THE IMPLICATIONS OF BUSHMEAT HUNTING ON THE ENVIRONMENT IN THE ULUGURU MOUNTAINS, TANZANIA

BY

REGINA MASATU MAUNDE

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ABSTRACT

A cross sectional study was done to examine the implications of bush meat hunting on the environment on the Uluguru Mountains. Questionnaires were administered to a total of 120 respondents in 8 villages around the Uluguru Mountains in the Morogoro Municipality. Focus group discussions (FGDs) were also used during the study. The data were analysed using the Statistical Package for Social Sciences (SPSS). Implications of the bushmeat hunting practices on the environment were examined. The types of animal species commonly hunted in the area, the methods/techniques used for hunting; and the type of environmental degradation brought about by bushmeat hunting were identified. It was found that bushmeat hunting in the villages around the Uluguru Mountains was purely a subsistence activity aimed at getting animal protein, income and medicine. Among the respondents, 83.3% acknowledged the presence of bushmeat hunting activity around the Uluguru Mountains. Among the wildlife species commonly hunted, grass cutter "*ndezi*" ranked number one followed by the Steenbok and wild pig. Respondents reported the most common techniques used for hunting were traps, spears, dogs and bush fires. 84.2% of respondents acknowledged the use of bushfires as a technique for bushmeat hunting. Apart from hunting, burning of bushes was either deliberately for farm clearing or accidental (cigarettes butts and cooking). Unsustainable agriculture, use of firewood and charcoal for energy as well as bushmeat hunting were the major causes of environmental degradation in the Uluguru Mountains.

DECLARATION

I, Regina Masatu Maunde, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work, and has not been submitted for a higher degree in any other University.

Regina Masatu Maunde — Date

(M.A. Candidate)

The above declaration is confirmed

Supervisors:

Signature 26/10/10

Prof. A. Z. Mattee — Date

Signature 26/10/2010

Dr. Mirende Kichuki — Date

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DEDICATION

This work is dedicated to the Almighty God who helped me in every stage during my study.

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LIST OF ABBREVIATIONS

BCTF	Bushmeat Crisis Task Force
CBNRM	Community – Based Natural Resource Management
CBOs	Community Based Organizations
DELPHE	Development Partnerships for Higher Education
DSI	Development Studies Institute
EIA	Environmental Impact Assessment
FGDs	Focus Group Discussions
FAO	Food and Agriculture Organization
IUCN	International Union for Conservation of Nature
MKUKUTA	*Mkakati wa Kukuza Uchumi na Kuondoa Umaskini Tanzania*
NSGRP	National Strategy for Growth and Reduction of Poverty
SNAL	Sokoine National Agricultural Library
SUA	Sokoine University of Agriculture
UN	United Nations
URT	United Republic of Tanzania

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Hunting and gathering of wild animals have always been and continue to be an important aspect of life in rural African societies (Kümpel *et al.*, 2010). Hunting for bushmeat is a major component of rural strategies in the tropical forest zone of West and Central Africa (Davies and Brown, 2007). In the past, hunting provided the main source of animal protein and professional hunters occupied a highly respected position in the society. Even in modern days, some groups such as the Bushmen in southern Africa depend almost entirely on hunting and gathering to obtain essential protein and cash income, while many other groups supplement their livelihood considerably by hunting (Ajayi, 1979; Tutu *et al.*, 1993; Waite, 2007). In many developing countries, wildlife is an essential food resource, the source of incomes for rural people and an important part of human spiritual and cultural systems (Robinson and Benneth, 2000; Benneth *et al.*, 2007).

In the past, hunting was mainly carried out for subsistence reasons. In recent years illegal bushmeat hunting has increased dramatically for several reasons. Among the reasons for increased bushmeat hunting include increased human population, use of efficient modern hunting technologies (i.e. firearms and wire snares), loss of traditional hunting controls and increased commercialization of hunting (Wilkie and Carpenter 1999; Robinson and Benneth, 2000; UN, 2005).

Over-hunting in many tropical countries is seriously depleting populations of many wild animals (Willcox and Nambu, 2007). Loss of wildlife threatens survival of the whole forest ecosystem as crucial pollinators, dispersers and browsers are lost, thereby reducing species diversity and curbing the ability of the forest to maintain itself, and to regenerate after

disturbance (Weite, 2007). It also adversely affects rural communities who rely on forest wildlife for food, income and their culture (Robinson and Bennett, 2000).

The option to farm wildlife species for meat allows people to eat wild meat while conserving wildlife population. However this solution is controversial due to the concern about the viability of such farming, its cost effectiveness, and its impacts on wildlife population (Emmons, 1997; Fa, 2000). Farming a wide range of animals, including tropical forest species, has been proposed since the 1950s in response to food security concerns (Ntiamoa-Baidu, 1997). Despite these historical origins, wildlife farming has not become widespread in Africa, Latin America, or Asia, and today few wild vertebrate species native to the humid tropics are commonly farmed for protein (Fa, 2000).

Today, protected area managers are increasingly aware that law enforcement alone cannot conserve wildlife. Conservation requires a perspective that stretches well beyond park boundaries and needs to involve programs affecting the livelihood of local communities. This recognition has resulted in Community-Based Resource Management (CBNRM), where the aim is to encourage conservation by reconciling the management of protected areas with the social and economic needs of the local people (Nielsen, 2006).

CBNRMs have, however, been under serious debate on their ability to fulfill the two-fold goal of wildlife conservation and improved local welfare (Golden, 2009). First, several projects have failed in addressing internal constraints (i.e. corruption and other institutional problems). Second, revenues are often transferred to local communities without being adequately linked to the conservation objective. Third, benefits of CBNRM may stimulate human migration to communities that receive conservation benefits, which may result in additional management problems (Blaikie, 2006).

Human-wildlife conflicts are one of the major threats to conservation in Africa. While such conflicts have existed for decades – if not for centuries – they occur in a different setting today. Increasing land scarcity, hunting prohibitions and wildlife-induced damage to property are factors that may create local hostility towards wildlife and protected areas. Such aspects are therefore likely to be detrimental for local people's incentives to exploit wildlife and hence knowledge about human-wildlife conflicts in and around protected areas is crucial in wildlife management (FAO, 2007).

Moreover, wildlife hunting represents one of the major threats to biodiversity and the long-term survival of many ecosystems (Mfunda and Røskaft, 2010; Laurance and Useche, 2009; Hayward, 2009; Benneth *et al.*, 2007). An appropriate knowledge of how economic and biological factors shape the patterns of wildlife hunting is therefore essential in order for economic development to encourage the local people to change to more park-friendly activities (URT, 1998).

1.2 Problem Statement

Wildlife populations in many parts of the African continent are declining as a result of over-exploitation and destruction of wildlife habitats caused by increasing human populations. Current levels of wild animal exploitation are not sustainable anywhere on the continent and areas where large populations of wildlife still occur coincide with the enforcement of protection measures (Ntiamoa-Baidu, 1997).

In Eastern and Southern Africa widespread illegal hunting and deforestation are identified as major threats to wildlife (Barnett, 2000; Pelkey *et al.*, 2000). In Tanzania, partially protected areas appear to be particularly hard – hit by illegal bushmeat hunting combined with high rates of habitat degradation (Pelkey *et al.*, 2000).

For example in the Uluguru Mountains bushmeat is still widely collected from the wild. Unfortunately its collection from the wild is attained through setting of bushfires and use of chemical poisons (Wurster and Burgess, 2005). The implications of hunting by setting bushfires and use of chemical poisons are of environmental concern. Little information is available on the implication of bushmeat hunting on the environment. This study therefore was intended to determine the common species of wildlife hunted, the methods and tools used for hunting and their effects to the environment, and possibly advise the government and other authorities on strategies which can make bushmeat readily available while conserving the environment.

1.3 Significance and Justification of the Study

The study is in line with the Wildlife Policy on wildlife protection (URT, 1998). The policy aims at promoting the conservation of wildlife and its habitat, it also aims at ensuring that wildlife is appropriately valued in order to reduce its illegal off-take and to encourage its sustainable use by rural communities.

The study is compliant with Millennium Development Goal number seven which intends to maintain sustainable environment (reduce environmental destruction). Furthermore the study is conforming to "MKUKUTA" which aims at reducing risks from environmental pollution and destruction.

The study provides information and knowledge on the implication of bushmeat hunting on the environment. In addition, information is presented on how people could get bushmeat without destroying the environment. The information obtained in the study will enable wildlife conservation authorities/institutions to improve their approaches on the issues related to bushmeat hunting and environmental conservation. Information obtained will be

available to be used by the community and finally people will know how they can benefit from wildlife species without environmental destruction.

1.4 Objectives

1.4.1 General objective

To examine implications of bushmeat hunting on the environment.

1.4.2 Specific objectives

i. To identify types of animals commonly hunted,

ii. To identify methods/techniques used for bushmeat hunting,

iii. To determine the types of environmental degradation brought about by bushmeat hunting.

1.5 Organization of the Study

The study is organized into five chapters including this introductory part. Chapter Two presents literature review and an overview of bushmeat hunting in Tanzania and the study area in particular. Issues concerning bushmeat hunting and its implication to the environment are partly addressed in this Chapter. Chapter Three presents methodology employed in the research study whereas empirical results pertaining to the case study are explicitly presented and discussed comprehensively in Chapter Four. Summary of major findings, conclusions and recommendations are given in Chapter Five.

1.6 Operational Definition of key variables

Age:	Number of years since birth
Sex:	Being male or female

Education:	The level of formal schooling
Religion:	Traditional beliefs, Christian or Islamic
Bushmeat:	Meat from wild animals
Bushmeat Hunting:	Refers to chasing and killing/collecting wild animals for food and income
Environment:	Surroundings in which a person, animal or plant lives
Environmental degradation:	The decline in wild species and habitat destruction
Source of income:	Source of monetary value accrued
Occupation:	An activity which enhance people's livelihood (Job)

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Global Overview of Wild Meat

Wild meat provides a major source of protein for tropical forest people around the world. In Latin America, ten indigenous groups consume an average of 59.6g of protein per person per day from wild meat; this amount is above the minimum protein levels required for healthy subsistence (Ntiamoa-Baidu, 1997). In the Malaysian state of Sarawak, 67% of the meals of Kelabits contain wild meat, and it is their main source of protein (Robinson and Bennett, 2000).

Traditionally, in many Asian countries wild meat has not been a significant source of protein for urban people. This is partly because of religious taboos amongst Hindus and Moslems, but also because urban tropical Asia has tended to look to the sea for its traditional protein. In spite of this, wild meat is widely eaten in urban areas in Asia, especially South-east Asia. The scale of such urban trade is difficult to access accurately, but it is considerable. In a single market in North Sulawesi, an estimated 3848 wild pigs were sold every year from 1993 to 1995, of which (a third to half) were endangered and legally protected babirusa. Market sales also included macaques (50 to 200 a year), forest rats (50,000 to 75,000 per year), bats up to 15,000 per year, as well as occasional sales of cuscus and tarsier (Clayton and Milner–Gulland, 2000).

In spite of the scale of trade in urban areas in south-east Asia, wild meat is generally a luxury item for town people, eaten especially by the wealthier sectors of society. In towns it is not a basic protein source. In rural, forested areas of Asia, the picture is different. Here, wild meat does traditionally form a major source of human protein. Forest people in

Borneo have been hunting significant quantities of wildlife for at least 35,000 years (Zuraina, 1982), and wild life provides a major source of protein to many people. In Sarawak, an average of 29% of evening meals eaten by rural farmers throughout the state contains wild meat. The dependence on wild meat increases with distance from towns and the coast and in the far interior is the main source of protein (Robinson and Bennett, 2000).

Growing human populations, lack of livelihood options in many areas of the globe means that demand for wild meat is likely to continue to rise. The overall picture indicates that growing human populations have affected all ecosystems. Poverty and lack of alternative resources mean that traditional taboos restricting the consumption of certain species are increasingly being ignored and traditional resource management systems are breaking down (Mainka and Trivedi, 2002).

2.2 Wild Meat Production Systems

Supplies of bushmeat and other wild animal products on the African continent are derived from four main sources; these include wild sources, game ranching, game farming and wildlife domestication. Wild sources comprise National Parks, game and forest reserves, unprotected forests and savannah land and account for the greater proportion of bushmeat production on the African continent. Depending on the population densities and prevailing ecological and political conditions, stocks in protected areas may be culled for utilization, while stocks in lands outside protected areas are basically communal property, where there may be little or no control on exploitation (Ntiamoa-Baidu, 1997).

Game ranching comprises the maintenance of wild animals in defined areas delineated by fences. It is a form of husbandry similar to cattle ranching; the animals are managed on natural vegetation although the habitat may be manipulated to improve production

efficiency. Game ranching is done for a variety of reasons which include cropping of wild animals for export, production of game meat for local consumption and export, preservation of animal species threatened with extinction, hunting for sport or trophy and tourism. Game farming involves the confinement of wild animal species in a semi-domestic state where they are fed and grown to required weights and exploited for consumptive use. Wild animal species that are farmed are no longer truly wild and represent an intermediate stage between wild and domesticated species. Common animals farmed include the ostrich, crocodile, water buffaloes, elephants and duiker (*ibid*).

Wild animal domestication refers to the process which results in genetic adaptation of wild animals to the extent that the animal breeds readily in captivity and its owner has some control over its production. The idea of domesticating wild animal species for meat production to improve protein supply in Africa is not new. As far back as 1848, the domestication of the eland and buffalo was mooted in South Africa. However, the only African wild animal species that have been successfully domesticated completely are the ostrich and the camel. West African countries like Ghana and Benin have attempted domestication of wild animals such as giant snails and grass cutter with great success. The bushmeat has been made readily available and the environmental destruction that accompanied its collection from the wild has been relieved (*ibid*).

Conservationist and advocates of wild animal domestication have argued for the farming of favorite species to increase bushmeat production and supply in the Sub-region and also to reduce pressure on wild populations. Domestication and farming of favorite wild species could provide viable complementary or alternative source of animal protein and offset the negative environmental effect resulting from its collection from the bush (Elliot, 2002).

2.3 Species of Wild Animals in Africa

Virtually all species of wild animals are acceptable as a food resource to some groups of people in Africa. Species which may be tabooed by one group of people are a delicacy to another group elsewhere. Species eaten vary from antelopes to monkeys, rodents, reptiles and a whole range of invertebrate species including snails, termites and beetles. Jardin (1970) lists hundreds of species belonging to 236 genera reported to be eaten by people in Africa. Bushmeat is eaten as fresh meat, smoked, salted or sun dried (biltong). Smoking is the most widespread form of preservation and smoked bushmeat is available in urban markets in most African countries (Ntiamoa-Baidu, 1997).

The range of species taken and relative importance of the different species have been documented in several areas of the continent. This varies from locality to locality depending mainly on the species available for exploitation in each region and also on hunting restrictions enforced in each country. Rodents are particularly important in terms of range of species and numbers taken in many parts of Africa, possibly because they are not subject to hunting restrictions in many countries and also the fact that their high reproductive capacity makes them relatively more abundant (*ibid*).

2.4 Bushmeat Crisis in Africa

The bushmeat crisis is a global concern and all nations must step forward to work collectively with colleagues in Africa toward identifying and implementing solutions to the bushmeat crisis. The Bushmeat Crisis Task Force (BCTF), based in the United States, is a collaborative effort of over 30 organizations and hundreds of individual professionals. It works to increase understanding about the causes and solutions to the bushmeat crisis. Although located in United States the organization focuses on the conservation crisis in

Africa, this was due to the fact that conservation of African wildlife is of global interest and therefore, should be a global responsibility (Mainka and Trivedi, 2002).

It is recognized that wildlife is harvested daily across Africa but hunting methods and strategies vary considerably and include legal and illegal means as well as sustainable and unsustainable ones. There are three primary modes of wildlife hunting currently taking place in Africa and resulting in three different products namely bushmeat, game meat and wild meat. BCTF gives explanations of the modes as:-

Bushmeat is considered as the meat illegally and commercially derived from wildlife. Usually the use of illegal methods of hunting is employed like snares and unregistered guns. Game meat describes legally obtained meat that is regulated and controlled. In addition to that monitoring of the wildlife populations and habitat is carried out. Trade is legally controlled with authorized agents and Government controls. Wild meat is that which is derived for subsistence, non commercial purposes using legal means (traditional snares, nets, registered guns and traps) and conducted by individuals with the legal rights to access the wildlife for this purpose. Wild meat includes only those species legally authorized for harvest (Eves and Ruggiero, 2000).

The importance of wildlife as a source of protein, religious significance, cultural value, medicinal use and income to rural African communities is as true as it was during pre-colonial histories. Despite the assumption that rural people traditionally harvest resources sustainably (Godoy and Bawa, 1993), the sustainability of subsistence economies, requiring internal controls on population and exploitation, has not been demonstrated to exist. One of the primary concerns of those working on the bushmeat issue is the very real threat that this

trade poses to communities that are truly dependent upon wildlife for meeting their primary protein needs and cannot avail themselves of alternative sources of protein.

2.5 Bush Meat and Food Security

The utilization of bush meat is at the forefront of the convergence of biodiversity conservation, livelihoods and food security in many developing countries (Mainka and Trivedi, 2002). Wildlife is critically important as a source of cheap and preferred protein and when traded, provides a source of cash where few alternative sources of income are available. Bushmeat contributes both directly and indirectly to the food security of many people, a decline in the availability of bushmeat to the people who depend on it will have a negative effect on food security.

2.6 Ecological Effects of the Bushmeat Trade

As human populations increase, the demand for bushmeat also increases. Traditional hunting was probably sustainable in the past because of low population densities, simple hunting tools and subsistence oriented consumption. In the Congo Basin a transition from subsistence to commercial hunting has resulted in over-hunting with 60% of hunted animals being exploited unsustainably (Tieguhong and Zwolinski, 2009).

Overexploitation of wildlife species has caused a number of species to extinct. From a biodiversity-conservation perspective bushmeat trade threatens the survival of many species as well as the ecosystems in which they live. From a human development perspective bushmeat trade threatens to remove a needed source of proteins from rural, poor human communities (Mills, 2010).

The bushmeat trade relies upon the availability of wildlife populations as a resource. Current rates of bushmeat exploitation are causing rapid depletions in the wildlife resources of West-Central Africa (Barnes, 2002). Declines in bushmeat populations denote declines in an important income and food source, threatening the role of bushmeat in rural Africans' livelihoods.

2.7 Farming Wildlife versus Hunting

Where wild animals are readily available and hunting is low-risk without a significant threat, hunting of an animal costs less than raising it on farm. Hunters only pay for the costs of bullets or snares and the effort which they expend on hunting trips. If wildlife is free for the taking hunting is generally easier faster and cheaper than farming wildlife (Gumal *et al.*, 1998).

In many countries across the humid tropics, however, enforcement of hunting laws is weak or non-existent (Robinson and Bennett, 2000), however, the laws of many countries provide exceptions for subsistence hunting in rural areas. Returns from hunting are immediate, with the wild meat being consumed or sold as soon as it is hunted. It is generally more cost- effective to hunt wildlife than to farm it.

2.8 Farming Wildlife versus Domestic Livestock

To be economically attractive, wildlife farming would have to offer returns per unit investment equivalent to rearing domestic species. This is generally not the case, due to the low productivity of many wildlife species compared to domesticated ones. The general lack of experience in raising wild species also makes these farms riskier than raising domestic animals. Production of cane rats is more complicated than that of domesticated livestock.

Asking marginalized farmers in developing countries to expend considerable amounts of time, energy, and capital on untried systems is unlikely to succeed (Drury, 2009).

2.9 Hunting of Wildlife in Tropical Forests

Humans have lived in tropical forests for at least 40,000 years and throughout that time they have undoubtedly hunted. Historically, extinctions of certain large animals have correlated with the presence of humans, and were almost certainly due to hunting. Tropical forest people have depended on wild meat and fish to meet their animal protein requirements for thousands of years. For species which were hunted and have survived, harvesting in the past must have been sustainable (Robinson and Bennett, 2000).

Tropical forests are rich in biodiversity, and the use of wildlife in human culture is widespread. The impact of humans on wildlife is so pervasive that the very survival of many animal species in the world's tropical forests depends on good management of wildlife. Moreover, the interrelationships of wildlife and humans in such forests are so intricate that the social and economic well being of humans in tropical forest countries often depends on good management. Wildlife in tropical forests is an important resource for local communities living in, and around those forests. Wild species are hunted for food, sale, social, agricultural pests and cultural reasons (*ibid*).

No matter how important wild species are to people, if hunting is not sustainable the resource is depleted. Sustainable hunting occurs when harvest does not exceed production. The harvest rate is driven by the demands of consumers on the hand and is controlled by taboos, rules, regulations and enforcement (*ibid*).

Moreover, wildlife populations comprise living individuals which are part of dynamics and complex systems. They live in social groups which are disrupted by the loss of individual members. Loss of significant numbers of individuals has wider repercussions throughout the ecosystem (Madhusudan and Karanth, 2000; Brodie, 2009). According to Robinson and Benneth (2000) the interrelationship between animals and plants are complex.

Hunting in many tropical forest areas today is not sustainable, the reasons for this are; First, the intrinsically low rate of production of wild animals in tropical forests places strict biological limits to the amount of hunting that can be done sustainably. Secondly, increasing access to forest areas, which allows outsiders to come into the area, promote loss of forest. It also increases access to markets for sale of wild meat and buy new and improved hunting technologies; Thirdly, increasing effective human population density in forest areas; Fourthly, changes in hunting practices, including loss of traditional practices and increasing use of modern technologies, make hunting more efficient and less discriminating; and finally, the increasing commercialization of hunting, the advent of the wildlife trade and commercial logging of many forest areas (IUCN, 2005).

There is no one simple answer to solve the problem of unsustainable hunting. Solutions must be area specific. Governments, aid agencies, rural planners and conservations organizations working in tropical forest areas recognize that current hunting levels are unsustainable. The implications are manifold, both for biodiversity communities and economies. According to Robinson and Benneth (2000) the following recommendations were therefore targeted at national governments, NGOs, academic institutions and international institutions:-

(i) Recommendation at National level:-

- Establish system of land use comprising a network of protected areas and contiguous extractive reserves, including totally protected areas where hunting is not allowed or very strictly limited.
- Maintain a permanent forest estate for extractive uses, including hunting.
- Ensure that the legal, technical and administrative mechanisms and trained personnel are in place for conservation regulations to be enforced, both inside and outside the protected area system. This can be done though either national or local institutions, but it is the role of the Government to ensure that they do indeed exist and function properly.
- Ensure that the legal and practical mechanisms are in place for local communities to be involved in decision making and management regarding wildlife resources and hunting in their area. This must be done so that the necessary checks and balances are in place to prevent over- exploitation.
- Establish a law to protect the more vulnerable species from all hunting. These are generally species with low natural densities, low intrinsic rates of population increase, loud or eye catching displays, species which roost or nest communally or are especially sought for their high economic or cultural value.
- Promote programs to ensure production of domestic animals.
- Promote research into the effect of hunting at both national and local levels to assist in good management.
- Promote education and awareness programs on conservation of wildlife, and the need to reduce hunting at all levels: decision makers, general public, schools and local communities.

(ii) Recommendations at the local community level:-

- Promote education and awareness programs among all community members, so that they are aware of the problems, potential solutions, and the long-term benefits.
- Ensure that mechanism exist so that community members are closely involved in monitoring, management and decision making regarding hunting.
- Establish registers of local residents allowed to hunt in the extractive reserves and mechanisms to ensure that unregistered outsiders cannot hunt there.
- Provide training in animal husbandry as a way to generate income and provide alternative sources of protein.

(iii) Recommendations applicable to NGO's and academic institutions:-

- Act as intermediaries between government and international agencies, local communities to ensure that proper systems of hunting management can be put into effect.
- Promote and conduct research on ecological and social topics relevant to hunting.
- Disseminate results of research and monitoring widely, especially to resource users and decision makers.
- Promote and conduct major education awareness programs aimed at all levels of resource users.
- Promote and conduct extension programs in local hunting communities with the aim of developing alternative livelihoods and / or sources of protein to reduce the dependence on wild meat.

- Provide training to professional field staffs that are skilled both in managing biological resources and addressing local development needs.

(iv) Recommendations applicable to international donors:-

- Ensure that the issue of hunting is addressed in all development programs for tropical forest areas. This includes all Environmental Impact Assessments (EIAs) for, and implementation of any projects.
- Ensure that international community development projects and rural development programs are based on solid research into what is biologically realistic and locally appropriate.
- Promote conservation education and extension programs to ensure that hunting levels are reduced, and that alternative sources of protein and / or income are developed. This could include establishment of agricultural programs for local production of domestic animals and /or fish, and extension programs to develop the necessary husbandry expertise.

2.10 Hunting in Tanzania

Tanzania is renowned as one of the richest countries in Africa in terms of biodiversity. In response, over 24% of the land is devoted exclusively to wildlife, upon which much of the tourism industry is now based. Three government organizations are responsible for wildlife management in different categories of protected areas namely Tanzania National Parks, Ngorongoro Conservation Area Authority and the Wildlife Division within the Ministry of Natural Resources and Tourism. Local authorities under the President's Office – Regional Administration and Local Government also play a major part in wildlife management (URT, 1998).

Hunting for wild meat takes place throughout the country and has led to informal and often secretive trade dynamics. The Tanzania Wildlife Policy notes that escalating illegal wildlife off-take and trade is one of the major challenges facing the wildlife sector (URT, 1998). Communities living adjacent to Game Reserves and National Parks, especially hunters and gatherers, or any community facing a food scarcity situation, often seek access to terrestrial animals as a source of protein. For example, wild meat constituted 55- 95% of meat protein requirements in Western Serengeti and Meatu Districts. In Western Serengeti a high proportion of the population are involved in hunting. It is estimated that up to 60% of households regularly consume or sell bushmeat (Jambiya *et al.*, 2007)

Overtime, hunting has expanded from mainly subsistence activity to one with developed commercial market. Bushmeat obtained in the Western Serengeti region supplies markets as far away from the Western Serengeti as Lake Victoria. In addition to the subsistence and cash benefits associated with its utilization, the presence of wildlife provides a number of indirect benefits to landholders in the Western Serengeti from government-controlled tourism and hunting activities. Two schemes exist which share wildlife revenues generated by government in Serengeti National Park, Grumeti and Ikorongo Game Reserves with villages in the Western Serengeti area. Both, by allocating a proportion of tourist and hunting revenues to rural development activities mainly the construction, rehabilitation and maintenance of infrastructure such as schools, bridges, roads, dispensaries and water supplies, but also including some support to small enterprise development (Emerton and Mfunda, 1999).

Despite being an illegal activity over the last half century, the wild meat trade has continued to thrive and expand for a number of reasons (Baldus, 2002):

- There is very low public awareness regarding the illegality and conservation impacts associated with buying and eating wild meat, so for many people living in rural areas it is not seen as a wrongful activity.
- The demand for wild meat is present and growing because of an expanding population and increasing purchasing power of people
- There is not always a sense of ownership of wildlife and protected areas, leading to uncontrolled exploitation of wild meat.
- Wild meat is cheaper than beef and is in many rural areas the only meat readily available especially in tsetse fly infested parts of the country.
- Failure of law enforcement

After failure to fight the wild meat trade there is need for the Tanzanian Government and all stakeholders to look for new ways that might be more effective and practical. This is a formidable challenge, and it is therefore important that effective partnerships are developed between conservation professionals and local organizations and partners within the development community (Barnett, 2000; Baldus, 2002).

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

This Chapter explains the methodology used in this study. It addresses such aspects as study area and major economic activities done by people therein, sampling procedure, and sample size, sources of data and methods of data analysis.

3.1 Study Location

The study was conducted in Morogoro peri-urban area along the Uluguru Mountains. The area comprises of villages bordering Uluguru Mountains Forest Reserve. The villages were selected purposely on the basis of being near Uluguru Mountains Forest Reserve where there were diverse natural resources with different wild animals and plant species. The area lies between longitudes 37^0 10′ and 38^0 31′ East and 5^0 50′ and 7^0 4′ South. The Uluguru Mountain areas receive a bimodal rainfall pattern. The short rain season begins in October- December and lasts up to January. The climate is principally influenced by altitude and mountain slopes. Dry periods occur in July and August. In the forest areas rainfall reaches up to 3000mm per annum. The temperature varies with altitude from 24°C to 12°C at 2000m above sea level. The study area is shown in Figure 1.

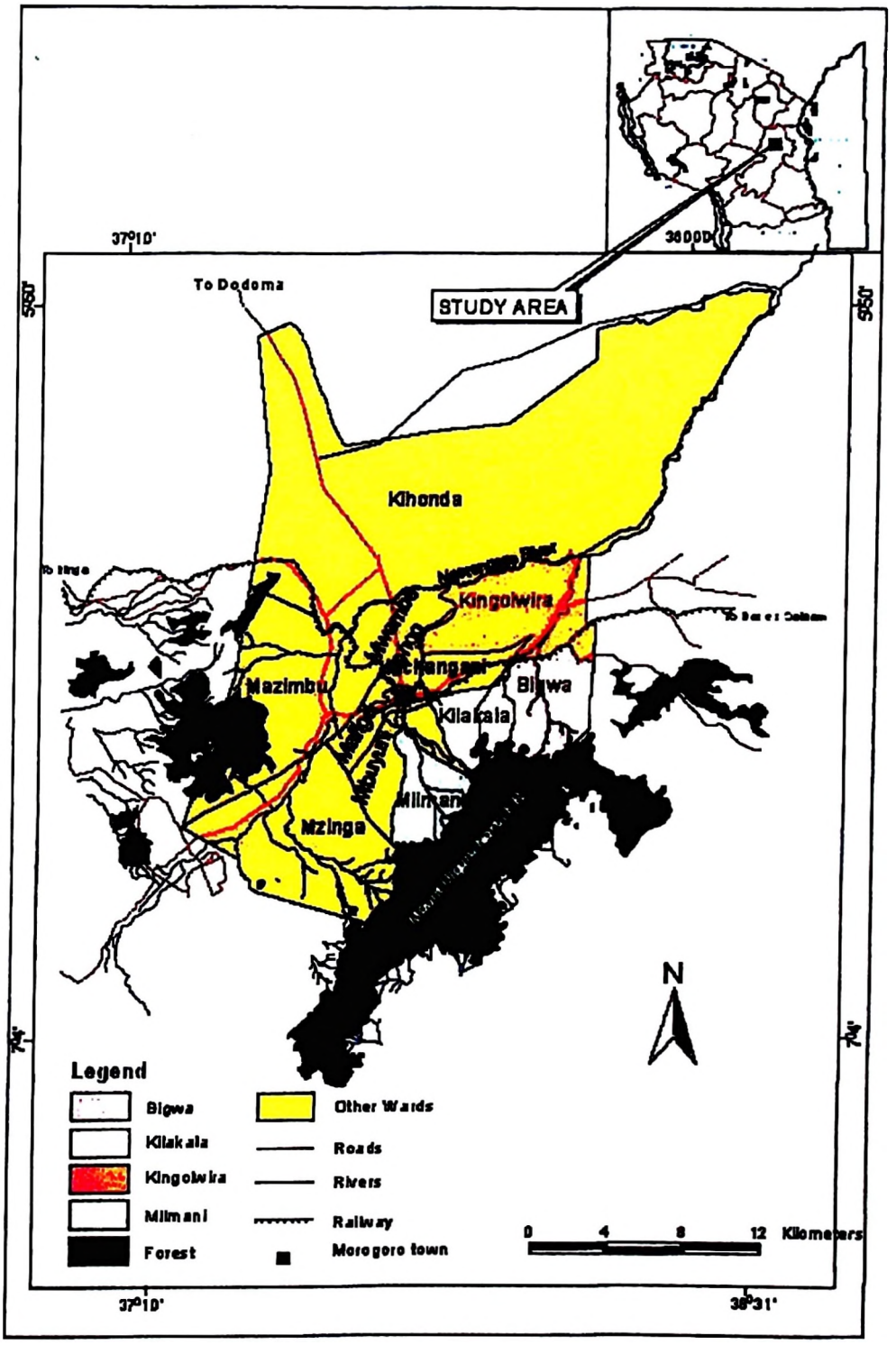

Figure 1: A map showing the study

3.2 Research Design

A cross- sectional design was used during data collection. This method allowed data to be collected at one point in time. It also helped to establish relationships between variables for the purpose of testing the hypothesis (Bailey, 1998). The method was useful because of time limitation and budget constraints.

3.3 Sampling Procedure

3.3.1 Selection of study wards and villages

This study involved eight villages which were purposively selected from four wards. The criteria used in selecting the wards and villages includes being closer to the Uluguru Mountains, having many people involved in hunting, accessibility and willingness of the people to participate in the study. The wards and villages involved in the study were Korogoso and Misongeni Villages in Bigwa ward, Choma and Kireka villages in Mlimani ward, Ualimu and Bong'ola villages in Kireka ward and Legezamwendo and Kingolwira in Kingolwira ward. In each village an equal number of respondents were selected for the study, the selection was done randomly.

3.3.2 Respondents selection and sample size

In this study the sample size was calculated as shown in Appendix 1. A total of 120 respondents were selected through simple random sampling from twelve villages with a total of ten respondents in each village. This sample size was chosen because of the limited financial and time resources.

3.3.3 Sampling unit

The household was considered as the ultimate sampling unit. The members of the household aged 18 years and above were conveniently selected. This means the interview was conducted to the available members. The head of the household was considered first, followed by other members of the household, in case he or she was not available.

3.4 Data Collection Procedures

3.4.1 Primary data

3.4.1.1 Structured questionnaire

Both quantitative and qualitative data collection methods were used to obtain primary data. The main instrument for quantitative data was a structured questionnaire containing both closed and open-ended questions (Appendix 2). Both qualitative and quantitative data were collected subsequent to a pilot study conducted one week before the main study. The pilot study survey was used to test the clarity, sequence of the questions and the discussion guides proposed as well as estimated time for each questionnaire. The structured interview schedule was used to collect information on the types of animals hunted, method of hunting, implication of bushmeat hunting on environment, strategies on how to obtain bushmeat while conserving the environment. The questionnaire was formulated in English and translated into Kiswahili to facilitate easy communication during data collection.

3.4.1.2 Non- participant observations

Much information was obtained by direct observation on the study area. The researcher had an opportunity to observe what was going on and compare with what has been said about the implication of bushmeat hunting on environment. This method was used to supplement the information obtained from the interviews. This method has several advantages which include elimination of subjective bias, the information obtained was related to what is

currently happening, independent to respondent willingness to respond, and also it is relatively less demanding of active cooperation (Kothari, 2005).

3.4.1.3 Focus group discussions

Focus group discussions (FGDs) were used to collect qualitative data. The focus group was an informal session in which participants representing the target population discussed the various aspects of specific topics or subject matter (Morgan, 1997). It involved a group interview of about 6 to 12 people who were preferably unfamiliar to each other to minimize each other's influence but had similar backgrounds. The selections were based on their knowledge on hunting issues. Gender balance and age distribution were considered during the selection of members. FDGs were conducted in the village office and primary school premises but privacy was maintained. The principal researcher was the discussion facilitator assisted by one research assistant.

All the discussions were conducted in Kiswahili. The facilitator introduced the topic and allowed the group members to discuss, all the discussion points being recorded in a note book. Each discussion session took a maximum of two hours.

3.4.2 Secondary data

Secondary data were used to enrich the primary data source. The data were extracted from reports and documents like publications, journals and books both published and unpublished from relevant institutions such as environmental conservation NGOs, CBOs and Ministry of Natural Resources and Tourism as well as from Sokoine National Agricultural Library (SNAL).

3.5 Data Analysis

Data from the field survey were edited, coded and analyzed using the Statistical Package for Social Sciences (SPSS 11.5) computer software in conformity with the objectives of the study. The means, frequencies, proportion and standard deviations were established so as to find out the extent of hunting with different variables. Content analysis was used to analyze qualitative data. Tables were used in presenting the analysed data.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

This Chapter presents findings of the study as well as a detailed discussion pertaining to these findings. It is presented in a manner that manifests congruently to both the general and specific objectives of the research study.

4.1 Socio-economic Characteristics of the Respondents

4.1.1 Age of respondents

The selected sample for this study comprised 120 respondents, with an age range from 18 to above 50 years old. 11.7% of the respondents had the age between 18 to 25, 25% of the respondents had the ages between 26 and 35, 30.8% of the respondents had the ages between 36 and 50, and 32.5% of the respondents had the age of above 50 years old (Table 2). During FGDs it was found that elders have more experience on hunting activities as compared to the youth.

Table 2: Distribution of respondents by age

Age group (years)	Frequency	Percent
18 - 25	14	11.7
26 – 35	30	25.0
36 – 50	37	30.8
50 – above	39	32.5
Total	**120**	**100.0**

4.1.2 Sex of respondents

Of 120 respondents 71.7% were males while 21.3% were females (Table 3). Under Tanzanian culture, the hunting work is mostly done by males and females are left at home to do other domestic activities (Mainka and Trivedi, 2002). However, during data collection, the targets were heads of the household who normally are male and other members of the household were interviewed when the head was not available. This could have also contributed the number of males to be higher than the females.

Table 3: Distribution of respondents by sex

Sex	Frequency	Percent
Male	86	71.7
Female	34	28.3
Total	**120**	**100.0**

4.1.3 Education level of respondents

Respondents were distributed according to informal education, primary education, secondary education, adult education and tertiary education with the percentages of 12.5%, 75%, and 6.7%, 5% and 0.8% respectively (Table 4). Most of the respondents' education level was primary education suggesting that the level of knowledge on wildlife conservation may be limited. Respondents were not aware on the benefits of conserving wildlife for their own benefit and benefit of future generation. Education acts as an instrument in rising awareness towards environmental conservation. However, it has been observed that most of the "*Waluguru*" have no adequate conservation education.

Jacobson *et al.* (2006) found that appropriate education and outreach can foster sustainable behavior, improve public support for conservation, reduce vandalism and poaching in protected areas, improve compliance with environmental regulations and influence policies and decisions that the environment and natural resources.

Table 4: Distribution of respondents by educational level

Educational level of respondents	Frequency	Percent
Informal education	15	12.5
Primary education	90	75.0
Secondary education	8	6.7
Adult education	6	5.0
Tertiary education	1	0.8
Total	**120**	**100.0**

4.1.4 Religious beliefs of respondents

Of the respondents, 34.2% were Christians and 65.8% were Moslems (Table 5). Normally religion has an influence on the type of animal species taken/eaten. Note that not all animals are edible from Christians' and Moslems' point of view. For example Moslems do not eat monogastric animals like pigs or meat that is not *halal*. From the Christian beliefs: Lavitical law of the Old Testament verse 11, Deuteronomy verse14 argues on detestable animals that will defile man, and specifies only cloven and chewing cud, scales and fin fish to be eaten, but not non cloven, monogastric, eagles, vultures crawls, creeping insects with wings, unslaughetered carcass, etc. This Christian belief in most cases is strong for some denomination like Seventh Day Adventists.

Where societies do not hunt, religions act on the sustainability of hunting primarily by influencing the diversity of species harvested. For example in Northern Borneo, populations of many species of animals are higher in Moslem areas than in most non-Moslem areas (Robinson and Bennett, 2000).

Table 5: Distribution of respondents by religious beliefs

Religion	Frequency	Percent
Christian	41	34.2
Moslem	79	65.8
Total	**120**	**100.0**

4.2 Socio-economic Activities in the Uluguru Mountains

4.2.1 Livestock keeping

Of the total respondents interviewed, 54.2% keep chicken; 6.7% keep goats and 3.3% keep pigs (Table 6). The numbers of animals kept in Uluguru Mountains were relatively small. Livestock keeping is not a common practice due to land scarcity, culture and lack of technology of zero grazing (Bhatia and Buckley, 1998). The most probable alternative source of animal protein is thought to be bushmeat hunting for both Christians and Moslems.

Hunting in the forest is an activity related to satisfying household food (protein) requirements and at times, economic needs (Mainka and Trivedi, 2002). Whenever a household decides to manage livestock/poultry within their farming systems, it will reduce hunting pressure in the natural forests with a resultant positive impact on wildlife populations.

Table 6: Livestock keeping in the Uluguru Mountains

Livestock kept	Frequency	Percent
Chicken	65	54.2
Goats	8	6.7
Pigs	4	3.3
Do not keep livestock	43	35.8
Total	**120**	**100.0**

4.2.2 Charcoal production and firewood collection

Most respondents (80.8%) reported to use firewood as the main source of energy for cooking, 11.7% uses charcoal as the source of energy. 6.7% use charcoal and firewood as a source of energy and 1% of the respondents use residue as a source of energy. Charcoal production and firewood collection are both used as a source of income (Table 7). Charcoal production and firewood collection are associated with habitat destruction as people cut down trees and burn charcoal. This resulted to disturbance of the ecosystem in the Uluguru Mountains, and has caused wild animals to migrate from one area to another in search of suitable habit and food.

Table 7: Charcoal production and firewood collection

Source of fuel	Frequency	Percent
Charcoal	14	11.7
Firewood	97	80.8
Charcoal and Firewood	8	6.7
Crop residue	1	0.8
Total	**120**	**100.0**

4.2.3 Crop production, hunting and petty trade

Crop production was the major source of income as summarized in Table 8. More than three-quarters (86.7%) of the respondents were engaged in crop production, 7.5% engaged themselves in hunting activities and 5.8% of the respondents reported to have been involved in petty trade.

98% of the respondents acknowledge hunting occupation as a secondary occupation while 2% acknowledged hunting as the primary occupation. This is an indication that the number of wild animals declined overtime, currently it is not easy to get animals near the houses. Hunters need to walk a long distance.

Despite crop production being a major source of income, the methods of farming used are not friendly to the environment. Bushfires were observed to be used as a major means of farm clearing especially during the dry season. Moreover cultivation along water sources and shifting cultivation were common practices that endanger the continuous water flow in the rivers. Activities related to crop production have indirect influence to wildlife species as they are associated with habitat destruction. In Uluguru Mountains one of the major constraints facing wildlife sector is loss of habitat due to agriculture and settlements (URT, 1998).

Table 8: Household major source of income in the Uluguru Mountains

Major source of income	Frequency	Percent
Crop production	104	86.7
Hunting	9	7.5
Petty trade	7	5.8
Total	**120**	**100.0**

4.3 Reasons for Hunting

Sixty six percent of the respondents reported that hunting is done to get food while 33% of respondents reported that hunting is done for the purpose of getting both food and income, while 1% hunted for food and medicine (Table 9). Schenck *et al.* (2006) reveals that hunting is the way of getting food and immediate cash. Sale and Mossman (1983) reveal that animals hunted in the wild are regarded as having medicinal importance. According to Robinson and Bennett (2000), wildlife is an important resource for local communities living in and around those forests. Wildlife species are hunted for their nutritional value, for cash, for cultural reasons and for multiple combinations of these. Moreover wild species are hunted because they are agricultural pests.

During focus group discussions the respondents reported that some wildlife species are important pests to agricultural crops and livestock. Thus reduction of pest populations to minimize agricultural damage was mentioned as another reason for hunting. For example, animals like monkeys are very destructive to agricultural crops, but this type of wild animal is not eaten by most people in the Uluguru Mountains. So once hunted/killed it is just abandoned.

Hunting of wildlife (i.e. bushmeat hunting) is today considered a significant threat to conservation of biodiversity, particularly in tropical forests where production is much lower than in savannah type habitats (Milner-Gulland and Bennett, 2003; Magige *et al.*, 2009; Grey-Ross, Downs and Kirkman, 2010). Livestock keeping is limited due to physical features of the Uluguru Mountains, so the only alternative of getting food (animal protein) and income is through bushmeat hunting.

Table 9: Reasons for hunting in the Uluguru Mountains

Reasons	Frequency	Percent
Food	79	66
Food and income	40	33
Food and medicine	1	1
Total	**120**	**100.0**

4.4 Common Wildlife Species in the Study Area

There are various types of animals commonly hunted such as Grass cutter, Steenbok, Wild pig, Red Duicker, Pigmy Antelope, Southern Impala, Northern Tree Hyrax, Dassie, Bush buck, Hare-Cape, Monkey (Table 10). Among the animals listed above the type of species most preferred is Grass cutter (*ndezi*) followed by Steenbok and Wild pig since their meat is tastier and more palatable. Grass cutter is among the animals eaten by all categories of people, that is, Christians and Moslems.

The preference of wild species eaten in most cases is influenced by religion, traditional beliefs and availability of wild species. Socialization is also among factors influencing the type of animals eaten in a certain community. Children may follow the trends of their parents, in terms what they eat and what they don't eat.

Table 10: Wild animals commonly hunted in the Uluguru Mountains

Wild animals commonly hunted	Frequency	Percent
Grass cutter	56	46.7
Steenbok	15	12.6
Wild pig	14	11.7
Red Duiker	12	10
Pigmy Antelope	9	7.5
Southern Impala	4	3.3
Northern Tree Hyrax	3	2.5
Dassie	3	2.5
Bush buck	2	1.6
Hare – Cape	1	0.8
Monkey	1	0.8
Total	**120**	**100.0**

4.5 Methods/Techniques used for Hunting.

Hunting is normally done by using traps, spears, dogs and bushfires. Few people used short guns. According to Carpaneto and Fusari (2000), four different techniques are used by local hunters to capture mammals. Three traditional techniques are represented by traps, spears) and dogs; a more technologically advanced technique is the gun.

In the Uluguru Mountains bushfire is mostly used in hunting grass cutter because as fire burns grass and bushes, the grass cutter are scared and run haphazardly and they are easily caught. 40% of the respondents acknowledged the use of bushfires on grass cutter hunting (Table 11). However, bush fires have negative consequences on the environment as they

lead to environmental degradation and habitat destruction. The use of bush fires as a hunting technique is among the major threat to biodiversity resources.

Table 11: Type of animals hunted with bushfire in the Uluguru Mountains

Animal	Frequency	Percent
Ndezi	48	40
Do not know	72	60
Total	**120**	**100.0**

4.6 Bushfires in the Uluguru Mountains

Most respondents (84.2%) revealed the occurrence of bushfires in the Uluguru Mountains, 9.2% of the respondents reported absence of bushfires in the Uluguru Mountains, 6.7% of the respondents were not aware on absence or presence of bushfires in the mountains (Table 12).

There is a long tradition for burning, and large areas on mountain slopes and high ridges are burned annually for various purposes such as honey collection, hunting and land preparation for agricultural activities. Bushfires are set in order to drive animals towards the snares or towards the direction of the hunters for easy catching of the animals, as a result the fires turn into uncontrollable wildfires which cause a great destruction to the forest (Menegon *et al.*, 2009).

Bushfires is the biggest single threat to the Eastern Arc Mountain Forests according to the people that live around the forest. Fire can start in farmlands outside the forest and move up slopes and into the forest, but it can also be started within the forest by some forest user groups such as honey gatherers, loggers, charcoal burners, hunters and herders. Burgess *et*

al., (2007) found that fire is the problem that destroys vegetation cover in the Eastern Arc Mountains Forests.

Table 12: Frequency of occurrence of bush fires in the Uluguru Mountains

Occurrence of bushfires	Frequency	Percent
Yes	101	84.2
No	11	9.2
Do not know	8	6.7
Total	**120**	**100.0**

4.6.1 Causes of bushfires in the Uluguru mountains

The cause of bushfires was both deliberate and accidental as reported by the respondents (Table 13). Accidental sources of bushfires include cigarettes burns and cooking in the bush. Deliberate sources were due to farm clearing, just burning and hunting of wild animals.

According to Bagamsah (2005) rural inhabitants use fire to facilitate many activities associated with daily life. The most commonly cited causes of bushfires include clearing land for agriculture, to drive game for hunting, for tapping honey and charcoal production. The impacts of bushfire include destruction of the vegetation, soil degradation, nutrients losses, and contribution to greenhouse effects and global warming.

Table 13: Causes of bush fires in the Uluguru Mountains

Causes of bushfires	Frequency	Percent
Deliberate	89	74.2
Accidental	3	2.5
Both	8	6.7
Do not know	20	16.7
Total	**120**	**100.0**

4.7 Environmental Degradation Brought About by Bushmeat Hunting

Seventy six percent of respondents revealed the presence of environmental degradation brought about by bushmeat hunting, 4.2% of respondents reported absence of environmental degradation and 20.5% of respondents were not aware of the environmental degradation brought by bushmeat hunting (Table 14). Type of environmental degradation reported by respondents included decline in wild species, wild animal habitat destruction, migration of animals and soil erosion.

The major current cause of biodiversity loss in Africa is habitat loss and that is likely to remain true for the first third of the 21st century (Sala *et al.*, 2000). Some common threats to species include direct exploitation and habitat destruction and modification (IUCN, 2008; Caldecott and Miles, 2005).

Table 14: Awareness on environmental degradation brought by bushmeat hunting

Awareness on the presence of environmental degradation	Frequency	Percent
Yes	91	75.8
No	5	04.2
Do not know	24	20.0
Total	**120**	**100.0**

4.8 Wildlife Catches

Most of the respondents (82.5%) reported that the number of animal catches has decreased over the years. One of the respondents said the number of animal catches is unchanged while 16.7% were not aware whether the number of animal catches had decreased or not (Table 15). Various reasons for decrease of animal catches mentioned by the respondents are hunting pressure, bushfires, habitat change, human population increase, and agricultural activities. Aryeetey-Attoh and Obia (2009) found that forest loss and illegal hunting collectively led to decline of wild species.

Table 15: Status of wildlife catches in the Uluguru Mountains

Trend of catches	Frequency	Percent
Decreased/reduced	99	82.5
Unchanged	1	0.8
Do not know	20	16.7
Total	**120**	**100.0**

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

This Chapter provides the conclusions and recommendations based on the findings of this study. The Chapter is, for convenience and clarity of understanding, divided into two subsections, conclusions and recommendations. Recommendations offered are specific to the findings made.

5.1 Conclusions

From the results of the present study it is concluded that

- Bushmeat hunting in the villages around Uluguru Mountains was purely subsistence activity aimed at getting animal protein, income and medicine.
- Decline of wildlife is one of the rural development and food security issues in Uluguru Mountains. One of the major indications of this is that people are walking longer distances searching wild animals, also there are number of people who are not aware of the impacts related to hunting.
- Livestock keeping in the Uluguru Mountains is limited with the nature of the environment, so the alternative of getting animal protein is through bushmeat hunting.
- The most common wildlife species hunted in the study areas are grass cutter, Steenbok and wild pig.
- The most common techniques used for hunting animals are using traps, spears, dogs and bush fires. In most cases grass cutter hunting is associated with bush fires.
- Apart from hunting, burning of bushes was either deliberate for farm clearing or accidental (for example, cigarettes butt and cooking).

- Burning of bushes is associated with habitat destruction and decline of wild species including wild animals.
- Unsustainable agriculture, use of firewood and charcoal for energy as well as bushmeat hunting were the major causes of environmental degradation in the Uluguru Mountains.

5.2 Recommendations

Based on the conclusion above, the following recommendations are made:

- Promote education and awareness programs among all community members, so that they are aware of the problems, potential solutions, and the long-term benefits of bushmeat hunting.
- Incorporate topics related to bushmeat hunting and biodiversity conservation into primary school curricula, this should be area specific depending on the types of species found in each area.
- Promote the domestication of wild species like grass cutter. Since most of Luguru people prefer grass cutter, domestication of the animal should be promoted. Ghana is one of the countries where domestication of grass cutter is common, Tanzania can gain experience domesticate grass cutter from Ghana and other countries where domestication of wild animals is common.
- Provide training in animal husbandry as a way to generate income and provide alternative sources of protein. Whenever a household decides to manage livestock/poultry within their farming systems, it will reduce hunting pressure in the natural forests with a resultant positive impact on wildlife populations.
- Promote and conduct extension programs in local hunting communities with the aim of developing alternative livelihoods and/or sources of protein to reduce the dependence on wild meat.

- Promote research into the effect of hunting at both national and local levels to assist in good management.
- Enforcement of laws related to biodiversity conservations.
- To ensure that the local communities living adjacent to mountains should have a role of managing and benefiting from wildlife on their own lands.

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APPENDICES

Appendix 1: Sample size Calculation

The sample formula used:

$$n = \frac{Z^2 pq}{d^2}$$

Where n = sample size

Z = Standard normal deviate, set at 1.96 (≈ 2.0) corresponding to 95% confidence level,

p = proportion in the target population estimate; if not known use 50%.

q = 1.0 – P

d = degree of accuracy desired, set at 0 .05 or 0 .02.

Therefore sample size will be

$$n = \frac{Z^2 pq}{d^2} = \frac{(2)^2 (0.50 \times 0.50)}{(0.05)^2} = \frac{4 \times 0.25}{0.0025} = \frac{1}{0.0025}$$

= 400 respondents.

30 percent of the sample size which is equivalent with 120 respondents was used in this study due to cost implications

Appendix 2: Questionnaire

Title: The implications of bushmeat hunting on environment. The main objective of the study is to establish baseline information on hunting in communities around Uluguru Mountains

A. QUESTIONNAIRE IDENTIFICATION

A1. Date of Interview .....

Questionnaire No .....

A2. Village.....

Sub village.....Ward.....

Division.....Name of Interviewer.....

A3. Respondent's name ..... (Optional)

B. BACKGROUND INFORMATION

B1. Family house hold Characteristics

Table 1: Household size and composition

Person	Number of household member	Age	Sex	Marital status	Education	Religion	Relation to Household head
1(hh)							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Sex	Marital status	Education level	Relation to household head	Religion
1. Male	1. Single	1. No formal education	1. Head	1. RC
2. Female	2. Married	2. Adult education	2. Husband/wife	2. Muslim
	3. Divorced	Primary education	3. Son/daughter	Other
	4.Widow	4. Secondary education	4. Spouse of son/daughter	
		5. Tertiary (College or University	5. Grand child	
			6. Father/Mother	
			7. Bother/sister	
			8. Niece/Nephew	
			9. Father/mother in law	

C. LIVESTOCK

C 5. Do your household own livestock?

1. Yes
2. No

C 6. Type of livestock and number owned

Table 2

Livestock type	Number owned	Estimated price(Tshs)	Total revenue
Cattle			
Oxen			
Goat			
Sheep			
Chicken			
Ducks			
Donkey			
Pigs			
Guinea pig			
Others (Specify)			

C. HOUSEHOLD INCOME

D7. What is the houschold's major source of income?

1. Crop production
2. Livestock keeping
3. Petty trade ( )
4. Wild animal hunting
5. Others (specify)

D8. What are other sources of household income?

1. .....
2. .....

D9. House construction material used

Table 3

Wall construction	1. Concrete 2.Bricks 3.Blocks 4. Mud 5. Mud & pole	
Roof construction	1. Thatch 2. Corrugated iron sheet 3. earth	
Floor	1. Concrete 2. Earth	
Water facility	1. Piped 2. River 3. Spring 4. Well 5. Bore hole	

D. GAME HUNTING

E10. Is there any member (s) in your household/ village that do hunting?

If yes go to question E9

1.Yes

2. No. ( )

E11. Is hunting primary or secondary occupation?

1. Primary occupation
2. Secondary occupation ( )

E12 How do you hunt animals

1. Individually
2. In groups/ association ( )

E13 Why do you/ they hunt?

1. Individually

.....

2. In groups

.....

E14 If in groups what is the group size? .....

E15 Please mention type of wild animals commonly found in your area?

1. .....
2. .....
3. .....
4. .....

E16 Please mention type of wild animals used as a source of meat.

1. .....
2. .....
3. .....
4. .....
5. .....

E17. Among the listed animals in Q E14; what are the most commonly caught?

1. .....
2. .....
3. .....
4. .....

5. .....

E18. What are the reasons for hunting these wild animals

E19. Which tools do you/they use during hunting

1.....

2.....

3.....

4.....

5.....

E20. How often do you/they hunt?

1. Per week
2. Per month
3. Per year ( )

E21. For how long have you been doing hunting activities

1. 1 – 4
2. 5 – 10
3. More than 10 ( )

E22. What is the average number of animals caught per single hunt? .....

E23. Compared to the past years the catches (accessibility) of animals have

1. Increased
2. Decreased ( )
3. Remained almost the same

E24. If decreased, what are the reasons?

1.....

2.....

3.....

4.....

5.....

E25. Is there any bush fire outbreak in your area?

1. Yes

2. No. ( )

E26. If yes in question E23 above, what are the causes for that bushfire outbreak in your Area?

1. Deliberate

2. Accidental ( )

E27. Reasons for deliberate bush fires

1. .....

2. .....

3. .....

4. .....

5. .....

E28. If hunting is the one of reasons of deliberate bush fire which animals are normally being hunted by using fire?

1.....

2.....

3.....

E29. What are the sources of accidental bush fire outbreak?

1. Dropping of cigarette butts
2. Honey bee collection
3. On- farm cooking ( )
4. Others (specify)

E30. Is there any environmental degradation brought by bushmeat hunting.

1. Yes
2. No. ( )

E31. If yes in question 23 above, mention type of environmental degradation brought by bushmeat hunting.

1.....
2.....
3.....
4.....
5.....

E32. Mention strategies on sustainable bushmeat hunting.

1.....
2.....
3.....
4.....
5.....

F. GRASS CUTTER HUNTING

F33. Do you know wild animal called grass cutter?

1. Yes
2. No ( )

F 34. Do you hunt grass cutter in your area?

1. Yes

2. No ( )

F35. Why do you hunt grass cutter

1. .....

2. .....

3. .....

4. .....

5. .....

F36. What do you prefer most between grass cutter and livestock meat?

1. Grass cutter meat

2. Livestock meat ( )

F37. How do you compare grass cutter meat with other bush meat?

1. Other bushmeat are better

2. Grass cutter meat is better ( )

F38. Do you prefer domesticating of hunting grass cutter in the wild?

1. Domesticating grass cutter

2. Hunting grass cutter ( )

Appendix 3: Checklist Guide for Focus Group Discussions

- What are the types of animals commonly hunted?
- What are the methods/techniques used for bushmeat hunting?
- What are the types of environmental degradation brought by bushmeat hunting?
- What are the strategies or alternatives for sustainable bushmeat hunting?