

**LOCAL COMMUNITIES' SOCIO-ECONOMIC ACTIVITIES AND THEIR
IMPACT ON NATURAL RESOURCES IN BADINGILO NATIONAL PARK
AND ITS SURROUNDINGS, SOUTH SUDAN**

BY

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DECLARATION

DECLARATION BY THE CANDIDATE

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DEDICATION

This thesis is dedicated to my family for all their encouragement and moral support.

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ABSTRACT

This study was conducted in Badingilo National Park (BNP) and its environs in South Sudan. The aim of the study was to assess the impact of selected socio-economic activities on natural resources within and around the park. Specific research objectives included: to determine the main community and household sources of livelihood and income within and around the Park; to evaluate the impact of human activities on resources within and around the Park; to determine natural resource based conflicts within and around the Park; and lastly to establish measures implemented to resolve the resource-based conflicts experienced. The study used the survey research design. The target population consisted of local communities living within the 5 km distance from the Park boundary and staff working in the wildlife sector. Data was collected using questionnaires, semi-structured interviews, focus group discussions and key informant interviews. Simple random sampling was used to select community members, while purposive sampling was used to select key informants from the wildlife sector. In total, a sample of 287 respondents was chosen for the study. With the help of the Statistical Package for Social Sciences (SPSS), data was analyzed using both descriptive and inferential statistics. Selected variables were subjected to the Chi-square test. Results are presented using tables, graphs, photographs and maps. Study findings established that the major source of community livelihood within and around the Park is agropastoralism, while secondary economic activities include brewing, agriculture, hunting, fishing and gathering. Results also showed that the human activities significantly impacted negatively on natural resources within and around the park. The study also revealed that resource conflicts have accelerated due to competition over declining and scarce resources like water and pasture particularly on community farms. Measures of resolving conflicts include compensation for losses incurred and fencing of farms and cattle camps. The study recommends the need to have an understanding of how access, use and management of natural resources are dealt with at village level and the social structures in which they are embedded.

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LIST OF ABBREVIATIONS

AEO	African Environmental Outlook
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
CEMP	Community Environment Management Plans
CPA	Comprehensive Peace Agreement
DRC	Democratic Republic of Congo
EAAU	Environmental Economics Association of Uganda
ECAPAPA	Eastern and Central Africa Programme for Agricultural Policy Analysis
HDI	Human Development Index
IDRC	International Development Research Centre
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resource Management
MDGs	Millennium Development Goals
NGO	Non-Governmental Organization
NRM	Natural Resource Management
PFM	Participatory Forest Management
SPLA	Sudan's People Liberation Army
SSA	Sub-Saharan Africa
UNEP	United Nations Environmental Programme
WCS	Wildlife Conservation Society

DEFINITION OF OPERATIONAL TERMS

Boma: Means or is equivalent to a village.

Household: People who live or dwell under the same roof and compose a family or a social unit composed of those living together in the same dwelling

Payam: Means or is equivalent to a district.

National Park: Is a place with one or several ecosystems, not materially altered by human exploitation and occupation, where plant and animal species, geomorphological sites and habitats are of scientific, educative, and recreative interest, or contain a natural landscape of beauty.

Natural Resource: Is a material source of wealth such as timber, fresh water or mineral deposit that occurs in a natural state and has economic value and is useful to humans.

Protected areas: Are areas or places in which human occupation or exploitation of resources are limited.

Socio- economic: Examines social and economic factors to better understand how combination of both influences something.

Wildlife: Includes all non-domesticated plants, animals, and other organisms.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Africa has rich and varied biological resources forming the region's natural wealth on which its social and economic systems are based. These natural resources underpin the livelihoods of millions of people. Four hundred million Africans who constitute two-thirds of Sub – Saharan Africa's (SSA's) people, rely on products from its forests. Wild resources and non-timber forest products provide up to 35 percent of rural household incomes in Zimbabwe, and more than 50 percent in Senegal (Malloch, 2004).

In hyper-arid Mali, fish makes up 60 percent of the total animal protein consumed annually, and in Central and Western Africa, bushmeat (wild animals and birds) is a major source of animal protein, making up more than 80 percent of consumption in some areas (UNEP, 2006). Unfortunately the natural resources upon which a multitude of livelihoods are intricately linked, is under extreme pressure resulting from: habitat loss and change; overexploitation as a result of illegal hunting for food, medicinal, or commercial use and national and international trade introduction of invasive alien species and climate change. The ultimate causes of habitat loss in Africa are human population growth and the resulting demand for space, food and other resources; widespread poverty a dependence on natural resources; and economic pressures to increase exports, particularly agricultural produce, timber and mineral

products. Lack of recognition of indigenous knowledge and property rights also pose serious threats to biodiversity conservation.

Although protected areas such as Badingilo National Park play a critical role in promoting wildlife conservation in the world, they have come under threat in recent years due to increasing pressure from conflicting land uses, expansion of agriculture, encroachment, unsustainable human activities manifested through hunting, gathering, and bio-prospecting, and more recently poor management approaches, policies and laws as well as climate change. In theory, it has been argued that multiple uses of protected area resources maybe a sound ecological practice that can be highly productive per unit area of land, because different animal species are at most only partially competitive for food when supply is abundant.

The foregoing argument is relevant to the utilization of grazing resources by both wildlife and domestic livestock within and around protected areas. In sub-Saharan Africa, where the wildlife endowment is particularly unique and diverse, the Winrock International Report (1992) concluded that wildlife and domestic livestock were compatible in most countries. Lightfoot and Posselt (1977) revealed that the eland was well adapted to complement cattle in the low and middle veldt, where their preference for browse was important for the utilization and control of woody plants. Similar observations were made about East African rangelands by Skovlin (1971).

However, the expansion of cultivation and high livestock densities in protected areas have resulted in the displacement, fragmentation and reduction of wildlife populations through changes in, or the destruction of habitats, and competition for the diminishing

grazing and water resources on one hand. On the other hand, wildlife is blamed for trespass and transmission of diseases to cattle, destroying crops, breaking fences, damaging irrigation ditches and predation.

Although various categories of protected areas exist in Sudan and other parts of the world, these only cover a small percentage of the earth's surface. Thus, despite their significance as jewels of conservation, protected areas are now subjected to encroachment by arable farming and domestic livestock. Monday and Infield (1993) studied the effects of increased human and livestock activity in the Lake Mbuho National Park in Uganda. Study findings indicated that despite the existence of an originally well-balanced *Themeda-Acacia* association, overgrazing and trampling by cattle, accentuated by burning had resulted in the destruction of the original vegetation resulting in the invasion of well-drained hillsides and hilltops by *Acacia hockii* which formed dense, inaccessible thickets.

In West Africa, an increase in cultivation, coupled with the utilization of woodlands by Sahelian cattle and hunting communities has caused fragmentation of wildlife populations and an appreciable reduction in their numbers. Due to these emerging conditions, there is competition for forage resources and water, especially in the dry season. Only elephants and giraffes are not significantly affected by the competition due to their capacity to browse above a height of 1.75 m, the upper limit for cattle. Based on the foregoing observations, Bie (1991) concluded that the introduction of livestock into areas occupied by wild ungulates had serious negative effects on the composition of wildlife communities and that the cultivation of food crops was incompatible with the conservation of large ungulate populations in this region. Overstocking not only caused a decrease in forage availability, but also altered the

composition and structure of the vegetation. This in the long run leads to degradation and ultimately the unavailability of quality grass and plants for both wildlife and lives. Similar conflicts have been reported outside Africa.

In a study conducted in Pakistan by Aleem (1978), results revealed that human activities manifested through overgrazing and wood cutting caused deterioration in vegetation, increased soil erosion and habitat destruction in the Chitral Gol Game Sanctuary. The wild goat (the Markhor), a key species in this area, was particularly under threat from domestic goats and sheep which brows on plants preferred by the Markhor which leads to competition on resources and reduction in the number of the wild goat.

South Sudan has a number of protected areas including gazette or proposed parks and game reserves. The designation of these areas is aimed at providing protection and sustenance of South-Sudan's diverse flora and fauna. Despite this, current and proposed protected areas have been persistently underfunded, lack expertise and do not have proper forms of management plans (UNEP, 2006). Over the years of Sudan's civil war, wildlife conservation institutions collapsed and conservation law enforcement was largely impossible. Agricultural productivity was crippled to such an extent that many rural communities either relied on relief food or were compelled to shift from agriculture to dependence on wildlife and wild food as source of livelihood. As a result human encroachment on protected areas increased as people sought utilizes protected area resources to meet their short and long-term needs. This led to environmental degradation as well as resource depletion.

1.2 Problem Statement

Badingilo National Park with an area of 8,400 km² was established in 1986 to protect its diverse resources and ecosystems. It was managed by the Directorate of Wildlife under the Ministry of Interior, Equatoria Region under the Khartoum Government until 2005 when its management was taken over by the Government of South Sudan under the Ministry of Wildlife Conservation and Tourism. The park has diverse wildlife species which are resident. Prior to the civil war, due to low human population within and around Badingilo National Park and the use of traditional methods in utilizing wildlife resources, the impact on wild animals was not greatly felt. However, during the civil war, there was ineffective park management thereby leading to uncontrolled exploitation of wildlife resources within and around Badingilo National Park.

Though generally still sparsely populated, the major human activities causing threats to the Park include poaching, competition for grazing and water, agriculture and destruction of forests for firewood and building materials. These activities, unless controlled and regulated may result in accelerated degradation and loss of habitats thus causing reduction in wildlife population.

A review of literature revealed that besides direct unsustainable exploitation of the park's resources that has negatively impacted on the Park, other factors that may exert pressure and adversely affect it include demographic pressure and armed conflicts. The latter will lead to weapons being easily available and accessible to majority of the residents leading to poaching and en mass slaughter of wildlife. In addition, large

population movements caused by war and displacement, particularly the return of refugees to Southern Sudan, may exacerbate the problem thus accentuating the negative impacts of these activities on the park.

Additionally, the uncertainty over the future of Southern Sudan means that it is difficult to know the regulatory framework which will be applied to the park. Therefore, it is not clear whether the park will be protected from human encroachment and current associated unsustainable resource use practices, or whether it will be opened up for settlement for returning refugees. Against this backdrop, this study aimed at assessing how socio-economic activities have impacted on the natural resources of Badingilo National park and its environs, with a view of shedding more light on the current problem, and proposing measures to ameliorate the situation.

1.3 Purpose of the Study

The main aim of the study was to assess the impact of socio-economic activities on wildlife and other natural resources within and around Badingilo National Park.

1.4 Objectives of the Study

1. To identify, document and describe community livelihood activities and sources of income within and around Badingilo National Park.
2. To assess the impact of selected socio-economic activities on wildlife and other natural resources within and around the Badingilo National Park.
3. To determine natural resource based conflicts within and around the Badingilo National Park.
4. To determine the measures put in place to resolve the resource-based conflicts within and around Badingilo National Park.

1.5 Research Questions

1. What are the livelihood activities carried out in the study area?
2. What are the local community's sources of income?
3. What are the impacts of the various livelihood activities on wildlife and other natural resources in the study area?
4. What natural resource based and human conflicts exist within and around Badingilo National Park?
5. What are the impacts of natural resource –based conflicts on park's wildlife and other resources?
6. What measures have been implemented to resolve the resource and human conflicts experienced?

1.6 Justification and Significance of the Study

This research aimed at assessing the impact of socio-economic activities on wildlife and other natural resources within and around Badingilo National park, as well as the emerging resource use conflicts. The impacts of natural resource based conflicts on the residents' livelihoods are devastating, and may include loss of lives of both livestock and humans. It is prudent, therefore, that local community perception on impacts of human activities on wildlife and other natural resources as well as the causes and management of natural resource based conflicts are studied and suggestions on possible solutions to enhance conservation and communities' resilience to conflicts are documented.

The study will lay a foundation for achieving sustainable natural resource use and effective wildlife management and conservation strategies through collaboration with

the Ministry of Wildlife Conservation and Tourism, and other Conservation organizations in South Sudan. The study will provide in-depth information on major community livelihoods and income sources and identify natural resource based conflicts within and around the Badingilo National Park with a view of adopting appropriate measures that will promote sound natural resource management.

Study findings will be useful to planners, policy makers, protected area managers and conservationists who have a critical role to play in reconciling human needs with conservation and development goals within and around protected areas. The thesis will be useful to researchers, scholars and students who are interested in undertaking studies on the socio-economic dynamics of protected areas.

CHAPTER TWO

LITERATURE REVIEW

2.1 Status of Protected areas and Wildlife Populations

Protected areas are located in diverse geographical locations traversing different biomes, agro-ecological zones, and ecosystems. In some cases, they are either located or traverse areas characterized with armed struggles, ethnic conflicts or frequent warfare. Despite having diverse resources like wildlife, forests, water and pastures among others, these areas have in recent years come under threat due to increasing human populations and activities, most of which are incompatible with conservation goals and objectives. In areas where there is intense fighting, troops often hunt large mammals for food.

During the war in Sudan, wildlife in the DRC's Garamba National Park, was heavily exploited by poachers who killed park animals primarily for their meat. Patrol monitoring and maps showed that poachers moved steadily south through the park, killing large mammals-initially buffalo (*Syncerus caffer*), later elephants (*Loxodonta africana*) from 1991 onwards. More than 70% of the annual poaching incidents involved the Sudan's People Liberation Army (SPLA) on the Sudan side close to the border (Hillmans, 1997).

Wildlife population estimates for South Sudan for the year 2001, suggested that there has been a drastic decline in nearly all the animal species populations compared to the 1980 estimates. The most affected ones are the white-eared kob (*Kobus kob leucotis*) and the Mongalla gazelle (*Gazelle thomsoni albonotata*) (Marjan *et al.* 2001). Despite

this, recent surveys by the Wildlife Conservation Society have indicated that South Sudan still contains vast grasslands, the size of Kenya and Uganda combined, that harbor an incredible abundance of wildlife, including the little known white-eared kob species. The region also contains a rich diversity of classic African wildlife, not to mention hundreds of species of birds (Elkan *et al*, 2007).

Elkan *et al*, 2007, further reported an estimated 8,000 elephants, with concentrations mainly in the Sudd, the largest freshwater wetland in Africa. The report has also documented some large numbers of elephants in Boma and in Jonglei landscape region. In spite of these recent findings, it has been reported that the South Sudan elephant population, for example, which was estimated to number 133,000 in 1976 (Watson *et al*, 1977) had declined to less than 40,000 by 1992 and is likely to have been reduced further since then (Said *et al*, 1995). Overall, this information indicates that in spite of the changes that have taken place in the study area and other parts of Southern Sudan, substantial remnants of the region's wildlife still exist. For example, a herd of 400 elephants was observed by a UN pilot in the Sudd swamps west of the Nile (Spinney, 1996).

SPLA wildlife officers have apparently assisted in the survival of the elephant population of Nimule National Park, despite fierce fighting close by. Despite this, it has been argued that the protection of the small pockets of elephants which survive in many corners of Southern Sudan depend largely on the remoteness of these areas (Winter, 1997). The Savanna woodlands of Southwestern Sudan, for example, have few settlements or livestock because of heavy infestation by tsetse fly. Parts of Boma

and Badingilo National Parks and adjacent areas also remain inaccessible to people due to lack of roads and insecurity (Winter, 1997).

In the early 1980, the seasonal migrations of the enormous population of white-eared kob in the Boma ecosystem were as spectacular as those of the Serengeti wildbeest. This antelope also occurred in significant numbers in other areas to the east of the Nile, such as the Jonglei area and Badingilo Park (Hillman and Fryxell 1988;). In addition, numerous numbers of antelopes occurred between Bor and Kongor in 1991 while thousands of kobs were observed from the air in Eastern Equatoria, about 180kms northwest of Lokichokio. Large numbers of tiang (*Damaliscus korrigum*) are still observed in South Eastern Sudan (Grossman *et al*, 2008). In the early 1990s the area was largely devoid of human inhabitants and continues to provide a wet season habitat for hundreds of thousands of tiang as well as white-eared kob and Mongalla gazelles. But due to construction of roads and the movement of rebels and relief trucks, this has led to the degradation of the habitat.

2.2 Community Livelihoods and their impacts in and around wildlife areas

Many indigenous societies all over the world depend on natural resources from wildlife and other conservation areas. According to the International Union for the Conservation of Nature (IUCN, 2008), the Kalor community in Thailand have a centuries-old relationship with the Kalor community forest , which is vital to village life as a source of water for rice farming and the production of parkia fruit pods, cardamom and other year-round forest products. In order to manage the forest, the community set up a voluntary forest patrol group, and also agreed on village rules to control forest use. Although this effort is commendable, not all communities can

claim to manage their natural resources in such an efficient manner. On the contrary, many communities' use of the environment for livelihood is not sustainable, and may have adverse impacts on the environment.

The effects of community livelihoods dependence on the environment are more pronounced in marginal areas with unreliable rainfall, such as the South Sudan. Semi-desert and low rainfall savannah areas represent some 25 percent of Sudan's agricultural land, and are at considerable risk of further desertification. It is forecasted that this is likely to lead to a significant drop (approximately 20 percent) in food production. In addition, there is mounting evidence that the decline in precipitation due to regional climate change has been a significant stress factor on pastoralist societies – particularly in Darfur and Kordofan – and has contributed to conflicts currently experienced in these areas (UNEP, 2007). These circumstances generate a vicious cycle, in which people can no longer make a living from the environment using their usual methods, and so they have to increase environmental degradation through encroachment on protected areas like Badingilo Park and/or engage in conflict with neighboring communities over declining resources in order to make a living.

Agriculture is the largest economic sector in Sudan, yet it is also at the heart of some of Sudan's most serious and chronic environmental problems, including land degradation in its various forms, riverbank erosion, invasive species, pesticide mismanagement in the large irrigation schemes, and water pollution. Disorganized and poorly managed mechanized rainfed agriculture, which covers an estimated area of 6.5 million hectares, has been particularly destructive, leading to large-scale forest

clearance, loss of wildlife and wildlife habitats, and severe land degradation (UNEP, 2007). It is apparent that the harsh climatic conditions in Sudan force its population to exploit natural resources in an unsustainable manner. This results in degradation of natural resources, which affects wildlife negatively.

Another problem facing the natural resource base of Sudan is the explosive growth in livestock numbers – which increased from 28.6 million in 1961 to 134.6 million in 2004 – and resulted in widespread degradation of rangelands. Inadequate rural land tenure is an underlying cause of many environmental problems and a major obstacle to sustainable land use, as farmers have little incentive to invest in and to protect natural resources (UNEP, 2007). Therefore, farmers are likely to cultivate land unsustainably, and also engage in other unsustainable practices, such as poaching. These practices have profound impacts on protected areas and their resources, as well as conservation efforts

The foregoing negative trends demonstrate that valuable resources upon which rural populations and a large part of the urban population depend on for energy and other needs are seriously threatened. The growing use of fuel wood for brick-making in all parts of Sudan is an additional cause for concern. For instance in Darfur, brick-making not only provides a livelihood for many internally displaced persons (IDPs) living in camps, but also contributes to severe localized deforestation. But as UNEP (2007) reports, if properly managed, the forestry sector could present a significant opportunity for economic development and a sustainable north-south trade. This is because Southern Sudan has more forest resources than the North, which, if used

sustainably, can be a source of income to its residents, and this can reduce environmental degradation due to unregulated exploitation.

2.3 Human activities and their impacts in and around protected areas

Local threats to protected areas in developing countries usually arise from unsustainable exploitation through hunting/poaching, agricultural encroachment, charcoal burning, logging, and collection of forest products. Areas surrounding most parks and other protected areas have been generally portrayed as marginal for agriculture, remote from markets and employment opportunities, lack essential services, roads and infrastructure, and the people are poor with little political influence (Wells and Katrina, 1995).

The activities in which local people engage in like hunting, poaching, firewood collection, gathering and logging for timber and poles may well represent the most immediate, direct, visible threat. Often, local people like those who inhabit Badingilo Park and its environs have no choice, as environmental exploitation represents their only means of earning a living. Therefore conservation efforts should be directed towards giving local people alternative sources of income that do not deplete natural resources. An overview of some of the activities local people inhabiting or bordering protected areas engage in to earn a living and their impacts on the natural resource base, protected areas, local livelihoods and conservation efforts is given in subsequent sections.

2.3.1 Hunting

Hunting for food has been the primary source of sustenance for man since the Stone Age, and it has been specifically identified as a threat to 84 mammalian species and

subspecies in West and Central Africa (Bowen-Jones *et al.*, 2002), and 60% of the mammal species are hunted unsustainably (Fay *et al.*, 2005). Hunting patterns in northeast Gabon have changed rapidly, mainly because of the spread of hunting using guns. Lahm (1993) reported that snares were more commonly used than guns in the late 1980s.

Hunting in villages of northeast Gabon is practiced both for local consumption (60% of the catch) and income (40%) to cover basic family expenses. Cultural factors explain the temporal variation in hunting activities. Hunting is more important during the dry season than during the wet season because circumcision ceremonies are organized during the dry season. At that time of year, most hunters are young men from the cities who return to the villages for their holidays. Hunters organize themselves into groups to stay in hunting camps for 3–9 days, and hunting occurs far from the villages.

The animals that are killed during traditional festivities are either used for food or have symbolic value; for example, the skin of servaline genet (*Genetta servalina*) is used for healing or ritual purposes (Sassen and Wan, 2006). For the rest of the year, men go hunting for only 1 day and hunt enough for their own family's consumption. Occasionally, the surplus is sold to people in passing vehicles. Socioeconomic factors also explain the variability in hunting. In December, hunting is frequently practiced to earn cash for the New Year festivities. The number of active hunters varies because, when they have a good opportunity, most village-based hunters leave the village for gold camps, and occasional hunters only come to the village during the dry season.

In Sudan hunting for products such as ivory and meat has undoubtedly had a large impact on wildlife populations. Between 1989 and 1992, aid workers with the Sudan People's Liberation Army (SPLA) reported heavy slaughter of migratory white-eared kob with automatic weapons at Pibor and of Mongalla gazelles between Pibor and Bor (Spinney 1996). Besides the ubiquitous AK47, some hunting has been conducted with heavy weapons, such as tripod-mounted machineguns (Dulling 1992a). Poaching using traditional weapons was on a small scale, which allowed wildlife populations to regenerate, but the use of modern automatic weapons means that entire wildlife populations can be decimated in a short period of time. Therefore poaching identified as a major threat to natural resources in the study area as well as other parts of South Sudan.

Before the war, hunting played an important role in the livelihoods of rural communities and contributed to about 16 percent of the overall household livelihood (Marjan *et al* 2001). During this period, some communities were attracted and settled near wildlife migratory routes. Poaching of wild animals involved use of weapons ranging from traditional to modern weapons. However, traditional off-take levels had little impact on wildlife. On the contrary, the war has left abundant fire arms in the hands of communities thus increasing the magnitude of hunting (Seme, 2008). During the pre-war period, the types of animals available for hunting were known and hunting was done in specific areas. Local people currently hunt wild animals during the dry season when most of streams and ponds in the park are dry, thus forcing the animals to move to areas near the River Nile for water. Due to this, the role of hunting has over the years dramatically increased.

The most alarming change in the pattern of hunting is that animals are now being continuously chased during the entire period of migration, unlike when they were hunted in specific locations (Marjan *et al.*, 2001). Firearms are becoming the main hunting tool and most members of the family are now involved in hunting with men and boys using firearms. The game meat is dried and used for both local consumption and for sale to the nearest market centers (Marjan *et al.*, 2001). Others exchange the meat with sorghum which is intended for buying cattle, goats and sheep for marriage purposes, especially by young men who own no livestock. Unless controlled and regulated, this practice can have a devastating impact on wildlife populations (Kalpers 2001b). Larger species with slow reproductive rates are particularly vulnerable and tend to disappear.

2.3.2 Agriculture and Deforestation

In Southern Sudan, the highest densities of human population are observed along the Nile River and other water drainage areas (Elkan *et al.*, 2007). When large numbers of displaced people are temporarily resettled in an area, they often clear away vegetation to farm, and to obtain firewood and timber for building. These practices lead to deforestation and erosion. Since internally displaced people often inhabit ecologically marginal and vulnerable areas, the ability of the environment to subsequently recover may be limited (Kalsper, 2001a).

In addition, loss of forest cover also causes destruction of wildlife habitats, thus affecting fauna and flora through deforestation. Expansion of slash and burn agriculture is widely evident in several areas of the Jonglei block (Elkan *et al.*, 2007). Deforestation of Acacia woodlands is evident in many areas in the eastern section

with houses recently erected by people moving into the area. Furthermore, humanitarian organizations themselves often use excessive amounts of local wood/timber for construction (Shambaugh *et al.*, 2001). Consequently, habitat destruction has increased resulting in some plant and animal species becoming locally threatened or even extinct.

2.3.3 Livestock Grazing

Pastoralists and their herds are now well entrenched in many major parks, creating competition for water and fodder, leading to land degradation through burning and overgrazing, and facilitating poaching. Encroachment has partly destroyed the integrity of Dinder National Park, and now represents a major challenge for the developing wildlife sector in Southern Sudan (UNEP, 2006)

Badingilo Park environs are inhabited by pastoralists who seasonally range their livestock into remote areas in search of grass and water. According to the Grossman *et al.*, (2008), 14,023 cattle were estimated to be in the surveyed zone of Badingilo park surroundings. Some of the areas within the park are used by pastoralists during the dry season for water and pasture. As predators from time to time attack the livestock, the cattle keepers get rid of these predators. Erection of cattle camps in the wildlife areas leads to disease transmission and competition over grazing areas (Seme, 2008). The result has been virtual local extinction of ungulates, including the roan antelope (*Hippotragus equinus*) and the eland (*Taurotragus oryx*) (Kalpers, 2001b).

One possible solution that has not been considered is the use of river Nile by both wildlife and livestock. Since the Nile is a permanent river, and it forms the western

boundary of the National Park, livestock and wildlife can exploit the river's water and riverine grazing areas from opposite banks without interfering with each other. This would solve problems of disease transmission and competition for pasture.

2.3.4 Gathering of wild food and herbal medicine

Over-exploitation of natural resources which is sometimes linked to armed-conflicts occurs both for subsistence and commercial reasons. An immediate result of political instability is that local people often cannot grow basic crops. For their survival, they are increasingly forced to depend on wild food plants and herbs for medicine. Exploitation on a large scale may however, be unsustainable even in the short-term. When displaced people return to their homelands, they are often forced to rely heavily on natural resources until they can re-establish their normal livelihoods. These observations concur with those documented by IUCN (2008) who while quoting a director of an NGO in the war-torn forest region of the DRC asserts that:

“Displacement of people during a war causes massive destruction of the environment. Forests are invaded, trees cut for firewood, animals hunted for food and even the (NGO's) tree nursery and plantations in Kiwanja have been damaged. Our seedlings have been stolen and our materials for making fuel efficient stoves have been destroyed.” (IUCN, 2008)

The foregoing scenario confirms that aid efforts to people displaced by war should take environmental considerations into account.

2.3.5 Wars and Natural Resources

The NGO interviewed by the IUCN (2008) in the north eastern DRC as indicated in the aforementioned quote faced the challenge of trying to care for a population of displaced people, while at the same time trying to minimize their impact on the

environment. The director of the NGO summed up the complexities of the situation by saying:

“We are used to living under this pressure in our daily lives for so many years. We have to continue doing what we believe in if we are to conserve our environment for our children, because if we don’t do anything and wait until the war is over, there won’t be any more forests and animals to conserve. And that means we will be very unfortunate and unhappy, because we are very dependent on our environment.”(IUCN, 2008)

Since people living in the study area, like those in many other areas as evidenced in the quote above, are heavily dependent on natural resources, they cannot be expected to adopt sustainable practices overnight. Therefore, the current research aims at identifying methods that can be used to limit the damage caused by displaced populations on natural resources.

Armed conflicts have a number of negative effects on natural resources. For instance, they make it harder to implement environmental projects, and many wild animals are eaten by combatants, as well as displaced people. Armies build roads and clear forests, while bandits and insurgents have always found forests a good place to hide. Timber and minerals exploited in conflict areas have been used to finance military operations in Cambodia, Liberia, and the DRC (IUCN, 2008). To complicate the situation further, concentrating refugees and displaced people in rural areas puts great pressure on nearby natural resources (IUCN, 2008). Therefore the environment is usually a major, though often invisible casualty of war. Hence this study examines how war which is a critical human activity and its consequences affect natural resources, with an emphasis on Sudan, which is no stranger to the phenomena of war and displacement.

UNEP (2007) reported that the past few decades have witnessed a major assault on wildlife and their habitats throughout Sudan. In northern and central Sudan, the greatest damage has been inflicted through habitat destruction and fragmentation due to farming and deforestation. Similarly, uncontrolled and unsustainable hunting has decimated wildlife populations in the south leading to the local eradication of many of the larger species like elephants, rhinos, buffaloes, giraffes, elands and zebras. Despite this, Sudan's remaining wildlife populations including very large herds of white-eared kob and tiang antelope are internationally significant. Thus all is not lost in the battle to conserve Sudan's natural resources. This research lays emphasis on the importance of preserving natural resources, including wildlife, for future generations.

In spite of the foregoing evidence, it must not be presumed that since war degrades the environment, the absence of war is a guarantee of environmental conservation. This assertion is supported by evidence from many countries, in which the recent decline in violence has re-opened natural resource rich areas for agricultural colonization, land speculation, and unsustainable logging. Governments have resettled former combatants and displaced people in areas they consider "uninhabited". These groups have taken up illegal logging and poaching to survive. In addition, international agencies have inadvertently funded or otherwise favored activities that increase the pressure on natural resources (IUCN, 2008). Thus it would be fair to say that war is not solely responsible for natural degradation, but that war tends to accelerate natural degradation which may have been taking place even before conflicts begin.

An example of the impact of war-displaced people on the environment is provided by the Ethiopians who fled to Sudan at the height of their nation's civil war in the 1980s and early 1990s (IUCN, 2008). Refugees need natural resources to help them reconstruct their lives, albeit temporary ones, in their hosting area. Providing fuel wood, timber for housing, and access to land for agriculture can come at a large environmental cost – including erosion, forest degradation, and pollution that was seen in eastern Sudan during its occupation by Ethiopian refugees.

An actual conflict can have serious impacts on the environment, but the impact on refugee hosting areas as a result of a conflict can be much longer term, incremental and often more damaging (IUCN, 2008). Therefore research is needed to explore ways of dealing with refugees that would have the least effect on the environment. One possibility is relocating them to urban areas, although this may have the effect of transferring a problem rather than solving it.

Since the signing of the Comprehensive Peace Agreement (CPA) by parties from northern and southern Sudan ending the Sudanese civil war in 2005, The Government of Southern Sudan and its affiliate states have been granted extensive and explicit responsibility in the area of environment and natural resources management. Therefore the CPA and new Interim Constitutions have significantly changed the framework for environmental governance in Sudan and helped create the conditions for reform.

However, while conditions on paper may be good for the preservation of natural resources in Sudan, more needs to be done on implementation, to ensure that this golden opportunity to protect Sudan's natural resources does not go to waste.

Research is needed to suggest ways in which the authorities in Sudan can implement environmental conservation in order to enhance a sustainable future.

As a result of devolution of authority on natural resources, approximately fifty wildlife sites throughout Sudan covering 10 and 15 percent of the areas of the north and south respectively are listed as having some form of legal protection. In practice, however, the level of protection afforded to these areas has ranged from slight to negligible, and several measures exist only on paper today. Many of these important areas are located in regions affected by conflict and have hence suffered from a long-term absence of the rule of law. With three exceptions (Dinder, Sanganeb and Dongonab Bay National Parks), the data on wildlife and protected areas including Badingilo National Park is currently insufficient to allow for the development of adequate management plans (UNEP, 2007).

Matters of environmental conservation in the aftermath of Sudan's civil war are important because UNEP (2007) estimates that deforestation in Sudan is occurring at a rate of over 0.84 percent per annum at the national level, and 1.87 percent per annum in UNEP case study areas. This is driven principally by energy needs and agricultural clearance.

Between 1990 and 2005, the country lost 11.6 percent of its forest cover, or approximately 8,835,000 hectares. At the regional level, two-thirds of the forests in north, central and eastern Sudan disappeared between 1972 and 2001. In Darfur, a third of the forest cover was lost between 1973 and 2006. Southern Sudan is estimated

to have lost 40 percent of its forests since independence and deforestation is ongoing, particularly around major towns.

Extrapolation of deforestation rates indicate that forest cover could reduce by over 10 percent per decade. In areas under extreme pressure, UNEP estimates that total loss could occur within the next 10 years (UNEP, 2007). Hence stakeholders in the natural resource arena need to act urgently to arrest these developments. Research results will act as a springboard for those who wish to take remedial action.

It is interesting to note that, apart from war causing environmental destruction, it is also possible for environmental destruction to be the cause of war. The infamous Jonglei canal engineering megaproject on the River Nile which started in the 1970s was closely linked to the start of the north-south Sudan civil war. As it was not completed, its anticipated major impacts on the Sudd wetlands never came to pass. However, the unfinished canal bed, which does not connect to any major water bodies or watercourses, now acts only as a giant ditch and embankment hindering wildlife migrations.

Nevertheless, lessons learnt from this project should be carefully studied and applied to existing efforts in peace building between the north and south, especially as economic motivations for the project still exist, including that from international partners (UNEP, 2007). This clearly shows that the effects of environmental damage on war and vice versa are not simple, and cannot be understood as a cause and effect relationship. Hence this study will make a deeper examination of these factors.

2.4 Natural Resource-Based Conflicts in Wildlife Areas

Conflict over natural resources such as land, water, and forests is ubiquitous (Anderson *et al.*, 1996; Ayling and Kelly, 1997; Ortiz, 1999). People everywhere compete for the natural resources they need or want to ensure or enhance their livelihoods. However, the dimensions, level, and intensity of conflict vary greatly. As a consequence, conflicts over natural resources may have class dimensions, pitting those who own the resource against those who own nothing, but whose work makes the resource productive (Chevalier and Buckles, 1995). Political dimensions may dominate where the state has a keen interest in a public good such as conservation or in maintaining the political alliances it needs to remain in power.

Differences in gender, age, and ethnicity may inform the use of natural resources, bringing to the fore cultural and social dimensions of conflict. Even the identification of natural resource problems may be contested in light of different information sources, world views, and values. Although the aforementioned authors have covered a wide spectrum of causes behind natural resource based conflicts, the current study will look at them in a more comprehensive and exhaustive way, and determine whether there are any causes that have not been taken into account.

The intensity of conflicts may vary enormously, from confusion and frustration among members of a community over poorly communicated development policies to violent clashes between groups over resource ownership rights and responsibilities. Therefore, it would be incorrect to classify all natural resource based conflicts as being caused by wars yet, many such conflicts occur within local communities,

(Ayling and Kelly, 1997). However, with reduced government power in many regions, natural resource management decisions are increasingly influenced by resource users, who include small-scale farmers and indigenous peoples as well as ranchers, large-scale landowners, and private corporations in industries such as forestry, mining, hydropower, and agribusiness.

Resources may be used by some in ways that undermine the livelihoods of others. Power differences between groups can be enormous and the stakes a matter of life and death. The resulting conflicts often lead to chaotic and wasteful deployment of human capacities and the depletion of the very natural resources on which livelihoods, economies, and societies are based. Further, with such a complex array of individuals, groups, and interests, it seems almost inevitable that there will be mutually incompatible positions.

The current study emphasizes that most of the conflicts cited above can be avoided if all the parties involved can be brought under a single resource management umbrella, preferably supervised by the state, which will regulate the impact of socio-economic activities on natural resources with a view to enhancing sound wildlife and environmental management and sustainable livelihoods.

2.4.1 Causes of Natural Resource Based Conflicts

In order to gain a comprehensive understanding of conflicts over natural resources, it must be recalled that natural resources are not found in isolation. They are set in an environment or interconnected space where actions by an individual or group in one place may generate effects elsewhere. Deforestation of a regional forest, for example,

will affect the health of an entire watershed system below it, therefore disrupting the livelihoods of those relying on the watershed for irrigation and other uses. 'Protecting' a forest under a conservation program can similarly influence the way the river system functions for upstream and downstream communities (Kameri-Mbote *et al*, 2007).

Linked biophysical or ecological processes in a specific environment disperse cumulative, long-range impacts such as erosion, pollution, or loss of plant and animal habitats. The nature of the problem may not be apparent because ecological relationships are often poorly understood. Thus, although the foregoing authors do not underscore the fact that much of the inappropriate resource use is due to ignorance, there is need to educate individuals and communities on the ecological importance of their actions.

Natural resource based conflicts may be of two types: implicit and explicit. Implicit conflicts are those, in which communities are affected by a process of environmental degradation they do not recognize although they might be aware of the degradation, they are unable to associate it with the activity of specific social agents. On the other hand, explicit conflicts refer to when communities establish an immediate logical connection between environmental degradation and the activities of certain social agents (Ascerlad, 1992). From there it is only a short step to confronting the social agent that is responsible for the degradation, and in the worst case scenario, such confrontation may be violent.

There are also economic causes of natural resource based conflicts. The primary ones include the economic status of the parties in conflict, the value associated with access

to or use of the natural resource, and the monetary value associated with its products and services. As markets expand into rural and remote areas, resource-dependent communities in areas characterized by conflicts are feeling the impact of economic policies. For example, the market value for wildlife tourism services often generates new interest in the resource base.

The foregoing changes are however, not always beneficial and can cause previously harmonious practices in resource management and use to become incompatible and conflicting (Castro and Nielsen, 2003). An example of this is the handicrafts industry. Once a local community realizes that tourists are interested in traditional wood carvings, they may deplete forests to get raw materials. This brings them into conflict with other communities who may need forests for other reasons, and with authorities who may be interested in preserving forests as wildlife habitats.

Another cause of conflict over natural resources is that they are increasingly becoming scarce due to rapid changes in the environment, increasing demand and their unequal distribution. Whether it is increased human population or land tenure laws that lead to over-exploitation, ecosystems are being abused, their resources depleted and many are losing their natural ability to renew over time and provide for other species (Kameri-Mbote *et al*, 2007). A solution to these problems will require a cross-sectoral approach, which takes all the various factors into consideration. However, as the scope of this study is limited, it will only discuss how authorities can contribute to sustainable management of natural resources.

Castro and Nielsen (2003) aver that increased competition for natural resources among multiple stakeholders with diverse interests is occurring worldwide within the

contexts of globalization, democratization, decentralization and urbanization. Tensions and conflicts including disagreement over access rights and lack of consensus on management objectives are common. Also, policy and economic changes affecting natural resource management can set in motion new conflicts or cause old ones to escalate. These occurrences are likely to become more frequent in future as the world population rises inexorably. An example of this is provided by northern Uganda, which provides useful lessons on the nature of conflicts over pasture and water resources (EAAU, 2003).

In its publication, EAAU (2003) contends that scarcity of water and pasture for livestock is largely the source of 'ethnic' conflicts in many parts of Uganda. In Karamoja, pastoralism is the main activity and is practised by the Dodoth, Jie, Bokora, Matheniko and Pian. The area has abundant wildlife and large areas of land have been gazetted for wildlife conservation. Thus, the possibility of communal conflict exists side by side with the possibility of human-wildlife conflict, which makes the area a hotbed of natural resource based conflict.

A conflict could unfold as a simple war of words and then escalate to armed confrontations involving loss of life. In Karamoja, conflicts involve not only competing for pasture and water but committing atrocities such as raiding cattle, raping women, killing people, and looting and burning rivals' homesteads. There is no longer a social hierarchy and the existence of arms in the region compounds the situation. Armed young warriors have virtually usurped the authority of the elders (EAAU 2003). Therefore, there is urgent need to reconstruct a plausible political/legal

context which will help to manage the situation. The current study attempts to shed light on this based on study area's experiences.

The foregoing conflicts often exist in a vicious circle in which conflict and environmental degradation play mutually reinforcing roles. Describing the situation in Sudan, UNEP (2007) states that Sudan's long history of conflict has had a significant impact on its environment. On the other hand, environmental issues have been and continue to be contributing causes of conflicts. Competition over oil and gas reserves, Nile waters and timber, as well as land use issues related to agricultural land are important causative factors in the instigation and perpetuation of conflict in Sudan.

Confrontations over rangeland and rain-fed agricultural land in the drier parts of the country are a particularly striking manifestation of the connection between natural resource scarcity and violent conflict. In all these cases, environmental factors are intertwined with a range of other social, political and economic issues. Indeed, Sudan can be considered a tragic example of the social breakdown that can result from ecological collapse (UNEP, 2007).

The aforementioned findings are supported by Homer-Dixon and Blitt (1998) who state that natural resources are subject to increasing scarcity due to rapid environmental changes, increasing demand, and their unequal distribution. Environmental change may involve land and water degradation, overexploitation of wildlife and aquatic resources, extensive land clearing or drainage, or climate change. Increasing demands have multiple social and economic dimensions, including

population growth, changing consumption patterns, trade liberalization, rural enterprise development, and changes in technology and land use.

Natural resource scarcity may also result from the unequal distribution of resources among individuals and social groups or ambiguities in the definition of rights to common property resources. Consequently, as noted by Homer-Dixon and Blitt (1998), the effects of environmental scarcity such as “constrained agricultural output, constrained economic production, migration, social segmentation, and disrupted institutions ... can, either singly or in combination, produce or exacerbate conflict among groups.” This in turn reduces the problem of environmental degradation to a question of population control. Therefore, controlling population growth, in conjunction with other measures, should be considered in the interests of preventing resource based conflict in future.

Finally, people use natural resources in different ways. As a result, symbolic association to the physical environment is important to subsistence cultures. When the surroundings deteriorate the very stability of these societies is threatened (Homer-Dixon and Blitt 1998). This is supported by Kameri-Mbote (2006) who argues that communities are differentiated into groups: women, men, youth, elderly, marginalized, landless, and landowners among others, and that a particular community’s social setting recognizes the relationship between different individuals, groups, communities or institutions and the values they place on resource management and use.

When marginalized groups are given scant if any recognition and their interests and constraints are not considered when decisions at the community level are made, they may resort to violence to redress their grievances. Since some societies know of only one way of life, they respond to any threat to their way of life by violence. This in essence is another common reason for resource based conflict.

Chevalier and Buckles (1995) also propose the notion that natural resources are used by people in ways that are defined symbolically. Land, forests, and waterways are not just material resources people compete over, but are also part of a particular way of life (farmer, rancher, fisher, and logger), an ethnic identity, and a set of gender and age roles. These symbolic dimensions of natural resources lend themselves to ideological, social, and political struggles that have enormous practical significance for the management of natural resources and the process of conflict management.

Ideological, social, and political practices are contested in most settings, making it difficult to bring to bear on natural resource problems the diverse knowledge and perspectives of resource users. For this reason, there is need to set up a framework which can provide solutions to natural resource conflicts by considering all the ideological, social, and political factors involved. As this is beyond the scope of the current study, it will be left to other researchers in various fields to come up with the way forward.

The political context also plays a role in influencing natural resource based conflicts. It includes the political structure of government institutions and decision-making processes, information on political boundaries and the dynamics between and within

committees, departments and ministries. At the local level, political structures include both formally and informally recognized institutions. Decisions made within the political context influence rules and regulations through which natural resource management processes are institutionalized. Therefore, the political stake usually relates to decision-making power (Homer-Dixon 1999).

The decision making power over natural resources wielded by local communities varies from place to place. Some communities have considerable autonomy over the natural resources in their surrounding areas, while other areas are under the direct supervision of the central government. When the interests of local communities and central governments are mutually exclusive, natural resource based conflicts can and do occur.

As stated earlier, natural resources are embedded in a shared social space where complex and unequal relations are established among a wide range of social actors – agro-export producers, small-scale farmers, ethnic minorities, and government agencies among others. As in other fields with political dimensions, those actors with the greatest access to power are also best able to control and influence natural resource decisions in their favour (Peet and Watts, 1996). For example, absentee Jellaba landlords (merchants, government officials, and retired generals) in northern Sudan made use of their direct connections to the State Agricultural Bank to channel international credit for mechanized farming into their operations in the Nuba Mountains in southern Kordofan.

The ruling government also helped divert attention and to consolidate the Jellaba hold on the best lands in the area by inflaming historical tensions between Arab Baggara and the Nuba people (Peet and Watts, 1996). This indicates that the political context may not be in favour of sustainable and equitable natural resource use. In such a scenario, the state is nothing more than the biggest agent of environmental degradation. It is not surprising that conflict erupts in such situations, as the state uses it to meet its exploitative objectives, or local communities resort to it to defend their rights.

It is also important to acknowledge the impact of legal structures on natural resource utilization. This is because laws can be considered as part of the political context within which a community lives. The legal context includes traditional, national and international policies, laws, rules and conventions. Most countries have plural legal systems where the formal state legal system on the one hand and groups on the other set their own rules regulating social behavior whose operations are neither sanctioned by nor emanate from state law (Kameri-Mbote 2002). Nevertheless, state law is the ultimate authority and dominates other plural legal orders.

Legal pluralism may result in a good environmental practice being discarded if it is not entrenched in the official legal system. For instance, rural communities have customary practices or rules to regulate access and use rights to natural resources. Unfortunately, they seldom complement the formal legal system since customary practices tend to evolve on a need basis and there is no guarantee that they are equitable. While formal legal systems standardize processes and in principle

guarantee fair and equitable treatment, in practice they could lead to injustice because they do not recognize customary practices.

Non- recognition of customary practices in the formal legal system thus leads to contradictions between formally recognized and customary laws (Kameri-Mbote 2006). Therefore, a legally plural framework is only useful if the dominant legal system enforces the best practices of all legal systems. Otherwise there may be a conflict of laws which may eventually result in armed confrontation between the central government and groups who feel that their rights are being infringed. Ultimately, this may lead to natural based resource conflicts, sometimes with profound implications on communities, wildlife and the environment.

The advantage of a plural legal system within the context of local communities and natural resource management is that it provides an opportunity to address conflicts outside the formal legal system. Conflict management should use these 'extralegal' practices to institutionalize processes that are flexible and which provide options to adequately represent different interests of communities (Kameri-Mbote and Oduor, 2007). However, such approaches require a great deal of trust, or at least open mindedness, between the parties.

The foregoing literature has discussed natural resource based conflicts from the context of conflict between societies, communities and governments among others. This should by no means be considered as the only type of natural resource based conflict. Hence more research should be conducted on how to build trust between

local communities, who are the ‘stewards’ of natural resources, and state governments, in order to ensure that natural resource based conflicts are averted.

2.4.2 Human-Wildlife Conflicts

Human-wildlife conflict represents a second type of conflict that is common in and around protected areas like Badingilo National Park. A notable example is the conflict between wildlife and the Maasai community, which arises due to loss of crops and livestock, damage to property, and injuries and deaths of humans. The most affected sections of the community are school-going children. The major conflict-resolution strategies include sharing benefits from wildlife earnings and enacting wildlife compensation schemes (Nyamwaro *et al*, 2007). However, it is not known how long such strategies will keep such a conflict under control.

Similarly, in south-western Uganda, increased human population and expansion of agricultural land into protected areas has resulted in continued loss of crops to wild animals (Musaasizi *et al*, 2005). A large proportion of the human population depending for their survival on agriculture coupled with the presence of many species of large mammals both within and outside protected areas has led to varied conflicts between agriculture and wildlife. Such conflicts are not unique to any one country or location, and more often cause a lot of casualties to humans and wildlife. Authorities could benefit from exchanging experiences in order to come up with tangible solutions to human-wildlife conflict.

Wildlife damage amounts to millions of shillings every year in crop losses and damage to homes and property. Human–wildlife conflict also manifests as negative

feelings towards conservation resulting in decreased cooperation with protected area managers. Wildlife also has a direct social impact by tying up people's time in guarding their fields from attack. Since this role of crop guarding is usually the responsibility of children, especially young boys, this often means that they do not attend school (Musaasizi *et al*, 2005). Levels of illiteracy are consequently higher in the frontline communities and this creates a cycle of intergenerational poverty that is very hard to break. This therefore calls for concerted efforts by all in providing long lasting solutions that can reconcile human needs and conservation goals.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Area

3.1.1 Location

The study area encompassed Badingilo National Park and its environs up to a distance of five kilometers from the park boundary. Badingilo National Park which was gazetted in 1986 covers 8,400kmsq and is located between the towns of Bor in the north, Juba in the south and Lafon to the east of the White Nile (Blower.1997). The park is situated in a swamp 40km east of Mongalla which provides a dry-season refuge for mammal populations. The park is surrounded by a large area of mostly waterless plains (Figure 1).

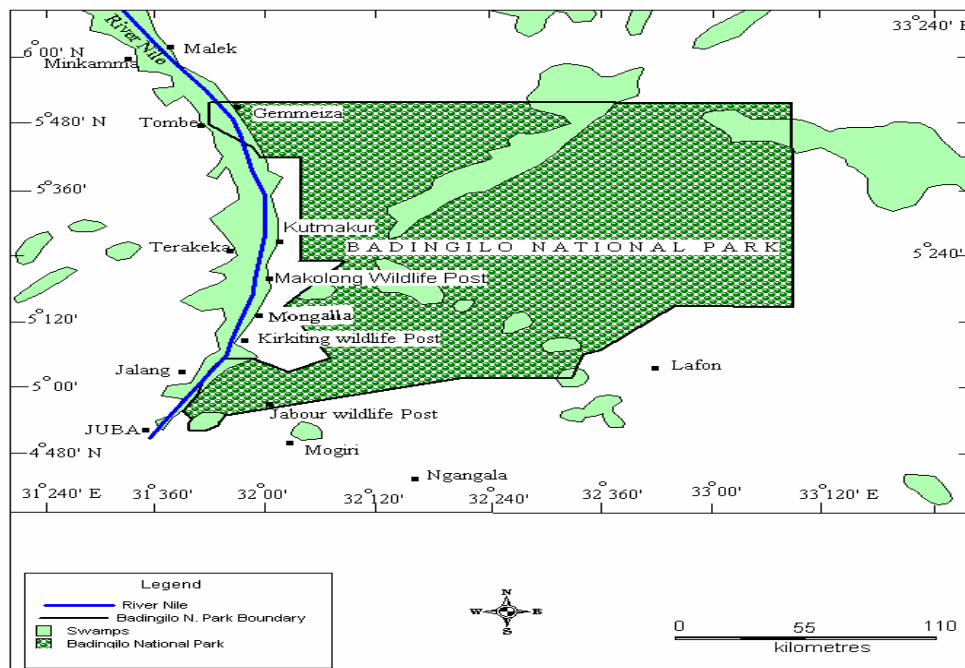


Figure 1: Map Showing the Study Area

3.1.2 Topography, geology and soils

The land, like much of Southern Sudan, is predominantly flat and marked by occasional isolated large hills. The low-lying land contains many rivers and lakes and is prone to flooding during the rainy season. The soil is predominantly clay-based, causing drainage and water retention problems, and provides a very fertile basis in support of cattle grazing. To the east, soils are sand loams while black cotton soils occur in the lowlands. The former are well drained while the latter are often water logged.

3.1.3 Climate

The area has tropical wet and dry climate and as it lies near the equator, temperatures are hot year-round. However, little rain falls between November and March, which is also the time of the year with the hottest maximum temperatures, reaching 38 °C (100 °F) in February. Between April and October up to 100 millimeters (mm) of rain falls per month. The annual total precipitation ranges from 1,000 to 1,500mm.

3.1.4 Flora

The vegetation ranges from equatorial dense forest in the mountains through wooded savannah and grassland to the west. The western side of the park is covered with woodland dominated by *Combretum sp*, *Tamarindus indica*, *Balanites aegytiaca*, *Acacia sp* and *Ficus sp*. The flat plains are covered with open grassland dominated by *Hypparrhenia sp*, *Sporobolus sp*, and *Echinochloa sp*. Areas around isolated hills of Lafon, in the flat plains, are dense thickets dominated by *Ziziphus sp*. and *Acacia sp*.

3.1.5 Fauna and avifauna

The study area was historically known as Badigeru Reserve which was famous for its

wide variety, diversity and abundance of wildlife including birds. Herbivore species reported in the area include the white-eared kob, Mongalla gazelle, Tiang, Reticulated Giraffe, Zebra, Grant's gazelle, Lesser Kudu, Beisa oryx, Warthog, Bohor reedbuck (Grossman *et al.*, 2008). Carnivores which should also be present include lion, spotted hyena, wild dog leopard and black-backed jackal. There are also a number of bird species which are resident including: ostrich, marabou stork, fox kestrel, white-crested turaco, white-bellied Go-away bird, somber nightjar, Red-throated bee-eater, and Jackson's hornbill, among others (Grossman *et al.*, 2008; Bird International, 2007).

3.1.6 Land tenure system and economic activities in the study area

Most of the lands in Southern Sudan were communally owned and customary land tenure practices are predominating in the land management system. Available literature informs that customary law has governed the use of land in South Sudan for centuries with each ethnic group applying its own laws relating to land and land rights within its own geographical settings.

The states focus their attention on developing mechanisms of exploring natural resources with special attention on agriculture and private sector development which form the back bone of the state economy. Other communities are farmers or pastoralists although the number of cattle keepers has declined to about 30% of population (WFP, 2006). Reduced ownership of livestock, which customarily denotes status, has increased armed clashes over cattle grazing and water. According to National Baseline Household Survey (2009) 58% of households depend on crop

farming or animal husbandry as their primary source of livelihood in Central Equatoria State while 86% in Eastern Equatoria State depend on such a livelihood too.

3.1.7 The People

The inhabitants of the study area include the Mundari, the Pari and the Bari tribes. The Mundari are a small Nilotic tribe whose traditional lands are located roughly 40 kilometers north of Juba. They are bordered to the north by the Bor Dinka at Pariak and to the south by the Bari of Juba at the Ku'da River. The main settlement areas in Mundari land are Terekeka, Mangalla, Gemeiza, Muni, Tombek, Tindalo, Rego, Rokon, Koweri and Ku'da. The Mundari, like other nilotic tribes rear cattle on a large scale. Cattle are a source of food, a medium or unit of exchange (currency) and a source of wealth and social status. The Mundari also cultivate sorghum and groundnuts, and fish using nets and spears.

The Bari ethnic groups in the Sudan occupy the savanna lands of the Nile Valley, and speak the Bari language. The Bari are sedentary agro-pastoralists and exploits the savanna lands along the river Nile up to 64.4 Km to the east and west of the River Nile. The Bari economy is based on subsistence mixed farming, and livestock are mainly raised to supplement other food sources, and also as a socio-economic and financial investment.

The Pari live in Southeastern Sudan east of the River Nile around Lafon Hills, a small rocky elevation that rises abruptly out of the surrounding plain and is completely covered with terraced Pari villages. Until February 1993 they used to live at the foot of the Lipul Hills (Jebel Lafon) in six large villages namely Wiatuo, Bura, Puchwa,

Kor and Augulumere. When all the villages were burned down during the war, the people scattered and now live in various settlements along the Hoss'Atondi' river to the east and the Hinyetti 'Chol' river to the west.

Pari land is composed of wooded Savannah, and annually receives 800mm of rainfall. Many places become swampy during the rainy seasons. The economy is mixed and is characterized by subsistence agriculture, animal husbandry, hunting and fishing. Although the Pari cultivate sorghum for local use, the surplus is normally sold. Other major crops grown are cowpeas, green grams, pumpkin, okra, sesame and tobacco. They also raise cattle, goats, sheep and chickens.

Domestic animals are essential as a medium; connecting human beings, as commodities and as sacrifices to their gods. During the dry season, the Pari actively engage in hunting and fishing to supplement their protein diet and as source of income. Rivers Hoss and Hinyetti provide fish of various kinds, thus the Pari make dried and smoked fish an important trade item. In addition, gathering of wild edible plants also plays an important part in food supply, in particular during starvation period.

3.2 Research Methods

3.2.1 Research design

The study utilized the survey research design. This design encompassed undertaking different surveys among different sub-groups of the local community engaged in hunting, gathering, livestock, fishing and agriculture among other activities. Both village and household surveys were conducted to enable the researcher have a view of

the conditions at the grassroots level, and also reflect on the various interrelated components of resource use and human factors which impact on natural resources and affect wildlife populations within and around Badingilo National Park. The surveys targeted individuals, key informants, members from selected households around and within the park, and the local communities in general. Distance covered from the park was up to 5 kms.

3.2.2 Target Population

The target population consisted of all the local residents living in villages and households within the 5 km distance from the park boundary, park staff, government employees in relevant ministries and departments, and personnel from conservation organizations working in the study area.

3.2.3 Sampling procedures, Sample selection and sample size

3.2.3.1 Sampling of Villages

Three Payams (Districts) namely Gemeiza, Mongalla and Lafon surrounding the park were purposively selected for the study (see Figure1). A total of seven bomas (villages) were selected, two each from Gemeiza and Mongalla, and 3 from Lafon. Each boma is composed of 10 households thus giving a total of 70 households in the 7 selected bomas.

3.2.3.2 Selection of Local Residents and Key Informants

From the 7 bomas and 70 households indicated in section 3.2.3.1 above, a sample of 212 respondents constituting the Pari, Bari and Mundari were systematically randomly selected to answer specific questions on various activities carried within or around the park. Five key informants were purposely selected and include 1 official

working in the Ministry of Wildlife Conservation and Tourism, 2 park wardens in Central Equatoria State, and 1 staff each from the Directorates of Wildlife Services and Wildlife Conservation Society, South Sudan were purposively selected thus giving a sample of 217 respondents. The later sample constituted the chiefs, community elders and some household heads. These respondents were selected due to the positions and the influence they have in their communities, and also because they were well versed in different aspects of their communities' way of life including indigenous knowledge systems and their role in wildlife and environmental exploitation and conservation. Overall, 287 respondents participated in the study

3.3 Data collection Methods

3.3.1 Primary Data

Primary data was collected using various methods among them questionnaires (Appendices I to VI), semi-structured surveys, key informant interviews. Semi-structured surveys were aimed at generating information on local perspectives on available natural resources and livelihood activities, as well as understanding the complexities of rural life and resource use at the household, village and community level.

3.3.2 Secondary Data

Secondary data was collected through review of secondary sources among them books, journals, reports and other published and unpublished works on Southern Sudan and other parts of the world.

3.4 Data Analysis and Presentation

Questionnaires were coded and data analyzed with the help of the Statistical Package for Social Sciences (SPSS 18.0). Analysis was done using descriptive statistics

(frequencies and percentages) and the Chi-square test. The later was used on some variables to test whether or not the differences were significant. Results are presented using tables and charts.

CHAPTER FOUR

RESULTS

4.1 Community Livelihood Activities and Sources of Income

The major household and community livelihood activity and source of income is agro-pastoralism 40.5% income followed by brewing (22.9 %) (Figure 2). Further, it was established that although the communities from which respondents were drawn were mainly agropastoralists, they also get little monetary benefits from sale of agricultural products since they have to depend on the little and scarce rains that fall in the study area to grow crops, and almost all the crops are grown for subsistence. Animal products which contribute to 9.5% of the household income include milk and meat. Chi-square results showed that there was a significant difference among livelihood activities, ($\chi^2 = 120.4$, $df=6$, $P=0.000$).

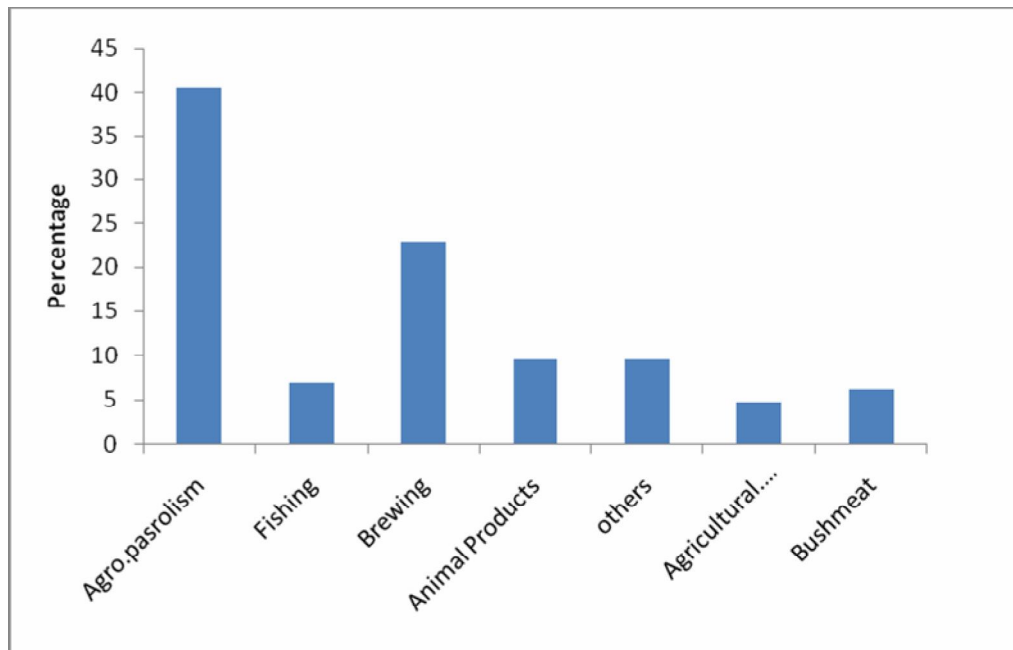


Figure 2: Livelihood activities and sources of income in the study area

4.2 Economic activities practiced in and around the Park

4.2.1 Fishing and Fishing Zones

Fishing is mainly undertaken in the zones shown in Appendix I, and majority of the respondents (64%) believed that the amount of fish caught per unit effort was similar to the amount caught before the war and was significantly different ($\chi^2 = 90.59$, $df=2$, $P=0.000$) from those who believed that the amount caught was more (18%) or less (18%) than the amount caught before the war (Figure 3).

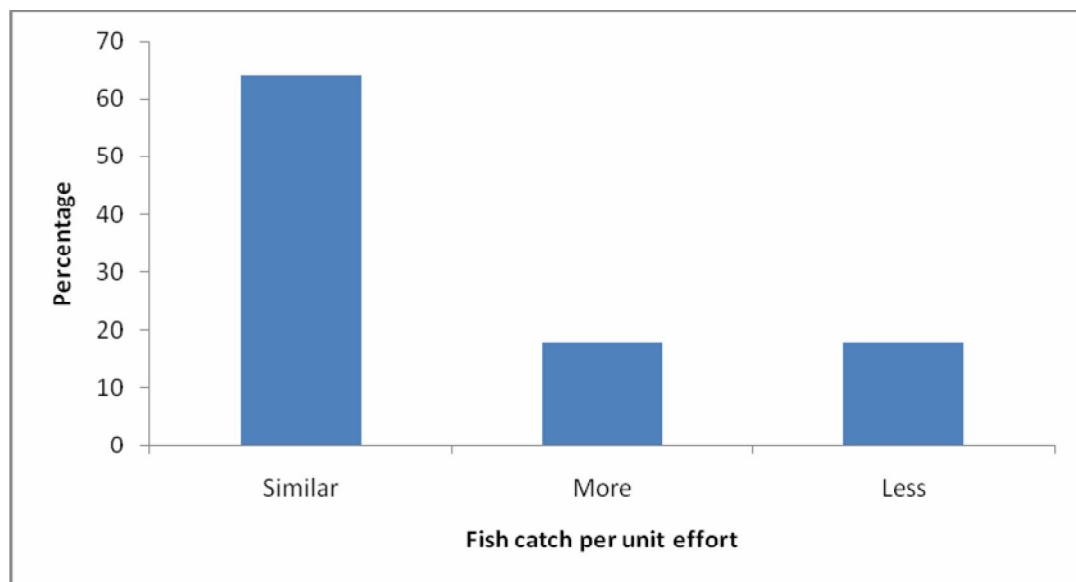


Figure 3: Fish catch per unit effort (CPUE) relative to the CPUE before the war

The proportion of respondents who fished for both money and food (58.3%) was significantly higher ($\chi^2 = 436.17$, $df= 2$, $p=0.0000$) than those who fished for food (33.3%) and money (8.4%) (Figure 4).

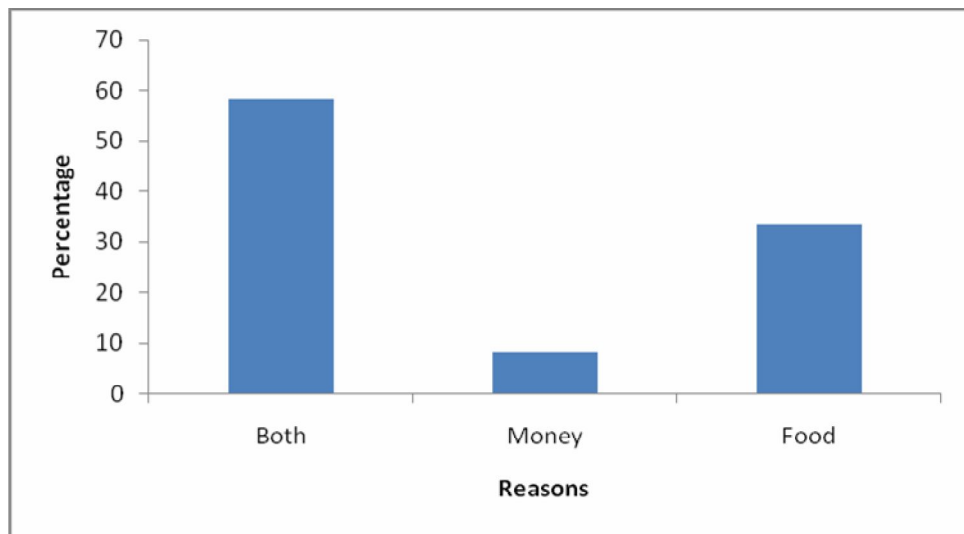


Figure 4: Reasons for Fishing in Badingilo National Park

4.2.2 Agricultural Activities Practiced

Compared to the period before, during and after the war, 50% of the respondents believed that the effort made towards farming after the war is less while 33.3% believe it is similar (Figure 5). The effort made towards farming before, during and after the war is significantly different ($\chi^2= 54.75$, $df=2$, $p=0.0000$)

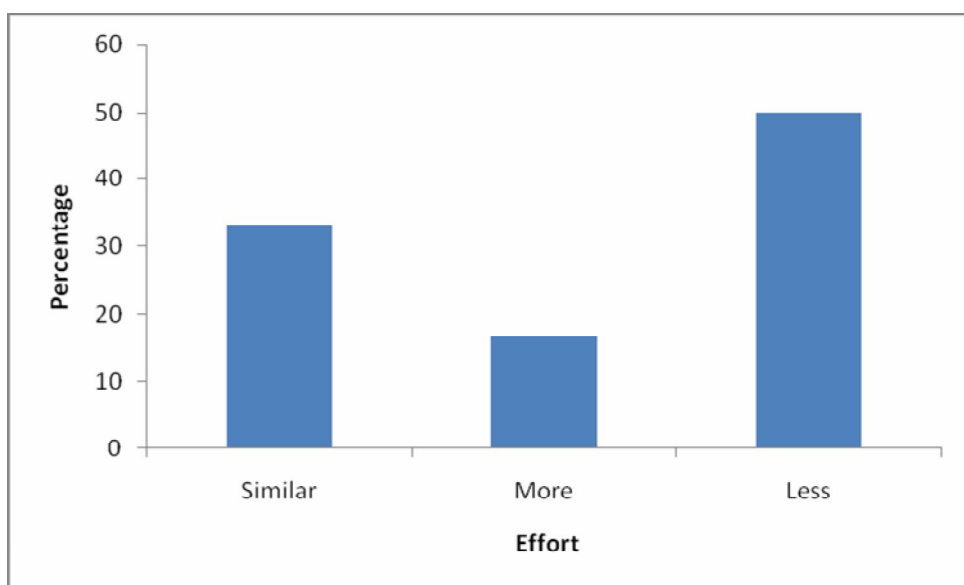


Figure 5: Effort made towards farming before, during and after the war

4.2.3 Hunting

Results revealed that the effort made by communities in hunting was the same as before the war (42.4%, Figure 6) and was significantly different ($\chi^2 = 94.09$, $df=2$, $P=0.0000$) from those who believed that the amount hunted was more or less than the amount hunted before the war.

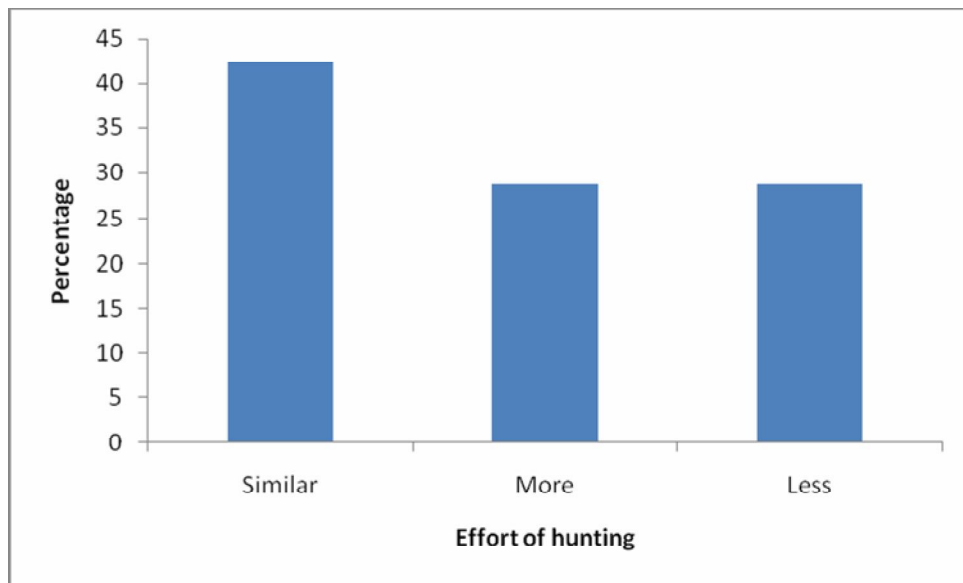


Figure 6: Effort of hunting before and after the war

Hunting was done mainly to generate money from sale of game meat (commercial) and other wildlife products from hunted game (50%), for both food and money (41.7%), and for food only (subsistence) to enable the local people vary their diet or complement it (8.3%) (Figure 7). The proportions of respondents who believed that hunting was done for either commercial, subsistence or for both purposes were significantly different ($\chi^2 = 61.13$, $df=2$, $p=0.0000$)

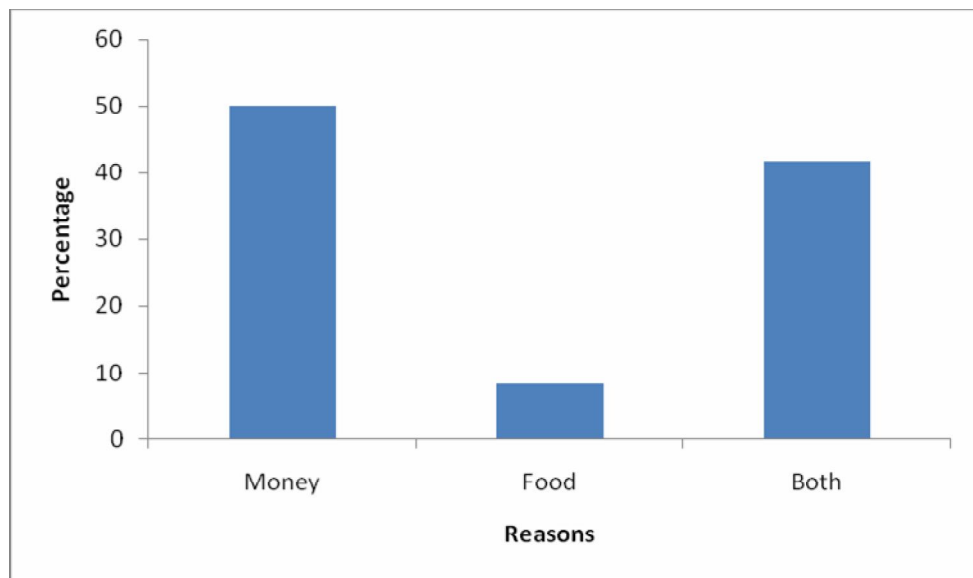


Figure 7: Reasons for hunting in the Park

4.2.4 Gathering of Wild foods and Medicinal Herbs

Results showed that fruits are the most common food type gathered by the communities (41.5%), followed by tubers (25%), while leaves and mushrooms are the least frequently gathered (Table 1). Among the four foods gathered there was a significant difference ($\chi^2= 34.77$, $df=3$, $p=0.0000$) in the type of food gathered by communities.

Table 1: Food types gathered in and around Badingilo National Park

Food type	Frequency	Percent
Fruits	88	41.5
Leaves	36	17.0
Mushrooms	35	16.5
Tubers	53	25.0
Total	212	100

Results indicated that the main resources or products traded in are bush meat (40.1%), fish (30.2%) and building materials (25%) (Table 2). There was a significant difference ($\chi^2= 54.69$, $df=3$, $p=0.0000$) between the type of natural resources traded in by the communities.

Table 2: Resources Used in Trade or Exchange in and around BNP

Resources	Frequency	Percent
Bush meat	85	40.1
Fish	64	30.2
Building materials	53	25.0
Wild fruits	10	4.7
Total	212	100

4.2.5 Livestock grazing

Results showed that livestock owned by respondents ranged in number from 0-20 (63.5%) to 61-80 (3.2%) among others (Figure 8)

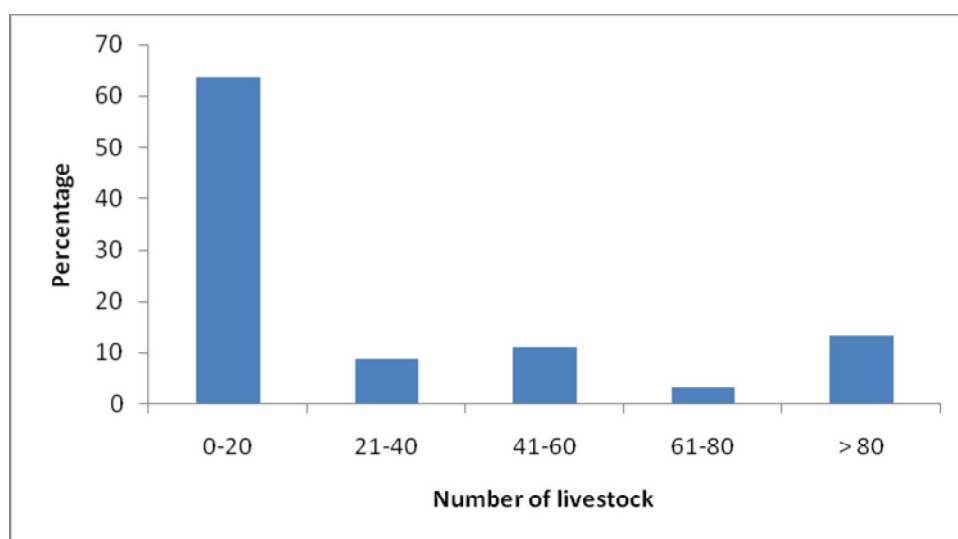


Figure 8: Number of Livestock Owned by Respondents

Results shown in Figure 9 indicate that 52.4% of respondents reported that none of their livestock had fallen victim to predators. Whereas several predators had attacked livestock, the hyena was the major culprit and recorded a significantly higher ($\chi^2=64.4$, $df=5$, $p=0.0000$) number of attacks.

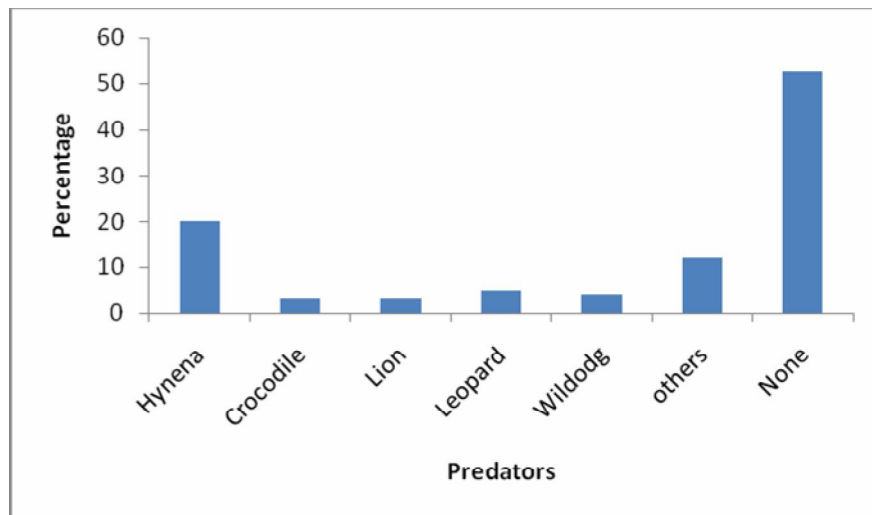


Figure 9: Major Livestock Predators

In spite of the foregoing findings, results indicated that 30.2% of the respondents had their shoats preyed on, followed by cattle (11.1%) and chicken (6.3%) (Figure 10). A significantly higher ($\chi^2=42.794$, $df=2$, $p=0.0000$) proportion of shoats are preyed on relative to cattle and chicken.

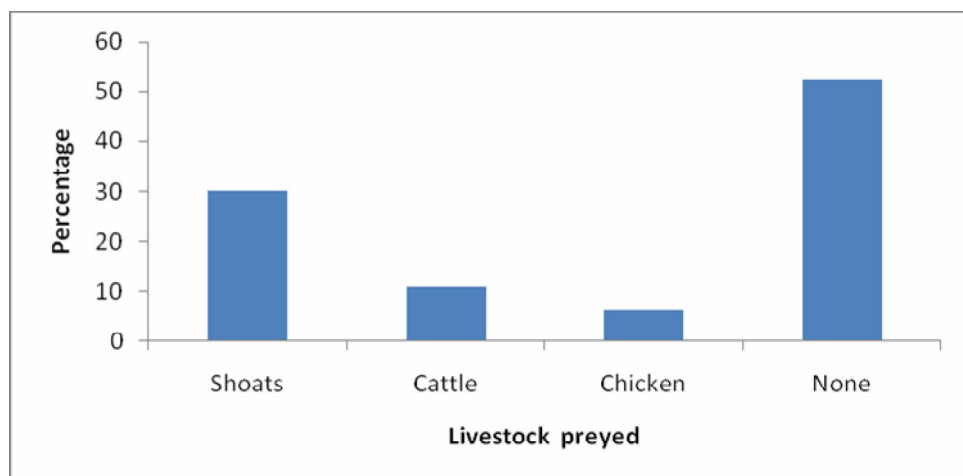


Figure 10: Major Livestock Preyed on by Predator

4.4 Human-Wildlife Conflicts

Results showed that 50% of the respondents reported facing challenges mostly with domestic animals (livestock), 30% of the respondents complained of problems and challenges posed by wild animals and 20% alluded to problems and challenges from both domestic stock and wild animals (Figure 11). The challenges posed by livestock were significantly higher ($\chi^2= 29.86$, $df=2$, $p=0.0000$) than those posed by wild animals.

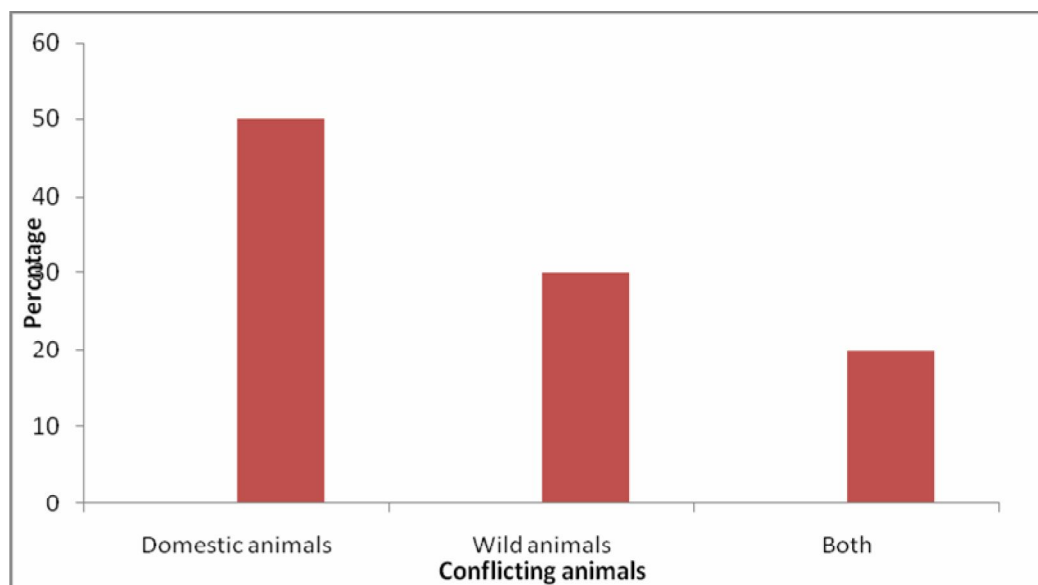


Figure 11: Challenges faced by farmers in their farms

4.5 Conflict resolution measure

Problems and challenges faced by respondents were overcome through fencing of farms (35%), compensation for crops damaged or destroyed by the owners of the stray livestock (35%) and shooting of problematic and nuisance wild animals (30%) (Figure 12) with chi-square results showing a significant difference ($\chi^2=0.95$, $df=2$, $p=0.0000$).

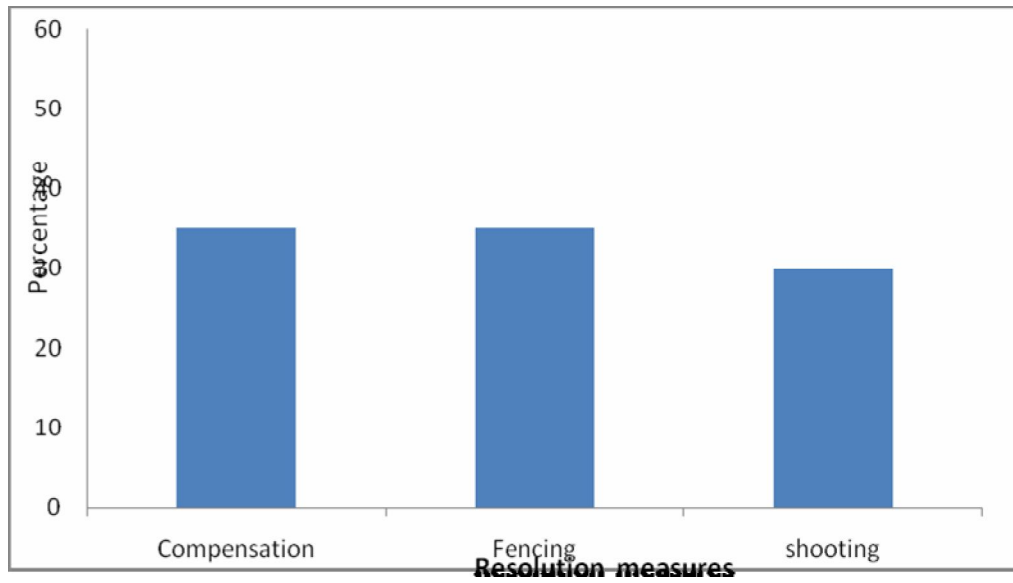


Figure 12: Measures to minimize problems and challenges faced

CHAPTER FIVE

DISCUSSION

5.1 Community livelihood activities and sources of income

Study results showed that the major livelihood activity practiced in the study area is agro-pastoralism. This shows that agriculture and pastoralism are the main livelihood activities among the three communities sampled. These findings are consistent with those of Wells and Katrina (1995) which showed that agriculture and pastoralism represent the main livelihood systems in Southern Sudan. Other secondary livelihood and income generating activities include brewing, animal product such milk, fishing, agricultural, bushmeat and others which were employed either by government or Non-governmental organizations mainly working in the local Primary Health Centers.

Due to high levels of poverty and illiteracy, brewing remained the second major source of income. Local brew is made from sorghum and is a major source of income in addition to bush meat. Bush meat was reported to be a lucrative source of income as well as a source of protein for the communities. It was either sold for cash or exchanged with sorghum. Income derived from animal products like milk was not reliable due to lack of good animal feed hence the amount of milk obtained was little. Other sources of income include salaries for employees like soldiers or civil servants.

5.2 Socio-economic activities of the local communities

5.2.1 Fishing

As documented by Elkan *et al*, 2007, the highest densities of human population were

observed along the River Nile and other water drainages. This enabled the inhabitants to engage in fishing for subsistence. Fishing is undertaken throughout the year and had no specific seasons.

The Bari and Mundari communities' fished along the Nile while the Pari got their fish from Atondi and Chol rivers, and the Wandida, Pul and Kut swamps. A lot of time and effort is spent fishing in order to obtain enough fish for both food and sale. The largest amount of fish was sold to the nearest market centers while the rest were taken to Juba and Torit. The money earned from the sale of fish was mainly used to buy clothing, and other food stuff. For respondents who did not own cattle or goats, they put more effort in fishing to enable them have more money from fish so that they can buy livestock to pay dowry.

Although a lot of effort was expended in fishing, the amount of fish caught was low due to the low rains that had fallen in the study area in the previous two years prior to undertaking of this research. Furthermore, decline in forest cover has led to the drying up of some water sources which in turn affected fish habitats, and consequently the fish catches (Appendix V).

5.2.2 Agriculture practiced

Agricultural activities undertaken by the communities were mainly for subsistence. The crops which were grown included sorghum, maize, legumes, groundnuts, sesame, tobacco and vegetables. These crops were grown by both men and women. However, compared to the time before the war, the amount of crops grown now is less since most energetic young men who could do farming have left the villages to join school,

some have been recruited as soldiers, others have left for towns to look for jobs, and some died during the war. Therefore, most agricultural work is left to old men, young boys and women. However, when the harvest is good the surplus is either sold or exchanged with other goods within the village (Appendices I, IV and VII).

5.2.3 Gathering

Gathering of wild foods and medicinal herbs was done by all the three communities. Gathering of wild foods by the communities is not done because of hunger or drought but because they are edible and are resources for exchange or sale. For the Pari community, fruits are not common in their area. Only mango trees which were grown by soldiers during the war are found around Lipul hills, but the number of trees is low. Therefore, the Pari depend totally on wild fruits such as *Balanites aegyptiaca*, and palm nuts. Bush meat and fish are their main sources of protein because they are open access resources.

Due to lack of medical health facilities, the Pari and the Mundari communities depend on medicinal herbs which are given by traditional healers. There are different types of herbs that cure different types of diseases such as malaria, jaundice, cough, rheumatism, syphilis, eye ache and diarrhea. Animal products such as oils from ostrich and python are used to cure asthma. The Bari community grows fruits such as mangos, bananas, lemons, and guavas, and therefore, depend less on wild fruits. They mainly gather *Balanites aegyptiaca* and, *Tamarindus indica*, which they believe cures diseases like malaria (see Plate 6 for wild fruits or foods gathered).

5.2.4 Hunting

Hunting plays an important role in the livelihoods of rural communities in the study area. Although hunting is mainly done during the dry season when everyone has little work and can hunt, greater effort is made to enhance this as was reported. In the past, people in the villages sampled went hunting in groups using traditional weapons, snares and traps in specific seasons. However, in recent years firearms and sophisticated weapons are used. These findings concur with the views of Marjan (2001) and Seme (2008) who contend that that firearms are currently the main tools used. It is easy to obtain a gun- because the war left abundant firearms in the hands of communities.

The most hunted species are the small and medium sized antelopes which are caught near water points where hunters' camp and lay snares and traps along migratory routes waiting for animals. This is commonly done by the Bari and Mundari who, despite being officially disarmed, a few of them still own firearms.

According to the communities living around the park, hunting is done for the purposes of getting money, food and for traditional reasons. Findings showed that communities mainly hunt to sell bush meat and other animal products for money. Hunting among the Mundari and Pari communities also plays an important role in their traditions and festivals. For the Pari, the number of animals killed indicates how brave or courageous your age-set group is, and an age-set group is named after the largest number of animals the group has killed.

During the "Nyalam" (harvest feast), the youth are sent by the elders to go and hunt

for an animal that can be offered as a sacrifice to the gods. For traditional dances, skins of leopards or cheetahs, ostrich feathers, and the zebra's tail are used. For the Mundari, the leopard is a symbol of bravery. Therefore, the leopard is hunted in order to get its skin and wear it during traditional dances and wrestling.

5.2.5 Livestock Rearing

Results further showed that, most community members kept cattle as well as sheep and goats. The animals were kept as sign of wealth and payment of dowry, used during funerals and sometimes for disposal to use the money obtained for treatment during sicknesses. Lack of good veterinary services in the area, coupled with lack of knowledge of good animal husbandry has made livestock less beneficial to the community. Therefore, in order to fill the gap, communities were involved in other secondary activities. Livestock were taken by young men and boys to the park in search of water and pasture. In the process, the pastoralists took advantage and harvested the park's resources (Appendices I, IV and VII).

The study also investigated the implications of human activities within and around the park on the population of wildlife. Findings indicated that there was a significant influence of human activities on wildlife population. The findings concur with the views of Seme (2008) that efficiency of hunting has been increased by the war that left abundant firearms in the hands of the communities. These views are supported by Marjan *et al.* (2001) that firearms are becoming the main tool and most members of the family are involved in hunting. Further, as Kalpers (2001b) notes, this practice can have a devastating impact on wildlife populations. Indeed it is apparent that the population of wildlife has started dwindling. This view is supported by Marjan (2001)

who stated that there is an alarming change in the pattern of hunting that currently sees the continuous chasing of animals during the migration period, as opposed to when they were hunted in specific locations.

Further, the clearing of vegetation to cultivate, obtain firewood and timber by resettled people has led to deforestation and erosion. As observed by Elkan *et al.* (2007), expansion of slash and burn agriculture was widely evident in several places of Jonglei block. The increase in habitat destruction has therefore, led certain animal species becoming locally threatened or extinct.

According to Winter (1997), since the 1970's deforestation may have led to increases in the frequency of drought and depletion of natural resources. This has also affected wildlife which had to migrate to other habitats. Furthermore, lack of forest cover has led to drying up of some water sources which in turn has seen the decline in wildlife numbers as well as in fishing activities.

The settlement of cattle camps in wildlife areas has also led to competition over grazing fields. This was reported by Kalpers (2001b) to result in the local extinction of ungulates, including roan antelope and the eland. Additionally, as predators face declining wild prey, they attack livestock from time to time, and the cattle keepers get rid of these predators by shooting them.

5.3 Natural resource-based and Human-Wildlife conflicts

The findings revealed that conflicts were as a result of resources such as water, land,

pasture, fish and forest. The findings agree with the views of Wells and Katrina (1995) that since agriculture and pastoralism represent the main livelihood systems, there is bound to be competition over resources (water, land and pastures). Conflict over the use of these resources has traditionally occurred between farmers and pastoralists and amongst pastoralists themselves. The establishment of cattle camps in wildlife areas can lead to competition over grazing fields. Additionally, livestock are attacked by predators from time to time. In the wet season, the livestock keepers do not move long distances from areas of settlement and farming.

The study established that the resource based conflicts include different types of conflicts that cut across a variety of boundaries (ethnic, regional and national). However, more predominant are conflicts between farmers and pastoralist and problems related to ownership and access to land. These results are supported by the findings by Winter (1997) that conflicts between sedentary and nomadic people have historically been generated by the competition over grazing areas and land use.

According to Watson *et al.*, (1977), land ownership or allocation is another factor central to conflicts. Various land use policies have led to conflicts because they do not address all groups and their needs properly. Furthermore, assigning a tribe or an ethnic group a specific homeland contradicts nomadic patterns of land use. It should be noted that the distribution of ethnic groups is not controlled by objective and fixed natural areas but by the distribution of the specific ecological niches which the group, with its particular economic and political organization is able to exploit.

Consequently, whole tribes or communities were forced to move southwards in search for water, arable land and pasture. But this large scale population movement and displacement, caused by drought, created competition over resources and initiated conflicts in areas where large influxes of people occurred.

In most cases there was illegal hunting, thereby leading to unsuitable commercial trade in wildlife meat. As observed by Iregi (2010), there is a ‘Bush meat crisis due to uncontrolled access to wildlife, rising demand, lack of economic alternatives; and absence of substitutes’. Consequently, over hunting wildlife for food and income can cause extinction, leading to impoverished communities, erosion of natural resource base and compromise the ecosystems. On the other hand, competition for pasture led to increased invasion of farms by animals such as monkeys, elephants among others. Predators have often raided livestock. This finding is consistent with the view of Seme (2008) that as predators attack the livestock from time to time, the cattle keepers enter into conflict with them.

5.4 Measures to resolve conflicts

Respondents reported overcoming the challenges and conflicts faced by either fencing their farms, or the owner of the farm was compensated. As documented by Nyamwaro *et al* (2007) the major conflict-resolution strategies adopted in human - wildlife conflict areas include sharing benefits from wildlife earnings and establishing wildlife compensation schemes Other measures include fencing to protect farms from some wild animals such as squirrels, porcupines, monkeys, bush pigs, and birds like guinea fowls, weavers, and quelea quelea, and livestock. When the wild animals, are found in the farms they are shot while birds’ nests are destroyed.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Study findings showed that agro-pastoralism is the main livelihood activity practiced in the sampled villages although other activities like brewing, fishing and hunting are also practiced.

Agricultural activities undertaken are mainly for subsistence and animals are kept for food, payment of dowry and as a sign of wealth, while brewing is a major source of income among the females.

Local people living around Badingilo Park collect/gather and consume a variety of wild foods including leaves, wild fruits, tubers and mushrooms. Traditional or herbal medicines still plays a major role in the health care systems of local communities living adjacent to Badingilo National Park.

Open access to forests, wildlife and fisheries resources, and changes in the methods of fishing and hunting have led to overfishing, overhunting and illegal logging all of which have led to serious decline of these resources. As a result, increased competition for pasture has led to increased invasion of farms by both domestic and wild mammals-and birds.

Attacks of livestock by predators have led to conflicts between cattle keepers and wild

animals. Consequently, this sometimes leads to retaliatory attacks manifested through killing of wildlife, or further conflicts especially when the loss of or competition for natural resources threatens people's livelihoods.

6.2 Recommendations

6.2.1 Policy and management recommendations

There is need for more recognition of wild animals and plants as sources of food and medicine for the local people living around BNP unless alternatives are provided.

There is need to sensitize and train the local people about sustainable utilization of the natural resources in the study area. This will empower local people and give them a sense of the value and importance of natural resources, which will in turn promote an understanding of the need to protect the park and the entire ecosystem surrounding it.

There is need to promote the participation of the local community in the conservation and management of BNP, and also encourage them to use their indigenous knowledge for conservation.

Conflict resolution and mitigation strategies should involve communities at grass root levels and also build on both indigenous approaches and novel strategies.

Increased local support is needed to mitigate natural resource-based conflicts within and around BNP where this conflict is a threat to biological diversity as well as human life and welfare, and livelihoods.

6.2.2 Recommendations for further research

- Since this research dwelt on socio-economic activities and their impact on natural resources in Badingilo National Park of Southern Sudan and in particular the Mundari, Pari and Bari communities, there is need for further research to encompass other communities and villages that were not covered.

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Appendix I: Questionnaire for the local Community

I am Lona Nalurit Darius from University of Eldoret conducting a research on “LOCAL COMMUNITIES SOCIO-ECONOMIC ACTIVITIES AND THEIR IMPACT ON NATURAL RESOURCES IN AND AROUND BANDINGILO NATIONAL PARK”. The information you provide will be treated confidential and used for academic purposes only. Kindly spare some time and answer the questions listed

I General Information

1. Village name _____
2. Payam _____
3. County _____
4. GPS location _____
5. Chief's name _____
6. When was the village established in its current location? _____
 - a. Previous location _____
 - b. Why moved to here? (Or why was it formed?) _____
 - c. How many people have been here? Less than 5 yrs? ____ Less than 10yrs (categorize 0-25%. 25-50%, 50-75%, 75-100%)
7. Is there a school in the village? Name _____
 - a. How many students (boys/girls) _____
 - b. How many teachers? _____
 - c. In what language are classes taught? _____
 - d. What is the quality of education (rated by interviewer)? Poor Fair Good Excellent
 - e. If there is not a school in the village, how close is the nearest school? _____
 - f. (i) Do girls go to school? Yes, No, Don't Know
(ii) Until what age? _____
 - g. (i) Is there a wildlife club? Yes No Don't Know
(ii) Would people be interested in one? _____
8. Are there some diseases that are common in the area? _____
 - a. How do people get treatment? _____
 - b. Do people visit traditional healers? Yes No Don't Know
 - c. How close is the nearest health care center? _____
9. How strong is the community fabric? Rate on a scale from 1-5 (5 being strong, 1 being no community relationship; filled out by interviewer)
 - a. If you left your machete outside at night, would it be stolen? _____
 - b. If your child was sick and you had no money, would someone in the village lend you money? _____
 - c. When the village borehole/school needs work, do many people help?
 - d. Do village problems get resolved easily? _____
 - e. Is there a sense of neighborhood? Explain _____
10. Outside NGOs/Churches working in the area (name, what they do/help provide, how often they come) _____

11. Community organizations/NGOs (name, what they do, how active are they) _____
12. Was there NGO activity in the past? Yes No Don't Know
13. If so, what activities were done, and how successful were they?

14. Which NGO's left? And why did they leave? _____

II Livelihoods

15. How close is the nearest market? (Name, and km) _____
 - a. What do people send to the market? _____
 - b. What do people buy from the market? _____
 - c. Where do the manufactured items in the market come from?

16. Are there any village shops? _____
17. How often is there transport from the village? _____ what type?

 - a. Is it seasonal? Yes No, Don't Know When? _____
 - b. How much does it cost to get to market? _____
 - c. How long is the trip _____
18. Is it possible to send agricultural goods to market? _____
19. Major village activity: pastoralism, agriculture, agro-pastoralism, others _____
20. Secondary livelihood activities in the village (honey harvesting, fishing, hunting, etc) _____
21. Are there any people who make crafts or goods in the village?
Yes No Don't Know What type? _____
22. What other types of livelihood activities would you envision in this village? _____

III Natural Resources Information

23. Nearest water source, type, and in village _____
24. What are the seasonal water sources? _____
25. a Do you have guardians of the pools?
b Explain their importance today

26. What types of fruit trees are grown in the village? _____
27. Land tenure—is there any control over the use of natural resources? Yes, No, Don't know By whom? _____
 - a. Are the resources communally owned? Yes, No, Don't know.
Explain _____
 - b. Are the resources accessible by anyone in the community? Yes, No, Don't know _____
 - c. Who makes the decisions on where people can farm? _____
 - d. For grazing? _____
 - e. For Non Timber Forest Products? _____
 - f. Do clans come together to discuss resource use in the area? Yes, No Don't know If No, explain how resources are divided in boundary areas _____

28. Can someone from another village come in and pay to use resources? Yes
No Don't Know
29. a What about from another region? Yes No Don't Know
b Another country? Yes No Don't Know
30. Natural resource conflicts
- a. What conflicts exist over resources? Explain. Ask to list all the words for different conflicts
 - i. Water _____
 - ii. Pasture _____
 - _____
 - iii. Space _____
 - iv. Natural resources _____
 - v. If there is limited honey, who gets it? _____
 - vi. Wild foods _____
 - vii. Specific areas _____
 - viii. Other _____
 - ix. Can women collect grass anywhere? Yes No Don't Know
Explain _____
 - x. Is there any ownership of natural resources? Explain

 - b. With whom do you have these conflicts? (For example, neighbors, other groups, young men, women, etc) _____

 - c. Are there other types of conflict within the village or between villages? Explain _____
 - d. Who makes decisions about disputes over resources? _____
 - e. Are there leaders who actually have authority? Yes No Don't Know
Explain _____
31. Are the good pockets with resources common or scarce? Explain

32. Who are the influential leaders in your area? List their names and which villages they reside in _____

IV: Household Information

Data collector

- _____ Village _____
-
32. Homestead ID _____ Household ID _____ Date _____
Number of Toukels _____ Number of Granaries _____ Total number wives
in homestead _____
33. Number of people living permanently in the household
- a. Number, age, and age-set of men _____
 - b. Number and age of women _____
 - c. Number and age of boys _____
 - d. Number and age of girls _____
34. Number and age of people who are a seasonal member of the household (i.e in cattle camps part of year) _____
- e. Where are they right now, and why do they leave? _____
 - f. (i) Do they plan to return and live here permanently?

Yes No Don't Know

(ii) Why? _____

g. (i) Do you have children outside the country? Yes No

(ii) Will they come back? Why or why not? _____

35. Name of male head of household unit _____

h. Ethnicity and clan _____

i. Education level _____

j. Primary occupation of male household (HH) _____

k. Secondary activities of male HH (may have more than one answer)

36. Name of female head of household unit _____

l. Ethnicity and clan _____

m. Education level _____

n. Primary occupation of female HH _____

o. Secondary activities of female HH (may have more than one answer)

37. Extra wives who do not live in this village (list and where they live)

38. Number of years in the village _____

Reasons for moving to village _____

Where did they come from? _____

V Household Wealth

39. How many cattle does your HH own? _____

40. How many shoats does your HH own? _____

41. How many chickens do you own? _____

42. Have you had any livestock raided last year? Yes No _____

43. a Have any been eaten by predators? Yes No _____

Major predator _____

Major victim _____

45. How many dogs does your HH have? _____

If needed, where do you sell your livestock to? _____

At what times of the year? _____

46. Wealth category (poor, average, above average, very wealthy)

VI Other Livelihood Details

47. What type of protein do you eat, and how many times per week?

Fish _____ Livestock _____ Bushmeat _____

48. What types of bushmeat? _____

49. (i) Are there any members of the household that go hunting? _____

(ii) What do they hunt? _____

50. How many sacs of sorghum do you harvest? _____

a What do you plant _____

b Are your agricultural goods for sale, exchange, or private consumption? (circle)

c Where do you sell each to? _____

51. What other sources of income do you have? _____

52. What types of livelihood activities would you like to do but cannot accomplish right now? _____

53. Notes _____

Appendix II: Questionnaire for those involved in Hunting

I am Lona Nalurit Darius from University of Eldoret conducting a research on “LOCAL COMMUNITIES SOCIO-ECONOMIC ACTIVITIES AND THEIR IMPACT ON NATURAL RESOURCES IN AND AROUND BANDINGILO NATIONAL PARK”. The information you provide will be treated confidential and used for academic purposes only. Kindly spare some time and answer the questions listed

Hunting and hunting zones **Boma** _____

1. Bushmeat
 - a. What types of animals cannot be (or are not) eaten by anyone? Why?

 - b. Are there certain animals that can be eaten by some but not others? (by women, by children, by men, by elders) Why?

- 2 Historical hunting locations
 - a. Before the war, where did people *find* wildlife? Why did they find them there? (list species and their locations) _____
 - b. What animals did they hunt? _____
 - c. Where did they go to hunt animals? Explain and map... _____
 - d. During the war, what animals did people hunt? Why?

 - e. Where did they go to hunt these animals? (Explain and map)

3. Current hunting
 - f. Today, how have those areas where people find wildlife changed? Explain and map... _____
 - g. Today, are the animals still hunted in the same place? Explain

 - h. What tools are used today, and % that they are used? Spears _____
Guns _____ Traps _____ Dogs _____ Other _____
4. Is the amount people obtain More, Less or the Same as before the war? Why?

- b) Is the effort by which people hunt More, Less or the same as before the war? _____
5. When do people hunt now? Explain seasons _____

6. Do women hunt? If so, where? If not, why not? _____

7. Where do people hunt? Map and mark areas which are used for specific hunting (dry season, all-year hunting, etc) _____
8. List the 5 spp. you hunt most _____

- What are other species that you see _____
9. For what reasons do people hunt today? Food Money Want a varied diets Other.
Explain... _____
10. On what do people spend the money they make from wildlife?

12. What happens to the meat? Is it consumed in the family, locally, or exported?

- a. If exported, where?

- b. How much do they get per animal (fresh and dried)

- c. Is that more or less than during the war? More or less than before
the war? (circle appropriate answer)
13. How have hunting methods changed from the past? _____
- c) In your opinion, what does that mean for wildlife populations?

- d) What does that change mean for people?

14. If you had an alternative livelihood, would you still hunt? Why or why not?
(Explain) _____
- _____

Appendix III: Questionnaire for those involved in Gathering

I am Lona Nalurit Darius from University of Eldoret conducting a research on "LOCAL COMMUNITIES SOCIO-ECONOMIC ACTIVITIES AND THEIR IMPACT ON NATURAL RESOURCES IN AND AROUND BANDINGILO NATIONAL PARK". The information you provide will be treated confidential and used for academic purposes only. Kindly spare some time and answer the questions listed

Notes: _____

Date: _____

Data collector: _____

Participants (where born, age & length of time in village): _____

Gathering zones

Boma

1. Wild foods (responses put in table below)

- What types of foods are gathered from the waters, savannas, mountains? Place in table below
- At what times of the year are each collected? _____
- Where _____
- What role does each play? For example, food during the hunger months, food for selling (honey, lulu), food for the entire year, food for medicines
- Are certain foods only eaten by children? Men? Women?

Food name	Food type	Habitat	Time of year	Role food plays in diet/ society	Who collects	Who eats

Food types include: fruit, tuber, leaves, roots, flowers, mushrooms, meat etc

- Are there differences between what is collected in the village, and what is collected in the cattle camps? Yes No Don't Know
Explain _____
 - Have the values of wild foods changed since before the war? Since the war? Since the end of the war? _____
- ##### 2. Building materials and daily use materials (firewood)
- What types of natural resources are gathered for constructing items around homesteads?

Natural resource	Where collected	By whom	What time of year	How often

3. Resources for exchange or selling

Natural resource	Where collected	By whom	Time of year	How often	Market	Lucrative?

c. Are resources constant across years? _____

4. Medicines

a. Are there any items/resources gathered from the wild to treat people?

Yes No Don't know

b. Where are items/resources found? _____

c. Is it difficult to find these items? _____

d. Who is able to treat others? (Healer midwife, mothers) _____

5. Besides pasture and firewood, what are the most important resources for you? _____

Appendix IV: Questionnaire for those involved in Agriculture

I am Lona Nalurit Darius from University of Eldoret conducting a research on “LOCAL COMMUNITIES SOCIO-ECONOMIC ACTIVITIES AND THEIR IMPACT ON NATURAL RESOURCES IN AND AROUND BANDINGILO NATIONAL PARK”. The information you provide will be treated confidential and used for academic purposes only. Kindly spare some time and answer the questions listed

Notes: _____

<p>Agriculture and Food Security</p> <p>1. What crops are grown? _____</p> <p>2. Who grows these crops? Men Women Both _____</p> <p>3. Do different people grow different things? Explain _____</p> <p>4. Can grain be stored? Yes No Don't Know _____</p> <p>5. Can it last a year? Yes No Don't Know _____</p> <p>6. Where are the materials for farming obtained? _____</p> <p>7. Where do you get seeds? _____</p> <p>8. a. Would you allow people to borrow/lease agricultural land for a season? Yes No Don't Know</p> <p> b. Why? _____</p> <p>9. Can people from other areas come and farm? What would they need to do? _____</p> <p>10.a. Compared to before the war, do you plant more or less? More Less Don't know</p> <p> b. Explain _____</p> <p>11. Where are the crops grown? _____ (and map) _____</p> <p>12. Why are they grown there? _____</p> <p>13. What challenges are there when growing crops? _____</p> <p> a. Conflicts with people/cattle _____</p> <p> b. How do you deal with these challenges _____</p> <p>14. Which wild animals do you have conflicts with? _____</p> <p>15. a. How do you keep them away? Chase with dogs Shoot them Scare devices</p> <p> b. Fencing Others _____</p> <p>16. Does this conflict with wildlife affect where you grow crops? _____</p> <p>17. a. In comparison to neighboring villages, how would you rate your village's food security? Worse Same Better On a scale from 1-10, (10 being very secure)</p> <p> b. What level would you rate it at? _____</p> <p>18. Has anyone in the village over the past year gone days without food? Yes No Don't Know</p> <p>19.a. Is the hunger season a problem in the village? Yes No Don't Know</p> <p> b. Why or why not? _____</p> <p>20. Is this different from uncommon Droughts? Yes, No, Don't Know Explain _____</p> <p>21. How often do droughts occur? _____</p>	<p>Date: _____</p> <p>Data collector: _____</p> <p>Participants (where born , age & length of time in village): _____</p> <p>_____</p> <p>_____</p>
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22. What strategies does the village employ to combat drought?

23. What types of food are eaten during droughts? _____

25. Are those eaten normally? _____

26. If you had the opportunity, what about farming would you like to learn?

Appendix V: Questionnaire for those involved in Fishing

I am Lona Nalurit Darius from University of Eldoret conducting a research on “LOCAL COMMUNITIES SOCIO-ECONOMIC ACTIVITIES AND THEIR IMPACT ON NATURAL RESOURCES IN AND AROUND BANDINGILO NATIONAL PARK”. The information you provide will be treated confidential and used for academic purposes only. Kindly spare some time and answer the questions listed

Notes: _____

Fishing and fishing zones

Boma _____

1. Fish
 - a. What types of fish cannot be (or are not) eaten by anyone?
 - b. Are there certain fish that can be eaten by some but not others? (by women, by children, by men, by elders) Why? _____
2. Historical fishing locations
 - a. Before the war, where did people fish? (Explain and map)_____
 - b. What species did they fish? _____
 - c. During the war, what fish did people fish? Why? _____
 - d. Where did they go to get these fish? (Explain and map) _____
3. Current Fishing
 - i. Today, how have those areas where people find fish changed? Explain and map... _____
Check for specific species areas (for example do people go to a certain place to find mudfish?)
 - ii. Today, are the fish still obtained in the same place? Explain

4. Is the amount people *catch* More, Less or the Same as before the war? Why?
 - a. Is the effort More, Less or the Same as before the war?
5. When do people fish now? Explain seasons _____
6. Do women fish? If so, where? If not, why not? _____
7. For what reasons do people fish today? Food, Money, Want a varied diet, Other Explain... _____
8. On what do people spend the money they make from fish? _____
9. What happens to the fish? Is it consumed in the family, locally, or exported?
 - a. If exported, where? _____
 - b. How much do they get per fish (fresh and dried) _____
 - c. Is that more or less than during the war? More or less than before the war? _____
10. Have fishing methods changed from the past?

How _____

 - a. In your opinion, what does that mean for fish populations? ____
 - b. What does that change mean for people? _____
11. If you had an alternative livelihood, would you still fish? Why or why not?

Appendix VI: Key informant interview guide Questions

I am Lona Nalurit Darius from University of Eldoret conducting a research on “LOCAL COMMUNITIES SOCIO-ECONOMIC ACTIVITIES AND THEIR IMPACT ON NATURAL RESOURCES IN AND AROUND BANDINGILO NATIONAL PARK”. The information you provide will be treated confidential and used for academic purposes only. Kindly spare some time and answer the questions listed

1. What are the major village activities? Tick

- a) Pastoralism _____
- b) Agro-pastoralism _____
- c) Agriculture _____

Other secondary livelihood activities in village (fishing, charcoal burning, hunting, honey gathering).

2. When do they hunt now? Explain seasons
3. Where do they hunt? (Map or name) _____

For what reasons do people hunt? Tick

- a) Food _____
- b) Money _____
- c) All the above _____

4. How have hunting methods change from the past?

5. If they have an alternative livelihood would they still hunt? Why and why not?

6. What types of food are gathered from the water, savannas?

- a) i. At what times of the year and Where? What types of natural resources are gathered for constructing items around homestead?
- ii. Are there certain things gathered to treat people, where?

7. What conflict exists over resources? Explain,

- a) Water
- b) Pasture
- c) Natural resources

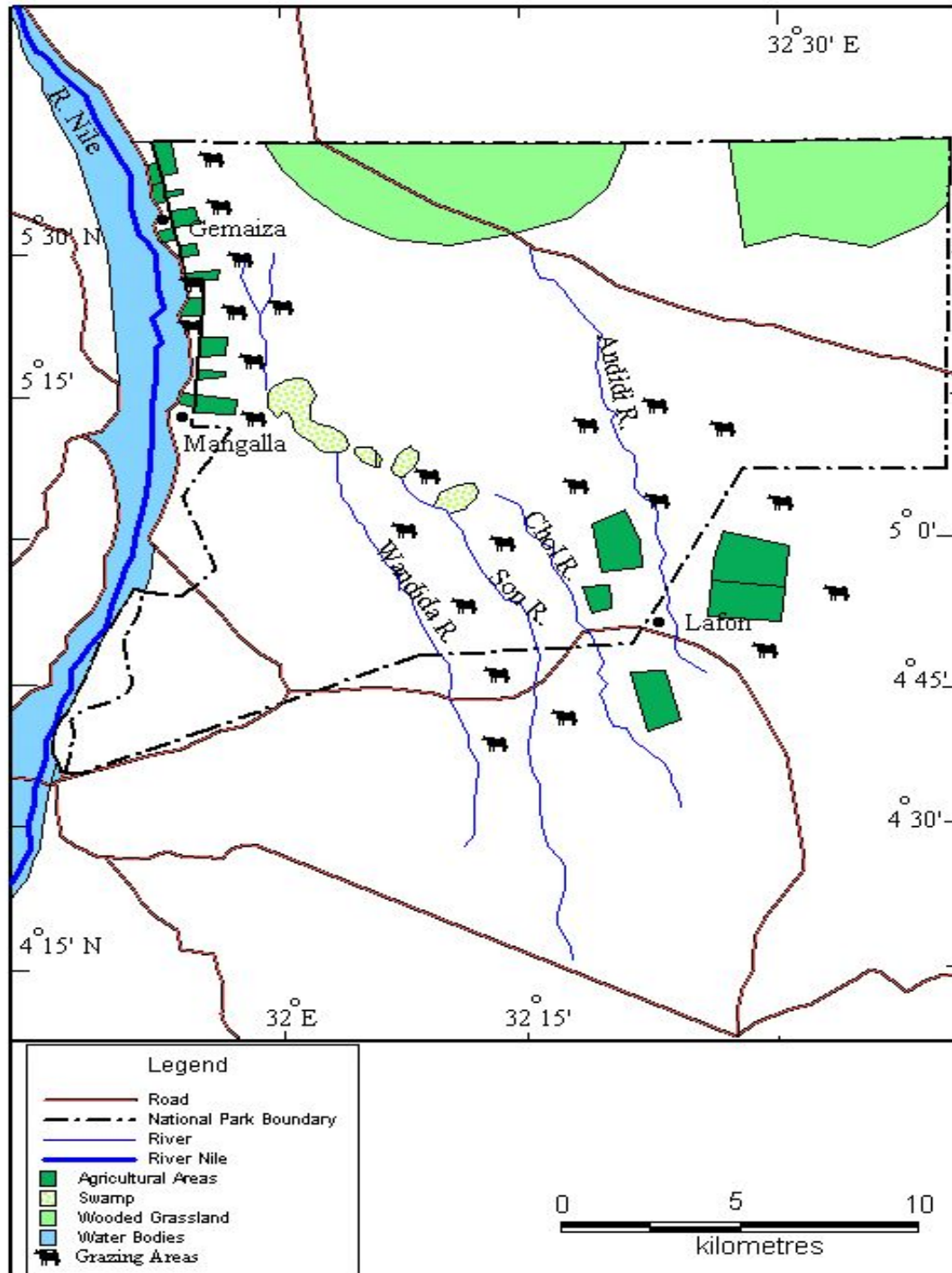
8. Is there any control over the land used for grazing?

9. Where do people go with cattle and at what time of the year?

Where do people have conflict with Wild grazers?

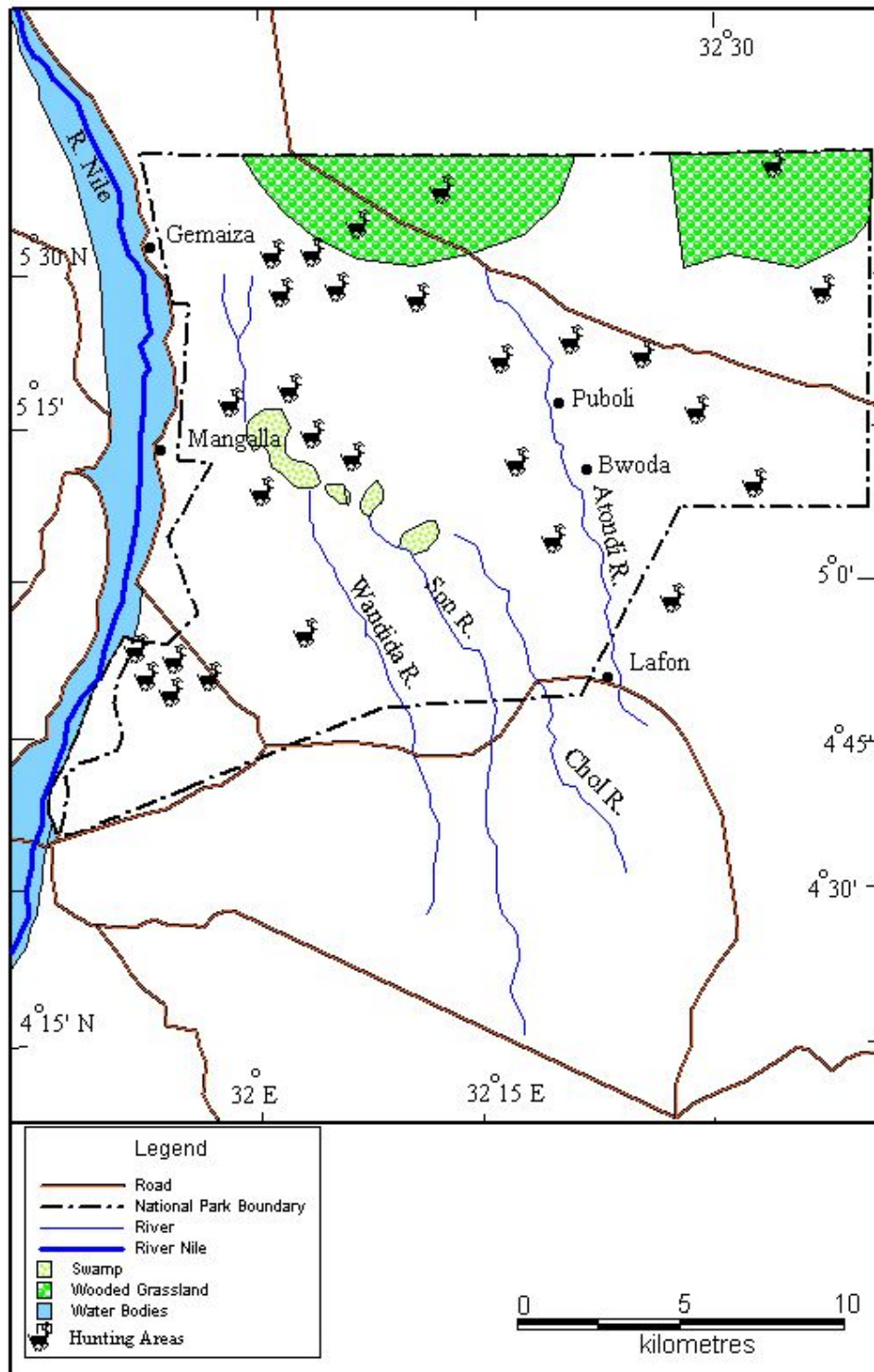
- a) Where do people have conflict with carnivores?
 - b) Do people kill carnivores?
10. a). Is there any increase or decline of wildlife population in the park for the past years?
- b). If there is, give reasons.
11. What other socio-economic activities are being practiced and what are their impacts natural resources?
12. What measures are taken to minimize the impacts?
13. Are there any cases of human wildlife conflicts?
14. Measures taken to resolve the conflicts.

Appendix VI: Map showing areas for agricultural activities and grazing for
the three communities after the war



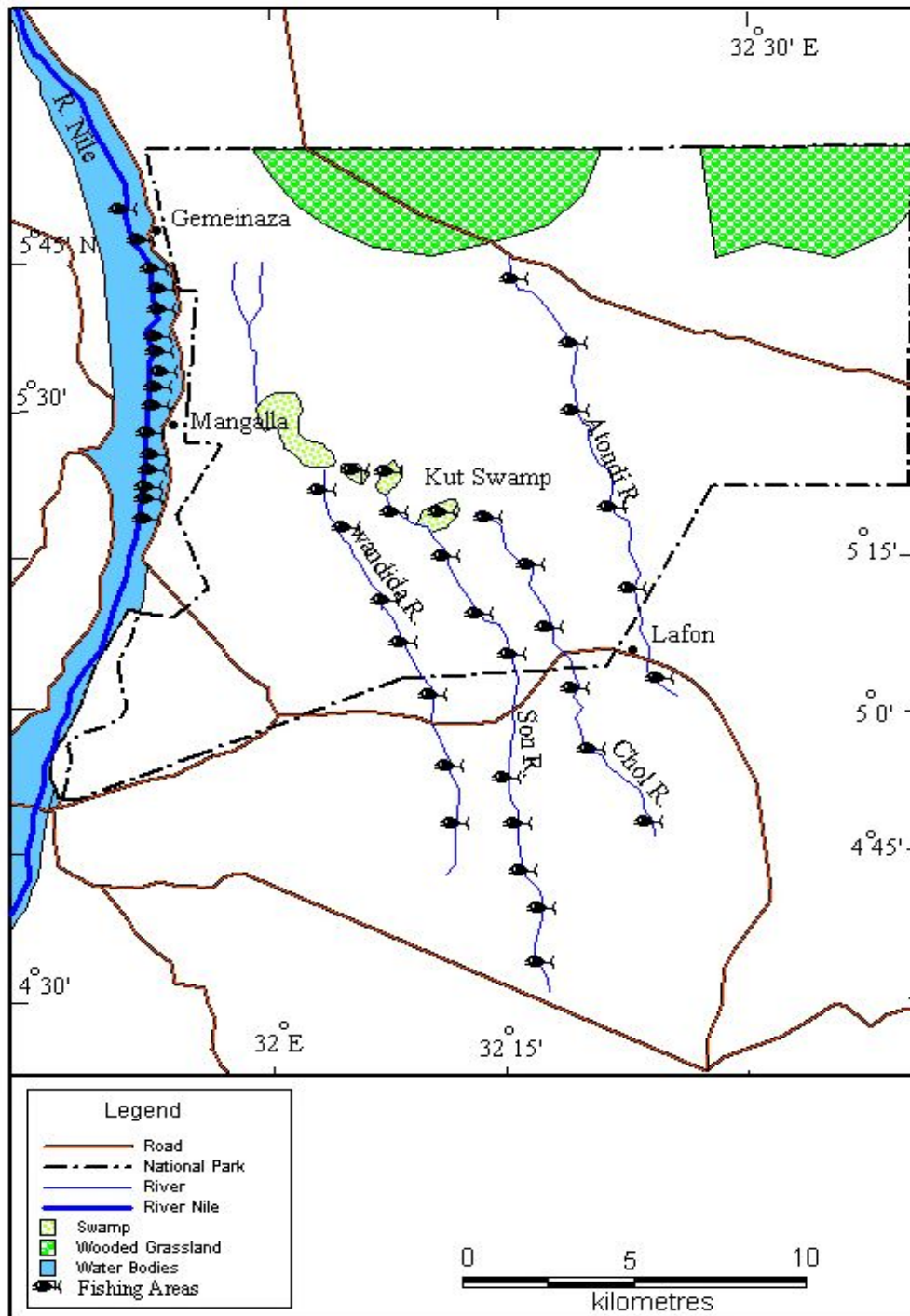
Source: UNEP, 2007

**Appendix VIII: Map showing areas of hunting for the three communities after
the war**



Source: UNEP, 2007

**Appendix IX: Map Showing the Fishing zones Used by the Three Communities
after war**



Source: UNEP, 2007



Plate 1: Tools Used for Hunting

Source: Researcher, 2011



Plate 2: Bush Meat at the Road Side for Sale at Gemeiza

Source: Researcher, 2011



Plate 3: Hunting Camp near Pora Swampy Area

Source: Researcher, 2011



Plate 4: Fenced livestock

Source: Researcher, 2011



Plate 5: Fenced agricultural piece of land

Source: Researcher, 2011



Plate 6: Gathered wild food

Source: Researcher, 2011