THE INFLUENCE OF INTERNALLY DISPLACED PERSONS' SETTLEMENTS ON THE ABUNDANCE, DIVERSITY AND CONSERVATION OF INDIGENOUS TREE RESOURCES IN THE SHEA PARKLANDS OF NORTHERN UGANDA

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DECLARATION

I**,** Adokorach Joyce, declare that this dissertation is my original work and has never been submitted for any Masters Degree award in this University or any other Institution of Higher Learning.

All the information in this dissertation is a result of my personal work unless otherwise stated.

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DEDICATION

I dedicate this book to Baba, Mr. C. Anywar and posthumous Mummy, Ms. Mary Bigabwenda Anywar and all my brothers: Henry, Clovis, Josephat and Bony-fast and sisters: Consolata and Amelia.

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TABLE OF CONTENTS

Content **Page**

LIST OF TABLES

Table **Page**

LIST OF FIGURES

LIST OF PLATES

Plate **Page**

LIST OF ACRONYMS/ ABBREVIATIONS

CBD	Convention on Biological Diversity
CBOs	Community Based Organizations
CFM	Collaborative Forest Management
COOPI	Cooperation Internationale
COVOL	Cooperative Office for Voluntary Organization
DBH	Diameter at Breast Height
DOH	Department of Health
EIA	Environment Impact Assessment
FAO	Food and Agricultural Organization of the United Nations
FGD	Focus Group Discussion
FD	Forest Department
GPS	Global Positioning System
GoU	Government of Uganda
IDPs	Internally Displaced Persons
IUCN	International Union for Conservation of Nature
ITS	Indigenous Tree Species
JFM	Joint Forest Management
LC	Local Councils
LRA	Lord's Resistance Army
MAAIF	Ministry of Agriculture Animal Industries and Fisheries
MFPED	Ministry of Finance Planning and Economic Development
MDGs	Millennium Development Goals
MWLE	Ministry of Water, Lands and Environment
NARO	National Agricultural Research Organization
NEAP	National Environment Action Plan
NEMA	National Environment Management Authority
NFA	National Forest Authority
NGOs	Non Governmental Organizations
NRA/M	National Resistance Army/Movement
NUSPA	Northern Uganda Shea Processors Association
OFDA	Office of U.S. Foreign Disaster Assistance
PEAP	Poverty Eradication Action Plan
PMA	Plan for Modernisation of Agriculture
UDIH	Uganda Districts Information Handbook
UN	United Nations
UNOCHA	UN Office for the Coordination of Humanitarian Affairs
WID	Wetlands Inspectorate Division

ABSTRACT

A study to assess the influence of Internally Displaced Persons' (IDP) settlements on the abundance, diversity and conservation of shea parkland tree resources was carried out in Lira and Pader districts, Northern Uganda, between March 2007 and February 2008. The specific objectives were to: document ethno uses of major indigenous tree species, assess on-farm traditional management and conservation strategies of shea parkland tree resources and analyze related policies and bye-laws with influence on conservation of indigenous trees in the shea parkland. Both socio-economic and tree inventory data were collected from Lira and Pader districts. One hundred eighty households were interviewed and tree inventory was conducted in 240 plots of 50 m by 40 m. Results of the study showed that over 90% of the respondents purposely used shea and other indigenous trees for firewood and construction purposes. The major traditional tree management strategies included protecting naturally regenerating individuals when opening farmlands, weeding, early burning and use of taboos/bye-laws. The willingness of the respondents to protect and plant shea on- farms was significantly influenced by marital status and duration of stay in the area ($P<0.05$). Both relative abundance and diversity of indigenous tree species generally varied with distance from the camp centre. Most existing natural resource policies in Uganda do not promote optimal implementation of improved traditional management practices in the shea parklands. For example, forest policies which do not recognize secondary-right of trees to land owners make it difficult for people in IDP camps to effectively implement traditional tree management practices. To improve planning and implementation of sustainable parklands' resources management, extended surveys and research on indigenous knowledge of useful tree species and their uses need to be carried out. Results from the surveys can then be used to plan for appropriate tree planting, reforestation and shea parklands rehabilitation in the former IDP camps. To ensure local communities' full participation in the conservation of indigenous trees, both the local and central governments need to plan and execute appropriate awareness training and extension programmes targeting shea and other useful trees in the shea parklands.

CHAPTER ONE

INTRODUCTION

1.1 Background

The majority of armed conflicts in Africa generally result in the displacement of people from their traditional lands into protected camps. According to Brown (1994), the effects of settlement camps on the environment can be felt locally, nationally, regionally and globally. This is because during conflicts, a large population of local people often becomes more dependent on natural resources in a small land area. This kind of over dependence on the natural resources often has a negative impact on the environment (Lynch, 1998). Since 1986, Northern Uganda has been under insurgency. According to the UNOCHA (2004), the Lord's Resistance Army's (LRA's) attacks and Government of Uganda's (GOU's) counter-insurgency measures resulted in the displacement of nearly 95% of the ethnic Acholi population in Gulu, Kitgum, and Pader districts and 66% of Lango population in Lira district. The internally displaced persons (IDPs) have been living in more than 200 camps without adequate food, protection, water, sanitation facilities, and health care resulting into high level of poverty and malnutrition (UNOCHA, 2004). According to OFDA (2006), the conflict continues to threaten food security, even in normally productive agricultural areas.

As reported by Lynch (1998), the intensity of environmental impacts within and around a settlement area is always determined by a combination of human and environmental factors including population size, duration of residence and dependence on natural resources. The lifestyles of the displaced persons (which include farming and keeping of domestic animals in a small area) lead to deforestation and devegetation. Because of the high population densities and increased anthropogenic activities in the displaced areas, a lot of pressure can be exerted on the natural resources (without any regard for conservation) thus leading to deterioration of natural resources (Nampindo, 2005). Although general estimates show that over 90% of the IDPs rely on the natural resources for their livelihoods, in northern Uganda, this almost approached 100% (Nampindo, 2005). It is therefore important that influence of the internal displacement of people on the distribution and conservation of highly valuable indigenous species such as shea trees be assessed and documented.

In Uganda, shea trees grow wild as perennials in the districts of Lira, Gulu, Amuru, Pader, Kitgum, Katakwi, Abim, Kotido, Soroti, Kumi, Amuria, Dokolo, Kaberamaido, Arua, Adjumani, Nebbi, Yumbe, Moyo, Koboko and Nakasongola (Okullo, 2004). These districts comprised the shea parkland. According to Bagnoud *et al.* (1968), parkland is a regular, systematic and ordered presence of trees within fields. Parkland also results from a long evolutionary process during which an association between natural elements (trees and shrubs conserved, maintained and enhanced because of their utility) and crops grow within a regularly exploited space. Parklands include fields in which different types of crops (cereals, cotton and peanut) are cultivated over several years punctuated by fallows (when active cultivation is stopped on parcels of land in order to restore soil fertility). In most cases, the length of the fallow period (3-4 to 25-30 years) is unique to each farmer, depending upon the land he/she possesses, the needs of his/her households and the way he/she manages his/her land (Kelly *et al.*, 2004).

In Africa, shea parkland and shea trees are very important natural resources acting as a source of food, fuel, medicine, construction materials and also mediation in climate regulation. Although shea trees like any other plants are renewable natural resources and are capable of regenerating themselves, currently the rate of its depletion is very high compared to the rate of regeneration (Von, 1990). When fallows are cleared for another cultivation cycle, saplings of species providing livelihoods to the indigenous peoples are preferably maintained while volunteers of other species are removed. These practices as reported by Lovett & Haq (2000) result into a landscape of random but well-spaced indigenous highly valued and economic tree species. Although these economic species are maintained and protected from bush fires while other highly valued indigenous species are restricted to margins (Etkin, 2002), the high rate of their depletion has resulted in their decline, abundance, unique spatial distribution and high degradation levels.

1.2 Statement of the Problem

The over 20 year’s persistent conflict in northern Uganda has caused suffering and damage to both the people and the environment. The conflict also forced over 1.5 million people to live in protected villages and camps (UN OCHA, 2004). In these camps, people live very miserable lives without any option other than depending on the immediate natural resources. Besides construction of the Internal Displaced People's (IDPs) camps, continued dependence on natural resources can cause great damage to the surrounding environment. In Northern Uganda, shea parkland is one of the environments where natural resources have been affected by uncontrolled human exploitation of tree resources for firewood, charcoal and construction materials.

Although the trees and non-wood vegetation in the shea parkland are the main sources for energy, building materials, medicines and craft items such as baskets, ropes and mats, they are being utilised as a common property resource. The problem with the utilization of common pool resources, however, is that no one is responsible for the state of the resources. This is because everyone wants to gain maximum benefits from the common pool of resources. Consequently, when the resources are completely degraded, everyone loses the benefits, leading to what is known as the tragedy of the commons. It was therefore important to investigate the extent of damages through use of common pool resources in the northern Uganda shea parkland. With the IDPs returning home, an assessment of the influence of IDPs settlements on the spatial distribution and conservation of important tree species in the shea parkland was thus considered paramount and timely.

1.3 Aim and Objectives

1.3.1 Aim

The aim of this study was to assess the influence of IDPs' settlement on the abundance, diversity and conservation of shea parkland tree resources in northern Uganda.

1.3.2 Specific Objectives

The specific objectives were:

i. To document ethno uses of major indigenous tree species.
ii. To assess on-farm traditional management and conservation strategies of shea and other indigenous tree resources.
iii. To examine the influence of internal displacement of people on the abundance of shea trees and diversity of indigenous tree resources in the shea parklands.

iv. To analyze related policies and bye-laws with influence on conservation of indigenous trees in the shea parkland of Northern Uganda.

1.4 Research questions

In this study attempts were made to answer the following questions:

1) What socio-economic factors have affected the existence of shea trees both on farm and fallow lands?
2) What has been the influence of displacement of people on the diversity of indigenous trees in the shea parkland?
3) What are the importance of shea and other tree resources to the local community?
4) What do local communities do to see that the shea trees and the other indigenous tree species are conserved?
5) What are the opportunities for domesticating shea trees?
6) What has been the impact of internal displacement of people on shea and other indigenous trees?
7) What government policies and local bye-laws are in place to ensure that indigenous trees are conserved in the shea parkland?
8) How can these policies and bye-laws be made effective?
9) What other policies and by-laws may be needed to conserve shea parkland tree resources visa viz internal displacement of people.

1.5 Hypotheses

The following hypotheses were tested:

Ho: There is no variation in the abundance and diversity of indigenous tree species with distance from the centre of the IDP camps in northern Uganda

Ho: Socio-demographic characteristics of the respondents do not influence their attitudes towards conservation of indigenous tree species in the shea parklands of northern Uganda.

1.6 Justification

Considering the potential and actual benefits that the utilisation and conservation of the indigenous tree species in the shea parkland can provide both to the local population and the nation, it was important to carry out a study that can provide relevant authorities with data/information for use by the local community in the conservation of valuable tree resources. Resource managers also need such kind of information to facilitate decision making and implementation of conservation strategies by the communities. This research has provided future researchers with bench mark information that can be use for designation of appropriate policy in accordance with the current post-war programme. The vital information provided in this study can also be used by both national and local government planners to create awareness among the local communities more especially on the value of shea butter tree and shea parkland's tree resources conservation.

CHAPTER TWO

LITERATURE REVIEW

2.1 Humans and plant use in the shea parkland

Ever since the dawn of human civilization, plants have served as important sources of food for humans and feeds for animals. Michael (1996), reports that there are few arenas of human endeavours in which plants do not play an important role. According to Anthony (2001), throughout the world, wild, natural or non-cultivated plants provide a 'green social security' to hundreds of millions of people. This could be in the form of low cost building materials, fuel, food supplements, herbal medicines, basketry and containers for storage, processing and preparation of food crops or as a source of income. Despite this important role, continued cutting and over- exploitation of trees may lead to desertification. For example, (in Uganda), the opening of new agricultural land to cope with increasing demand for food (as a result of population increase) has been reported to be contributing to deforestation of woodlands and shea parkland on private lands (MFPED/MAAIF, 2000).

A report by Schreckenberg (2000) indicates that local population always take advantage of many resources in the woodland-savannah mosaic and thus can impact on them through grazing activities, bushfire, agricultural practices and selected logging activities. According to Adokorach (2003), there is widespread knowledge about medicinal plants among the local population. Rejmannek & Richardson (1996) and Robbins (2004) have also reported that human alteration of plant distribution and abundance results from complex interactions of socio-cultural and biophysical systems. Henceforth, ensuring sustainable use of tree plant resources can lead to the improvement of the ecosystem's integrity of the region for the present and future generations.

Although many studies of African ecosystems have rarely included comprehensive analysis of the effects of human activities over long time-scale (Turner, 2000), studies by Fairhead & Leach (1998) and Bassett & Crummey (2003) indicate that dominant scientific discourse has long characterized African vegetation as profoundly altered by humans. In Africa, north of the equator, landscapes dominated by one particular economic species are common. According to Neuman (1998) and Boffa (1999), the parkland savanna landscapes are closely associated with indigenous farming activity which consists of cycles of alternating cultivation and bush fallows. In such a system, indigenous trees like shea butter play an important role in the life of communities. The importance of shea butter has been on the increase since 1830, when the French explorer Roger Chaillie described them during his trek across west Africa that: “the indigenous people trade with it; eat it; rub their bodies with it; burn it to make light; and they assured me that it is a very beneficial remedy against aches and pains and sores and wounds” (Poulsen, 1981). In Uganda, Cooperative Office for Voluntary Organization (COVOL) and Northern Uganda Shea Project Association (NUSPA) have been making soap from both fresh and stale shea butter (Okello, 2001).

The shea butter tree (*Vitellaria paradoxa,* sub-species *nilotica*) is a dicotyledonous plant that belongs to the family Sapotaceae. This tree grows wild, reaching a height ranging from 7-13 metres (Hall *et al.*, 1996). The leaves of shea tree have oblong shape and normally cluster at the branchlets (Masters & Puga, 1994). Flowers are small, creamlike and fragrant, appearing in dense clusters on short branchlets where the tree is almost bare. The tree has a deciduous characteristic, shedding its leaves in the dry season (Okullo *et al*., 2004). According to the tropical products Institute (1971), shea trees take 10-15 years before flowering and fruiting to reach full productivity after 25 years. In Uganda, primary harvests occur around April and May (Masters, 1992) through June to July (Okullo *et al*., 2004).

2.2 Traditional Knowledge on the management and conservation of indigenous trees

According to Barrow (1996), local people in dry lands have seldom been consulted about which tree species they consider valuable and why, yet technical interventions should be based on tree species that are locally acceptable and useful. Before planning for sustainable use and management of natural resources, resource managers and other stakeholders need to know the availability of the resources. The starting point to all this, however, is the knowledge that indigenous people already possess (Jarvis *et al.,* 2000). Such knowledge is dynamic as it changes over time with a particular ethnic group and varies among groups.In sub-Saharan Africa, nearly all decisions affecting the ecological integrity of a landscape are made at the local level, by local indigenous people.

According to de Saint Sauveur (1999), higher profitability from tree resources to the primary producers has directly led to the management decisions which promote regeneration of the species by local farmers. This is always done through protection of young shea trees when clearing land for cultivation. The management and conservation of shea resources in Uganda can be classified into identification of desired qualities, propagation, tending, protection and ownership. Improvement of the species by the protection of productive individual trees on farmland is based on locally favoured criteria such as sweetness of fruit, total harvestable yield, tree health and reduced competition with annual crops (Lovett and Haq, 2000; Maranz and Wiesman, 2003).

COVOL (2006) reports that the local communities in eastern and northern Uganda (living in the shea parkland) cannot identify a good shea tree before it starts fruiting. Nevertheless, some farmers claim that good seedlings usually have large light green leaves with good vigour while others identified good shea trees on the basis of fruit yield (COVOL, 2006). According to Katende *et al.* (1995), application of different management techniques allows tree growers to maximise the production from trees. He indicated that some management strategies may also be applied in order to reduce negative side effects and that the most common management practices include coppicing, lopping and pollarding.

2.2.1 Coppicing

This is a management practice whereby trees are cut at about knee-height from the ground. Coppicing should be carried out towards the end of dry season or just at the beginning of a rainy season (Oluka *et al.*, 2000) so that the coppiced plants have the opportunity to sprout and grow well. Although this is not a common practice with farmers, during land clearing, the trees are coppiced to allow advantages of rotational cropping (Alexander, 1998).

2.2.2 Stem and Root pruning

According to Timmer *et al.* (1996) there are traditional forestry techniques for management of the shea tree though they are currently not being employed by most rural farmers. The inventories of methods indicate clearly that pruning is the most practiced traditional technique for management of the shea trees. This aims at improving shea nut production by up to 34% (Hall, 1996). In situation where trees which form extensive branches are grown together with annual crops, these trees can easily shade the companion crops and reduce crop yields. Removing the side branches is then necessary to maintain good crop yields. The branches are cut from the base of the trees to about 2/3 of the height of the trees (Oluka *et al.*, 2000).

Even then, the roots of trees grown together with food crops should be pruned when the trees have grown to heights of 2 to 5 metres from the trunks. Pruning also reduces the severity of certain parasites like *Tapinanthus* sp. which can affect up to 95% of trees in some areas (Boussim *et al*, 1993). In general, root pruning is done on larger trees whose roots can compete with crops for water and nutrients. Boffa (1995) in his study of shea trees in Burkina Faso found tha; out of about 2000 shea trees, 56% of them had signs of pruning of one or more branches up to 15 cm in diameter which had been done with obvious care to reduce the impact on crops.

2.2.3 Pollarding

In some situations, it may only be necessary to remove the whole top (crown) of the trees and the top branches to reduce competition between the tree and the companion crop. This is what is known as pollarding. The top of the trees are cut at about 3m from the base of the tree (Oluka *et al.,* 2000). Example of trees on which pollarding commonly occurs include *Mangnifera indica* and *Persea americana*. The leaves from the pollarded trees can then be used as mulch or fodder and the branches as fuel wood.

2.2.4 Thinning

Thinning is a process whereby some of the trees are cut-down with the objective of reducing the number of trees in a plot. Thinning is especially recommended where a commercial woodlot is grown (Oluka *et al.,* 2000). The starting plant population is deliberately higher than the expected final plant population, depending on the desired final products.

2.2.5 Tending

The practice of protecting and managing indigenous tree resources is an old one in Africa. Twenty to thirty years ago, before deforestation become as severe as it is today, most families living in the shea parkland kept a grove of indigenous trees including shea trees adjacent to the homestead by tending and protecting them (Obua, 2004). Tending operations as a management strategy employed by the local communities on shea trees are limited to pruning heavily branched trees to reduce the effect of shade on agricultural crops (COVOL, 2006).

2.2.6 Lopping

Lopping is the cutting of selected or portions of branches from the base of a stem. This is done to obtain fodder or firewood. Only small portions of branches can be cut to allow trees to continue growing well (Oluka *et al.,* 2000). Trees like *Grevillea robusta* and shea butter that can be lopped and are able to re-grow easily from the cut portions.

2.2.7 Sparing growing seedlings on farms

According to Obua (2004), shea and other valuable trees are always conserved and protected on-farm. Methods such as sparing trees during cultivation, weeding around the seedling/sapling/tree to prevent fire from burning it, practicing prescribed early burning to dispose off combustible dry phytomass before the bush fires are set and enforcing local rules and byelaws that forbid cutting shea trees are always employed. Although healthy shea tree seedlings are normally spared by farmers when opening agricultural land (COVOL, 2002), great care and tending need to be given to growing seedling until it reaches maturity. In addition, local beliefs and culture also help to protect shea trees from unnecessary cutting (Lovett, 2000).

2.3 Impact of human settlement on the environment

A study by DOH (1992) reveals that there are essentially three patterns of settlements in Uganda namely; dispersed pattern of rural homesteads; nucleated and linear patterns. A dispersed human settlement pattern is one where rural inhabitants live in scattered dwellings, spatial isolation ranging from a settlement with a family to those with about twenty as an upper unit. This type of settlement is typically found in Northern Uganda. With internal displacement, however, large communities in Northern Uganda are currently living in overcrowded IDP camps. In such a case, the poor would depend entirely on natural resources like forest for the satisfaction of their basic needs. The dependence is usually manifested in the cutting down of trees for charcoal burning as the only alternative source of income (NEMA, 2005).

According to MWLE (2001), human settlements have major impacts on land use for a number of reasons including natural resource allocation, use and manipulation. As new members are added, there is always accelerated environmental disturbance due to the fact that more people draw upon the same natural resource base. Grainger (1993) added that local population increases resulting from either inherent growth or immigration always lead to devegetation in the immediate vicinity for fuel wood, building materials, land for settlement and agriculture.

Although many ecosystems and harvested tree species population are resilient and have a long history of human use, they can be pushed beyond recovery through habitat destruction or over exploitation (Anthony, 2001). In most cases, many cultures that live close to nature and depend on its products for their needs can consequently suffer rapid cultural, social and economic change through over exploitation (IUCN, 1993). Even if most decisions concerning land and other natural resources are made on an individual basis, some elements of common property still persist. For example, individual owners can allow kin and neighbours to extract fuel wood and medicinal plants for non-commercial purposes from their local forests and old fallows (Edmunds, 1997).

According to Edmunds (1997), although the guidelines for ecological and social changes are flexible, they are increasingly stressed by growing market opportunities for the products and derived goods such as charcoal. In addition, as land holding size continues to decline, income is increasingly sought from off-farm employment such as white color jobs. At this stage, processing of planted trees and other perennials (requiring only low labour inputs that form the main components of home gardens) would allow farmers to cultivate their land while seeking off-farm work (Stoler, 1978).

Apart from the above, other major factors controlling the distribution of vegetation types and boundaries these days are the effects of human interference such as grazing, burning and cultivation (Grove, 1995). According to Struhsaker (1987), most of the accelerated destructions that occur are due to agricultural encroachment and increased demand for fuel wood. Howard (1991) estimated that 12% of the forested land within Uganda's principle reserves had been affected by agricultural encroachment. The increased demand for agricultural land and forest products has been attributed to the high population growth rate of more than 3%, which has led to the doubling of population since 1960 (Hamilton, 1984).

2.3.1 Societal transition in conflict environment

Throughout history, war has invariably resulted in environmental destruction. Moreover, advancements in military technology used by combatants have even resulted in increasingly severe environmental impacts. According to Wall (2003), during modern war fare, military machinery and explosives can cause unprecedented levels of deforestation and habitat destruction. This results into a serious disruption of ecosystem services, erosion rate, water quality, and level of food production. For example, a destruction of up to 35% occurred on Cambodia's intact forests due to two decades of civil conflict. Bombs alone destroyed over 2 million acres of land in Vietnam (Wall, 2003). These environmental catastrophes have been aggravated by the fact that ecological protection and restoration become a low priority during and after war (Wall, 2003). According to COVOL (2006), the recent economic pressures due to insurgency in northern Uganda have brought a decline in the ecological integrity of Uganda's shea parkland.

As has also been reported by Michelle (2003), during wartime, the environmental impacts of conflicts are often forgotten in the midst of the massive human suffering and loss. More so, war-induced migrations can add environmental stress on marginal lands and overflowing urban centres. Since, war can cause damage to the environment from the small land area; it can intensify damage to both land and vegetation (Sogge, 1992). According to NEAP (1992), during conflicts, construction and maintenance of shelter heavily depend on the use of local natural resources. As the methods of harvesting of these resources are wasteful (not conforming to traditional specifications and standards developed when the building materials were abundant), displaced persons always resort to edible wild plants that often help reduce starvation during droughts (Anthony, 2001). In general, this implies that important plant species that always provide a buffer against unemployment/ food security during cyclical economic depressions are destroyed.

2.4 Policies for conservation of natural resources

In Uganda and perhaps elsewhere in the world, the orthodox understanding of the term policy is that it is a general statement of aims and desirable goals in relation to given circumstances (Kamugisha, 1993). A state like Uganda will always have series of complex laws and policies that sought to regulate the indigenous people's relations with the environment. The following are some of the Uganda's policies and legal backing for the sustainable utilization of the environment and natural resources.

2.4.1 The 1995 Constitution of Uganda

Being a supreme law, a constitution always provides for the protection of the environment. The state has a duty to promote and implement energy policies that ensure that people's basic needs and those of the environment are met. According to Article 237 of the 1995 constitution, the state is required to create and develop parks, wildlife reserves and forest reserves that are vested in the state. Uganda Wildlife Authority (UWA) and Natural Forest Authority (NFA) are responsible for the supervision and enforcement of these laws.

The constitution of Uganda also imposes a duty on the state to protect important natural resources including land, water, minerals, oil, fauna and flora such as shea trees on behalf of the people of Uganda. In Article 245, the state through National Environment Management Authority (NEMA) has a duty to protect and preserve the environment from abuse, pollution and degradation. It also has a duty to manage the environment for sustainable development and to promote environmental awareness.

2.4.2 The Land Act (1998) and the Local Government Act (1997)

According to the Land Act (1998) section 44(1) Cap 227, the government or a local authority shall hold in trust for the people and protect natural lakes, rivers, ground water, natural ponds, natural streams, wetlands, forest reserves, national parks and any other land reserved for ecological and tourist purposes for the common good of the citizens of Uganda. Section 70 of the Land Act (Cap 227), states that; Subject to section 44, all rights in the water of any natural spring, river, stream, water course, pond or lake on or under land, whether alienated or unalienated, shall be reserved to the government: and no such water shall be obstructed, dammed, diverted, polluted or otherwise interfered with directly or indirectly, except in pursuance of permission in writing granted by the minister responsible for water or natural resources in accordance with the water Act.

The decentralization framework provided for in the Local Governments Act (1997) involves the devolution of powers from central government to the districts and other lower councils. The Act also designates District Land Boards for every district. The district boards are charged with the functions of holding and allocating land (which is not owned by any person or authority), causing surveys, plans, maps and other incidental matters in the districts. Other activities carried out by the district boards include giving land titles with recommendations from local councils, finding land for government projects and advising parties disputing on land issues.

2.4.3 National Environment Statute (1995)

The National Environment Statute (1995) provides for the formulation of guidelines by NEMA for the protection of hilltops, bare hills and river banks. Although the Forest Act of 1964 is considered very weak with regard to forest regeneration (Kazoora, 2001). It has now been revised and strengthened by the new Forest Policy. Other policies that also advocate for linking natural resource functions to social and economic development are the National Environment Management Policy (1994) and the Uganda Wildlife Policy (1995).

Following the National Environment Action Plan's (NEAPs) objective to integrate environmental sustainability into socio–economic and development planning, an Environment Policy was adopted in 1994. While National Environment Management Authority (NEMA) was established in 1995, the National Environment Statute was also formulated in 1995 to coordinate the implementation process of NEAP in collaboration with relevant Ministries, NGOs, the private sector and local communities. In all these, there is a substantial overlap between the Poverty Eradication Action Plan (PEAP) targets and Millenium Development Goals (MDGs). Like the MDGs. The PEAP also has broad national goals for poverty eradication and environmental sustainability.

2.4.4 Forest Policy and National Forest Plan

In March 2001, the Uganda government formulated a new Forest Policy. Thereafter, it made a National Forest Plan to translate the implementation of policy into practice. The policy has strong focus on rehabilitation of degraded forests in water catchment areas and bare hills. It also recognizes the need to promote forests on private landholdings (which actually constitute 70%) and which are under human pressure. Devolution in decision making, consensus building, strategic partnerships and a wide range of instruments for sustainable forest management are also embedded in the policy.

The National Forest Plan (which goes a step further to make a framework for the implementation of the policy), has embedded some principles of natural resource conservation. The plan is also linked to other development strategies such as Plan for Modernization of Agriculture (PMA), PEAP and Land Sector Strategic plan (2001-2011). With regard to the environment, the three elements of sustainability, conservation and regeneration are clearly stressed in the vision 2025. Although the Forestry Plan goes along to advocate for setting aside a fund in support of regeneration activities as a form of an incentive (Kazoora, 2001). This can be done for species in unprotected areas such as shea trees is unclear.

2.4.5 The Water Statute of 1995

The water statute is one of Uganda's environmental legislation with key provisions to enhance sustainable development. It has provisions on the use, protection and management of water use and supply. Important aspects in the statute include rights on water, planning for water use, control on the use of water resources and control over water works and water use.

2.5 Uganda's position in relation to International Conventions

Even if Uganda has ratified several international conventions in the field of biodiversity conservation, the national legislations, must however, first be modified in order to give the treaties binding force in Ugandan laws. Although the Convention on Wetlands of International importance was ratified by Uganda in 1988 (National Wetland Policies-Uganda, 1995), currently Lake George wetland is the only wetland in Uganda listed as a Ramsar site. There are however, progressive plans to list four other sites, including Lake Nabugabo, Lutembe/Mabamba Bays, Lake Opeta and Lake Bisina.

Uganda also ratified the Convention on Biological Diversity (CBD) of Rio de Janeiro, (1992) in 1993. At present, NEMA is in charge of Uganda's participation in international environmental conventions and has drafted the country action plan for CBD. Most of the provisions in the CBD however had already been included in the National Environment Statute (1995). The issues presented by the CBD, if well understood by Ugandans, can enable communities to sustainably utilize their natural resources and negotiate issues of access to genetic resources as well as indigenous knowledge appropriately.

Other Conventions ratified by Uganda are the United Nations Framework for Convention on Climate Change (1992) ratified in 1993. The main objective of the Convention is to regulate levels of greenhouse gases in the atmosphere to avoid undesirable global climate change. This convention requires sinks and reservoirs of carbon to be conserved and sustainably managed. Although the ratification has led to replanting of forests such as Mount Elgon and Kibale forest under the FACE foundation this has not been realized in non protected where shea trees is one of the valuable species. With the ratification of the Convention for the Protection of World Cultural and Natural Heritage, (Paris, 1972) in 1987, only three sites (Bwindi Impenetrable National Park, Rwenzori Mountains National Park and Kasubi Tombs) in Uganda have been inscribed as World Heritage Sites. There is still need for ratification of more of these sites in other parts of the country so that species such as the shea tree which are highly valued by the community can also be inscribed.

CHAPTER THREE

STUDY AREA AND METHODS

3.1 Study Area

3.1.1 Geographical Location

This study was carried out in Lira and Pader districts in Northern Uganda (Figure 1). Lira and Pader districts are situated 347 Km and 360 Km North of Kampala respectively (UDIH, 2006). Lira district lies between latitudes $2^{\circ}50'$ N and $2^{0}00'$N and longitude $33^{\circ}10'$E and $33^{0}00'$E while Pader district is situated at latitude $2^{\circ}50'$N and $3^{0}10'$N and longitude $33^{\circ}05'$E and $32^{0}50'$E (UDIH, 2006). The study area consisted of six sub counties with three in each district. In each Sub County two parishes were sampled (Figure 1).

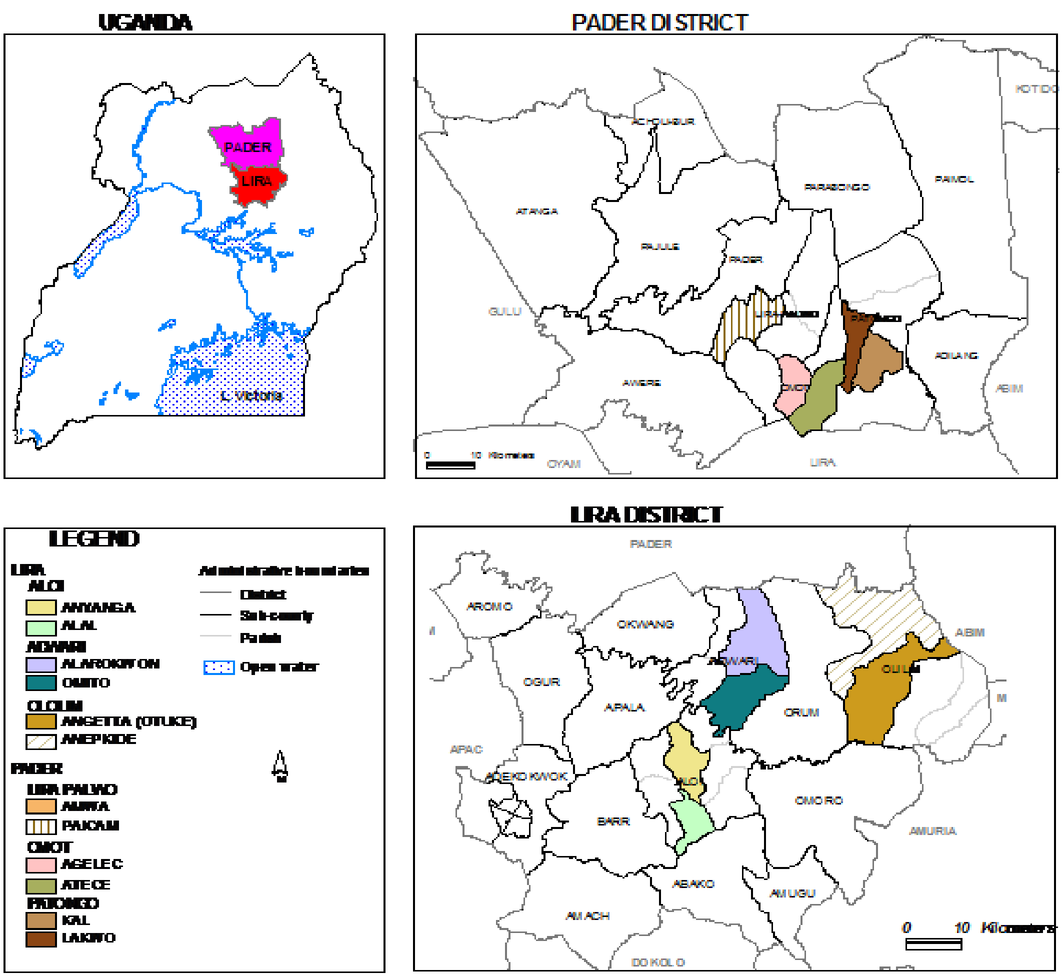

Figure 1: Map of the study area with sampled sub counties/ parishes

3.1.2 Topography and Drainage

The topography of Northern Uganda consists of flat plains with the two districts of Lira and Pader lying at an approximate altitude of between 975 m and 1,146 m above sea level (asl) and 351 m and 1,3441 m asl respectively (Rwabogo, 2002; Howard, 1991). The water resources of the area consist of south flowing rivers of Aswa, Ayago, streams, swamps, springs and underground water reservoirs, which are tapped using hand pumps. Due to the up-warp of the rocks in the northern region of Uganda, the water holding rocks were exposed to the surface of the ground. This explains the great number of spring wells all over the region (Achola, 2006).

3.1.3 Climate

The climate of both Acholi and Lango sub regions consists of wet and dry seasons. The rainfall ranges between 1,000 mm – 1,500 mm per annum with average minimum and maximum temperatures of 18^{0}C and 30^{0}C respectively. The relative humidity is high during the wet season and low in the dry season. Normally the wet seasons extend from April to October with the highest peaks in May, August and October (Rwabogo, 2002). The dry seasons begin in November and extend up to March (Achola, 2006).

3.1.4 Vegetation

The vegetation of Northern Uganda is generally savannah woodland characterized by woody covers and grass layers. According to NEMA (2000), the vegetation consists of intermediate savanna grassland between the moist and dry savanna. These types of vegetation are characterized by open canopy trees of 10-12 meters high and underlained by grasses. The grass stratum of the moist savanna community is dominated by *Hyperenniah rufa* and *Panicum maximum* which occur on fertile soils with annual rainfall of 1,000 – 1,500 mm. Other common grasses important for grazing are *Chloris gayana, Brachiaria spp*., *Hyperrhenia. variabilis* and *Imperata cylindrica* (MAAIF, 2008). Most trees are fire resistant and therefore able to regenerate themselves after fire. The common tree species include: *Combretum fragrans, Piliostigma thonningii, Annona senegalensis, Vitellaria paradoxa and Terminalia macroptera* (NEMA, 2000/2001).

3.1.5 Geology and Soils

The soils of Northern Uganda are of the precambrian period consisting of the predominant rocks formed between 3,000 and 6,000 million years ago (Ollier, 1960). Acoording to Ollier (1960), the region is underlained by granitic and metamorphic rocks of the basement complex (Pre-Cambrian). The rock types include schist, gneiss, alluvium, and quartzite. These soils can best be described as shallow and brown loams.

3.1.6 Population and Economic Activities

There are over 757,763 and 325,885 persons in Lira and Pader districts respectively (Rwabwogo, 2002; MFPED, 2004). Over 90% of the people in these districts had been displaced and concentrated in camps clustered around towns and trading centres (CSOPN, 2005). The majority of the Langi and Acholi are subsistence farmers producing mainly food crops such as finger millet, cassava, sorghum, field peas, sweet potatoes, beans, simsim, pigeon peas, sunflower and vegetables.

The main cash crops grown in the area are cotton and sugarcane. The cattle population has been drastically reduced due to rustling (Rwabwogo, 2002; MFPED, 2004). According to MFPED (2004), poverty has forced the majority of people to engage in activities like cutting trees for charcoal burning. Of all the tree species in northern Uganda, shea tree (*Vitellaria paradoxa*) species has been affected most as an alternative source of income to the community due to the impact of insurgency (MFPED/MAAIF, 2004).

3.2 Methods

3.2.1 Research Design

This study used both household survey and tree inventory techniques to assess the relationship between internal displacement, utilization and conservation of indigenous tree species. Household interviews were used to seek information from a household head or a member of the household aged 18 years and above. Tree species inventory was also conducted to assess the population structure and distribution of indigenous tree species in the North, South, East, and West direction from the camp boundaries out wards.

a) Household surveys and interviews

Questionnaires were administered to one member of a household who was 18 years and above to ascertain the demographic and socio-economic status of the local community (Appendix 1). Focus Group Discussions (FGDs) using a questionnaire guide were conducted to elicit information on on-farm traditional management and conservation knowledge of shea butter trees in the study area. Some questions from the household questionnaires were used for in-depth interviews. The in-depth interviews were held with key informants such as the local council authorities, parish chiefs and representatives of relevant NGOs and CBOs to review the current conservation policies on trees. Information was assembled on the list of important/major trees utilized by members of each household interviewed.

b) Plot establishment and Tree Inventory

Tree inventory data collection was carried out in sample plots established along transects laid out in four (4) evenly spaced locations in different directions outwards of the selected IDP camps in each of the (6) sub-counties. Trees were identified and counted within 0.2 ha in 240 established plots in each sub-county to determine abundance and stocking rate per hectare. Data such as diameter at breast height, and number of various tree species in the shea parkland was collected.

In the same plot, data on altitude, GPS positions and slope were also measured in order to help locate the study site on the map. The tree species were again categorized according to their location to ascertain which of the tree species were more abundant either near or far away from the IDP camps. The first five transects were referred to as near and the last five as far away from the centre of the IDP camps.

c) Policy Review

Relevant and related bye-laws and policy documents from both central and local governments, NFA, NARO, NEMA, MWLE and other relevant documents from NGOs, and CBOs' libraries were reviewed. In addition, key informant interviews were conducted with District Forest Officers, District Environmental Officers, Community leaders, and Production sector and Secretaries for Environment secretaries in the district and Sub County local councils. They were interviewed in order to validate their awareness of and the availability of natural resources conservation bye-laws and policies in the area.

3.2.2 Sampling Procedure and Size

This study was carried out in Lira and Pader districts which were purposively selected because of the presence of shea trees. Three sub counties in each of the districts were also purposively selected due to the abundance of shea trees and presence of the Internally Displaced Persons (IDPs) settlements. Then, two parishes in each of the sub counties and the subsequent households where questionnaires were administered were randomly selected. Permission was sought from the local authorities in Lira and Pader districts before commencement of the survey. Alal and Anyanga in Aloi sub-county, Omito and Olarokwon parishes (Adwari sub-county), Angetta and Anepkide parishes (Olilim sub-county), Kal and Lakwar parishes (Patongo sub-county), Paican and Amua parishes (Lira-palwo) and then Atece and Central (Omot sub-county) were sampled.

To avoid bias in selection of the household members for the study in the sampled parishes, random sampling technique was used. Heads of household list was obtained from the local council leaders written on pieces of paper and thrown into a box. Using a lottery technique (Mullins, 2002), 15 names in each parish were randomly withdrawn from the box without replacement. These were the households where questionnaires were administered. Both male and female respondents of 18 years and above were interviewed in subsequent sampled households in order to cater for the gender issues involved.

An interview guide was used to conduct an in-depth interview with key informants such as the local councilors, sub-county and parish chiefs and focal persons of CBOs and NGOs dealing with tree management and conservation activities in the area. In addition, Focus Group Discussions (FGDs) were conducted with two categories of both female and male groups aged 18-30 and 31-65 years. Each discussion group of about 8-10 persons were held separately and their views recorded to assess on-farm traditional management and conservation knowledge of shea butter trees in the study area (Krueger, 1988).

3.2.4 Tree Inventory and Plot establishment

Tree inventory was conducted in 240 plots of 50 m by 40 m of which 120 were established in Acholi and another 120 in Lango sub-regions. The transects and plots were established from the centre of the main IDP camps towards the woodlands (Figure 2).

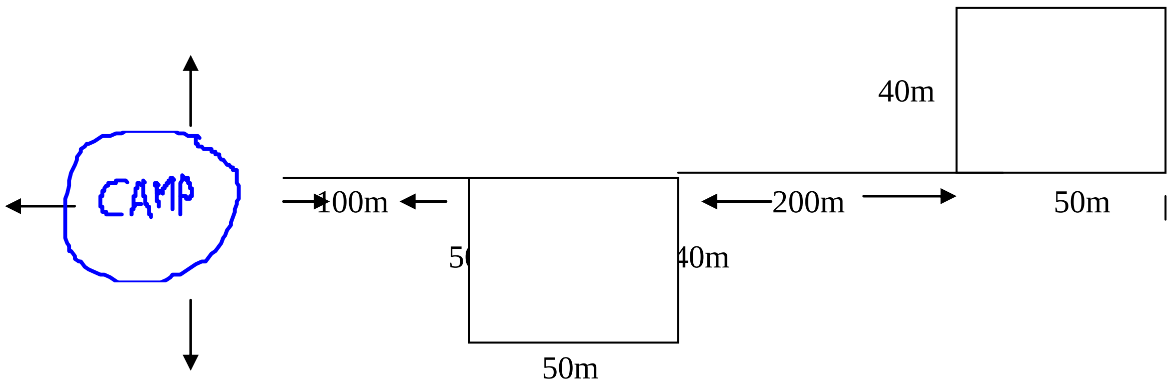

Figure 2: Schematic representation of plot establishment along each transect

In a larger plot of 50 m x 40 m, trees with diameter at breast height (DBH at 1.3m) were enumerated, measured and identified basing on the FTEA (Polhill, 1952) and Katende *et al*.(1995). Voucher specimens of woody plants that could not be identified in the field were collected and pressed for identification at the Makerere University Herbarium. Geographical Positioning System (GPS) positions of all shea trees encountered were recorded for the determination of its spatial distribution in each of the sub region. Nested plots/quadrats of different sizes corresponding with the different tree size classes were established (Table 1), basing on a series of smaller (nested) quadrants that decrease in size geometrically within a larger quadrat.

In the 20 m x 20 m sub-plots, poles (> 5 – 10cm dbh) and saplings (>50 cm to 1m height) were also enumerated. Regenerating individual shea seedlings were counted in the sub-subplots of 10 m x 10 m (Table 1) as per Kent and Coker (1996**).**

Table1 Class sizes of trees and plot size

Plot size	Size class (DBH) of trees enumerated	Tree categories
50 m x 40 m	>10cm or circum ≥ 31cm	Adult trees
20 m x 20 m	5 – 10cm (>1m height)	Poles
20 m x 20 m	5 – 10cm (>50cm to 1m height)	Saplings
10m x 10 m	2 - <5cm (ground level to <50cm height)	Seedlings

Adapted from Kent and Coker (1996)

According to Outhred (1984), Outhred *et al.* (1985), Le Brocque and Buckney (1995), and Morrison *et al.* (1995a and 1995b), this method is capable of detecting subtle community patterns which are functionally equivalent to frequencies and directly related to plant density. The nested plots were used to assess the succession of growth of the shea trees and other woody plants from seedlings, saplings, and poles to adult trees.

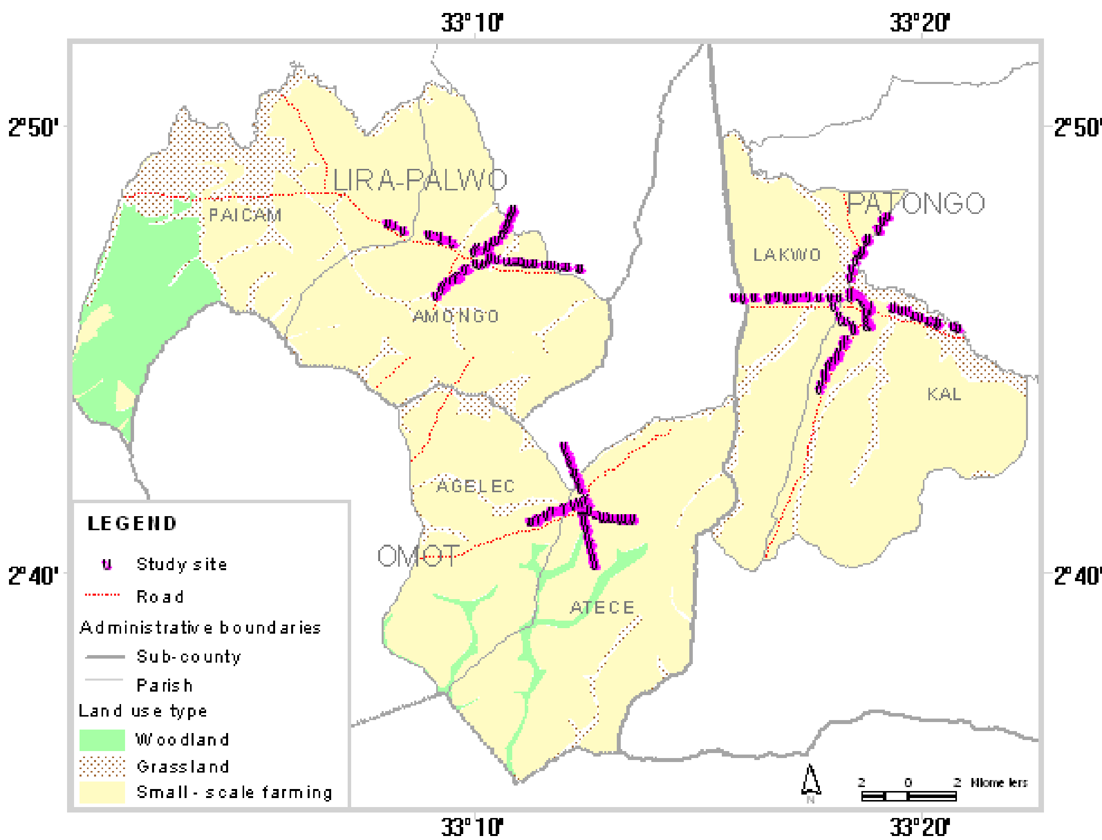

Figure 3: Sampled plots in Patongo, Lira-palwo and Omot sub-counties (Acholi sub region)

Transect lines of 2.5 km length were established from the edge of the camps moving outwards in the North, South, East and West directions surrounding the camp (Figures 3 and 4)

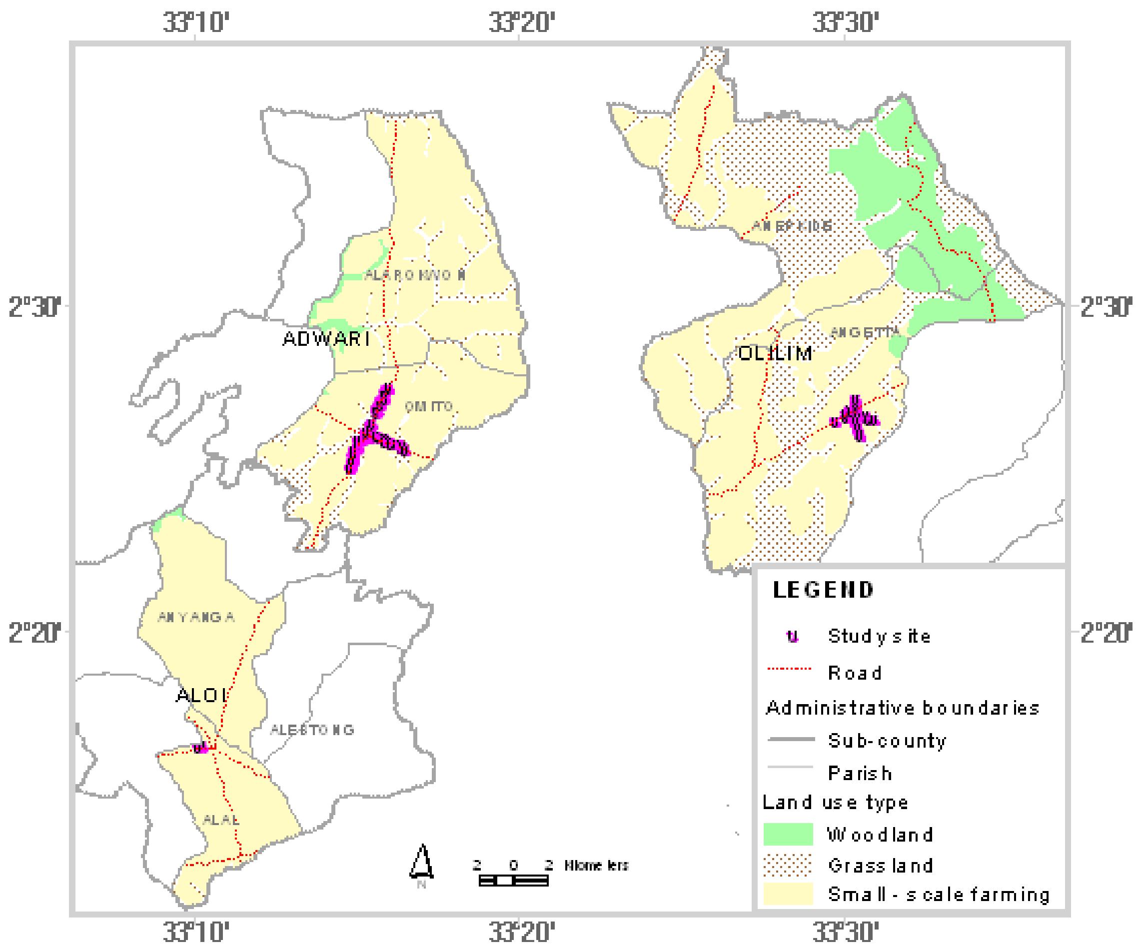

Figure 4: Sampled plots in Aloi, Adwari and Olilim sub counties in Lango sub region

Along each transect, a series of 10 sample plots of 40 m x 50 m (0.2 ha) were established at regular intervals of 200 m apart, using a measuring tape (Buckland *et al.*, 2001). The first plot was established at a distance of 100 m from the edge of the sampled camp, thereafter subsequent plots were established at a regular interval of 200 m until the end of the transect, making a total of 10 plots along each transect. In total, 240 plots (40 plots per sub-county) were established.

The DBH of trees were measured at 1.3 m above ground level using the diameter tape in each quadrat and recorded on the Tree Inventory (TI) data sheet (*Appendix 2)*. Signs of tree harvests such as charcoal burning and fire wood collection were noted. Altitude and slope, plot centre and corner coordinates were recorded using a Geographical Positioning System (GPS) in order to identify the study sites on the map (Figures 3&4).

3.2.5 Data Analysis

The filled questionnaires were edited; responses coded and entered into Statistical Package for Social Science (SPSS 10.0) computer programme for analysis. Data were then summarized into frequencies and percentages. Logistic regression analysis (Green, 1995) was used to show how socio-demographic characteristics such as age, gender, education, family size, occupation and residence duration influence local people's willingness to plant and protect V. *paradoxa* and other indigenous tree species on their farms. Logistic regression analysis allowed appropriate predictions to be made because of its flexibility and coding of characteristics.

The tree species diversity was calculated using Shannon-Weiner diversity index (H') following Kent & Coker (1992). The Shannon Weiner species diversity indices (H') were calculated for all the plots from 1 to 10.

To determine the diversity of mature tree species from the centre of the camps outwards; using the formula:

$$\mathbf{H'} = -\sum_{i=1}^{S} (\mathbf{pi.lnpi})$$

Where H' = Shannon index,

S = the number of species

Pi = the proportion of individuals/ abundance of the ith species expressed as a proportion of total sample.

L_n = Log base n.

The plot data were entered and analyzed using Excel. The population densities were then calculated for all recorded mature trees, poles, saplings and shea tree seedlings. The densities were then expressed as number of trees per hectare and presented as histograms.

One way Analysis of Variance (ANOVA) was used to determine whether there was a variation in tree density from the camp center to the exterior (Boffa, 1999). In addition, policy review information was analyzed and used to make proper recommendations for the management of indigenous tree resources and also Internally Displaced Persons (IDPs) in the study area.

As point of evidence, a camera was used to photograph features of vegetation and indigenous tree species that were affected by human activity in the study area. Photographs were also taken for those products obtained from important tree species like shea, charcoal burning process and any other relevant features (Plates 1-9).

CHAPTER FOUR

RESULTS

4.1 Socio-demographic characteristics of the respondents

Generally, there were more males than females during this interview. Over 50% of the respondents were males and 43.9% were females (Table 2).

Table 2 Socio-demographic characteristics of the respondents N=180

Variable	Frequency	Percentage
Sex of respondents		
Male	101	56.1
Female	079	43.9
Respondent's age		
< 25 years	011	06.1
26-35 years	063	35.0
36-45 years	068	37.8
46-55 years	021	11.7
> 56 years	017	09.4
Marital status		
Single	006	03.3
Married	148	82.2
Divorced	012	06.7
Widowed	014	07.8
Education level		
None	047	26.1
Primary	100	55.6
Secondary	030	16.7
Tertiary	013	07.2
Duration of stay in the camp		
1-10 years	114	63.3
11-20 years	025	13.9
> 20 years	041	22.8
Household size		
1-5 people	052	28.9
6-10 people	108	60.0
> 10 people	020	11.1
Occupation of the respondent		
Peasant farmer	104	57.8
House wife	019	10.6
Teacher	016	08.9
Army soldier	017	09.4
Food vendor	011	06.1
Tailor	009	05.0
Carpenter	004	02.2
Major source of income		
Farming	119	66.1
Trade in charcoal and firewood	076	42.2
Formal salary	057	31.7
Hand craft materials	043	23.9
Trade in of tree poles	040	22.2
Brewing	025	13.9

Of the five age groups interviewed, the age group of 36-45 years constituted the largest number of respondents (37.8%) followed by the age group 26-35 years (35%). Age groups of less than 25 years and greater than 56 years constituted the smallest percentages of 6.1% and 9.4% respectively. The vast majority of people interviewed were married (82.2%) and those who were single constituted only 3.3%. Most of the respondents (55.6%) had attained primary education and 7.2% of them had studied up to tertiary level of education (Table 2).

Over 60% of the respondents had lived in the camp for a period of 1-10 years. Above 60% of the respondents had between 6-10 persons in the household followed by those who had 1-5 persons (28.9%) per household. The majority of the respondents (57.8%) were peasant farmers. More than 66% of the respondents reported the major sources of house hold income to be farming followed by trade in charcoal and firewood reported by 42.2% of the respondents. The least source of household income was brewing of alcohol reported by about 14% of the respondents (Table 2).

4.2 Ethno-uses of the shea and other indigenous trees

Over 10 ethno-uses were reported for *Vitellaria paradoxa* and other indigenous trees were reported (Table 3).

Table 3: Ethno-uses of indigenous trees commonly utilized by the local people

Ethno-use	Purpose	Frequency	%
1 Firewood	Domestic and Commercial	169	93.9
2 Construction	Poles for construction of huts and fences	162	90.0
3 Food/Fruits	Domestic food and Commercial	153	85.0
4 Handcraft materials and Farm tools	Stools, hoe and axe handles for domestic and commercial	144	80.0
5 Oil from shea nuts	Domestic and commercial	139	77.2
6 Medicine	Household health emergencies	127	70.6
7 Timber	Commercial	124	68.9
8 Charcoal	Domestic and commercial	118	65.6
9 Culture/social use	Traditional ceremonies, taboos and beliefs	113	62.8
10Environmental services	Ecological benefits, conservation benefits and Livelihoods	108	60.0
11 Shade	Shade near the home compound	096	53.3
12 Ornamental	Decoration and design	096	53.3
13 Sap	Domestic use	079	43.9

The most reported use was firewood; constituting (93.9%) followed by construction poles (90%), food (85%) in form of fruits (Plate 1) and handcraft materials such as stools, hoe and axe handle (80%). About 66% of the respondents reported that they use indigenous trees for charcoal production (Plate 2).

Plate 1: Shea fruits, these are usually consumed fresh

Plate 2: Billets of wood ready for charcoal production

The least reported ethno-use was extraction of sap from plants (43.9%). The major uses for the indigenous trees were for both domestic and commercial purposes. Other least reported common uses were ecological benefits, decorations and designs reported by 60% and 53.3% of the respondents respectively (Table 3).

A total of 36 tree species belonging to 18 families were reported during the household interview (Table 4). There were 13 use categories of the indigenous trees. Most of the trees reported were multi purpose. Besides firewood, other uses were reported as well. For example *Lannea schweinfurthii* was highly valued as a source of fish floats and construction poles. Tree species utilized for medicinal purporses included *Sclerocarya birrea*, *Tamarindus indica*, *Kigelia africana*, *Combretum collinum*, *Erythrina abyssinica*, *Dichrostachys cinerea*, *Milicia excelsa*, *Vitellaria paradoxa* and *Steganotaenia araliacea*. The major timber species were *Croton sylvaticus*, *Acacia sieberiana*, *Senna siamea*, *Albizia coriaria*, *Acacia sieberiana*, *Albizia grandibracteata*, *Milicia excelsa*, *Ficus ovata* and *Ficus sycomorus.*

The tree species utilized for crafts and musical instruments included *Stereospermum kunthianum*, *Albizia coriaria*, *Ficus natalensis*, *Erythrina abyssinica*, *Borassus aethiopum*, *Steganotaenia araliacea* and *Vitex doniana*. The tree species preferred for fruits included *Annona senegalensis*, *Tamarindus indica*, *Bridelia micrantha*, *Borassus aethiopum*, *Vitellaria paradoxa* and *Vitex doniana.* The charcoal species were *Combretum collinum, Combretum molle, Milicia excelsa* and *Vitellaria paradoxa*.

Table 4: The tree species commonly utilised by the local communities in the area

Family	Botanical names	Local names	Use category
Anacadiaceae	*Lannea schweinfurthii* (Engl.)	Kwogo (Ac/La)	Co, Lf, Fw
Anacadiaceae	*Sclerocarya birrea* subsp caffra (Sonder)	Titiku/ Ijakayit (Ac/La)	Fw, Me, Co
Annonaceae	*Annona senegalensis* (Pers)	Obolo/ Obwolo (Ac/La)	Fr, Sh, Fw
Bignoniaceae	*Kigelia africana* (Decne)	Yago (Ac/La)	Me, Sh, Lf
Bignoniaceae	*Stereospermum kunthianum* (Cham.)	Olurukwon/Olutukwon (Ac/La)	Me, Cfm
Caesalpinaceae	*Tamarindus indica* (L.)	Cwa/ Cwao (Ac/La)	Fr, Me
Caesalpinaceae	*Piliostigma thonningii* (Schumach) Milne-Redh	Ogali (Ac/La)	Fw,Me, Co
Combretaceae	*Combretum fragrans* (F. Hoffm)	Omeng/ Imeng(Ac/La)	Fw, Ch &Co
Combretaceae	*Combretum collinum* (Fresen.)	Oduku/Odugu(Ac/La)	Fw, Ch, Me & Sh
Combretaceae	*Combretum molle* (R.Br. Ex G.Don)	Ooro/Ioro(Ac/La)	Fw, Ch, Po & Sh
Combretaceae	*Terminalia macroptera* (Laws)	Opok(Ac/La)	Fw & Co
Euphorbiaceae	*Croton macrostachyus* (Del.)	Okango(Ac/La)	Fw
Euphorbiaceae	*Croton sylvaticus* (Krauss)	Chetwingo/Colawinyo(Ac/La)	Ti, Fw
Euphorbiaceae	*Bridelia micrantha* (Hochst) Baill.	Larwece/Orweco(Ac/La)	Fw, Ch, Po & Fr
Leguminoceae	*Acacia Senegal* (L) Wild.	Achika/ Okuto (Ac/La)	Sh, Co
Leguminoceae	*Erythrina abyssinica* (DC.)	Obiny /Awilakot(Ac/La)	Fw, Cfm , Ff & Me
Leguminoceae	*Acacia sieberiana* (DC)	Okuto itiri(Ac/La)	Ti, Po
Leguminoceae	*Senna siamea* (Lam).	Agacia(Ac/La)	Co, Ti & Fw
Loganiaceae	*Strychnos innocua* (Del.)	Kwalikwali/Akwalakwala (Ac/La)	Fw
Meliaceae	*Pseudocedrela kotschyi* (Schweinf.)	Oput/Aputo(Ac/La)	Me, Cfm, Ti, Fw
Mimosaceae	*Albizia coriaria* (Welwe.) Ex Oliv.	Ayekayek/ Itek (Ac/La)	Fw, Ti, Po & Cfm
Mimosaceae	*Albizia grandibracteata* (Taub.)	Owak/ Abata(Ac/La)	Ti, Fw, Co
Mimosaceae	*Dichrostachys cinerea*	Okworo(Ac/La)	Fw, Po, Lf & Me
Moraceae	*Ficus ovata* (Vahl)	Ibule(Ac/La)	Ti, Fw, Sh
Moraceae	*Milicia excelsa* (Welw.) C.C. Berg	Itura/ Ilwa (Ac/La)	Ti, Fw, Me, Ch, Sa
Moraceae	*Ficus sycomorus* (L.)	Olam(Ac/La)	Ti, Fw, Co
Moraceae	*Ficus glomosa* (Del)	Kworo(Ac/La)	Sh, Lf & Co
Moraceae	*Ficus natalensis* (Hochst)	Annar/ Ananga(Ac/La)	Fw and Cfm
Palmae	*Borassus aethiopum* (Mart.)	Tugu(Ac/La)	Fr, Cfm, Co, & On
Rhamnaceae	*Zizyphus abyssinica* (A.Rich)	Okutu lango(Ac/La)	Po and Lf
Rubiaceae	*Sarcocephalus latifolius* (Smith) Bruce	Ibele(Ac/La)	Fw
Sapotaceae	*Vitellaria paradoxa* (C.F.Gaertn.)	Yaa/ Yao(Ac/La)	Fr, Me, Ch, & Fw
Tiliaceae	*Grewia mollis* (Juss.)	Opobo/ Pobo (Ac/La)	Po, Co & Fw
Umbelliferae	*Steganotaenia araliacea* (Hochst.)	Olwedo(Ac/La)	Fw, Cfm, Ft and Me
Verbenaceae	*Vitex doniana* (Sweet.)	Owyelo/ Owelo(Ac/La)	Fr, Sh, Cfm &Co

Fw=Firewood; Me=Medicine; Ti=Timber; Fr=Fruits/food; Co=Construction; Ch=Charcoal; Lf=live fence; Sh=shade; Cfm=crafts & musical instrument; Ft=farm tools; Po=Poles; Ff=Fish floats; On=Onamental

4.3 On-farm traditional management and conservation strategies of shea tree resources

The local and major conservation strategies for *Vitellaria paradoxa* were management of seedlings, stands and parkland. The most management strategy for the shea seedlings that was reported by 83.3% of the respondents was allowing the natural regeneration to come up, followed by weeding (68%), sparing of shea seedlings while digging (56.7%) and regular inspection to protect shea trees from fires (55%). Pruning and staking were reported by about 39% of the respondents as the least common strategy employed for managing on farm shea tree seedlings (Table 5).

Table 5: Local tree management and conservation strategies used in the area

Local management of shea seedlings	**Frequency**	**Percent**
Allow natural regeneration to come up	150	83.3
Weeding around shea trees	123	68.3
Sparing shea seedlings while digging	102	56.7
Regular inspection to protect shea from fires	099	55.0
Pruning other trees near shea seedlings	070	38.9
Staking shea seedlings	069	38.8
Local management of shea stands		
Discouraging people from cutting shea trees	140	77.8
Thinning shea trees to allow adequate spacing for crop cultivation	132	73.3
Plant shade tolerant crops under the shea stands	107	59.4
Enforcement of local bye-laws	101	56.1
Selective harvesting of shea trees	095	52.7
Local management of the shea parklands		
Sensitization of local communities	120	66.7
Sparing other tree species growing together with shea trees	114	63.3
Conducting early burning	109	60.6
Fighting bush fires	098	54.4
Cutting down trees infected with pests/diseases	097	53.9
Use of taboos and enforcement of local bye-laws	097	53.9

The most commonly used strategy for managing shea stands included discouraging people from cutting the shea trees and thinning some unproductive shea trees to allow adequate spacing for crop cultivation. The least applied strategies were selective harvesting and use of bye-laws (Table 5).While the most commonly reported strategy for management of the shea parkland was sensitizing the local community (66.7%) followed by sparing of other tree species growing with shea (63.3%), the least reported management strategy was use of taboos and bye-law enforcement (Table 5).

4.4 Attitude of the local people towards conservation of indigenous tree species

Over 70% of the respondents strongly agreed that there was plenty of opportunity to domesticate shea trees and that shea trees were: being conserved for social and cultural values the most demanded tree species in the parkland, important sources of food and oil and difficult to propagate (Table 6).

Table 6: Motivations for protecting the shea trees on-farm

Nature of motivation	Response				
	SA	**A**	**D**	**SD**	**DK**
Source of firewood & charcoal	105	043	-	-	-
	(70.9%)	(29.1%)	-	-	-
Source of timber & poles	040	040	002	-	-
	(48.8%)	(48.8%)	(2.4%)	-	-
Source of herbal medicines	090	049	-	-	002
	(63.8%)	(34.8%)	-	-	(1.4%)
Source of food & oil	125	050	-	-	-
	(71.4%)	(28.6%)	-	-	-
Source of fodder	070	40	020	015	015
	(43.8%)	(25.0%)	(12.5%)	(9.3%)	(9.3%)
For cultural & social values	105	010	-	-	005
	(87.5%)	(8.3%)	-	-	(4.2%)
Difficult to propagate in anyplace	40	015	-	-	002
	(70.2%)	(26.3%)	-	-	(3.5%)
Shea tree does not easily survive	-	005	020	015	120
outside its natural habitat	-	(3.1%)	(12.5%)	(9.3%)	(75%)
Easier to protect on-farms	097	055	023	002	-
	(54.8%)	(31.1%)	(13%)	(1.1%)	-
Shea tress are most demanded species	035	140	002	002	-
in the woodland	(19.6%)	(78.2%)	(1.1%)	(1.1%)	-
Shea trees has plenty of opportunities	152	020	-	-	-
to be domesticated	(88.4%)	(11.6%)	-	-	-

Key: SA – Strongly agree; A – Agree; SD – Strongly disagree; D – Disagree; DK – do not know.

4.4.1 Reasons for not planting or protecting *Vitellaria paradoxa*

While 64.1% of the respondents strongly agreed that they did not plant or protect shea trees on-farm (because it competes with crops for nutrients and light more than other trees), 56.7% strongly agreed that shea trees were still plenty in the parkland. Over 70% of the respondents agreed that the long period shea tree takes to mature and fruit discouraged them from planting and protecting the tree on their farm lands (Table 7).

Table 7: Reasons for not planting or protecting shea trees on-farms

Reason for not planting/protecting shea trees	Response				
	SA	A	D	SD	DK
Competes with crops more than other trees	75 (64.1%)	25 (21.3%)	12 (10.3%)	05 (4.3%	- -
Still plenty in the woodland/parkland	85 (56.7%)	35 (23.3%)	10 (6.7%)	20 (13.3%)	- -
Harbors more natural pests than other trees	10 (8.7%)	78 (67.8%)	05 (4.3%)	12 (10.4%)	10 (8.7%)
Slow growing compared to other trees	20 (14.3%)	105 (75.0%)	05 (3.6%)	05 (3.6)%	05 (3.6%)
Unfavourable land tenure system	10 (17.2%)	40 (69.0%)	02 (3.4%)	06 (10.3%)	- -

*Key: **SA** – Strongly agree; **A** – Agree; **SD** – Strongly disagree; **D** – Disagree; **DK** – do not know.*

Apart from 69% of the respondents agreeing that land tenure system was a major setback to planting trees, 67.8% agreed that they did not have motivation to plant or protect shea trees on-farm because of associated pests (Table 7).

4.4.2 Willingness of the local people to conserve shea and other tree species

The willingness of the respondents to conserve shea and other indigenous tree species was significantly ($P<0.05$) influenced by period of stay in the camp and marital status of the respondents (Table 8).

Table 8: Logistic regression of socio-demographic characteristics influencing and people's attitude towards conservation of indigenous trees

Socio-demographic Characteristics of the respondents	R	Odd ratio	Probability level	Significance
Age	0.026	0.919	0.672	ns
Sex	0.016	0.891	0.052	ns
Period of stay	0.934	0.124	0.047	**
Household size	0.917	0.595	0.774	ns
Marital status	5.134	0.325	0.023	**
Education level	0.867	0.671	0.561	ns
Occupation	0.624	0.214	0.538	ns
Major source of income	1.011	0.828	0.912	ns

ns = not significant ** = significant at $P \leq 0.05$

4.5 Abundance of shea and other tree species in Lango and Acholi sub regions

4.5.1 General abundance of indigenous tree resources in Lango and Acholi sub regions

Vitellaria paradoxa had the highest density (11 trees ha^{-1}) followed by *Vitex doniana* (3.6 trees ha^{-1}) and the least abundant was *Albizia coriaria* (1.8 trees ha^{-1}) in Lango sub region. In the Acholi sub region, *Vitellaria paradoxa* with 4.3 trees ha^{-1} had the highest density followed by *Bridelia macrantha*, *Vitex doniana* and the least one was *Combretum collinum*.on the whole, and the Lango sub-region had higher tree densities than the Acholi sub-region (Fig. 5).

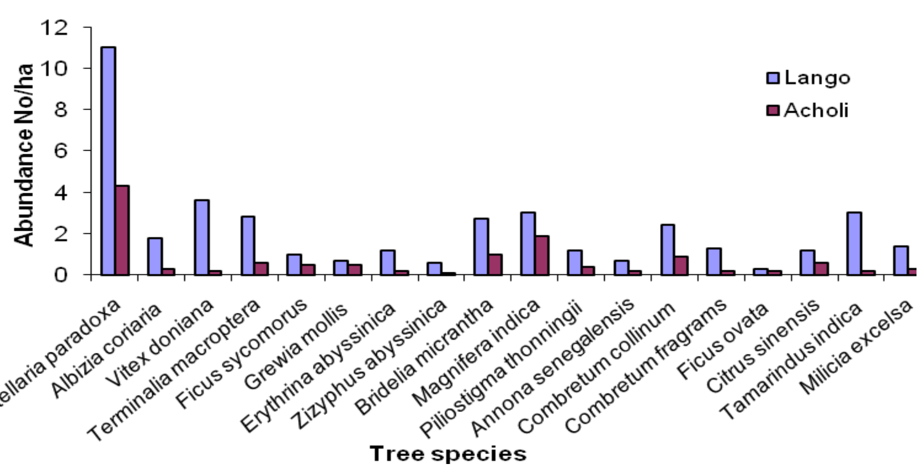

Figure 5: Abundance of mature tree species in Lango and Acholi sub region

At the pole stage, *Combretum collinum* had the highest density (131.3poles ha^{-1}) followed by *Piliostigma thonningii* (60.3poles ha^{-1}), *Vitellaria paradoxa* (41.9 poles ha^{-1}), *Grewia mollis* (4.2 poles ha^{-1}) and *Albizia coriaria* with 4.4 poles ha^{-1} in Lango sub-region. *Combretum collinum* had the highest density (14.4 poles ha^{-1}) followed by *Vitellaria paradoxa* (8.4 poles ha^{-1}) and *Albizia coriaria* (0.4 poles ha^{-1}) in the Acholi sub region (Figure 6).

In the Lango sub-region, *Piliostigma thonningii* had the highest density of saplings (118.4 saplings ha^{-1}) followed by *Combretum collinum* (112.9 saplings ha^{-1}), *Vitex doniana* (56.3 saplings ha^{-1}) and *Vitellaria paradoxa* (55.7 saplings ha^{-1}). The least recorded species at the sapling stage were *Albizia coriaria (*2.3 saplings ha^{-1}), *Grewia mollis* (17.1 saplings ha^{-1}), *Terminalia macroptera* (26.1 saplings ha^{-1}) and *Annona senegalensis (*52.7 saplings ha^{-1}).

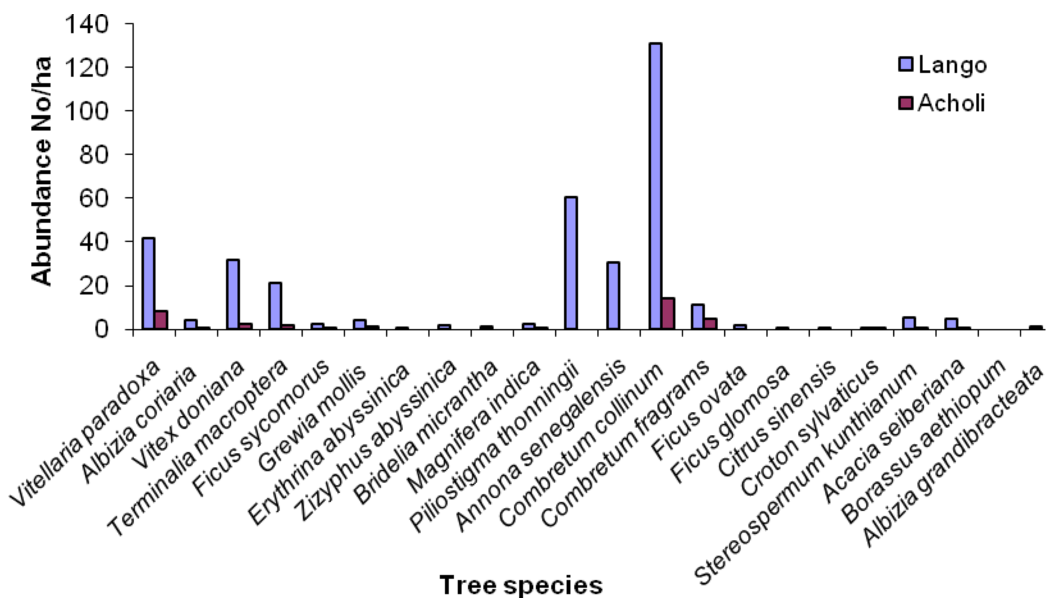

Figure 6: Abundance of poles in Lango and Achoil sub regions

The species with highest density of saplings recorded in Acholi sub region were *Combretum collinum* (13.2 saplings ha^{-1}) followed by *Combretum fragrams* (8.4 saplings ha^{-1}) and *Vitellaria paradoxa* with 2.7 saplings ha^{-1}(Figure 7).

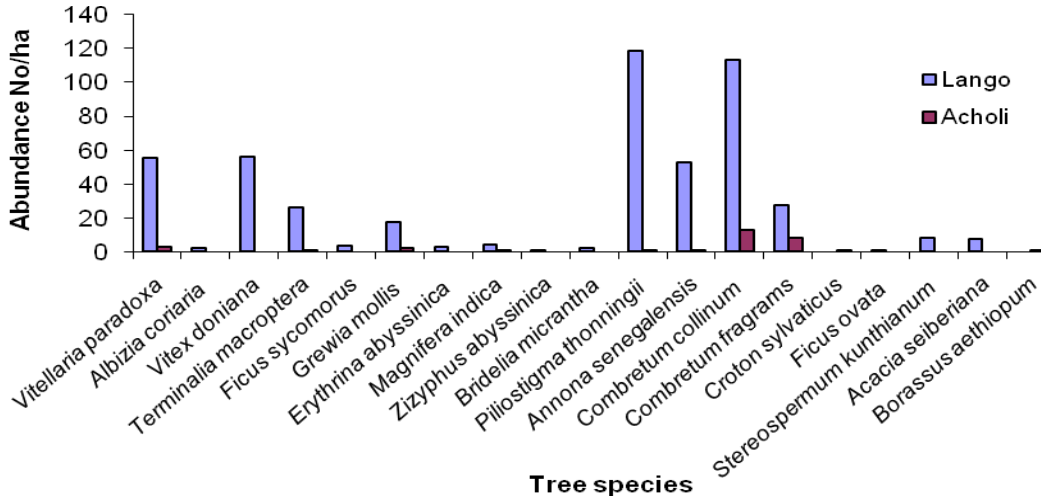

Figure 7: Abundance of saplings in Lango and Achoil sub regions

4.5.2 Relative abundance of shea and other tree species in and around IDP camps in Lango and Acholi sub-regions

a) Relative abundance of mature trees

The most abundant mature tree species near the IDP camps in Lango sub-region were *Vitellaria paradoxa* (11.5 trees ha^{-1}), *Mangifera indica* (4.4 trees ha^{-1}) and *Tamarindus indica* (4.4 trees ha^{-1}).

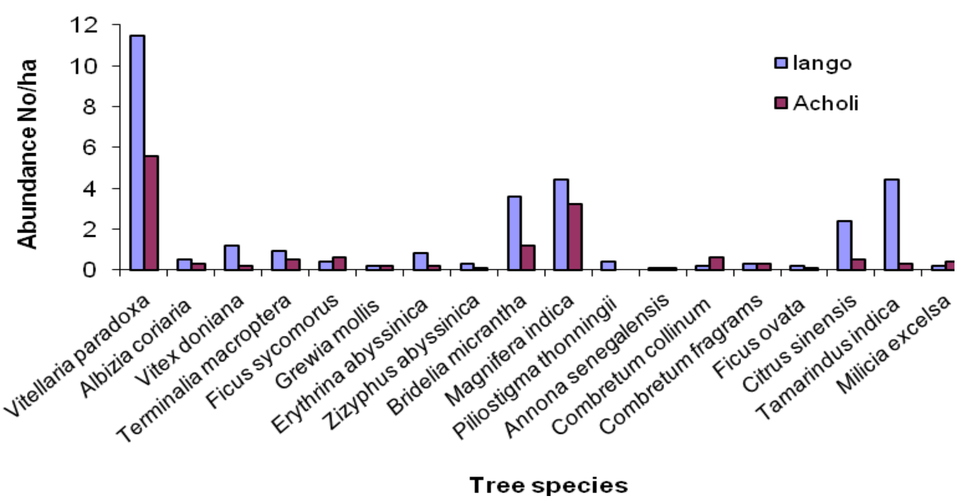

Figure 8: Abundance of mature trees near the camps in Lango and Achoil

The most abundant trees far away from the IDP camps in Lango sub region were *Vitellaria paradoxa* (10.5 trees ha^{-1}), *Vitex doniana* (6 trees ha^{-1}), *Terminalia macroptera* (4.6 trees ha^{-1}) and *combretum collium (4.6 trees ha^{-1}).* The least abundant species were *Grewia* mollis (1.2 trees ha^{-1}), *Annona senegalensis* (1.3 trees ha^{-2}), *Bridelia micrantha* (1.8 trees ha^{-1}), *Tamarindus indica* (*2* trees ha^{-1}) and *Milicia excelsa* (2.6 trees ha^{-1}) respectively.

The most abundant tree species far away from the IDP camps in Acholi sub region is *Vitellaria paradoxa* (3 trees ha^{-1}) followed by *combretum collium* and *Grewia mollis* (Figure 9).

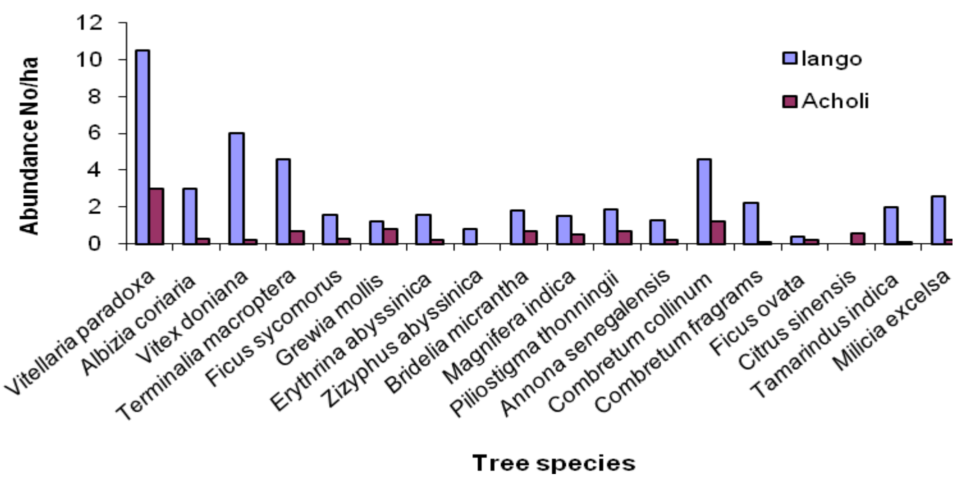

Figure 9: Abundance of mature trees far away from the IDP camps in Lango and Achoil

b) Relative abundance of poles

The most abundant tree species at pole stage near the IDP camps were *Combretum collinum* (117 poles ha^{-1}), *Piliostigma thonningii* (65 poles ha^{-1}), *Vitellaria paradoxa* (35.3 poles ha^{-1}), *Vitex doniana* (34.3 poles ha^{-1}) and *Terminalia macroptera* (21.3 poles ha^{-1}) in the Lango sub region. In the Acholi sub region, the most abundant trees near the camps were *Combretum collinum, Combretum fragrans* and *Vitellaria paradoxa* with 21.2, 8.9 and 5.8 poles/ha respectively (Figure 10).

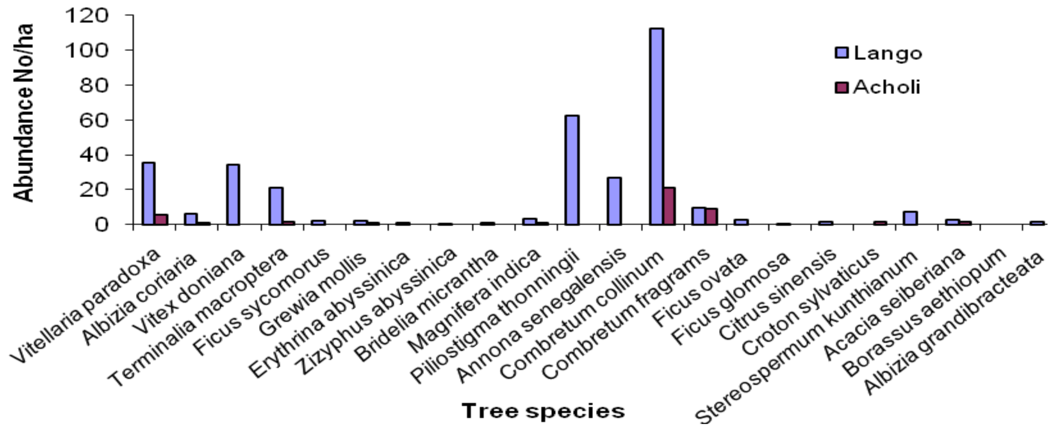

Figure 10: Abundance of poles near the IDP camps in Lango and Acholi

The most abundant tree species at pole stage at a distance far away from the IDP camps were *Combretum collinum* (150.3 poles/ha), *Piliostigma thonningii* (59.2 poles/ha), Vitellaria paradoxa (48.4 poles/ha) and *Annona senegalensis* (33.3 poles/ha). The least abundant ones were *Albizia coriaria* (1.7 poles/ha) and *Grewia mollis* (6.7 poles/ha). On the other hand, the most abundant species at pole stage far away from the IDP camps in Acholi sub-region were *Vitellaria paradoxa* (10.9 poles/ha), *Combretum collinum* (7.6 poles/ha) and *Vitex doniana* with a density of 4.6 poles/ha (Figure 11).

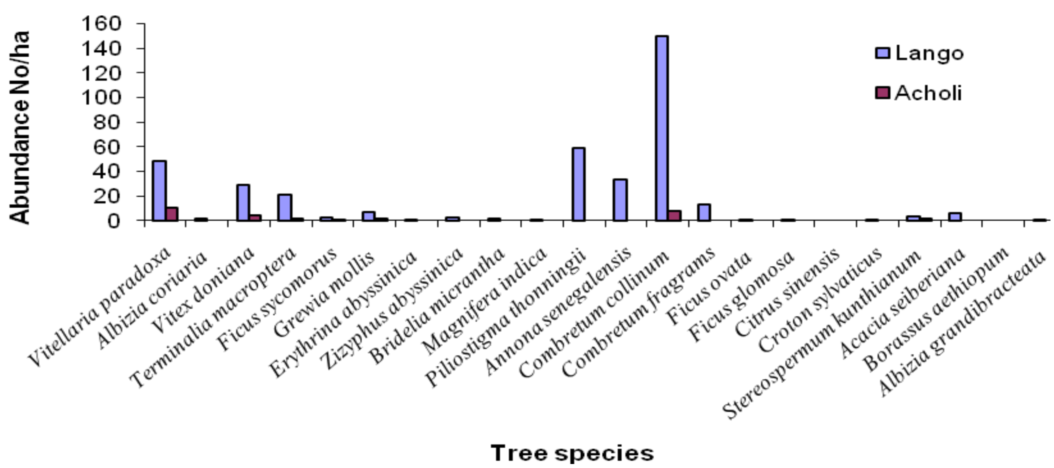

Figure 11: Abundance of poles located far from the camps in Lango and Acholi

c) Relative abundance of saplings

The most abundant species at the saplings stage nearer to the IDP camps in Lango sub-region were *Piliostigma thonningii* (125.4 saplings/ha), *Combretum collinum* (120.3 saplings/ha), *Vitex doniana* (64.2 saplings/ha) and *Vitellaria paradoxa* (46.7 saplings/ha). In the Acholi sub-region, the most abundant species at sapling stage were *Combretum collinum* (17.9 saplings/ha), *Combretum fragrans* (17.9 saplings/ha) and *Vitellaria paradoxa* (2.6 saplings/ha) (Figure 12).

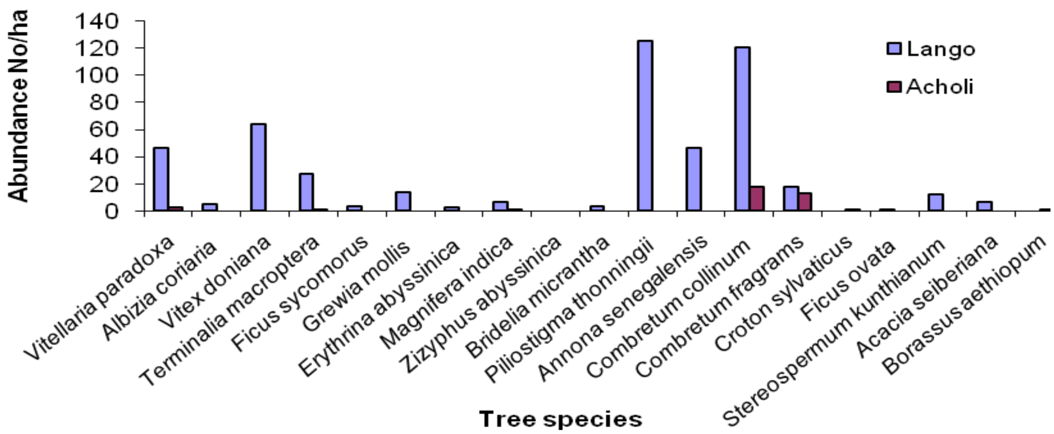

Figure 12: Abundance of saplings located near the camps in Lango and Achoil sub regions

While *Piliostigma thonningii* (111.7 saplings/ha), *Combretum collinum* (105.3 saplings/ha), *Vitellaria paradoxa* (64.3 saplings/ha) and *Anonna senegalensis* (59.3 saplings/ha) were the most abundant species at the sapling stage away from the IDP camps in Lango sub-region, in the Acholi sub-region, the most abundant species at this stage far away from the IDP camps included *Combretum collinum*, *Vitellaria paradoxa* and *Grewia mollis* with 8.4, 4.2 and 2.7 saplings/ha respectively (Figure 13).

d) Differences in the variation of tree densities from centre of the camps outwards

While there was a significant variation in the tree density as one moves away from IDP camps in the Lango sub-region ($P<0.05$), there was no significant variation ($P>0.05$) in tree species density as one moves away from the IDP camps in the Acholi sub-region (Table 9).

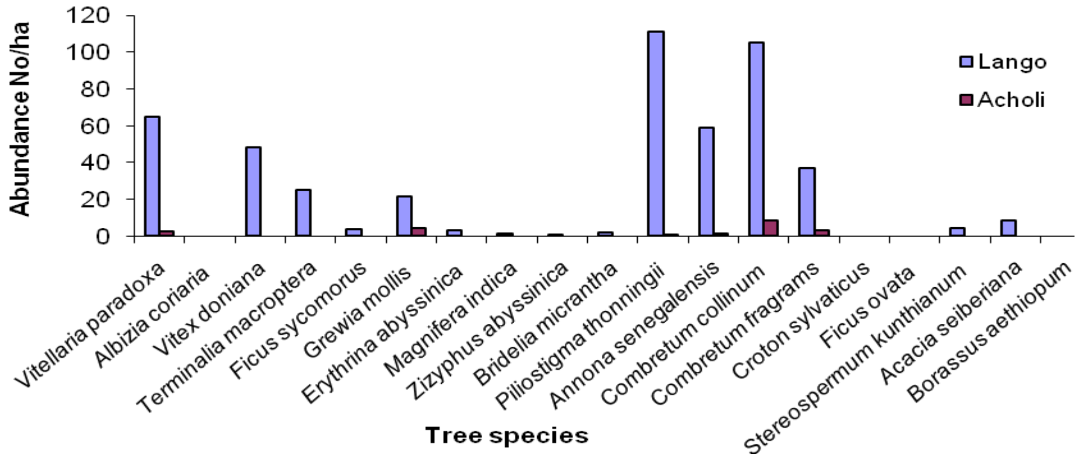

Figure 13: Abundance of saplings located far from the camps in Lango and Acholi

Table 9: Analysis of Variance (ANOVA) of tree species density from the IDP camp centre outwards in the Lango sub region

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	195.0009	9	21.66677	2.042628	0.037438	1.935315
Within Groups	1803.241	170	10.6073			
Total	1998.242	179				

Analysis of Variance (ANOVA) of tree species density from the IDP camp centre outwards in the Acholi sub region

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1.389388889	9	0.154376543	0.080113	0.999844	1.935315
Within Groups	327.5872222	170	1.92698366			
Total	328.9766111	179				

4.6 Indigenous tree species diversity in the shea parklands of Northern Uganda

The overall indigenous tree diversity index for the entire study area was H’ = 2.51 (Table 10). Plot 8 had the highest diversity with Shannon Weiner species diversity index (H’) of 2.59 followed by plot 2 with diversity index of H’=2.38. Generally, the diversity of trees increases with the distance from the camps.

4.6.1 General indigenous tree species diversity in the study area

The diversity indices of indigenous trees in both Lango and Acholi sub-regions were generally high. There were thirty two tree species identified in the study area.

Table 10 Shannon Weiner species diversity indices for indigenous tree species from the centre outwards of the camps

Plot no.	Total no.of trees	No. of tree species	∑ln(Pi)	∑Pi*ln(Pi)	$H^{/} = -\sum$ Pi In Pi
1	82	16	-56.9717	-1.79677	1.80
2	114	24	-89.9842	-2.38458	2.38
3	109	21	-81.2621	-2.05507	2.06
4	80	17	-58.4188	-2.13601	2.14
5	96	18	-69.3336	-1.77094	1.77
6	86	13	-45.646	-1.45335	1.45
7	80	16	-51.0133	-2.21811	2.22
8	101	25	-94.403	-2.58928	2.59
9	104	19	-64.4148	-2.34981	2.35
10	83	20	-66.7584	-2.30122	2.30
Entire area	935	37	-176.271	-2.50578	**2.51**

4.6.2 Indigenous tree species diversity in the Lango and Acholi sub regions

There were twenty nine tree species identified in the Lango Sub-region and twenty eight species in the Acholi Sub-region. Tree species in the Acholi Sub-region was more even than in the Lango Sub-region with evenness (E’) of 0.070 and 0.075 respectively. The diversity indices (H’) for mature indigenous tree species was higher in Acholi than in Lango sub-region with $H^{'}$ = 2.03 and $H^{'}$ = 2.11 respectively (Table 11).

Table 11: Shannon Weiner species diversity indices for indigenous tree species in Lango and Acholi sub regions.

Tree species	Lango				Acholi			
	No.	Pi	Ln pi	Pi*lnPi	No.	Pi	ln pi	Pi*lnPi
Acacia sieberiana	0	0	0	0	3	0.00898	-4.7125	-0.0423
Acacia Senegal	0	0	0	0	9	0.02694	-3.6139	-0.0973
Albizia coriaria	10	0.01706	-4.0707	-0.0694	2	0.00598	-5.1179	-0.0306
Albizia grandibracteata	3	0.00511	-5.2747	-0.0270	0	0	0	0
Annona senegalensis	13	0.02218	-3.8083	-0.0844	4	0.01197	-4.4248	-0.0529
Borassus aethiopum	0	0	0	0	5	0.01497	-4.2017	-0.0629
Bridelia micrantha	19	0.03242	-3.4288	-0.1111	8	0.02395	-3.7317	-0.0893
Combretum collinum	14	0.02389	-3.7342	-0.0892	21	0.06287	-2.7666	-0.1739
Combretum fragrams	17	0.02900	-3.5401	-0.1027	5	0.01490	-4.2017	-0.0629
Combretum molle	1	0.00170	-6.3733	-0.0108	1	0.00299	-5.8111	-0.0174
Croton macrostachyus	5	0.00853	-4.7638	-0.0406	0	0	0	0
Croton sylvaticus	7	0.01194	-4.4274	-0.0528	13	0.03892	-3.2461	-0.1263
Dichrostachys cinerea	3	0.00511	-5.2747	-0.0270	8	0.02395	-3.7317	-0.0893
Erythrina abyssinica	19	0.03242	-3.4288	-0.1111	4	0.011976	-4.4248	-0.0529
Ficus glomosa	7	0.01194	-4.4274	-0.0528	2	0.00598	-5.1179	-0.0306
Ficus natalensis	2	0.00341	-5.6801	-0.0193	3	0.00898	-4.7125	-0.0423
Ficus ovata	4	0.00682	-4.9870	-0.0340	4	0.01197	-4.4248	-0.0529
Ficus sycomorus L.	15	0.02559	-3.6652	-0.0938	11	0.03293	-3.4132	-0.1124
Grewia mollis	9	0.01535	-4.1760	-0.0641	12	0.03592	-3.3262	-0.1195
Kigelia Africana	3	0.00511	-5.2747	-0.0270	2	0.00598	-5.1179	-0.0306
Milicia excelsa	5	0.00853	-4.7638	-0.0406	2	0.00598	-5.1179	-0.0306
Piliostigma thonningii	28	0.04778	-3.0411	-0.1453	8	0.02395	-3.7317	-0.0893
Pseudocedrela kotschyi	2	0.00341	-5.6801	-0.0193	1	0.00299	-5.8111	-0.0174
Sarcocephalus latifolius	1	0.00170	-6.3733	-0.0108	0	0	0	0
Senna siamea	3	0.00511	-5.2747	-0.0270	0	0	0	0
Spathodea campanulata	5	0.00853	-4.7638	-0.0406	1	0.00299	-5.8111	-0.0174
Stereospermum kunthianum	3	0.00511	-5.2747	-0.0270	1	0.00299	-5.8111	-0.0174
Tamarindus indica	1	0.00170	-6.3733	-0.0108	5	0.01497	-4.2017	-0.0629
Terminalia macroptera	20	0.03410	-3.3775	-0.1152	14	0.04191	-3.1720	-0.1329
Vitellaria paradoxa	264	0.45051	-0.7973	-0.3592	117	0.35029	-1.0489	-0.3674
Vitex doniana	25	0.04266	-3.1544	-0.1345	6	0.01796	-4.0193	-0.0722
Zizyphus abyssinica	14	0.02389	-3.7342	-0.0892	1	0.00299	-5.8111	-0.0174
Total -Σ	**522**	**0.89061**	**128.943**	**2.0366**	**273**	**0.817176**	**120.633**	**2.1112**
Evenness (E')				**0.070**				**0.075**

H^I = 2.04 and H^I = 2.11 for Lango and Acholi respectively

CHAPTER FIVE
DISCUSSION

5.1 Socio-demographic characteristic of the respondents

Consideration of socio-demographic characteristics is of great importance in monitoring abundance, distribution and conservation of plant species by local communities. According to Anthony (2001), tree species population can be pushed beyond recovery through habitat destruction or over exploitation. Studies elsewhere also show that ecological protection and restoration can become a low priority during and after war (Wall and Michelle, 2003). This is so because the environmental impacts of conflicts are often forgotten in the midst of the massive human suffering and loss.

As insecurity had forced most respondents to live in the IDP camps (for between 11 – 20 years), the majority of them stopped at primary level. This resulted into more peasants among the respondents without trained skills and with high dependency on handouts from humanitarian organizations. Although most aspects of conservation can be appreciated by educated community in the study area, there is low conservation effort because of poor educational level of the respondents. In order to promote shea parkland resources, both formal and informal education should be encouraged. As has also been reported by Obua *et al*. (1998) that both formal and informal education can increase people's awareness, appreciation of the value of trees and people's ability to communicate, formal and informal training should be promoted in the shea parklands.

5.1.1 Ethno uses of indigenous tree species in the shea parklands of northern Uganda

Through careful tree selection, farmers have deliberately shaped tree production on their farmland to fulfill their specific needs (Boffa, 1999). As a result of scarcity of fuel wood in northern Uganda, especially in the Internally Displaced People's (IDPs) camps, the local people (over 90%) heavily depend on the available indigenous tree species for firewood. The shea tree is specially cut for firewood and charcoal making in spite of its economic importance as a source of nuts and cooking oil.

The tree boles and branches are usually converted into charcoal, an activity that has tremendously reduced the number of shea and other indigenous trees in the war ravaged region. At the extremes even twigs are also utilized as firewood by mostly the rural women (FAO, 2002). Although tree species like *Grewia mollis* are commonly utilized for making handicraft materials (Plate 4), where economic incentives and a tradition for conservation of the shea tree exist, the tree is maintained and used for oil production (Masters & Puga, 1994).

Plate 3: Firewood collected from the shea parkland near the camp in Pader district

Plate 4: A man carrying a bundle of *Grewia mollis* for construction in Pader district

According to Nafan (2001)**,** shea butter is the most valuable product from shea trees. The butter normally obtained from its seed kernels is the most economically important product and has a fat content of 55%. The butter is traditionally made by crushing the kernels after which water is added to the mixture, boiled and later distilled (Plate 5).

As the traditional process of shea oil extraction yields low oil quantities (varying between 15%-20%, industrialized extraction processes which have recorded yields of up to 60% (Masters, 2002) should be promoted in order to increase its value.

Plate 5: Shea oil being extracted locally after grinding and boiling on fire

Shea butter has various uses ranging from preparation of food, manufacture of soap, to cosmetic and skin care. Shea fruits are also consumed as food especially in times of agricultural labour which normally occurs at the beginning of the rainy season (FAO, 2002). In addition, the leaves of shea trees can also be used to cure stomach pain (Koumaro, 2002).

In northern Uganda, shea butter is used for smearing bodies of newly born babies and pregnant mothers. In West Africa, shea butter is kept for social needs such as gifts for births and weddings, or dowries (Ouédraogo, 1995). Such uses can provide incentives for exploitation and conservation of shea and other indigenous tree species in the shea parklands while at the same time enhancing economic growth (Obua *et al.*, 2000). Gum arabic obtained from *Acacia senegal* and shea nut butter from *Vitellaria paradoxa*, for example, have been providing primary export earnings for several nations in the Sahel. In some places in West Africa, agro-forestry parklands account for up to 75% of total harvests of wood and non-wood products (Boffa, 1999).

A part from shea, other multipurpose indigenous trees in northern Uganda include *Kigelia africana*, *Stereospermum kunthianum*, *Combretum collinum*, *Erythrina abyssinica*, *Dichrostachys cinerea* and *Steganotaenia araliacea* (Table 4). These parkland tree resources are also of considerable social and cultural significance (Boffa, 1999). According to Tabuti *et al.,* (2003), indigenous plant species that can be used for firewood, herbal medicines, poles and traditional construction materials/activities are always spared, hence strengthening the case for their conservation. Although this might be true, people living in IDP camps had been left absolutely with no other option but to entirely depend on the indigenous trees for survival. This dependency has posed a great threat to conservation of indigenous tree species in northern Uganda. Thus, despite having a lot of knowledge on the indigenous tree species' products, such as which species are best for building poles, or good for fuel and medicine, the local community still collects most of these from the wild. This is because people still have the notion that it is still considered cheaper to harvest woody plant products from the wild than to grow them on farms (FAO, 2002).

5.2 On-farm traditional management and conservation strategies of shea and other indigenous trees

The most common strategy for managing shea seedlings has been the protection of naturally regenerating shea followed by weeding, digging around and conducting regular inspection against fires (Table 5). These strategies have also been reported by Obua (2004) who pointed out that shea and other valuable trees on farm are conserved and protected through sparing during cultivation and weeding around the seedling/sapling/tree to prevent fire from burning it. In northern Uganda, tending operations are limited to thinning and pruning of heavily branched trees to reduce the effect of shading on agricultural crops.

Traditionally, farmers do not cut all trees at the time of land clearing for agricultural production (Plate 6). They usually preserve valuable species such as *Vitellaria paradoxa* and nurture them in the crop fields. This shows that parkland species which easily regenerate naturally are not traditionally planted but are spared during clearing of land for agricultural production (Boffa, 1999). According to Gary (2004), recent increase in the knowledge on value of *Vitellaria paradoxa* and demand for its products, have increased the need to conserve and utilize the shea resources in an environmentally sustainable and economically beneficial manner.

Plate 6: Shea trees being conserved in crop fields

Even if valued for its various products, *Vitellaria paradoxa* is rarely planted by farmers in its parklands. Over 80% of the respondents in this area conserved shea seedlings by allowing them to regenerate naturally. As noted by FAO (2002), species retention is the most common strategy for conserving on-farm tree species. Due to its long juvenile period, regeneration and conservation of shea trees is facilitated by human management, both by covering germinated seeds with mulch and through protection of the young shea seedling along with other useful species, when clearing land for cultivation (Masters, 2002).

Field observations showed that on lands protected from bush fires, numerous young shea trees were sprouting from existing old stumps. Thus, where farmers, bush fires, or browsing animals do not destroy young shea trees, they naturally regenerate and grow into mature trees (Plate 7). According to Lovett and Wasser (1999), conservation strategies employed in Eastern Africa range from monitoring and inventory of forest resources (where the distribution, location and numerical status of the resource) is used for planning conservation strategies and deciding land use objectives.

Plate 7: Well protected mature shea trees in crop field along a roadside

Apart from the above, improved management of the parklands can be achieved through provision of sufficient numbers of supervisory staff and facilities to protect the resource from illegal entry, encroachment and over exploitation.

Since, conservation of woodland and shea parkland resources requires management inputs into both the resources and the human population who depend on the resources for their livelihood (Lovett and Wasser, 1999), successful conservation strategies must have the support of the people at both local and national levels. This implies that concerned authorities should take into consideration the needs and interest of the local population (Madrama, 2006). This is so because where traditional products from parkland trees can be substituted by cultivated crops or items purchased at the market, farmers may be less motivated to regenerate parklands (Boffa, 1999).

A case in point is the substitution of shea butter by animal butter in areas of livestock production or by vegetable oils such as groundnut, sunflower or palm oil favoured by some groups for their less variable annual yields, relative ease of processing and preferred taste.

According to Obua (2002), local beliefs and culture can help to protect shea trees from unnecessary cutting. For example, taboos and bye-laws that forbid cutting shea trees have played a role in determining which tree species to conserve in northern Uganda. One of the key cultural uses is the use of shea oil reported by elders for smearing new-born babies and their mothers as a sign of blessing. Various types of fines are also imposed on those who cut shea trees.

For example a fine of Uganda shillings 5, 000/=, a goat or a cow would normally be charged and paid to the owner of the shea tree cut (Obua, 2002). In some cases, the decision to conserve or plant a certain species of trees has also been dictated by the beliefs and myths of the community about such species.

Both formal and informal education has also been reported to increase people's awareness, appreciation of the value of trees and people's ability to communicate (Obua *et al.*, 1998). What this means is that lack of education can greatly affect implementation of parkland management strategies. As training may be an important means to increase national capacity for interdisciplinary research involved in on-farm conservation, it should be carried out in a participatory manner if shea and other indigenous trees are to be conserved. On-farm conservation initiatives and projects also should be promoted in a manner that ensures gender equity in participation and decision making (Hall *et al*, 1996).

In Uganda, protection of shea resources would be based on defined actions for sustainable woodland management including objectively variable indicators for monitoring and follow-up. Establishment of such a monitoring system for follow-up and control would ensure that exploitation of the resource is effectively compensated with the renewal to avoid irreversible decline. The recognition of farmers' decisions and indigenous knowledge should be a component as it is important in the development of better and sustainable conservation strategies for the shea resource. This would necessitate a practical dialogue involving participation of all concerned stakeholders to harmonize strategies for conservation of shea and other indigenous tree species as peace returns in the region.

5.2.1 Willingness to plant shea and other indigenous trees

Conservation is greatly influenced by both the perceived and actual attitudes that people have towards planting of multipurpose indigenous trees on their farmland (Barrow, 1996). *Vitellaria paradoxa* is the most highly valued and most demanded species from Lira and Pader woodlands. Such a local perception of the shea tree greatly influences people's attitude towards its conservation. According to Bonkoungou (2002), less desirable trees are usually cut down, while the preferred and multipurpose ones are maintained in the cropped field (at densities compatible with crop production) and nurtured to optimize the respective yields of crops and tree products.

Although the benefit of trees in the overall agricultural system is the primary factor determining whether parkland trees are maintained and planted, evidence shows that when farmers perceive that trees and their products have increased economic worth, they are more likely to invest actively in the protection and reproduction of such parklands (Louppe and Ouattara, 1997). For example, *Borassus aethiopum* parklands in the village of Wolokonto in Burkina Faso are expanding both spatially and in density because of the high income that are generated from palm wine (Bonkoungou, 2002).

In contrast, farmers may neglect their tree resources and favour alternative and sometimes competing practices, consumer items and income-earning activities when these yield higher benefits than those involving parkland trees (Obua, 2002). A report by Louppe and Ouattara (1997) indicates that external parameters such as markets, external pressure on village resources, migration and relations with urban centers appear to have a strong influence on the relative value of parkland trees. For example, in northern Côte d'Ivoire, management of the shea tree densities has responded rapidly to changes in the relative prices of its products. Although shea regeneration can be promoted where shea nuts/ butter sell for higher prices, trees tend to be felled and sold in the fuel wood market, if fuel wood outstrips those of other products (Foster, 2000).

Logistic regression analysis of the socio economic characteristics versus people's willingness to plant shea trees showed a significant relationship between period of stay in the area, marital status and willingness to protect and plant shea on their farms (Table 8). The marginal change on the willingness of the respondents to plant/ protect shea trees on their farmlands as a result of the period of stay in the area was 0.124. This means that if a respondent had stayed in the area for over 20 years, his or her probability to plant and protect shea increases by 12.4%. This may be attributed to the fact that most of people who have stayed in the area for over 20 years attach more value on indigenous trees than those who have stayed in the area for less than 20 years especially those who have been displaced and forced to stay in the IDP camps.

The marginal change on willingness to plant shea trees as a result of marital status is 0.325 implying that if a respondent is married, his/her probability of planting shea increases by 32.5%. According to Okullo *et al.,* (2004), the shea butter tree plays an important role in augmenting house hold incomes for rural people and this may be a motivation for married people. Any interventions employed to protect shea and other indigenous tree species in the northern region should therefore put more focus on married households as well as those that have stayed in the area for over 20 years not those who are temporarily staying in the camp.

5.3 Influence of IDPs on the abundance of shea and other indigenous tree species

According to COVOL (2006), deterioration of security conditions in northern Uganda from 2002 onwards; made thousands of slow growing shea trees to be cut by highly organized charcoal traders who allegedly used military vehicles to transport their products to urban markets. This resulted into a considerable damage to the integrity and sustainability of the shea resource. Although the respondents had good reasons for protecting or planting shea trees, their efforts to conserve shea and other indigenous trees were constrained by the effects of the two-decade northern war (Masters, 2002).

In Lango sub-region, the abundance of mature shea and other indigenous tree species was generally low near the IDPs and gradually increased as one moved away from the camps (Figure 8). The main cause of the low abundance close to the camps could be attributed to pressure exerted on the nearby trees by the large number of people in the camps in search of fuel and building materials. According to Grainger (1993), local population increase resulting from either inherent growth or immigration, can lead to over exploitation of the natural resources in the immediate vicinity for charcoal, building materials and land for settlement.

A report by Marini – Bettolo (1993) also indicates that rapid population growth and poverty are often interlinked. As most of the internally displaced people were not employed and lived in absolute poverty, their dependency on natural resources accelerated environmental disturbance in the area. Although the abundance of mature tree species in Acholi sub-region was extremely low even in the plots that were distant from the camps, there was no significant variation ($P>0.05$) in the density of tree species from the centre of the camps outwards in Acholi sub-region. This implies that displaced communities in the Acholi sub region IDP camps did not only cut trees near the camp but also moved far away from the camp (Plate 8).

Plate 8: Mature shea trees cut down for charcoal near a camp in Acholi sub region

The movements further away from the camp to look for poles, firewood or other tree products could also be linked to the duration of stay in the camp which was much longer almost 20 years in the Acholi sub-region than in the Lango sub-region (between 6-10 years).

Contrary to the situations in the Acholi sub-region IDP camps, higher densities of mature good-timber and charcoal tree species such as *Albizia coriaria, Milicia excelsa, Terminalia macroptera* and *Combretum collinum* were registered in the far off plots than in nearby plots in the Lango sub-region (Figures 9). There was also a significant variation ($P<0.05$) in the densities of mature tree species as one moves away from the centre outwards of IDP camps in the Lango sub-region (Table 9). This could have been due to fear of land mines and duration of camps in the Lango sub-region which was shorter than in the Acholi sub-region.

Even so, internal displacement coupled with communal land use practices can also have direct negative impacts on the abundance of trees. According to Bonkoungou (2002), trees on crop fields tend to be dominated by large diameter mature trees. In northern Uganda, the abundance of tree poles and saplings was higher in plots that were located in the natural bushes (normally located far from the camps) and fallows than in the crop fields (near the camps). This may be due to low seedling survival rate in the crop fields hence a small proportion of seedlings reaching the sapling and pole stages. Notwithstanding differences in the local conditions, a consistent characteristic of abundance in shea population was that larger diameter individuals dominated, especially in crop fields, where young regenerants were few. Unlike *Faidherbia albida* parklands which thrive under continuous cultivation, shea parklands regenerate during fallow periods (Bonkoungou, 2002). However, if retained by farmers, trees on cropland can become more vigorous than in the natural bush or in old fallows because they benefit from farmers' care and protection from fires.

According to Okafor (1988), indigenous fruits contribute significantly to diets of rural households because of their high nutritive value. In this study, the abundance of fruit trees such as *Anona senegalensis, Tamarindus indica*, *Vitellaria paradoxa* and *Vitex doniana* were relatively the same irrespective of the distance from the camps. Although there is a tendency to exotic fruits (Agea *et al*, 2007), the local people in northern Uganda (especially in Lango sub-region) have also protected indigenous fruit tree species. In fact, exotic fruit trees like *Mangifera indica* are conserved by the people in camps amidst insecurity in the region because they can supply the needed fruits during famine times.

As peace returns to northern Uganda, the shea tree comprises a unique resource for rebuilding the lives and livelihoods of rural farmers now returning to their villages (The Shea Project, 2008-2012). As such there is need for establishment of tree nurseries where demonstrations on the importance of trees on-farm, their production and management can be carried out to both the young and old ones. Besides, appropriate conservation efforts are urgently needed especially in northern Uganda where concentrations of IDP camps have reduced tree densities tremendously.

5.3.1 The Influence of IDPs on the diversity of indigenous tree resources

Conserving biodiversity where people live is a major challenge, especially where the growing population pressure on the natural resources is paramount (McNeely, 2004). In northern Uganda, the diversity of indigenous tree species generally increases from the centre of the IDP camps outwards. The over exploitation of shea woodland resources for fuel, construction and creation of land for crop cultivation near the camps, have led to loss of tree/forest species and decline in tree species diversity. It has also resulted into damage to the residual trees and loss of soil nutrients exposing the ground to erosion, increased light intensity and changes in the forest structure (Sunderland *et al,* 1999). According to Yadav and Gupta (2006), considerable changes in the forest structure may occur in the diversity of herbaceous species even due to partial disturbance of the vegetation. As large scale felling of trees may cause irreversible changes in the composition of the herbaceous vegetation of the parkland ecosystems, a high species diversity of the parkland vegetation may be protected only by *in-situ* conservation.

In this study, more mature trees were found protected near the camps, with evidence of low species diversity near the camps (Figure 8). According to Gjsbers *et al.*, (1994), tree species diversity can decrease with aging tree populations and lack of regeneration. Such cases have also been reported by Kelly *et al.*, (2004), Schreckenberg (1999), Boffa (1999) and Nikiema (1993). One of the factors that could better explain the degradation of the parkland resources is the harvesting of trees for firewood and construction poles at a high rate by the IDPs. The destructive harvest cannot give any chance for the trees to produce seeds which could promote regeneration of plants in the camp surroundings. Since most of the identified plant species were reported to be exceptionally useful (Table 4), their level of utilization may far exceed their regeneration and productions as has also been reported by Luoga *et al.*, (2000), thereby perpetuating further environmental devastation in the area.

The high tree species diversity registered in plots far off from the camps may be linked to field types. In related study by Okullo and Waithum (2007), fallow fields were reported to be more species diverse than fields under continuous cropping system. This may be due to loss of plant vegetation during land cultivation, which was carried out on the land near the camps. In IDP camps, no crop cultivation was observed to be carried out in distant places from the camps. The fear of rebel attacks and land mines, made the trees in the far off areas not to be cut down, thus contributing to the high diversity of indigenous tree species in distant plots (8, 9 and 10) of the respective transects. According to Lundgren and Raintree (1983), the influence of continuous cropping on species diversity has been reported to be worse as it does not provide any opportunity for natural regeneration.

When the diversity indices of indigenous trees in both Lango and Acholi sub-regions were calculated separately, high diversity indices were registered for both regions. Although the diversity index for the Acholi sub-region was higher than in the Lango sub-region (Table 11), both regions have experienced human disturbance on the vegetation. The trend in diversity was due to evenness rather than in species richness. According to intermediate disturbance hypothesis, diversity can also be highest when disturbance is neither too rare nor too frequent (Connell, 1978). This implies that species diversity is also dependent on the degree of disturbance on an ecosystem.

To be able to conserve biodiversity in a given area, there is need to understand how tree species diversity is impacted by different management strategies (Roth *et al*, 1994). The shift in biodiversity conservation from a protectionist form of preservation towards one of sustainable utilization has included an emphasis on the need for participation in conservation management (Rehema *et al*, 2005). The rationale is that citizens/communities would feel responsible for realization of conservation goals if they are involved in their interpretation and implementation, and that deliberative decision making could assist when peoples' livelihoods are influenced by conservation actions (Rehema *et al.*, 2005). Since the largest proportion of the population in this study had a low level of education coupled with little or no knowledge of the importance of conservation and sustainable use of tree resources, the benefits from the conservation of woody species are seen as long term. Initiative to curb environmental degradation should therefore take into consideration the local people's knowledge and use of different tree species in order to ensure their active participation and smooth adoption.

As the protection of natural regeneration of parklands would contribute to conservation of the genetic resource of the species, local communities and advocacy groups need to be empowered with the necessary management tools required to increase the efficiency of their interventions. Meanwhile establishment of protected genetic pools of maximum diversity would enhance the long-term conservation of the resource. Although the assessment of the diversity of indigenous trees is vital for their conservation, such information can also be required for selection of agroforestry species and monitoring of their dynamics in agricultural ecosystems (UGADEN, 2000).

5.4 The Influence of forest policies on implementation of improved tree management practices in the shea parkland in the shea parklands

The 1998 Uganda Land Act stipulates that where any group of persons holds land communally, the land may be held on behalf of the group by a trustee chosen by the group, according to the customs of such a community. This provision permits the registration of communal land and the management of forest resources as common property. According to Obua (2002), the major problem with the utilization of common pool resources is that no one is responsible for the state of the resources but everybody wants to gain maximum benefits from them. When the resources are completely degraded, everyone loses the benefits, thus leading to what is known as the tragedy of the commons. Although the Uganda Local Government Act (1997) devolved some decision-making to districts so that they can manage local forest reserves, it is emerging that districts have little incentives to invest in forests. They are more interested in the revenue aspects than in the multi-functions of forests which have led to serious destruction of these devalued forests. This therefore makes it difficult to implement improved traditional management practices for shea and other indigenous trees since there will be lack of commitment to the programme.

According to Boffa (1999), national forest policies in the Sahel region often do not promote optimal implementation of improved traditional management practices. A key constraint of Sahelian parkland management is that all farmlands with trees in them are included in the national forest domain falling under state control, unless the land is registered (McLain, 1992). This does not give opportunity to farmers to register their land, because they are generally not well informed while registration is also costly. Thus many restrictions intended to protect forest trees are inappropriately applied to trees on farms and fallows. For instance, farmers are required to obtain permits for cutting and pruning of parkland trees or transporting tree products. This has discouraged them from carrying out basic management activities such as thinning, removal of old or dead trees, parasite control, coppicing and pruning, which are crucial to optimizing their land use systems (Boffa, 1999). In the end, most people become reluctant to plant trees and may choose to eliminate them as they regenerate.

A report by the MWLE (2001) indicates that at the time when Uganda gained independence in 1962, most basic aspects on policies remained virtually intact. However, recent studies by the MWLE (2003), revealed that population growth and general economic changes and policies are significantly contributing to the increasing destruction and degradation of Uganda’s natural resources. Apart from these, forest policies which do not recognize secondary right of land owners can also hinder implementation of traditional management practices (Boffa, 1999). For example, where people are in camps and obviously mainly secondary land holders (like in northern Uganda), adjustments could be made to effect improved management practices. This is so because where tenure arrangements are secure and unambiguous, parklands have the greatest chance of reproduction. There is also need for forestry extension and development personnel to develop a detailed understanding of local land and tree tenure dynamics to help local people negotiate clearly articulated and mutually appropriate agreements regarding land and tree rights.

5.4.1 Opportunities for natural resource management

According to the Constitution of Uganda (1995), local administrations are granted the right and responsibility of managing forest resources for the benefit of the local people. The Uganda Local Government Act of 1998 further gives legal authority to the local governments to establish and manage small forests on public land to meet the needs of the local people. As the same Act even establishes local committees/councils to govern natural resources, the local committees/councils have the power and authority to plan and manage the local forest resources in their respective areas. It is therefore highly recommended that the local authorities in IDP Camps in northern Uganda utilize the powers entrusted to them in the constitution to effectively implement good parkland management programmes. Good parkland management programmes will enhance conservation of parklands and hence survival of the shea trees. How best this can be done needs cooperation and involvement of the local communities.

Thus, to enhance conservation of parklands, local community participation is paramount (Sarin, 1996). This recognition is based on the assumption that local communities can make rational decisions and participate in managing resources around them collectively when they clearly envisage net tangible benefits in terms of income, products and services (Ostrom, 1990). In northern and eastern Uganda, some families have begun to protect mature shea trees (Plate 9) and re-growth from being cut to allow the trees to grow back especially as peace returns to the region. Commercialization of shea products through appropriate value addition would in consequence go along to encourage the local communities to promote its conservation.

Plate 9: A well protected shea tree**:** Protecting such a big size requires good governance and local-community participation

According to Gombya–Ssembajjwe and Banana (2000), another avenue of natural resource management through community based management of rural resources is Collaborative Forest Management (CFM), also known as Joint Forest Management (JFM). A change in the forest policy of many countries like Uganda, Kenya, Tanzania, Gambia, India, Thailand among others has allowed for the participation of local communities in establishment and management of the community forestry within its operation at all levels. In this system, there is need to give back 40% of the revenue collected from the forest resources within a sub-county to the community as an incentive to help local communities effectively manage forest resource,. Even then, a common concern among the communities living in the shea parklands is the need to bring up children who are aware of the uses and values of shea trees (Obua, 2002). Such an approach could be used to reinforce the conservation of local forests or shea parklands of northern Uganda.

In general, Uganda has several policies with diverse tools or mechanisms, which if implemented successfully, would ensure sustainable conservation of natural resources. For example, the National Environment Statute (1995), the Water Statute (1995) and the Wildlife Statute (1996) all make compulsory the use of Environment Impact Assessment for projects. Likewise, the Forest Policy (2001) and the National Environment Management Policy (1994) stress the importance of public participation in environmental management. However, there is growing evidence that despite existence of policies and laws, striking a balance between utilization and protection remains a political-economic question. This means that all the above opportunities cannot be implemented without ensuring political stability of the war ravaged northern region. Although the government of Uganda has shown a great interest in resolving the conflict through peace talks, more pressure is still needed to capitalize on recent progress in order to come up with a final agreement that brings both sustainable peace and meaningful justice to northern Uganda.

According to Kazoora (2001), policies are always formulated to keep management in line with perceived short and long-term objective of the state. Since policies are required to protect indigenous plants outside protected areas, they should be translated into a legal instrument. The protectionist policy in the management of natural resources poses a paradox to government because of the need to eradicate poverty through utilizing resources (Onencan, 2002). It therefore requires a balance between protection and utilization of natural resources such as in the shea parklands, usually termed ‘wise use’ of natural resources.

In 1997, the Ugandan government designed the PEAP to fight poverty. One of the concerns under PEAP is ‘the need to strengthen national policy, legislative and community institutional capacity (MFPED, 2004) with the aim of ensuring that biodiversity resources are utilized to meet national poverty eradication and sustainable development goals”. Pillar 2 of PEAP recognizes the importance of preservation of the natural resource base, particularly soils and forests, and improvement in infrastructure and energy. Besides, PEAP also recognizes that environmental degradation is both a cause and a consequence of poverty. Preparations therefore need to be taken at a community level to protect the natural resource base if encroachment on forest reserves, deforestation and local loss of trees are to be minimized.

According to the MFPED (2004), the PMA is a holistic, strategic framework designed to implement and meet the objectives of PEAP. The objectives of PMA are to: increase incomes and improve the quality of life of poor subsistence farmers; improve household food security; provide gainful employment; and promote sustainable use and management of natural resources. As the focus of PMA is not simply planting trees (but rather their contribution to socio-economic well being and poverty eradication), proper implementation of PMA objectives is thus highly recommended in the shea parkland. This may, however, require some necessary adjustments to suit the conditions on the ground.

The legal and policy frameworks also pose a paradox in enforcement. For example, although the Local Government Act of 1997 gives powers to local governments to make policy, regulate delivery of services, receive, raise, manage, and allocate revenues through approval and execution of own goals, the National Forestry Policy (2001) mandates the NFA to supervise, monitor, regulate and control forestry activities. This controversy in policy implementation limits proper enforcement of conservation policies. According to MAAIF (2004), the enforcement standpoint, the mechanisms and facilities available are also generally weak in areas related to management of natural resources. This always puts conservation of highly valued indigenous tree species such as shea trees at a risk.

5.4.2 Bye-laws and policy framework for the conservation of natural resources

By the time of this study, no specific bye-laws had been put in place for the conservation of the indigenous tree species in the area. What the majority of the respondents referred to as bye-laws are societal norms and taboos that when abided by would act as conservation measures for natural resources like shea and other indigenous trees. Such taboos include a ritual performance of slaughtering a goat/sheep in case a person cuts a shea tree that does not belong to him/her.

Furthermore, most secondary information on the conventions and government policies which existed did not impinge specifically on shea and other trees in the parkland. For example, the Convention on Biological Diversity (CBD); the Convention on International Trade in Endangered Species of Fauna and Flora (CITES); the PMA (MAAIF and MFPED, 2000); the Uganda Forestry Policy (MWLE, 2001); and the NAADS Programme (MAAIF, 2000) all do not specifically have clauses related to conservation of indigenous trees including shea. Even policies on the establishment of the National Wetlands Conservation Programme which was charged with the formulation of a National Wetlands Policy 1995 did not consider parklands which also have a lot of wetlands.

In the Wildlife Sector, the government in seeking to improve management systems and practices, formulated the Uganda Wildlife Policy in 1995, followed by the enactment of the Uganda Wildlife Statute in 1996. Although the policy and the law brought changes in the existing institutional structure by bringing the management of all wildlife resources under the newly created Uganda Wildlife Authority, this left out forests and wetland. As a result, community participation in management decisions and activities only increased for management of the wildlife resources in the national parks and game reserves not forest or wetlands. This therefore denied the creation of a room for private sector to participate in the management and sustainable utilization of natural forests or shea parklands. Even if the new policy and law also sought to implement Uganda's outstanding obligation under various international treaties including the Convention on International Trade in Endangered Species of Fauna and Flora (CITES) of 1972, the Convention on Migratory species of Wild Animals (CMS) of 1979 and the Convention on Biological Diversity (CBD) of 1992, there has been no mention of most of the species from the shea parklands.

Although the Uganda Constitution of 1995 addresses the issue of natural resources (where under Article 237(1) of the Constitution land has been vested in the citizens of Uganda), under Article 237(2)(b) natural resources are to be held *in* trust for the people. The government is to protect natural lakes, rivers, wetlands, forest reserves, wildlife reserves, national parks and any land to be reserved for ecological and touristic purposes for the common good of all citizens." This provision reflects the contents of National Objective XVII (also part of the Constitution) that requires the state to protect natural resources including forests, water, wetlands, minerals, oil, fauna and flora (on behalf of the people of Uganda). This needs to be implemented properly for the benefit of everyone including communities in the shea parklands.

The Constitution of 1995 that provides for the establishment of a local government system based on the District as the Unit should have been used hand in hand with the Local Governments' Act of 1997 that clarifies the responsibilities of the Local Government to enhance the management of shea parklands. Although under this Act, the responsibility for the management of wetlands is put in the hands of the District, the natural forests are under the NFA. Separations of these resources thus bring in a lot of delays or difficulties in trying to implement proper management regimes for forest resources. Even then, there are avenues such as the wetlands Policy and the National Environment Management Policy/the National Environment Statute that should be made use of in management of shea parkland resources. For instance, even if under sections 35 - 38 of the National Environment Statute; the need for carrying out Environmental Impact Assessment (EIA) for activities and developments in wetlands and other natural resources of conservation concern has been stressed, its implementation has been very difficult in the shea parkland. This could be due to inadequate capacity at the districts and local council levels.

Other policies that need to be made use of include the National Forestry Policy (NFP)/ National Tree Planting Act that was formulated by the MWLE in 2003. The purpose of the NFP was to address incomes and quality of life of the poor; increase economic activity and employment in forest industries; as well as achieve sustainable resource management in central forests. The operationalization of the NFP by the NFA and other stakeholders such as the District Forest Services, the private sector and the local communities, the shea parkland communities needs to be carried out appropriately so everyone cab benefit from its implementation.

The National Planning Authority Act (2002) that established the National Planning Authority (NPA) should also be made use of. This is so because the NPA has a goal of harmonizing national planning and minimizing duplication, and consequently improving performance efficiency in various government sectors. Since the authority has the primary function of producing comprehensive and integrated development plans for the country (elaborated in terms of perspective vision, the long-term and medium term plans), the identification of linkages and synergies in the integration of conservation of natural resources/shea parklands in development plans will be paramount to conservation of the shea and other indigenous trees in northern Uganda.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The following conclusions have been drawn from the study:

i. The shea tree is specially cut for firewood and charcoal in spite of its economic importance as a source of cooking oil. Other ethno-uses of indigenous trees include timber, medicine, fodder, art and crafts and services such as shade in home compounds.

ii. The major on-farm traditional management and conservation strategies of shea and other indigenous tree resources in northern Uganda include: allowing natural regeneration, weeding, sparing the seedlings while digging, regular inspection of fields to protect shea from fires, pruning, protecting seedlings by staking them, practicing early burning, fire fighting, cutting down infested shea trees, use of bye-laws and selective harvesting.

iii. The local people in northern Uganda are willing to plant and protect shea trees growing on their farmlands. However their willingness to protect and plant shea trees on their farms is significantly influenced by marital status and period of stay in the area.

iv. Internal displacement of people in northern Uganda has a significant negative impact on the abundance and diversity of shea trees and other indigenous tree resources in the area.

v. The provision in the 1998 Land Act which permits the registration of communal land and the management of forest resources as common property has a negative impact on conservation of parklands.

vi. Some forest policies in Uganda do not promote optimal implementation of improved traditional management practices. For example, forest policies which do not recognize secondary-right of land owners make it difficult for people in IDP camps to effectively implement traditional tree management practices.

vii. Although the respondents had good reasons for protecting or planting shea trees, their efforts to conserve shea and other indigenous trees were constrained by the persistent political instability and two-decade northern war.

6.2 Recommendations

The following recommendations have been made:

i. There is need to mobilise and sensitise the local community about the value of conserving shea and other indigenous tree resources on their farmlands. This could be done by encouraging farmers to practice agroforestry. Furthermore, the aspect of conservation of trees could be incorporated in school curriculum to be taught to pupils and students at both primary and secondary schools. In addition, local communities' bye-laws and informal education that exist within the community in form of taboos respectively need to be promoted and encouraged in the area.

ii. The local authorities in the Internally Displaced People's camps should utilize the powers entrusted to them in the Uganda Constitution (1995) to effectively implement appropriate parklands management programmes with the local people's participation.

iii. Local community projects that target shea tree and associated products should be supported by both central and local government and other conservation bodies. This will help to effectively carry out their activities and promote shea conservation initiatives among the local communities as people return to their ancestral homes.

iv. Both *ex-situ* and *in-situ* conservation strategies for shea tree and other useful indigenous trees should be promoted in the region. For example, establishment of tree nurseries where demonstrations on the importance of trees on-farm, their products and management can be carried out and protection of mature and re-growth from being cut.

v. To ensure people's participation, both the local and central governments need to create awareness through training and appropriate extension programmes. The trained community leaders, forestry extension and community development workers are to be facilitated so that they can effectively participate in the sustainable management of shea parklands resources while promoting both the local land tenure and tree dynamics. This is expected to enhance the local communities' capacity to negotiate and clearly articulate or mutually appropriate agreements regarding land and tree rights.

vi. To improve planning and implementation of sustainable parklands' resources management, detailed surveys and research on local/ indigenous knowledge of useful tree species and their uses need to be carried out. Results from the surveys can then be used to plan for appropriate tree planting, afforestation, reforestation and shea parklands rehabilitation in the former IDP camps.

vii. All the above opportunities cannot however, be implemented without ensuring political stability of the war ravaged northern region. The Central government should capitalize on the peace process and push for a final agreement that will bring both sustainable peace and meaningful justice in northern Uganda.

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APPENDICES

Appendix I Questionnaire used to collect socio-economic data

ASSESSMENT OF INFLUENCE OF INTERNAL DISPLACEMENT ON ETHNO-USES, LOCAL COMMUNITIES' ATTITUDES TOWARDS MANAGEMENT AND CONSERVATION OF SHEA & OTHER TREES IN UGANDA SHEA PARKLANDS, 2007

SECTION 1. Demographic and socio-economic characteristics

1.1HouseholdNo……County:…………… Subcounty:………….. Parish:…………… Village:…………
1.2 Name:………………………
1.3 Sex:………Age:...yes
1.4 Occupation:………………
1.5 Number of persons in the Household ………
1.6 How long have lived in this village?………yrs
1.7 Education Level? None...1 Primary level…..2 Secondary….3 Tertiary……....4
1.8 Marital status: Married…..1 Single….2 Divorced…3 Windowed.…4 Separated.…..5
1.9 Sources of income for the household:

Major source of income	Ranks	Expenditure	Ranks

SECTION 2: SOCIO-ECONOMIC IMPORTANCE & ETHNO USES OF SHEA AND OTHER TTREES IN SHEA PARKLANDS

2.1 Are shea trees important to you? Yes [ ] No [ ]
2.2 If yes, in what ways?...
2.3 List the products that you or the family obtain from the shea trees and their uses by gender

Parts	Products	Source of knowledge by gender
Flowers		
Leaves		
Twigs		
Fruits		
Seed kernels		
Stem bark		
Root bark		
Log		
Shea tree itself		

•indicate whether men, women, boys girls or all

2.4 What other benefits does the family get from shea trees?………………………
2.5 What benefits do the family get from the shea parkland?..................................

2.6 How can you recognise a good shea tree?..

2.7 Apart from shea could you list other 9 major tree that are important to the household in this area?

Species/local name	Part utilized	Uses/function

2.8 could you please rank up to 4 most important trees that provide the following products/services:

Products/Services	Sale/home/both	Rank 1	Rank 2	Rank 3	Rank 4
Charcoal					
Firewood					
Poles/fence post					
Timber or sawn wood					
Fibre/rope					
Medicine					
Furniture					
Stools/crafts					
Food/fruits/seeds					
Ecological/ Environmental service					

SECTION 3: LOCAL MANAGEMENT AND CONSERVATION KNOWLEDGE OF SHEA IN THE SHEA PARKLAND

3.1 Do you manage the shea trees on your farm? Yes [ ] No [ ]

3.2 If yes, how do you manage?

a) A shea tree ……………………………………………………………….

b) The stands or population of shea trees:……………………………………….

c) The shea parkland/ woodland…………………………………………………

3.3 If no, who manages and how?…………………………………… ………… …… ……

Who manages	How managed

3.4 What manage problems do you encounter with shea trees in this area?……… ………… … … … … … … … … … … … … … …… … … …

3.5 What local knowledge do you have to address the problems? ………………………………

3.6 Could you list any taboos you are aware of in line with shae trees, parkland/ woodland?

3.7 What do you do to improve the quality of shea tree in terms of:

Variables	**Actions**
Tree	
Flowering	
Fruiting	
Fruit collection	
Germination	

3.8 When opening land for agricultural crops, do you cut or spare shea trees? … ……… ………… …………………………………………………………………………

3.9 If you cut, how do you choose the shea trees to be cut?..

3.10 If you spare, how do you choose the shea trees to spare?……………………………

3.11 Do you take care of the shea seedlings that you come across on your farm or woodland? Yes [ ]No

3.12 If yes, how? ………………………………………………………………………..

SECTION 4: ATTITUDES TOWARDS PLANTING AND PROTECTION

4.1 Do you plant or protect shea on your farm? Yes [ ]No [ ]

4.2 If yes, what motivates you to plant or protect shea?

SA (strongly agree) **A** (agree) **SD** (strongly disagree) **D** (Disagree) **DK** (don't know)

Variables	**Responses**					**Remarks/ reasons**
	SA	**A**	**D**	**SD**	**DK**	
Guaranteed future investment						
Sources of food (fruit, seed, oil)						
Source of wood (timber, poles)						
Energy (firewood and charcoal)						
Source of animal feed						
Source of medicine						
Most demanded species in the woodland						
Ca not be planted easily in any place						
Do not survive outside its natural habitat						
Planting/ protection conserve shea trees						
Easier to protect on farm						
Plenty of opportunities to domesticate and establish shea plantations						

4.3 If you do not plant or protect shea what discourages you from planting or protecting shea?

SA (strongly agree) **A** (agree) **SD** (strongly disagree) **D** (Disagree) **DK** (don't know)

Variables	**Responses**					**Remarks/ reasons**
	SA	**A**	**D**	**SD**	**DK**	

Competes with agricultural crops more than other trees						
Still plenty in the woodland/ parkland						
Harbour more natural pests than other trees						
Slow growing compared to other trees						

4.4 If No, what discourages you from planting shea on your farm? …………………
4.5 What do you think would encourage planting of shea in this area?............ ... .
4.6 What are you views about conservation of shea trees?...................... ....
4.7 What are the views of the local people on conservation of shea trees? …………………
4.8 Do you see shea trees being threatened? Yes [ ] No [ ]
4.9 If yes, complete the table below.

Threats	What should be do

4.10 Do you get advisory services on management and conservation of shea in woodland and on-farms? Yes [ ] No [ ]
4.11 If yes, complete the table below

Types of advice	Source of advice	View on the quality of advisory services

4.12 Which agricultural crops would you grow along side shea trees on farm? …………
4.13 Do you carry out any form of management on agricultural crops grown alongside shea trees?
Yes [ ] No [ ]
4.14 If yes, what kind of management?...................................... ....
4.15 Would you grow shea trees if planting materials were available? Yes [ ] No [ ]
4.16 If yes, where would you grow them?..
4.17 For what purpose would you grow shea trees? ………………………….
4.18 What other trees and shrubs would you grow alongside shea trees?

Trees/ shrubs	Reasons for growing

4.19 What do you think are the major threats to regeneration and management of seedlings and young shea trees?.......... ... .
4.20 How can the threats be minimized?.. ....
4.21 Are you aware of any by-laws on protection or conservation of shea trees? Yes [ ] No [
4.22 If yes, state the by-laws……………………………………………………….

4.23 If no, what do you think could be proposed as appropriate by-laws for conservation and protection of shea trees? ………

4.24 On farm lands…………………………………………………….

4.25 In woodlands……………………………………………………..

4.26 What has the community here agreed upon to see that shea trees are protected/ conserved?

……………………………………………………………………………………………………

4.27 What do you think could be appropriately done to ensure conservation of shea in this area? .. ...

....

SECTION 5: PLANTING AND PROPAGATION OF SHEA IN WOODLAND RESERVE

5.1 Do you know of any local method (s) of propagating and /or planting shea?
Yes [ ] No [ ]

5.2 If yes, describe it…………………… ………………………………

5.3 Have you ever planted shea nut tree? Yes [ ] No [ ]

5.4 If yes, where was it planted? …………………… ………………… ………… …

5.5 In what form was it planted? ……………… ………………… ………… ………

5.6 Give reasons for planting………….. ………….. ………….. ………… …………

5.7 What would encourage the family to plant shea their farm?............ ....

5.8 What would discourage the family to plant shea their farm?............ ....

5.9 What do you see as an opportunity for domesticating or planting shea trees

5.10 Would you grow shea trees if planting materials were available? Yes [ ] No [ ]

5.11 If yes, where would grow them……… ……………… …………… ……………

5.12 For what purpose would you grow shea trees?........... ....

SECTION 6: INFLUENCE OF INTERNAL DISPLACEMENT ON UTILISATION, MANGEMENT AND CONSERVATION OF SHEA TREES

6. 1 Have you ever been displaced? Yes [ ] No [ ]

6.2 If yes, where/ camp………………………………… ……….. …….. ……… …

6.3 How has the displacement affected the distribution of shea trees?………… ………… 6.4 How has the displacement affected the regeneration of shea trees?.................. ....

6.5 How has displacement affected various uses of shea trees

Products	How the use has been affected	Mitigation measures

6.6 How has the displacement affected conservation of shea trees on farm, woodland and in the area?

SECTION 7: MANAGEMENT OF SHEA WOODLAND RESERVE

7.1 Do you see tree population declining or increasing in this area? Yes [ ] No [ ]

7.2 If yes, tick category declining 1. Younger and regenerating trees 2. Mature trees 3. Both

7.3 If declining, what do you think could be the possible reasons for the decline for each species?

Tree species	Reasons for the decline	Mitigation measures

7.4 Have been involve in cutting trees from forest reserve? Yes [ ] No [ ]
7.5 Have you ever cut trees from woodland? Yes [ ] No [ ]
7.6 If yes, to any of the above, for what reasons do you cut the trees?

Tree species	Reasons for the cutting	Mitigation measures

7.7 Are you aware of any forest reserve with shea trees in this area? Yes [ ] No [ ]
7.8 If so, what is the name of the forest reserve?... ... .
7.9 Who manages the forest reserve?..
7.10 What management are being carried for the forest reserve?............. .... ……
7.11 Have you ever heard from any government official / NFA about conservation and management of shea nut in the forest reserve? Yes [ ] No [ ]
7.12 If yes, describe what you have heard……… …………………… …………
7.13 If no, what are your views on shea trees in government protected areas?....... .... ……… ……… …………… …………………… ………………………
7.14 Describe how you think shea trees should be conserved and managed for future generation in the forest reserve…… …………………… …………… ……………
7.15 If shea is to be planted in forest reserve what other trees do you think would also be conserved alongside shea trees?......... ....
7.16 Give reasons for the above…………………………………………
7.17 What is the government doing to ensure that shea trees and other useful trees to the community are made available or conserved?............ ....
7.18 If shea trees are to be grown, where would you want the plantation to be established?..... ....……… ………… ……………
7.19 Are you aware of any by-laws on protection or conservation of shea? Yes [ ] No [ ]
7.20 If yes, state them……………………………………………………………
7.21 If no, what do you think could be proposed as appropriate by-laws for conservation of shea trees
a) on farm land?..
b) in forest reserve?................. ....
7.22 How can these threats be minimised or addressed?...... ....
7.23 What other comments do you have on conservation and management of shea?..... ...

Thank you for your time and participation

Appendix II Tree inventory data sheet used

TREE INVENTORY DATA SHEET: MATURE TREES (10+ cm Dbh)

Transect number (Length up to 1.8 Km)…………… **plot size** 50 m x 40m

Plot No………… GPS center (clock wise): Date……………………………………….

Corner 1………………………………. 2……………………………………………

3………………………….. 4……………………………………………

TREE SPECIES	DBH/CIR	PLOT DECSCRIPTION

SAPLINGS AND POLES

Transect number (Length up to 1.8km……… **Plot size**. 20m x 20m Plot No.………

TREE SPECIES	DBH/CIRCUNFERENCE (5<10cm At Gruond Level) or Over 1m Above ground)	No.OF SAPLINGS(<5cm At Ground level or 50 cm to 1m Height)

REGENERATION OF V.PARADOXA (SEEDLINGS)

(Seedling are any young shea trees <50cm in height)

Transect number ……………… Plot size 10m x 10m: Plot No…………………….

SUBPLOTS	NUMBER	COMMENTS ON THE STATUS OF THE SUB PLOTS
SUB-PLOT 1		
SUB-PLOT 2		

SUB-PLOT 3		
SUB-PLOT 4		
SUB-PLOT 5		
TOTAL		

Appendix III: Use categories of tree species encountered in the study area

Use category	Freq	%
Firewood(Fw)	26	72.2
Medicine(Me)	12	33.3
Timber(Ti)	10	27.8
Fruit/food(Fr)	6	16.7
Construction(Co)	13	36.1
Charcoal(Ch)	6	16.7
Live fense(Lf)	5	13.9
Shade(Sh)	8	22.2
Crafts(Cfm)	8	22.2
Farm tools(Ft)	1	2.8
Poles(Po)	8	22.2
Fish floats(Ff)	1	2.8
Ornamental (On)	1	2.8
Sap(Sa)	1	2.8