al., 2009). Traditional herbal medicine has flourished in Africa and has continued to be the main source of health in the rural communities and is heavily relied on by the majority of the sub-Saharan African population. In Africa, traditional herbal medicine was used to cure diseases until colonialists introduced the use of the counter and prescription drugs. For example, large sectors of the population in remote areas of Tanzania still rely mainly on medicinal plants for their day-to-day medicinal needs as modern systems are out of reach (Mahonge et al., 2006).

In Kenya, access to affordable health care is still generally unavailable for the average Kenyan, and 90% of the population has used traditional herbal medicine at least once for various conditions (Chirchir et al., 2006). The art of using traditional herbal medicine derived from plants has been practiced in Kenya for many years (Kokwaro, 1993), and it continues to play a major role in Primary Health Care (PHC). Growing human population, increasing levels of poverty, and decreasing standards of healthcare security for most Kenyans has stimulated an increasing demand for traditional herbal medicine derived from plants (NCAPD, 2007).

The Samburu people are among the traditional communities of Kenya that use traditional herbal medicine (Wanyama, 1997). Traditionally, the Samburu community utilizes herbal medicine derived from plants for therapeutic purposes. The dependence on traditional herbal medicine is high due to lack of modern medicinal services (Omwenga et al., 2009). It is against this background that this study sought to
investigate species diversity of medicinal plants, and explored issues of access to traditional herbal medicine among the Samburu people.

1.2 Problem statement

Efforts made by the government to promote use of medicinal plants and access to traditional herbal medicine (THM) have not yielded the expected results because medicinal plants and access to THM are still declining in many communities (Wanyama, 1997). This brings with it the destruction of medicinal plants and many challenges faced in accessing traditional herbal medicine. The Samburu people are no exception. Consequently, medicinal plants and traditional herbal medicine, important as they are, have continuously received just a shallow treatment. The species diversity of medicinal plants and access to traditional herbal medicine has little been evaluated in Kenya and among the Samburu people in particular (Tijjani et al., 2009). Medicinal plant species diversity and access to traditional herbal medicine among the Samburu people therefore calls for serious investigation.

1.3 Justification of the study

A study of the Samburu people was quite necessary because they are found in a remote area that is cut off in terms of infrastructure, and being a pastoralist community, they depend so much on traditional herbal medicine derived from plants for their healthcare in the treatment of both human and livestock diseases. The Samburu people are a marginalized nomadic people who have no access to conventional medical services.
1.4 Objectives of the study

1.4.1 General objective
To investigate the medicinal plants species diversity and access to traditional herbal medicine among the Samburu people.

1.4.2 Specific objectives
i). To investigate the species richness, characteristics and abundance of plants commonly used as traditional herbal medicine by the Samburu people.

ii). To evaluate the impact of human activities on access to traditional herbal medicine among the Samburu people.

iii). To assess the influence of the status of traditional medicinal knowledge on access to traditional herbal medicine among the Samburu people.

iv). To determine the influence of perceptions, culture and spiritual beliefs on access to traditional herbal medicine among the Samburu people.

1.5 Research questions

i). What is the species richness, characteristics and abundance of plants commonly used as traditional herbal medicine by the Samburu people?

ii). How do human activities influence access to traditional herbal medicine among the Samburu people?

iii). How does the status of traditional medicinal knowledge influence access to traditional herbal medicine among the Samburu people?
iv). What is the influence of perceptions, culture and spiritual beliefs on access to traditional herbal medicine among the Samburu people?

1.6 Hypotheses

To guide this research the following hypotheses were formulated:

$H_0$ There is no significant relationship between human activities and access to traditional herbal medicine among the Samburu people.

$H_0$ There is no significant relationship between the status of traditional medicinal knowledge and access to traditional herbal medicine among the Samburu people.

$H_0$ There is no significant relationship between the influence of perceptions, culture and spiritual beliefs and access to traditional herbal medicine among the Samburu people.

1.7 Significance of the study

Medical planners and policy makers do not have up to date information on species diversity of medicinal plants and access to THM among the Samburu people (Bussmann, 2006). This study yielded data and information that is useful in managing medicinal plants and examining access to traditional herbal medicine. This will contribute in decision making, institutionalization of a framework for management and development in the medical sector.

The findings and recommendations of the study will be useful to the policy makers, development workers, household heads, sellers of THM, specialized herbalists and
governmental agencies concerned with medical care. Henceforth, they will not rely on haphazard personal experiences or subjective expert judgment, but base their management of medicinal plants and access to traditional herbal medicine on concrete knowledge supported by the research findings.

1.8 Scope and limitations of the study

This study focused on medicinal plants species diversity and access to THM among the Samburu people, and the research was carried out in only four villages in Samburu; Lpartuk, Pooro, Loosuk and Suguta. This study investigated the species richness, characteristics and abundance of plants commonly used as THM and the influence of various factors on access to THM among Samburu people. The study was limited to a period of the past five years. This was because, only in the past five years the government tried to integrate the Samburu pastoral life with the use of THM derived from plant species and therefore much use had been witnessed during this period (Omwenga et al., 2009). The study faced various challenges and limitations. For instance, most of the Samburu people speak only the Samburu language and are semi-literate. This created a language barrier for the researcher. However, the researcher conducted this research with the help of research assistants (specifically trained and employed for this study) in Samburu language and translated to English with the help of native Samburu speakers.
CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter discussed literature related to this study. The literature review was structured into the foregoing sub-titles purely based on the study objectives.

2.2 Species richness, characteristics and abundance of plants commonly used as traditional herbal medicine

According to Bussmann et al. (2011), about 400 medicinal plants are used in India. About 40% of these are taken from the tropical forests, 35% from the temperate forests, and 25% from the arid and semi-arid lands. Traditional herbal medicines are derived from roots, bark, whole plants, flowers, leaves, seeds, wood, rhizomes and stems. Many of the medicinal plants were used in treating multiple diseases and a large percentage of the medicinal plants are derived from the tropical forests because the forests contain many plant species (Bussmann et al., 2011). Moreover, a study by Reinaldo et al. (2009) on useful plants of semi-arid Northeastern Brazil established that most plant species were used for medicinal purposes and for purposes of construction or fuel. Among the species that were used for treating many diseases were Myracrodruon urunduera and Schinopsis brasiliensis. In summary, there seems to be an agreement that most medicinal plants are used for treating multiple diseases. However, these studies did not establish the species richness, characteristics and abundance of plants commonly used as THM.
According to Okello et al. (2009), 107 plants belonging to 56 families are reported to be of medicinal value to the Sabaot community in Kenya. The study established that roots are the most frequently used parts of the plant followed by the bark, then leaves, the whole plant, seed, fruit, sap and flower. This study was important because it sounded a warning on the need to conserve the medicinal plants among Sabaot community. Most medicinal plant species among the Sabaot need urgent conservation measure. The conservation of these medicinal plants can only be conducted after establishing the parts of the plants that are used as THM. The roots are most frequently used because of the belief that they contain great quantity of the medicinal substances. Moreover, Njoroge et al. (2010) asserted that in the semi-arid region of Mwingi district, four highly prioritized plant species used as THM in treating animal and human diseases are Aloe secundiflora, Albizia amara, Acalypha fruticosa and Salvadora persica. A study of the medicinal plants commonly used as traditional herbal medicine among the Marakwet community in Kenya also found out that Bidens pilosa was commonly used as a medicinal plant species (Kipkore et al., 2014). These prioritized medicinal plants are being overexploited. This was an important finding because it brought to the fore the need for conservation of some of the plants that are commonly used as THM. Both the above studies agreed that most plant species used as THM were being overexploited. However, the studies did not establish the species richness, characteristics and abundance of plants commonly used as THM.

According to Wanyama (1997), there were different medicinal plants species found in the Samburu community. Among the plants used by the Samburu community to treat
diarrhoea, the family of *Mimosaceae* had the highest number of medicinal plants species (six) while *Vetaceae* family had two medicinal plants species and the rest of the family had one medicinal plant used as THM (Omwenga *et al*., 2009). These findings were important because diarrhoea is a common disease among the Samburu people due to the shortage of water. Omwenga *et al*. (2009) reported that *Bidens pilosa*, *Digitalis purpurea*, *Aloe secundiflora* and *Acacia nilotica* are some of the medicinal plant species used by the Samburu people. Omwenga *et al*. (2014) asserted that different medicinal plant species found among the Samburu people are used to treat malaria even though the educated prefer conventional drugs from hospitals to traditional herbal medicine. However, Nanyingi *et al*. (2008) reported that many medicinal plants among the Samburu people are threatened by anthropogenic and natural factors. However, the study did not investigate the species richness, characteristics and abundance of plants commonly used as THM.

2.3 Impact of human activities on access to traditional herbal medicine

Human activities can be classified as activities that would not occur in natural environments without human influences. It refers to something that people do or cause to happen (Kennedy, 2011). Examples of human activities include building and construction, grazing, burning of vegetation using fire, growing crops and exploitation of plants.

In a research study on factors that affect the quality of traditional herbal medicine, it was noted that widely used application of chemical fertilizers has brought changes in
trace elements and reduced the active ingredients, herb shape, smell and other issues (Motaleb, 2010). The researcher found that the chemical compositions of the fertilizers mutate the medicinal plants, making its content very different. The knowledge of the factors affecting the quality of THM will enable people avoid reduction of the quality of THM. However, the study did not document the influence of human activities on access to THM, which this study sought to investigate among the Samburu people.

In a study to identify the prevalence and factors which predict the use of herbal medicines among the Malaysian adults, Aziz et al. (2009) asserted that the prevalence of herbal medicine use was high. The study continued to assert that people's personal attributes and opinions influenced their likelihood of using herbal medicines. Shinwari et al. (2010) reported that cultivation of medicinal plants has continuously led to increase in species of medicinal plants, therefore leading to increase in traditional herbal medicine. According to Azeez et al. (2013), traditional herbal medicine was readily available in rural areas for treatment of many diseases. These findings were important because knowledge of the predictors of herbal medicine use may help health care providers to identify patients at increased risk who would be candidates for receiving guidance on safe use of herbal medicines.

Human activities lead to decline in traditional herbal medicine. According to Mesfin et al. (2013), in a study conducted in Samre District, South-Eastern Tigray, Northern Ethiopia noted that medicinal plants face extinction due to pressures from agricultural
extension, widespread cutting for fuel wood, livestock grazing and collection of fodder combined with seasonal drought. Khan et al. (2012) reported that in the mountains regions of Naran Valley in the Western Himalayas, overexploitation through forest cutting, livestock grazing and collection of fodder, edible and medicinal plant species puts the natural ecosystem at risk thereby leading to decline in traditional herbal medicine.

2.4 Status of traditional medicinal knowledge

Human communities have always generated, refined and passed on knowledge from generation to generation. Such traditional knowledge is often an important part of their cultural identity. In Latin America, despite many individual efforts of governments to preserve the biodiversity for future generations, traditional knowledge, especially which is derived from traditional medicine is disappearing (Calixto, 2005). Traditional knowledge on the use of medicinal plants and the techniques of making many herbal formulations have declined over the past few decades due to lack of awareness and spread of allopathic medicines (Kala, 1998). According to Kala (1998) and Calixto (2005) traditional medicinal knowledge (TMK) has declined over the past years. Romulo and Rosa (2010) reported that increasing disappearance of traditional medicinal knowledge has led to loss of traditional herbal medicine. However, they did not investigate the influence of the status of traditional medicinal knowledge (disappearance of TMK) on access to THM.
Kala (2000) reported that a great deal of traditional knowledge on the use of various plant species as herbs is still intact with the indigenous people of the Himalaya due to less accessibility due to terrain. The knowledge of therapeutic plants as herbs has started to decline and become obsolete through the lack of recognition by younger generations. In addition, most of the local communities in the highlands of Dolakha District in Nepal still possess substantial knowledge of plants used as THM despite gradual socio-cultural transformation (Shrestha and Dhillion, 2003). This was an important contribution because it indicated the status of the TMK. In summary, Shrestha and Dhillion (2003) concur with Kala (2000) that substantial TMK has been protected. However, they did not examine the influence of the status of the TMK on access to THM. However, the traditional knowledge of primary health care system of local communities in India is under great threat because of a number of factors including deforestation, environmental degradation and modern civilization (Jitin, 2013).

Traditional medicinal knowledge is essential to the health of millions of people in Africa. Mahmoud et al. (2013) asserted that in the Eastern Desert of Egypt, many knowledgeable elders provide the other members of the community with traditional knowledge on medicinal plants. According to Alqasim et al. (2013), Hausa and Fulani tribes of Keffi in Southern Nigeria are accustomed with local herbs and hold flamboyant knowledge base with reference to the use of herbal plants to treat various diseases. Traditional herbal medicine has been used for centuries by the herbalists, healers, spiritualists and farmers as primary health care at community level. However,
the loss of TMK is taking place in some African communities (Riley, 2000). The study found out that the loss of the TMK was likely to be due to the reluctance of the younger members of the community to carry forward traditional practices. Grade et al. (2009) and Haile and Yewhalaw (2007) also concur with Riley (2000). However, Haile and Yewhalaw (2007) added that the destruction of the tropical forests in Africa has led to the increasing disappearance of native people in many parts of the tropical regions who have accumulated compendium of folk knowledge about the usefulness of plants as THM. Gigeny (2010) reported that in Northern Ethiopia, despite many individual efforts of governments to preserve the biodiversity for future generations, traditional medicinal knowledge was disappearing. Protection of traditional medicinal knowledge promotes access to traditional herbal medicine. In summary, the authors agree that TMK is disappearing in most communities in Africa. However, the researchers did not examine the influence of the status of the TMK on access to traditional herbal medicine.

The study by Tonui (2008) in Kericho district in Kenya showed that majority of communities in divisions in Kericho district knew the local herbs or plants used to repulse mosquitoes and other insects as well as the local method of treatment or prevention of malaria. The study focused on environmental determinants of patterns and trends of occurrences of unstable malaria.
2.5 Perceptions, culture and spiritual beliefs on traditional herbal medicine

Cultures throughout the world explain illness in different ways. People of diverse cultural and spiritual backgrounds often make different attributions to illness, health, diseases and symptoms (Ver Beek, 2010). There are about 3000 African tribes, each with its own religious system which governs economics, education and healthcare and it is the greatest influence on thinking and living (Ver Beek, 2010). Most traditional African cultures believe that disease is caused by the malevolence of witches, sorcerers and medicinal healers, which are therefore a spiritual focus (Kennedy, 2011). According to Omatseye et al. (2010), most African cultures believe that ancestors and spirits act as intermediaries between human community, the gods and the Creator. The gods are appeased by offering sacrifices to them to increase the number of medicinal plants. Alqasim et al. (2013) reported that most cultures among Hausa and Fulani tribes of Keffi in Southern Nigeria promote use of medicinal plants as medicine. Some cultures also prevented overexploitation of medicinal plants. Bemar et al. (2013) reported that majority of the members of Pentecostal churches in Emurin, Ogu believed that traditional medicine was given by God. These were important contributions because the belief on the cause of disease will influence the type of treatment to be sought by people. However, they did not establish the influence of perceptions, culture and spiritual beliefs on access to traditional herbal medicine.

In Kenya, most communities still adhere to their cultural and spiritual beliefs (Sindiga and Nyaigoti, 1990). According to Ngaata et al. (2011), in Mfangano Island in Suba District, Kenya, the locals believe that only medicinal plants can treat certain ailments
associated with HIV/AIDS. However, they did not establish the influence of perceptions, culture and spiritual beliefs on access to THM.

The Samburu people have diverse spiritual and cultural system of beliefs, and the traditional deity known as Nkai; a personified being, but symbolically male and female aspects; provides life and good health (Straight, 2006). Bussmann (2006) also concurs with Straight (2006) by asserting that the Samburu community has diverse cultures. In summary, Straight (2006) and Bussmann (2006) agreed that the Samburu people have diverse culture. However, they did not document the influence of perceptions, culture and spiritual beliefs of the Samburu on access to traditional herbal medicine. Table 2.1 gives a summary of some of the key literature reviewed in this study.
Table 2.1: Summary of knowledge gaps

<table>
<thead>
<tr>
<th>YEAR OF PUBLICATION</th>
<th>AUTHOR</th>
<th>RESEARCH WORK DONE</th>
<th>FINDINGS</th>
<th>KNOWLEDGE GAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>Reinaldo <em>et al.</em></td>
<td>Useful plants of Semi-Arid Northeastern Region of Brazil</td>
<td>Medicinal plants are used in treating many diseases</td>
<td>Species richness and abundance of plants commonly used as THM</td>
</tr>
<tr>
<td>2009</td>
<td>Aziz <em>et al.</em></td>
<td>Factors which predict use of herbal medicines among Malaysian adults</td>
<td>People’s opinions influence their likelihood of using THM</td>
<td>Impact of human activities on access to traditional herbal medicine</td>
</tr>
<tr>
<td>2011</td>
<td>Kennedy E.</td>
<td>Herbalism, spirituality and treating diseases</td>
<td>Most traditional African cultures believe that disease is caused by malevolence of witches</td>
<td>Influence of perceptions, culture and spiritual beliefs on access to traditional herbal medicine</td>
</tr>
<tr>
<td>2010</td>
<td>Ver Beek K.A.</td>
<td>Spirituality: A development taboo</td>
<td>Cultures throughout the world use different systems of meanings to describe diseases</td>
<td>Influence of perceptions, culture and spiritual beliefs on access to THM</td>
</tr>
<tr>
<td>2008</td>
<td>Tonui W.K.</td>
<td>Environmental Determinants of patterns and Trends of occurrences of unstable malaria in Kericho district</td>
<td>Majority of communities knew local herbs or plants used to repulse mosquitoes</td>
<td>Influence of the status of TMK on access to traditional herbal medicine</td>
</tr>
</tbody>
</table>
2.6 Conceptual framework

Figure 2.1: Conceptual framework on the diversity of medicinal plants and access to traditional herbal medicine.

Ghuneim et al. (2008) defined engagement as; "consumer based measurement that regards interaction with an aspect of brand or media property". The authors further explained that engagement must be understood by type, and the value associated with each in terms of ultimate adoption, sales and brand loyalty. It must be considered how
the consumer's type of engagement affected the core values and positioning of that brand. Ghuneim et al. (2008) believed that various factors influenced the positioning of the brand which finally influenced the acceptability of the brand to the consumers. In this context, various factors influenced the species richness, characteristics and abundance of plants commonly used as THM and these two ultimately influenced species diversity of medicinal plants and access to THM.

Species diversity of medicinal plants and access to THM is conceptualized in this study as an outcome of interrelated factors which originate from species richness, characteristics and abundance of plants commonly used as traditional herbal medicine, impact of human activities, status of traditional medicinal knowledge and perceptions or cultural and spiritual beliefs (Figure 2.1). Three sets of factors are seen to interact and their interaction is indicated by the two sided arrows linking the three sets of factors. Species diversity of medicinal plants and access to THM is affected by the three sets of factors. The species richness, characteristics and abundance of plants commonly used as THM which brings together all the three stated factors finally determined diversity of medicinal plants and access to THM.
CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction
This chapter considers the relevant methodology used in carrying out the study. It highlights the research design, study area, target population, sampling techniques and sample size, research instruments, data analysis techniques and ethical considerations.

3.2 Research design
This study used a descriptive survey design. According to Creswell (2002), the descriptive survey design is cheap, effective, and easy to conduct and it also ensures ease in accessing information. The descriptive survey design was also used as it allows the researcher to gather information, summarize and interpret them for the purposes of clarification (Orodho, 2004). The units of analysis included the respondents (Specialized herbalists, household heads, sellers of traditional herbal medicine, knowledgeable elders, locals and key informants) and the medicinal plant species. The dependent variable was species richness, characteristics and abundance of plants commonly used as THM while the independent variables were status of traditional medicinal knowledge (TMK), human activities and perceptions, culture and spiritual beliefs.

3.3 Study area
The study was conducted in Samburu Central Sub-county, Samburu County, Kenya, which borders Samburu North Sub-county to the Northwest, Baringo East Sub-county
to the Southwest, Samburu East Sub-county to the Northeast, Isiolo to the East and Laikipia North to the South. The sub-county lies between Latitudes 0° 50' North and 1° 30' North and Longitudes 34° 24' East and 37° 36' East (Figure 3.1). Samburu Central Sub-county falls within the arid and semi-arid lands (ASALS). The mean annual rainfall in the area is 500 mm with a bimodal rainfall distribution, from April to May (long rains) and July to September (short rains), with the dry season extending from January to March. The altitude of the area ranges between 850 m and 1230 m above sea level. There are 9 established public health centers, 3 medical doctors and 8 clinical officers in Samburu Central Sub-county. The public health facilities in the interior have few personnel and poor infrastructure. All the medical doctors are stationed at Samburu Level Four Hospital situated in Maralal town, with one clinical officer stationed in Pooro, Lpartuk, Loosuk and Suguta Marmar respectively (Government of Kenya, 2009). Samburu Central Sub-county covers an area of 3979 km² and has a population of 105,052 according to the 2009 population census report (Kenya Bureau of Statistics, 2009). The Samburu people are engaged in pastoralism as their main socio-economic activity. They live in houses called manyattas and value large families.

### 3.3.1 Vegetation

The vegetation in Samburu Central Sub-county comprises scrubs, herbs, shrubs and forests. Scrubs cover much of the district and the most common are Acacia elator, Acacia tortilis and Salvadora persica. Small scattered forests are found in Pooro.
Figure 3.1: Map of Samburu Central Sub-county.
3.4 Target population

The target population in this study was that in Samburu Central Sub-county (105,052). These comprised of household heads, specialized herbalists, sellers of THM, key informants and knowledgeable elders, among others in Samburu Central Sub-county. The household heads are known to make key decisions with regard to use of THM from plants for home remedies for minor illnesses and their authority is often acknowledged by the other members. They were therefore in a position to provide adequate information that explained access to THM. The specialized herbalists among the Samburu people are well known in treating many illnesses with THM made from plant species. The sellers have information about the status of TMK, while the key informants have used THM frequently prescribed by the specialized herbalists. Finally, the knowledgeable elders who have lived for a long time and were able to give reliable information with regard to the status of the traditional medicinal knowledge and its influence on access to traditional herbal medicine.

3.5 Sampling techniques and sample size

The study used purposive sampling to select four study villages. This is because purposive sampling selects typical and useful cases only and also saves time. The four villages selected were Lpartuk, Loosuk, Suguta Marmar and Pooro. The first three villages were selected because THM derived from medicinal plants species was commonly used in the villages, while Pooro which has a large population was chosen as a control village. Purposive sampling was also used to identify the vegetative areas sampled or vegetation types sampled. Purposive sampling was adopted because it is
the most flexible sampling scheme and it allows for experience and decision making ability of the investigator. The centralized replicate sampling scheme was then used on the vegetative areas. The sampling frame (list of all medicinal plants) in the village was obtained from a specialized herbalist.

The stratified random sampling was used to sample the household heads. The household heads comprised of 109 men and 86 women. Stratified random sampling was used because it ensures that certain sub-groups in the population are represented in the sample, in proportion to their numbers in the population itself (Kothari, 2004).

The snowball sampling was used to sample specialized herbalists from an established list provided by the District Medical Officer (DMO). This was because snowball is faster in collecting sensitive information (Denscombe, 1998). The specialized herbalists sampled comprised of three old women and two young men. The specialized herbalists who were included in the study were those who had been living in the community and were frequently sought out by community members for advice on use of traditional herbal medicine.

Stratified random sampling was used to sample the key informants. The key informants were identified with the help of the specialized herbalists, and were stratified on the basis of age. The specialized herbalists among the Samburu people are well known in treating many illnesses with THM made from plant species. A random number table was used to prepare cards that were used to randomly select the required key informants. The key informants who were included in the study are those who had
been treated by the specialized herbalists on many occasions. The key informants selected included two young men, three old women and three old men.

The sellers of THM in the markets and the knowledgeable elders were sampled using systematic random sampling. According Krueger and Casey (2000) systematic random sampling is advantageous because it reduces bias. The sellers of THM who were included in the study are those who had been in the business of selling THM. An established list of the sellers of traditional herbal medicine was provided by the DMO. The sellers of THM chosen comprised of three young men and two old women. The knowledgeable elders were sampled from an established list provided by the local chiefs. The knowledgeable elders sampled included four men and four women. The knowledgeable elders who were included in the study were those aged 70 years old and above because a chat with the knowledgeable gatekeepers revealed that most elders aged seventy years and above had a lot of information on the status of TMK. The study chose knowledgeable elders had been living in the community for over 30 years because a generation is estimated to cover 30 years and the study sought to establish the status of TMK within the last generation.

Mathematical formula suggested by Nassiuma (2000) was used to determine the sample size.

\[
    n = \frac{NC^2}{C^2 + (N - 1)e^2}
\]
Where

\[ n = \text{sample size} \]

\[ N = \text{population, 105,052 in this case} \]

\[ C = \text{co-efficient of variation, assumed to be 70\% for most survey research} \]

\[ e = \text{standard error assumed to be 0.05 in this case} \]

Substituting these values in the equation, estimated sample size was:

\[ n = \frac{105,052(0.7)^2}{0.7^2 + (105,052 - 1) 
0.05^2} \]

\[ n=195 \]

Based on the population of each village, the sample size was distributed as follows:

Loosuk (40), Lpartuk (50), Suguta (26), and Pooro (79).

### 3.6 Data collection

Data was collected using various methods. These included administration of questionnaires, transect walks, conducting interviews and FGDs.

### 3.6.1 Questionnaire

The questionnaires (Appendix I) consisted of both open-ended and closed-ended questions. The questionnaire had two sections; section A and section B. Section A aimed at obtaining information about the general particulars, while section B was designed to get the responses for the research questions. The questionnaire was used to collect data on the impact of human activities on access to THM. The questionnaire determined the rate at which human activities such as building and construction,
grazing of livestock, fire, growing of crops and firewood collection affected access to traditional herbal medicine. The questionnaires were administered by the researcher with the help of research assistants in Samburu language and translated to English with the help of native Samburu speakers. The responses were recorded in a five point likert scale i.e. very high, high, moderate, low, and very low. The questionnaire is advantageous because it enables one to get a lot of information within a very short period of time from a large population (Berg, 2006).

3.6.2 Interviews

Interviews were conducted with five specialized herbalists, eight knowledgeable elders, five sellers of THM and eight key informants. An interview guide was used for this exercise (Appendix III). The interview guide consisted of questions focusing on the influence of the status of TMK on access to THM. According to Gray (2009) interviewing is appropriate because the interviewer will be able to probe deeper into the response given by an interviewee. There is greater flexibility under this method as the opportunity to restructure questions is always there and the language of the interview can be adapted to the ability of educational level of the person interviewed and as such misinterpretations concerning questions can be avoided. The eight key informants representing different social groups were identified for interviews with the help of the specialized herbalists. Market visits were carried out in all the four villages so as to conduct interviews with people selling THM. In addition to the market visits, in situ open individual interviews with the knowledgeable elders and specialized herbalists or group interviews were conducted by the researcher with the help of
research assistants in Samburu language and translated to English with the help of native Samburu speakers during outdoor field surveys.

### 3.6.3 Focus group discussions

Eight FGDs, comprising between 5-10 members for ease of moderation, was used to collect data on the influence of perceptions, culture and spiritual beliefs on access to traditional herbal medicine. Two FGDs were held in each village. The members of the FGDs composed of males and females aged 30-45 years. The discussions were facilitated by the researcher and his research assistant in Samburu language and translated to English with the help of native Samburu speakers and proceedings were noted. The FGDs had a discussion guide (Appendix IV). According to Krueger and Casey (2000), FGDs allows for a variety of views to emerge, while group dynamics can often allow for simulation of new perspectives. Group discussions were held in convenient centers like schools and chiefs’ camp.

### 3.6.4 Transect walks

Transect walk is essentially a walk along a transect of an area to observe and document biophysical features. Four transect walks were carried out to collect data on species richness and abundance of plants commonly used as THM. Transect data sheet was used for this exercise (Appendix II). While in the field, a specialized herbalist accompanied to help in identification of the plant species commonly used as THM. The information was recorded in a transect data sheet in Samburu language and later translated to English with the help of native Samburu speakers. Quadrants were laid
out on the open vegetation and used to determine the species richness and abundance of plants commonly used as traditional herbal medicine. A quadrant size of 25 metres by 25 metres was laid out in the shrub area, 30 metres by 30 metres laid out on the scrub area, and 60 metres by 60 metres laid out in the forested area. The abundance of medicinal plants in the study area was determined on the basis of methods described by Chaudhuri and Sarkar (2003). The abundance was categorized as: S = Sporadic, i.e. growing scattered, thus need careful monitoring; T = Threatened, i.e. the species taken care of for conservation; PS = Presently Safe but need efforts to protect them; D = Don’t know, i.e. doubtful presence; V = Vulnerable species, i.e. are easily destroyed and E = Endangered, i.e. existence facing extinction.

3.7 Research validity and reliability

Mugenda and Mugenda (1999) state that content validity is a measure of the degree to which data collected using a particular instrument represent a specific domain of content. The content validity of the instrument in this study was established by seeking experts’ suggestion in the department of Geography, Kenyatta University.

Reliability of an instrument concerns the degree to which a particular measuring procedure gives similar results over a number of repeated trials (Orodho, 2004). To establish the reliability of the instrument, the researcher used the pre-test technique. It was carried out by administering the instrument to the respondents in the pilot study. After the respondents had made their responses, the questionnaire responses were scored manually which were then correlated using the Pearson’s correlation
coefficient to establish the extent to which the contents of the questionnaire were consistent to eliciting the same responses. A correlation coefficient of 0.8 proved sufficient the reliability of the instruments.

3.8 Data analysis

Data was analyzed both qualitatively and quantitatively. All questionnaires were coded before analysis. Qualitative data was coded by identifying themes that related to the research questions. Simpson’s diversity index was used to calculate the diversity of medicinal plant species commonly used by the Samburu people using data from the transect sheet (Joft, 2006). Simpson’s diversity index took into account the number of species present as well as the abundance of each species. The Simpson’s diversity index ($\lambda$) was calculated using the formula,

$$\lambda = \sum n_i(n_i - 1) / N(N-1)$$

Where $n_i$ = number of individuals of each species

$N$ = total number of individuals for the site.

Data on impact of human activities on access to THM and the total species diversity was analyzed using descriptive statistics to obtain percentages and frequencies. The data on the influence of the status of TMK on access to THM, and the influence of perceptions, culture and spiritual beliefs on access to THM was analyzed qualitatively using inferential statistics in order to draw conclusions in regard to the two aspects. Data on species richness, characteristics and abundance was analyzed quantitatively to obtain mean, maximum, minimum and sum of medicinal plant species. Data was
analyzed using Statistical Package for Social Sciences (SPSS) computer software version 19.

3.9 Ethical considerations

The researcher explained the purpose and nature of the study to the participants in order for them to make informed decisions on whether to participate in the study or not. To ensure anonymity, the participants were not allowed to write their names on the questionnaires. A research authorization letter was also obtained from the National Council for Science and Technology to facilitate easy collection of data.
CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results and discussion based on the data collected from the respondents in relation to the objectives of the study. The results and discussion were structured into two separate sections.

4.2 Results

This section outlines the results of the study to investigate species diversity of medicinal plants and access to traditional herbal medicine among the Samburu people.

4.2.1 Demographic characteristics of respondents

A majority of the households surveyed were males (56%), while the females were 44%. For the interviewees, 69% were males and 31% were females. Of the 195 household respondents, 42% were above 49 years of age; 27% were aged between 40-49 years; while 19% were aged between 30-39 years. However, only 12% of the household heads were below 30 years. Moreover, 70% of the household heads earned less than Ksh 80 per day.

4.2.2 Species richness, abundance and characteristics of plants commonly used as traditional herbal medicine by the Samburu people

Four transect walks were carried out to collect data on species richness, abundance and characteristics of plants commonly used as THM. Data on species richness,
characteristics and abundance was analyzed quantitatively to obtain mean, maximum, minimum and sum of medicinal plant species.

4.2.2.1 Species richness of medicinal plants

Table 4.1 showed that the species richness used by the Samburu people comprised of 19 different medicinal plant species. Of all the species found in the study area, *Bidens pilosa* was the most common medicinal plant species used by the Samburu people.

**Table 4.1: Species richness of medicinal plants**

<table>
<thead>
<tr>
<th>Medicinal plant species</th>
<th>Samburu name</th>
<th>Diseases</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Carissa edulis</em></td>
<td>Lamuriai</td>
<td>Malaria</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><em>Croton megalocarpus</em></td>
<td>Lmarguit</td>
<td>Skin disease</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><em>Dovyalis abyssinica</em></td>
<td>Lkinyil</td>
<td>Stomach ache</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><em>Teclea nobilis</em></td>
<td>Lgilai</td>
<td>Colds</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><em>Bidens pilosa</em></td>
<td>Labaai</td>
<td>Wounds</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td><em>Digitalis purpurea</em></td>
<td>Lakirdingai</td>
<td>Asthma</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><em>Odentella fischeri</em></td>
<td>Lchingei</td>
<td>Heart disease</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><em>Aloe secundiflora</em></td>
<td>Sakoroi</td>
<td>Diarrhoea</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><em>Rhus natalensis</em></td>
<td>Lmusigio</td>
<td>Diarrhoea</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><em>Acacia albida</em></td>
<td>Senantei</td>
<td>Colds</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><em>Flacourtia indica</em></td>
<td>Sarai</td>
<td>Bee sting</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><em>Acacia tortilis</em></td>
<td>Lekeek</td>
<td>Skin ailment</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><em>Cadaba farinosa</em></td>
<td>Loitaakine</td>
<td>Colds</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><em>Cardial monoica</em></td>
<td>Sepei</td>
<td>Diarrhoea</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><em>Olea europaea</em></td>
<td>Lekarmunyuo</td>
<td>Dental hygiene</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><em>Acacia nilotica</em></td>
<td>Ikiloriti</td>
<td>Diarrhoea</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><em>Acacia senegal</em></td>
<td>Lmunishi</td>
<td>Sore throat</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><em>Ekebergia capansis</em></td>
<td>Subukiai</td>
<td>Wounds</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><em>Salvadora persica</em></td>
<td>Sekotei</td>
<td>Coughs</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>19</strong></td>
<td><strong>19</strong></td>
<td><strong>26</strong></td>
<td><strong>3</strong></td>
<td><strong>47</strong></td>
<td></td>
</tr>
</tbody>
</table>
4.2.2.2 Abundance of medicinal plants

Table 4.2 indicates that majority (46%) of the medicinal plants were being destroyed by human activities such as fire, livestock grazing, building and construction activities, firewood collection and growing of crops. Twenty three percent of the medicinal plants were presently safe. However, 15% of the medicinal plants were found in a few numbers that were irregular in pattern. Only 8% of the medicinal plants were vulnerable. The abundance of 8% of the medicinal plants was not known.

Table 4.2: Categorization of abundance of medicinal plants

<table>
<thead>
<tr>
<th>Categorization of abundance</th>
<th>Frequency (n=19)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threatened</td>
<td>8</td>
<td>46</td>
</tr>
<tr>
<td>Presently safe</td>
<td>4</td>
<td>23</td>
</tr>
<tr>
<td>Sporadic</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Vulnerable</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Not known</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100</td>
</tr>
</tbody>
</table>

4.2.2.3 Characteristics of the medicinal plants

Forty six percent of the medicinal plants found among the Samburu people were shrubs, 42% were trees, 8% were herbs and 4% were creepers. Ninety six percent of medicinal plant species were wild i.e. they grew on their own in their habitats without the influence of the people and 4% were found in cultivated land (Figure 4.1).
The Samburu people were making efforts to increase the number of medicinal plants by cultivating some in different areas. This increased the diversity of medicinal plants and the species richness in the area.

Figure 4.1: Status of medicinal plants.

Simpson’s diversity index value was 0.05. Table 4.3 indicates that a total of 47 medicinal plant species were counted in the laid quadrants during the transect walks in the villages. Plate 4.1 shows specialized herbalists identifying medicinal plants during transect walk.
Table 4.3: Simpson’s diversity index (λ) of medicinal plants

<table>
<thead>
<tr>
<th>Medicinal plant species</th>
<th>Samburu name</th>
<th>( n_i )</th>
<th>( n_i-1 )</th>
<th>( n_i(n_i-1) )</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Carissa edulis</em></td>
<td>Lamuriai</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td><em>Croton megalocarpus</em></td>
<td>Lmarguit</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><em>Doyyalis abyssinicia</em></td>
<td>Lkinyil</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Teclea nobilis</em></td>
<td>Lgilai</td>
<td>4</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td><em>Bidens pilosa</em></td>
<td>Labaai</td>
<td>8</td>
<td>7</td>
<td>56</td>
</tr>
<tr>
<td><em>Cardia purpurea</em></td>
<td>Lakirdingai</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><em>Odentella fischerii</em></td>
<td>Lchingei</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><em>Aloe secundiflora</em></td>
<td>Sakoroi</td>
<td>4</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td><em>Rhus natalensis</em></td>
<td>Lmusigio</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><em>Acacia albida</em></td>
<td>Senantei</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td><em>Flacourita indica</em></td>
<td>Sarai</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><em>Acacia tortilis</em></td>
<td>Lekeek</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Cadaba farinose</em></td>
<td>Loitaakine</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><em>Cardial monoica</em></td>
<td>Sepei</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><em>Olea europaea</em></td>
<td>Leparmunyuoo</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Acacia nilotica</em></td>
<td>Ikiloriti</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><em>Acacia Senegal</em></td>
<td>Lmunishi</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td><em>Ekebergia capansis</em></td>
<td>Subukiai</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Salvadora persicia</em></td>
<td>Sekotei</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>19</strong></td>
<td><strong>47</strong></td>
<td><strong>28</strong></td>
<td><strong>116</strong></td>
</tr>
</tbody>
</table>

Where \( n_i = \) number of individuals of each species.
Plate 4.1: Specialized herbalists during the transect walk.

4.2.3 Impact of human activities on access to traditional herbal medicine among the Samburu people

Table 4.4 indicates that 56% of the respondents reported that fire incidences highly affected access to THM. In some instances, the buds of some medicinal plants were completely destroyed, leading to total destruction of the plant. Fifty percent of the respondents were of the view that livestock grazing moderately affected access to THM. Forty six percent of the respondents reported that building and construction activities moderately affected access to THM. Moreover, forty three percent of the respondents reported that firewood collection affected access to THM. However, 40% reported that growing of crops affected access to THM.
Table 4.4: Rate at which human activities affected access to traditional herbal medicine

<table>
<thead>
<tr>
<th>Human activities</th>
<th>Very high</th>
<th>High</th>
<th>Moderate</th>
<th>Low</th>
<th>Very low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building and construction</td>
<td>1</td>
<td>29</td>
<td>46</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Grazing of livestock</td>
<td>1</td>
<td>28</td>
<td>50</td>
<td>21</td>
<td>1</td>
</tr>
<tr>
<td>Fire</td>
<td>29</td>
<td>56</td>
<td>12</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Growing of crops</td>
<td>4</td>
<td>12</td>
<td>38</td>
<td>40</td>
<td>6</td>
</tr>
<tr>
<td>Firewood collection</td>
<td>2</td>
<td>11</td>
<td>26</td>
<td>43</td>
<td>17</td>
</tr>
</tbody>
</table>

4.2.3.1 Assessment of access to traditional herbal medicine

Eighty three percent of the respondents were of the view that access to traditional herbal medicine was bad, while only 17% reported that it was good. The respondents gave various reasons as to why access to THM was good or bad. The results are summarized in Table 4.5 and Table 4.6.

Table 4.5: Assessment on access to traditional herbal medicine as bad

<table>
<thead>
<tr>
<th>Reasons</th>
<th>Frequency (n=160)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental degradation</td>
<td>109</td>
<td>56</td>
</tr>
<tr>
<td>Need to use modern medicine</td>
<td>38</td>
<td>20</td>
</tr>
<tr>
<td>Traditional herbal medicine is not a good cure</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Medicine men misleading people on herbs</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>160</strong></td>
<td><strong>83</strong></td>
</tr>
</tbody>
</table>
Table 4.5 shows that a majority (56%) of the respondents assessed access to traditional herbal medicine was bad due to environmental degradation. Twenty percent of the respondents who were of the view that access to THM was bad attributed this to the need to use modern medicine from hospitals. Only 4% of the respondents reported that traditional herbal medicine is not a good cure while 3% reported that medicine men were misleading people on herbs.

Table 4.6: Assessment on access to traditional herbal medicine as good

<table>
<thead>
<tr>
<th>Reasons</th>
<th>Frequency (n=33)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional herbal medicine are readily available</td>
<td>21</td>
<td>10</td>
</tr>
<tr>
<td>Better cure than modern medicine</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Commonly used by the community</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>17</td>
</tr>
</tbody>
</table>

Table 4.6 revealed that 10% of the respondents reported that the access to traditional herbal medicine was good since the traditional herbal medicine was readily available. Five percent of the respondents reported that THM was a better cure compared to the modern medicine. However, 2% of the respondents reported that access to THM was good because it was commonly used by the community.
4.2.3.2 Correlation between human activities and access to traditional herbal medicine

The information in Table 4.7 revealed a negative Pearson correlation between human activities and access to traditional herbal medicine. The negative Pearson correlation between human activities and access to traditional herbal medicine shows that the human activities led to the decline in access to THM. However, this relationship between human activities and access to traditional herbal medicine was not significant (building and construction = 0.393, grazing of livestock = 0.072, fire = 0.382, growing of crops = 0.296 and firewood collection = 0.367) as shown in Table 4.7.

Table 4.7: Correlation between human activities and access to traditional herbal medicine

<table>
<thead>
<tr>
<th></th>
<th>Building and construction</th>
<th>Grazing of livestock</th>
<th>Fire</th>
<th>Growing of crops</th>
<th>Firewood collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to THM</td>
<td>Pearson</td>
<td>-0.062</td>
<td>-0.130</td>
<td>-0.063</td>
<td>-0.076</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.393</td>
<td>0.072</td>
<td>0.382</td>
<td>0.296</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td>192</td>
<td>192</td>
<td>192</td>
<td>192</td>
</tr>
</tbody>
</table>

4.2.3.3 Regression analysis

There exists a negative linear regression (R=-0.222) relationship of human activities to species richness on access to traditional herbal medicine. Human activities such as building and construction, fire, growing of crops and firewood collection had no
significant effect on access to THM (P= 0.393, 0.072, 0.382, 0.296 and 0.367) respectively.

4.2.4 Use, reasons for use and knowledge of medicinal plants

Figure 4.2 indicates that 96% of the respondents used traditional herbal medicine derived from plant species, while only 4% did not use traditional herbal medicine derived from plant species. Out of those who use THM, majority (81%) of the respondents reported that they used traditional herbal medicine because they had confidence in it, while 12% used THM because it was cheap. However, only 4% of the interviewees reported that they used traditional herbal medicine because it was readily available and did not have side effects. All (100%) the respondents considered traditional medicinal knowledge as “Knowledge on use of medicinal plants” and had knowledge on use of traditional herbal medicine derived from plant species.

Figure 4.2: Use of traditional herbal medicine derived from plant species.
4.2.4.1 Source of traditional medicinal knowledge

The respondents acquired traditional medicinal knowledge from the sources summarized in Figure 4.3.

![Bar chart showing source of traditional medicinal knowledge](chart.png)

**Figure 4.3: Source of traditional medicinal knowledge.**

Many knowledgeable community elders had traditional medicinal knowledge (54%) and were willing to pass it to future generations (Figure 4.3). However, there were few specialized herbalists in the Samburu community and therefore some respondents reported that they acquired TMK from the specialized herbalists.

4.2.4.2 Influence of the status of traditional medicinal knowledge

Fifty four percent of the respondents reported that disappearance of TMK reduced access to THM, while 46% reported that protection of TMK promotes access to THM as shown in Figure 4.4.
Figure 4.4: Influence of the status of traditional medicinal knowledge.

4.2.4.3 Reasons for the disappearance of traditional medicinal knowledge

The study revealed that 43% of the respondents were of the view that destruction of forests and medicinal plants led to the disappearance of traditional medicinal knowledge while 36% reported that introduction of modern medicine from hospitals led to the disappearance of TMK. Twenty one percent of the respondents reported that traditional medicinal knowledge is disappearing because the younger generation does not embrace it. Plate 4.2 shows a photograph of research assistants interviewing sellers of THM on reasons for disappearance of TMK in Loosuk market.
Plate 4.2: Research assistants interviewing sellers of THM in Loosuk market.

4.2.4.4 Strategies of protecting traditional medicinal knowledge

Figure 4.5 indicated that 38% of the respondents reported that creating awareness in the community to continue using traditional herbal medicine and the elders educating younger generation on traditional herbal medicine can protect traditional medicinal knowledge. Fifteen percent reported that the government should promote use of traditional herbal medicine while only 8% reported that cultivation of medicinal plants protects TMK.
Figure 4.5: Strategies of protecting traditional medicinal knowledge.

4.2.4.5 Influence of educational levels on status of traditional medicinal knowledge

The information in Figure 4.6 shows that 62% of the respondents were of the view that higher educational levels led to the disappearance of TMK. However, 38% of the respondents reported that higher educational levels protected TMK.
4.2.4.6 Relationship between the status of traditional medicinal knowledge and access to traditional herbal medicine

Pearson Correlation coefficient was used to establish the relationship between the status of traditional medicinal knowledge and access to traditional herbal medicine. The results are summarized in Table 4.8.

Table 4.8: Relationship between the status of traditional medicinal knowledge and access to traditional herbal medicine

<table>
<thead>
<tr>
<th>Access to THM</th>
<th>Disappearing status of TMK</th>
<th>Protected status of TMK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>-0.549</td>
<td>0.338</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.042</td>
<td>0.283</td>
</tr>
<tr>
<td>N</td>
<td>14</td>
<td>12</td>
</tr>
</tbody>
</table>
Analysis in Table 4.8 revealed a significant (p = 0.042) negative Pearson correlation between the disappearing status of traditional medicinal knowledge and access to traditional herbal medicine. There is no significant (p = 0.283) positive Pearson correlation between protected status of traditional medicinal knowledge and access to traditional herbal medicine.

4.2.5 Perceptions, culture and spiritual beliefs related to use of traditional herbal medicine

Seventeen percent of the responses revealed that some herbs were given to expectant mothers only as a perception (Table 4.9). However, 13% showed that *Flacourita indica* (Sirai) medicinal plant could only be cut down when the moon appears. Eight percent perceived that THM was efficient as compared to modern medicine from hospitals. Only 4% perceived that *Cardial monoica* (Sepei) traditional herb helps barren women conceive.
Table 4.9: Perceptions, culture and spiritual beliefs related to use of traditional herbal medicine

<table>
<thead>
<tr>
<th>Perceptions, culture and spiritual beliefs</th>
<th>Frequency (n=24)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Perceptions related to use of THM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some herbs are given to expectant mothers only</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td><em>Flacourita indica</em> (Sirai) medicinal plant can only be cut down when the moon appears</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>Efficancy</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td><em>Cardial monoica</em> (Sepei) traditional herb helps barren women conceive</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td><strong>Culture related to use of THM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special herbs to be used after circumcision</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td><em>Dovyalis abyssinicia</em> (Lkinyil) herb for treatment of STDs is administered at night</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td><em>Acacia tortilis</em> (Lekeek) administered only at sunset</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Spiritual beliefs related to use of THM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goats are slaughtered before administering some herbs</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>Singing and dancing around Sepei sacred tree for it to rain</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>All herbs were given by God to be used by man</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>24</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.9 shows that 8% of the responses showed that certain special herbs were used after circumcision as a cultural practice among the Samburu people. Four percent showed that *Dovyalis abyssinicia* (Lkinyil) herb used for treatment of STDs was
administered only at night. Only 3% revealed that *Acacia tortilis* (Lekeek) was administered only at sunset.

Seventeen percent of the responses revealed that goats were slaughtered before administering some herbs as a spiritual belief of the Samburu people (Table 4.9). Thirteen percent reported singing and dancing around Sepei sacred tree for it to rain. Another 13% reported that all herbs were given by God to be used by man.

### 4.2.5.1 Influence of perceptions, culture and spiritual beliefs on access to traditional herbal medicine

Majority (87%) of the respondents reported that perceptions, culture and spiritual beliefs promoted access to traditional herbal medicine, while only 13% reported that perceptions, culture and spiritual beliefs did not promote access to traditional herbal medicine (Figure 4.7).

![Figure 4.7: Influence of perceptions, culture and spiritual beliefs on access to traditional herbal medicine.](image-url)
4.2.5.2 Customs that ensure conservation of medicinal plants

The responses summarized in Table 4.10 were revealed when the study investigated the customs that ensured conservation of medicinal plants among the Samburu people.

Table 4.10: Customs that ensure conservation of medicinal plants

<table>
<thead>
<tr>
<th>Customs</th>
<th>Frequency (n=23)</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Custom discouraging cutting down of <em>Cardial monoica</em> (Sepei), <em>Acacia albida</em> (Senantei) and <em>Olea europaea</em> (Leparmunyuo) herbs</td>
<td>8</td>
<td>35</td>
</tr>
<tr>
<td>No customs in place that ensure medicinal plants are not destroyed</td>
<td>6</td>
<td>26</td>
</tr>
<tr>
<td>No grazing in areas with abundant THM</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td><em>Flacourita indica</em> (Sarai) herb to be administered with plenty of milk or soup</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>Elders carry rituals so as to bless the land and punish those destroying THM</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

In Table 4.10, 35% of the respondents reported that customs discouraging the cutting down of special herbs ensured conservation of medicinal plants. Thirteen percent of the respondents reported that the elders of the community carried out rituals to bless the land and punish those who destroyed medicinal plants commonly used as THM. However, 26% of the respondents reported that no customs were in place that ensured conservation of medicinal plants.
4.2.5.3 Relationship between perceptions, culture and spiritual beliefs related to use and access to traditional herbal medicine

Analysis in Table 4.11 revealed no significant (p = 0.138) positive Pearson correlation between perceptions, culture and spiritual beliefs and access to traditional herbal medicine.

Table 4.11: Relationship between perceptions, culture and spiritual beliefs related to use and access to traditional herbal medicine

<table>
<thead>
<tr>
<th>Perception, culture and spiritual beliefs related to use of THM</th>
<th>Access to THM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception, culture and spiritual beliefs related to use of THM</td>
<td>Pearson Correlation</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
</tbody>
</table>

4.3 Discussion

This section outlines the discussion of the results of the study to investigate species diversity of medicinal plants and access to traditional herbal medicine among the Samburu people.

4.3.1 Demographic characteristics of respondents

A high number of male respondents implies that most households (56%) were headed by males, thus a larger number of interviewees (69%) were also males. The high age of most of the respondents implies that majority of the households were knowledgeable enough to provide reliable information on impact of human activities on access to traditional herbal medicine. Most of them were also able to make key
decision with regard to use of THM from plants for home remedies and their authority was often acknowledged by other members of the community.

4.3.2 Species richness, abundance and characteristics of plants commonly used as traditional herbal medicine by the Samburu people

4.3.2.1 Species richness of medicinal plants

The findings that their were 19 medicinal plant species majority of which were *Bidens pilosa* concurs with a study carried out among the Marakwet community in Kenya by Kipkore *et al.* (2014) which also reported that *Bidens pilosa* was commonly used as a medicinal plant species. This is because it promotes cleaning of the wound and accelerates its regeneration, while reducing the scar.

4.3.2.2 Abundance of medicinal plants

The medicinal plants that were threatened likely led to decline in access to THM. This finding agrees with Nanyingi *et al.* (2008) who reported that many medicinal plants among the Samburu people are threatened by anthropogenic and natural factors. However, the medicinal plants that were presently safe needed to be protected because of encroaching human activities such as building and construction, grazing of livestock, fire, growing of crops and firewood collection that were likely to wipe them out. In addition to these, the sporadic medicinal plants also needed careful monitoring because they are a few and scattered hence this shows that they were declining in number. The medicinal plants which are vulnerable can be attributed to the fact that they are easily destroyed.
4.3.2.3 Characteristics of the medicinal plants

Majority of the medicinal plants were shrubs because the rainfall in Samburu was sufficient to facilitate the growth of the shrubs. This finding is consistent with Omwenga et al. (2014) who found that different medicinal plant species are found among the Samburu people most of which are shrubs. Some of the medicinal plants were trees because most of the Samburu people did not use trees for building their houses. Some of the medicinal plants were herbs because they died out after flowering. However few medicinal plants were creepers because they were easily trampled on by livestock and man as they grew along the ground.

The high number of wild medicinal plants was as a result of efforts being made by the Samburu people to cultivate medicinal plants in different areas. Medicinal plant nurseries were later deserted and became wild habitats. This increased the diversity and species richness in the area. The cultivation of these medicinal plants had promoted access to THM among the Samburu people. This finding concurs with Nanyingi et al. (2008) who reported that many medicinal plants among the Samburu people are found in wild habitats. The low number of cultivated medicinal plants is attributed to infertility of the soil in the area.

A high value (0.05) of Simpson’s diversity index meant that there were different species of medicinal plants commonly used by the Samburu people. The findings concur with Omwenga et al. (2014), that there were different medicinal plants found in the Samburu community. The presence of the different species of medicinal plants
implied that the use of THM and access to THM were likely to be high among the Samburu people. The diversity was high because the area was dominated by many medicinal plant species.

4.3.3 Impact of human activities on access to traditional herbal medicine among the Samburu people

In this study, fire incidences highly affected access to THM because most of the Samburu people used fire to clear land so as to enable the grass to regenerate. The clearing of land using fire destroyed the medicinal plants commonly used as THM thereby reducing availability and access of traditional herbal medicine. This lowered the diversity and species richness of the medicinal plants in the study area. Grazing moderately affected access to THM because some of the Samburu people grazed their livestock in areas with medicinal plants commonly used as THM. Some medicinal plants were destroyed while others were conserved, particularly in areas where no grazing took place. Most of the Samburu people are nomadic pastoralists, hence medicinal plants were conserved when they moved to other regions in search of pasture. Some of the Samburu people also reduced the number of their livestock thereby reducing the negative effect of livestock grazing on medicinal plants. Building and construction activities moderately affected access to THM because building and construction was taking place in both the areas that had medicinal plants commonly used as THM and those areas that lacked medicinal plants. Moreover, firewood collection affected access to THM because some of the plants commonly used as firewood were medicinal plants. Growing of crops affected access to THM because a
few of the Samburu people grow crops since the soil in the area is infertile. These findings are also consistent with Mesfin et al. (2013) who found out that in Samre District, South-Eastern Tigray, Northern Ethiopia, pressures from agricultural extension, widespread cutting for fuel wood, livestock grazing and collection of fodder combined with seasonal drought led to depletion of the medicinal plants.

4.3.3.1 Assessment of access to traditional herbal medicine

In this study, access to THM by the Samburu people was bad due to environmental degradation that ultimately led to loss of medicinal plant species used as traditional herbal medicine. This finding is consistent with Shinwari et al. (2010) who reported that environmental degradation in Himalayas generally attributed to demographic pressure and other related effects have led to decline in traditional herbal medicine. The people who used conventional drugs from hospitals were likely to destroy medicinal plants as they deemed them not to be of any use.

However, a good access to THM was attributed to the availability of many sellers of THM and medicinal plants in the Samburu community. The finding concurs with Azeez et al. (2013) who reported that traditional herbal medicine is readily available in rural areas for treatment of many diseases. Traditional herbal medicine was also believed to be a better cure than modern medicine because it had healed them effectively on numerous occasions. Traditional herbal medicine was commonly used in the community because of the presence of many sellers of the medicine and specialized herbalists.
4.3.3.2 Correlation between human activities and access to traditional herbal medicine

The negative Pearson correlation between human activities and access to traditional herbal medicine suggests that areas having medicinal plants were cleared for building and construction purposes, grazing the livestock and clearing of land using fire led to the destruction of medicinal plants commonly used as traditional herbal medicine. These areas were cleared for growing of crops and the Samburu people collected medicinal plants as firewood, which led to decline in THM. There was no significant relationship between human activities and access to traditional herbal medicine because human activities were not allowed in areas with plenty of medicinal plants in the study area. It was also likely that the efforts made by some people in Samburu community to cultivate medicinal plants in wild habitats reduced the negative effects of human activities on medicinal plants. This finding is consistent with Shinwari et al. (2010) who found that cultivation of medicinal plants has continuously led to increase in species of medicinal plants, therefore leading to increase in traditional herbal medicine.

4.3.3.3 Regression analysis

The negative linear regression relationship means that as the rate of human activities such as grazing of livestock, growing of crops, building and construction, collection of firewood and fire reduces, the number of medicinal plant species increases. Increased rate of human activities threatens the abundance of the medicinal plant species. This implies that medicinal plant species are destroyed by the livestock which fed on the
species, while other species are collected as firewood and destroyed by fire. These findings are consistent with Khan et al. (2012) who found that in the mountains regions of Naran Valley in the Western Himalayas, overexploitation through forest cutting, livestock grazing and collection of fodder, edible and medicinal plant species subjects the natural ecosystem at risk thereby leading to decline in traditional herbal medicine. The species are also destroyed when clearing land for agricultural purposes and when setting up new homes in places with medicinal plants. This threatens the abundance of the medicinal plant species as their habitat is being destroyed.

4.3.4 Influence of the status of traditional medicinal knowledge on access to traditional herbal medicine among the Samburu people

The findings from this study show that the Samburu people used traditional herbal medicine because they had traditional medicinal knowledge. They are also found in remote areas that are cut off in terms of infrastructure with few hospitals. This finding concurs with Omwenga et al. (2014) who reported that in Samburu District in Kenya, many medicinal plants are used by the Samburu people especially to treat malaria. It is likely that they had confidence in THM because the medicine had treated them on previous occasions.

4.3.4.1 Source of traditional medicinal knowledge

This study established that the knowledgeable community elders protect TMK by passing the knowledge to many people especially the younger generation in Samburu community. This finding concurs with Mahmoud et al. (2013) who reported that in the
Eastern Desert of Egypt, many knowledgeable elders provide the other members of the community with traditional knowledge on medicinal plants. However, a few specialized herbalists were unwilling to pass TMK to others probably due to fear of competition in the business, and therefore a few of the respondents reported that they acquired TMK from the specialized herbalists.

4.3.4.2 Influence of the status of traditional medicinal knowledge

Findings from this study show that the disappearance of traditional medicinal knowledge affects access to traditional herbal medicine. This finding concurs with Gigeny (2010) who reported that in Northern Ethiopia, despite many individual efforts of governments to preserve the biodiversity for future generations, traditional medicinal knowledge was disappearing. Protection of traditional medicinal knowledge promotes access to traditional herbal medicine. The finding that TMK was protected is in agreement with Alqasim et al. (2013), who reported that Hausa and Fulani tribes of Keffi in Southern Nigeria are accustomed with local herbs and hold flamboyant knowledge base with reference to the use of herbal plants to treat various diseases. Traditional herbal medicine has been used for centuries by the herbalists, healers, spiritualists and farmers as primary health care at community level.

4.3.4.3 Reasons for the disappearance of traditional medicinal knowledge

Destruction of forests and medicinal plants led to the disappearance of traditional medicinal knowledge because the two activities led to the loss of THM which made a few people have the knowledge on the use of THM. The destruction of forests and
medicinal plants reduced the diversity and species richness of the medicinal plants. These findings are in agreement with Jitin (2013) who reported that traditional knowledge of primary health care system of local communities in India is under great threat because of a number of factors including deforestation, environmental degradation and modern civilization. Inability of the younger generation to embrace traditional medicinal knowledge is as a result of most of them seeking modern treatment.

4.3.4.4 Strategies of protecting traditional medicinal knowledge

This study established that creating awareness in the community would prevent the loss of TMK as a result of death of the few custodians of the TMK. Moreover, the passing of TMK from the elders to the younger people will ensure that the knowledge is passed on to the generations. This finding agrees with Gideny (2010) who reported that traditional healers in many communities in the Northern Ethiopia transferred their knowledge to interested persons in their communities to protect TMK. The cultivation of medicinal plants made many people to use THM thereby enhancing protection of TMK. Thus, most of the strategies of protecting TMK were geared towards passing the traditional medicinal knowledge to the members of the community.

4.3.4.5 Influence of educational levels on status of traditional medicinal knowledge

Findings from this study indicated that the Samburu people who were educated tended to ignore THM and prefer conventional drugs which led to the disappearance of TMK.
They also believed that THM had side effects and this made them turn to conventional drugs. This finding is consistent with Omwenga et al. (2014) who reported that the Samburu people who are educated prefer conventional drugs from hospitals to traditional herbal medicine. This made them to have little knowledge on traditional herbal medicine thereby leading to the loss of TMK. However, some of the Samburu people with higher educational levels conducted research on medicinal plants and documented their work thus protecting TMK. The documentation of their work also enhanced the spread of TMK leading to its protection.

### 4.3.4.6 Relationship between the status of traditional medicinal knowledge and access to traditional herbal medicine

The negative Pearson correlation between the disappearing status of traditional medicinal knowledge and access to traditional herbal medicine indicates that disappearance of traditional medicinal knowledge led to the loss of knowledge of the plants that had medicinal value and were used as traditional herbal medicine thereby reducing access to THM. This finding is consistent with Romulo and Rosa (2010) who reported that increasing disappearance of traditional medicinal knowledge has led to loss of traditional herbal medicine. The positive Pearson correlation between protected status of traditional medicinal knowledge and access to traditional herbal medicine suggests that protection of status of traditional medicinal knowledge led to availability of knowledge of plants used for medicinal value and therefore their eventual conservation thereby enhancing access to THM.
4.3.5 Perceptions, culture and spiritual beliefs related to use of traditional herbal medicine

In this study, traditional herbs given to expectant mothers only were believed to cause stomach upset when given to those who are not pregnant. Special herbs used after circumcision were believed to heal faster and compensate for the poor blood condition. These findings concur with that of Ngaata et al. (2011) who asserted that in Mfangano Island in Suba District, Kenya, the locals believe that only medicinal plants can treat certain ailments associated with HIV/AIDS.

*Acacia tortilis* (Lekeek) was administered only at sunset, this can be attributed to the fact that it would not work effectively if it was not offered at sunset. Goats were slaughtered before administering some herbs as a spiritual belief of the Samburu people who also believed that all herbs were given by God to be used by man. The Samburu people have diverse perceptions, culture and spiritual beliefs that reduced constant use of medicinal plants thereby enhancing their conservation and access to THM. These findings concur with Omatseye et al. (2010) who reported that most African cultures believe that ancestors and spirits act as intermediaries between human community, the gods and the Creator. The gods are appeased by offering sacrifices to them to increase the number of medicinal plants.
4.3.5.1 Influence of perceptions, culture and spiritual beliefs on access to traditional herbal medicine

This study established that most perceptions, culture and spiritual beliefs enhanced protection of medicinal plants thereby promoting access to THM. This finding is consistent with Alqasim et al. (2013) who reported that most cultures among Hausa and Fulani tribes of Keffi in Southern Nigeria promote use of plants as medicine. Some cultures also prevented overexploitation of medicinal plants. However, a few perceptions, culture and spiritual beliefs ensured continuous use of medicinal plants thereby reducing access to THM.

4.3.5.2 Customs that ensure conservation of medicinal plants

Findings from this study shows that Cardial *monoica* (Sepei) herbs were only extracted or cut when the moon appeared while *Acacia albida* (Senantei) and *Olea europaea* (Leparmunyuo) herbs were only cut when the moon was bright because it was believed that they would bring bad omen when used in the absence of the moon. These findings concur with Omatseye et al. (2010) who reported that most African cultures believe that ancestors and spirits act as intermediaries between human community, the gods and the Creator. The gods are appeased by offering sacrifices to them to increase the number of medicinal plants. These customs reduced overexploitation of medicinal plants thereby ensuring their conservation. The punishment was given to those who destroyed medicinal plants commonly used as THM by expelling them from the community for a given period of time. The punishment reduced the destruction on medicinal plants commonly used as THM,
which led to the conservation of medicinal plants. Those who believed that there were no customs in place that ensured conservation of medicinal plants were mainly the educated.

4.3.5.3 Relationship between perceptions, culture and spiritual beliefs related to use and access to traditional herbal medicine

The positive Pearson correlation indicates that most of perceptions, culture and spiritual beliefs promote use of medicinal plants as traditional herbal medicine and conservation of medicinal plants. Most perceptions, culture and spiritual beliefs among the Samburu people enhance protection of medicinal plants and use of THM. This finding is in agreement with Bemar et al. (2013) who reported that majority of the members of Pentecostal churches in Emurin, Ogu believed that traditional medicine was given by God.
CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of research findings, conclusion, and recommendations of the study whose objectives were to investigate the species richness, characteristics and abundance of plants commonly used as traditional herbal medicine; to evaluate the impact of human activities on access to traditional herbal medicine; to examine the influence of the status of traditional medicinal knowledge on access to traditional herbal medicine; and to determine the influence of perceptions, culture and spiritual beliefs on access to traditional herbal medicine among the Samburu people.

5.2 Summary of findings

The study revealed that the species richness used by the Samburu people comprised of 19 medicinal plant species. Out of these the study found that 46% were threatened, 23% presently safe, 15% were sporadic, 8% vulnerable, and status of 8% were not known. The study of the habitat of medicinal plant species revealed that 46% were found to be shrubs, 42% were trees, 8% were herbs and 4% were creepers. The Simpson’s diversity index ($\lambda$) used to determine the diversity of the medicinal plant species in the study area, had value of $\lambda = 0.05$ which indicated a higher diversity of medicinal plant species. The study found out that majority (96%) of the medicinal plants grew in the wild.
Concerning the impact of human activities on access to THM, 56% of the households reported that fire incidences highly affected access to traditional herbal medicine, 50% reported that grazing of livestock moderately affected access to THM, 46% reported that building and construction activities moderately affected access, while 43% and 40% reported that firewood collection and growing of crops respectively lowly affected access to traditional herbal medicine among the Samburu people.

From the study, 54% of the respondents reported that disappearance of TMK reduced access to THM, while 46% reported that protection of TMK promotes access to THM.

Majority (87%) of the respondents reported that perceptions, culture and spiritual beliefs promoted access to traditional herbal medicine, while only 13% reported that perceptions, culture and spiritual beliefs did not promote access to traditional herbal medicine.

5.3 Conclusion
This study concluded that, firstly, the study area comprised of a variety of species richness, abundance and characteristics, a large number of whose existence were threatened (46%) by various human activities such as firewood collection, fire, building and construction activities, grazing of livestock and growing of crops. Secondly, the diversity of medicinal plant species among the Samburu is high due to the presence of different medicinal plant species, majority (96%) of which grew in their wild habitat without the influence of the people as they were not cultivated.
Thirdly, a number of human activities such as fire (56%), grazing of livestock (50%), building and construction activities (46%), firewood collection (43%) and growing of crops (40%) affected access to THM. These impacts affected access at different levels or scales, namely highly, moderately and lowly respectively. The null hypothesis that there was no significant relationship between human activities and access to traditional herbal medicine is not rejected since the relationships (building and construction = 0.393, grazing of livestock = 0.072, fire = 0.382, growing of crops = 0.296 and firewood collection = 0.367) were not significant at 5% level of significance.

Fourthly, the protected status of traditional medicinal knowledge through cultivation of the medicinal plants increased access to traditional herbal medicine. The null hypothesis that there was no significant relationship between protected status of traditional medicinal knowledge and access to traditional herbal medicine is not rejected at 5% level of significance.

Lastly, the perceptions, culture and spiritual beliefs among the Samburu people helped to conserve most of the medicinal plants and therefore promoted access to traditional herbal medicine in the study area. The null hypothesis that there was no significant relationship between perceptions, culture and spiritual beliefs and access to traditional herbal medicine was not rejected at 5% level of significance.
5.4 Recommendations

The study came up with the following recommendations, based on the findings:

i) The government through National Environmental Management Authority (NEMA) and other law enforcement agencies should enforce laws that ensure conservation of the environment in order to protect medicinal plants commonly used as THM.

ii) The community elders through the youth groups should fence medicinal plants commonly used as THM in their habitats to protect them from being destroyed by encroaching human activities.

iii) The locals through the traditional herbalists should be encouraged to practice ex situ conservation by cultivating some medicinal plants as live fences and in nurseries.

iv) The locals through the community elders should be encouraged to document the TMK so as to minimize its disappearance.

v) The younger generation through their parents should be encouraged to embrace some of the perceptions, culture and spiritual beliefs related to the use of THM.

vi) There is need for further research to investigate the following: the influence of abiotic factors on species diversity of medicinal plants; the role of medicinal plants in livelihood improvement among the Samburu people and the role of the community in conserving medicinal plants and promoting use of traditional herbal medicine.
REFERENCES


APPENDICES

APPENDIX I

HOUSEHOLD QUESTIONNAIRE

INTRODUCTION

My name is Dikko Jeff Gafna, a student of Kenyatta University. I am carrying out a research on investigation of medicinal plant species diversity and access to traditional herbal medicine among the Samburu people.

The purpose of this questionnaire is to evaluate the impact of human activities on access to traditional herbal medicine or opportunity to use traditional herbal medicine derived from plant species. The information you give will be treated confidentially.

Instructions

1. You are not required to write your name on the questionnaire.

2. Indicate your choice by putting a tick (√) or filling in the empty spaces.

3. Please, answer all questions in the questionnaire.
SECTION A: BACKGROUND INFORMATION

1. Village

2. Age
   - 0 – 20 years
   - 21 – 29 years
   - 30 – 39 years
   - 40 - 41 years
   - Above 41 years

3. Sex
   - Male
   - Female

4. Level of income
   - Less than Ksh 100 per day
   - More than Ksh 100 per day
SECTION B: IMPACT OF HUMAN ACTIVITIES ON ACCESS TO TRADITIONAL HERBAL MEDICINE

5. How do you rate the following human activities on access to traditional herbal medicine?

<table>
<thead>
<tr>
<th>HUMAN ACTIVITY</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building and construction</td>
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<tr>
<td>Grazing of livestock</td>
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<tr>
<td>Fire</td>
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<td>Growing of crops</td>
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<tr>
<td>Firewood collection</td>
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</tbody>
</table>

**Key**

1- Very high
2- High
3- Moderate
4- Low
5- Very low
6. How do you assess access to traditional herbal medicine (i.e. bad, good, very good, or excellent) in your community and why?

............................................................................................................................
............................................................................................................................
............................................................................................................................
APPENDIX II

HOUSEHOLD QUESTIONNAIRE IN SAMBURU LANGUAGE

NKIPARA E NKAJIJIK

NGASUNOTO

Kaaji nanu Dikko Jeff Gafna, kaisomare Kenyatta University. Naa kaiyeta sipata olkekerei loitonyoki moiyatin tolosho laasampur o nekoni pootumi lolokek. Maetae likae tungani oyeloi ikilikwai linjeru.

Naa kore nkpirte yana nkipaaret payee a yielou ntokitin naipirita asat yo ltungana tenkiteyolounoto elmiro leaapa tanaa sii mpaash naata ninche te nkitumiaroto e lmiro lolkeek laapasha. Kore lomon lincheru naa kengamari te yiounot pooki.

Nkitodolunot

1. Meyiari ninger nkama tonal paloi e nkipara
2. Ntodolu ngelunot inono te (√)
3. Kore ndolnot inono pooki ninchoru naa keei te
MOTUA NABO: NKAPARA E NG’OJI NINGWA

1. Nkong/Aji imanya

2. Larin
   Larin tikitam nolotu sedi
   Takitam oobo mpaka takitam ousal
   Larin osom mpaka osom asaal
   Larin artam tana artam obo
   Kerepaa larin artam obo

3. Nyoira nabo
   Lee
   ntomononi/ntito

4. Kowuua choake ropiyani nutum
   Mebaki ropiyani ipnabo te mpari
   Kerepaa ropiyani ipnabo te mpari
MOTUA ARE: KEATAI NEIKO SIAITIN LO ITUNG’ANA NTUMOTO E KULO KEEK OMATI

5. Akwaa nduat lnono to kulosiaitin lo ltung’ana o ntumoto e kulo keek lentim omati?

<table>
<thead>
<tr>
<th>SIAI LO LTUNG’ANA</th>
<th>Nabo</th>
<th>Are</th>
<th>Uni</th>
<th>Ong’uan</th>
<th>Imet</th>
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<tr>
<td>Nchetare</td>
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<td>Nkitadaare e suom</td>
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<td>Nkima</td>
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<td>Nkutubulunoto e ndaki</td>
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<td>Njilunoto e Ikeeck</td>
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**Nduat**

1- Ee, oleng’ pii

2- Oleng’

3- Mara si oleng’ namara peneu

4- Peneu

5- Peneu pii
6. Aji etui ndolnot lnono to ntumoto e Ikeek le ntim outai moyantin etuwaa to ituruur linchi naa aanyo?

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APPENDIX III

TRANSECT DATA SHEET (for species richness and abundance of plants commonly used as traditional herbal medicine)

<table>
<thead>
<tr>
<th>Medicinal plant species</th>
<th>Vernacular name</th>
<th>Number of individuals</th>
<th>Habitat (CL = Climber, CR = Creeper, H = Herb, S = Shrub, T = Tree)</th>
<th>Status (W = Wild, C = Cultivated)</th>
<th>Abundance (D = Not Known, PS = Presently safe, S = Sporadic, T = Threatened, V = Vulnerable species, Endangered species = EN)</th>
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</table>

Abundance (D = Not Known, PS = Presently safe, S = Sporadic, T = Threatened, V = Vulnerable species, Endangered species = EN)

Habitat (CL = Climber, CR = Creeper, H = Herb, S = Shrub, T = Tree)

Status of plants (W = Wild, C = Cultivated).
APPENDIX IV

TRANSECT DATA SHEET IN SAMBURU LANGUAGE (for species richness and abundance of plants commonly used as traditional herbal medicine)

<table>
<thead>
<tr>
<th>Nkaji e lkeni</th>
<th>Nkarna</th>
<th>Siana olkeek</th>
<th>Lbulunyie</th>
<th>Mpukunote</th>
<th>Louwaa</th>
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</table>

Louwaa (D = Meyioloi, PS = Keitengelaki, S = Matare, T = Motumoi oleng, V = Kelelek peitarori, Keishunyeita =EN)

Lbulunyie (CL = Keirununye, CR = Keirab, H = Lmairo, S = Suur, T = Lkeni)

Mpukunoto elkeek (W= Lentim, C = Loouni).
APPENDIX V

INTERVIEW GUIDE (for knowledgeable elders, sellers of traditional herbal medicine, key informants and specialized herbalists)

INTRODUCTION

I am Dikko Jeff Gafna, a student of Kenyatta University. I am carrying out research on an investigation of medicinal plant species diversity and access to traditional herbal medicinal among the Samburu people.

The purpose of this interview guide is to establish the influence of the status of the traditional medicinal knowledge on access traditional herbal medicine or opportunity to use traditional herbal medicine derived from plant species. The information you give will be held confidential.

SECTION A: BACKGROUND INFORMATION.

Village………………………………………………

Gender Male □ Female □

Category of interviewee……………………………………
SECTION B: INFLUENCE OF THE STATUS OF TMK ON ACCESS TO THM

1. Do you use traditional herbal medicine derived from plant species?
   Yes ☐ No ☐

2. In your opinion what do you consider traditional medicinal knowledge?

3. How did you acquire traditional medicinal knowledge?

4. What is the status of traditional medicinal knowledge on the use of traditional herbal medicine among the Samburu people? (Is it disappearing or is it protected)
   Disappearing ☐ Protected ☐

5. What has led to the current status of traditional medicinal knowledge?
6. What do you think can be done to protect the traditional medicinal knowledge?

7. How does education level influence the status of traditional medicinal knowledge and how does higher education affect the status of TMK?

8. What is the influence of the status of TMK on access to THM?
APPENDIX VI

INTERVIEW GUIDE IN SAMBURU LANGUAGE (for knowledgeable elders, sellers of traditional herbal medicine, key informants and specialized herbalists)

NGASUNOTO


Ne kora nkipirte yana nkpaaret payee a yielou ntokitin naipirita asat yo ltungana tenkiteyolounoto elmiro leaapa tanaa si mpaash naata ninche te nkitumiaroto e Imiro lolkeeek laapasha. Kore lomon lincheru naa kengamari te yiounot pokli.

MOTUA NABO: NKAPARA E NG’OJI NINGWA.

Ii nikimanga...........................................

Nyoira nabo                  Lee    Ntomani/ntito

Nturur.................................
MOTUA ARE: NKISAIDIAROTO E NGENO EE LKEEK TO NTUMOTO EE LKEEK OMATI

1. Intumiyaa lyie lkeek le apu omati loingwa ntim?
   Ee [ ] Mara [ ]

2. Amu tu nduat lnono, lyie etuwana aji eingwa ngeno ee kulo keek?

3. Aji apa lnkuna lyie pitum e lkeek lo ntim omati?

4. Kuwon ebaa ana ngeno ee kulo keek omati te Sambur keishunyeta tuna kuwan ake e eatai?
   Ripo [ ] Aimin [ ]

5. Nyo naewua taata ana ngeno ee kulo keek omati?
6. Nyo l dol lyie ituwaa keishakino peasi pi meishunye ana ngeno e Ikeek omati?

7. Aji eiko nxisoma te neitatio tonaa artusupat ana ngeno ngeno ee kulo keek?

8. Aji eiko ngeno ee kulo keek ntumoto ee lkeek omati, keisoidia tuna?
Focus group discussion guide for locals

INTRODUCTION

My name is Dikko Jeff Gafna, a student of Kenyatta University and am carrying out research on an investigation of medicinal plant species diversity and access to traditional herbal medicine among the Samburu people.

The purpose of this focus group discussion will be to determine the influence of perceptions, culture and spiritual beliefs on access to traditional herbal medicine or opportunity to use traditional herbal medicine. The information you give will be held confidentially.
FGD CHECKLIST

1. What are some perceptions, culture and spiritual beliefs present in Samburu Community?

2. What are some of the perceptions, culture and spiritual beliefs related to use of traditional herbal medicine?
3. Are there any customs in place to ensure that medicinal plants are not destroyed?

4. What is the influence on the perceptions, culture and spiritual beliefs on the opportunity to use or access traditional herbal medicinal.
APPENDIX VIII

Focus group discussion guide in Samburu language for locals

NGASUNOTO

Kaaji nanu Dikko Jeff Gafna, kaisomare Kenyatta University. Naa kaiyeta sipata olkekerei loitonyoki moiyatin tolosho laasampur o nekoni pootumi lolokek. Maetae likae tungani oyeloi ikilikwai linjeru.

Kore supatisho ele turur naa keishouru rishata niki yelounyie, Ikeretin oo nkurukoto te yiaroto yo lmairon leapa tanaa sii mpaash namatieki kulo mairon loitaini too lkeek koree lomon linjaru naa keibung’i meatai uriare.
NKIPARA EE LTURURI

1. Akwaa nduat, lkeretin o nkaitin natii lturur le lokop?

2. Akwaa nduat, lkeretin o nkaitin nanyikita ana matata ee kulo keek?

3. Keatai lkkeretin otipikaki pe meri kulo keek omati?
4.  Aji eiko nduat, lkeretin tanaa nkaitin ntumoto ee kulo keek omati?
## APPENDIX IX

### Sampling frame of medicinal plant species

<table>
<thead>
<tr>
<th>Medicinal plant species</th>
<th>Samburu name</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Digitalis purpurea</em></td>
<td>Lakirdingai</td>
</tr>
<tr>
<td><em>Rhus natalensis</em></td>
<td>Lmusigio</td>
</tr>
<tr>
<td><em>Bidens pilosa</em></td>
<td>Labaai</td>
</tr>
<tr>
<td><em>Cardial monoica</em></td>
<td>Sepei</td>
</tr>
<tr>
<td><em>Flacourita indica</em></td>
<td>Sarai</td>
</tr>
<tr>
<td><em>Acacia catechu</em></td>
<td>Lebisei</td>
</tr>
<tr>
<td><em>Carissa edulis</em></td>
<td>Lamuriai</td>
</tr>
<tr>
<td><em>Acacia tortilis</em></td>
<td>Lekeek</td>
</tr>
<tr>
<td><em>Cadaba farinosa</em></td>
<td>Loitaakine</td>
</tr>
<tr>
<td><em>Datura merely</em></td>
<td>Lumunai</td>
</tr>
<tr>
<td><em>Acacia senegal</em></td>
<td>Lmunishi</td>
</tr>
<tr>
<td><em>Ekebergia capansis</em></td>
<td>Subukiai</td>
</tr>
<tr>
<td><em>Brassica campestris</em></td>
<td>Akiru</td>
</tr>
<tr>
<td><em>Croton megalocarpus</em></td>
<td>Lmarguit</td>
</tr>
<tr>
<td><em>Dovyalis abyssinicia</em></td>
<td>Lkinyil</td>
</tr>
<tr>
<td><em>Merua ferrea</em></td>
<td>Ikitalei</td>
</tr>
<tr>
<td><em>Teclea nobilis</em></td>
<td>Lgilai</td>
</tr>
<tr>
<td><em>Acacia albida</em></td>
<td>Senantei</td>
</tr>
<tr>
<td><em>Odentella fischerii</em></td>
<td>Lchingei</td>
</tr>
<tr>
<td><em>Aloe secundiflora</em></td>
<td>Sakoroi</td>
</tr>
<tr>
<td><em>Olea europaea</em></td>
<td>Lepamunyuuo</td>
</tr>
<tr>
<td><em>Acacia nilotica</em></td>
<td>Ikiloriti</td>
</tr>
<tr>
<td><em>Salvadora persicia</em></td>
<td>Sekotei</td>
</tr>
</tbody>
</table>
APPENDIX X

Research Permit

THIS IS TO CERTIFY THAT:
Prof./Dr./Mr./Mrs./Miss/Institution
Jeff Gafna Dikko
of (Address) Kenyatta University
P.O Box 43844-00100, Nairobi,
has been permitted to conduct research in
Samburu Central
Rift Valley
Location
District
Province
on the topic: An investigation on medicinal plants species diversity and access to traditional herbal medicine among the Samburu people, Samburu Central District, Kenya.

for a period ending: 31st August, 2013.

CONDITIONS
1. You must report to the District Commissioner and the District Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit.
2. Government Officers will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two (2)/four (4) bound copies of your final report for Kenyans and non-Kenyans respectively.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice.

GPK605503tm(10/2011)
APPENDIX XI

Research Authorization Letter

REPUBLIC OF KENYA

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telephone: 254-020-2213471, 2241349, 254-020-2673550
Mobile: 0713 788 787, 0735 404 245
Fax: 254-020-2213315

Our Ref: NCST/RCD/12A/013/82

Date: 13th June 2013

Jeff Gafina Dikko
Kenyatta University
P.O Box 43844-00100
Nairobi.

RE: RESEARCH AUTHORIZATION

Following your application dated 6th June, 2013 for authority to carry out research on “An investigation on medicinal plants species diversity and access to traditional herbal medicine among the Samburu people, Samburu Central District, Kenya.” I am pleased to inform you that you have been authorized to undertake research in Samburu Central District for a period ending 31st August, 2013.

You are advised to report to the District Commissioner, District Education Officer, District Agricultural Officer and Medical Officer of Health, Samburu Central District before embarking on the research project.

On completion of the research, you are expected to submit two hard copies and one soft copy in pdf of the research report/thesis to our office.

DR. M. K. RUGUTT, PhD, HSC.
DEPUTY COUNCIL SECRETARY

Copy to:
The District Commissioner
The District Education Officer
The District Agricultural Officer
The Medical Officer of Health
Samburu Central District.

"The National Council for Science and Technology is Committed to the Promotion of Science and Technology for National Development"
# APPENDIX VI

## RESEARCH SCHEDULE

<table>
<thead>
<tr>
<th>Activity</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
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<tr>
<td>Proposal writing</td>
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<tr>
<td>Thesis writing</td>
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<td>Analysis of data</td>
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</tbody>
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Legend:
- Y: Activity is scheduled for the indicated month.
- N/A: Activity is not scheduled for the indicated month.